

Appendix A: Data Collection

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Appendix A.1: Residential End Use Survey

A.1.1 – Summary of Findings

One of the key tasks in helping PSE develop its 2010 IRP was cataloging the assumptions from previous IRPs and looking for opportunities to update the data. One such identified area was customer characteristics and energy consumption patterns in the residential sector. As PSE had not conducted a Residential Appliance Saturation Survey (RASS) since 2003, it was determined that an update would be a worthwhile endeavor. An updated RASS was planned for late 2008, but these results would not be available in time for inclusion in the 2010 IRP, so a smaller-scale Residential End Use Survey (REUS) was designed and implemented by The Cadmus Group (formerly Quantec, LLC).

The main tasks in the design, implementation, and analysis of this survey were:

- Designing the survey instrument
- Creating the sample
- Conducting surveys
- Analyzing survey responses

Designing the Survey Instrument

To ensure that all necessary information was gathered, Cadmus worked closely with PSE staff on survey and question design. Questions were intended to gather information on:

- End uses present in homes
- Fuels used to run these end uses
- Building characteristics
- Energy efficiency measures already installed
- End use consumption estimates based on participant billing data

The final survey instrument is included in section A.1.2.

Creating the Sample

The sample frame used is this survey, as shown in Table 1, was intended to reflect the composition of PSE’s residential sector, based on dwelling type (single family, multifamily, and manufactured homes) as well as on service type (electricity only, natural gas only, and combination customers).

Table 1. Population Distribution Across Service and Dwelling Type

Service Type	Single Family		Multifamily		Manufactured		Total	
	Count	% of Population	Count	% of Population	Count	% of Population	Count	% of Population
Combo - Electric and Gas	316,788	25%	20,853	2%	2,686	0%	340,327	27%
Electric Only	308,338	25%	203,811	16%	65,881	5%	578,030	46%
Gas Only	305,024	24%	29,685	2%	673	0%	335,382	27%
Total	930,150	74%	254,349	20%	69,240	6%	1,253,739	100%

To obtain enough data points in each segment to attain statistically representative results, it was determined that 600 surveys would be completed, spread across the segments proportionally based on PSE’s customer population. Some segments, such as manufactured combo homes, were over-sampled in an effort to obtain a large enough sample to be statistically significant. Table 2 presents the sample distribution used for the survey quotas.

Table 2. Quota Distribution Across Service and Dwelling Type

Service Type	Single Family	Multifamily	Manufactured	Total
Combo - Electric and Gas	195	84	25	304
Electric Only	105	30	25	160
Gas Only	124	12	0	136
Total	424	126	50	600

A sample of 13,000 records, shown in Table 3, was drawn by PSE and provided to the professional survey firm contracted to administer the survey.

Table 3. Distribution of Survey Sample

Service Type	Single Family	Multifamily	Manufactured	Total
Combo - Electric and Gas	1,906	2,459	2,761	7,126
Electric Only	1,104	298	196	1,598
Gas Only	2,604	1,670	2	4,276
Total	5,614	4,427	2,959	13,000

Conducting the Survey

To administer the surveys, Cadmus contracted with Market Strategies. Of the 13,000 records provided, 3,171 were determined to be unusable prior to the fielding of the survey. This included: 2,741 cell phones, 285 “bad” numbers, 64 duplicates, and 81 records that were registered on the “do not call” list. Table 4 shows the sample attrition and final disposition for this study.

Table 4. Final Sample Disposition

	Record Disposition	Removed from Sample	Remaining
	Original Sample	-	13,000
Pre-call screen	Pre-Field Cleaning	3,171	9,829
	Quota Full	3,941	5,888
	No Answer	1,911	3,977
	Out of Service/Wrong Number	775	3,202
Unreachable	Answering Mach/Voice Mail	645	2,557
	Busy	201	2,356
	Business	86	2,270
	Refusal	1,604	666
Survey Not Completed	Screened Out	75	591
	Language Issues	74	517
	Completed Interview		517

Table 5 shows the distribution of the 517 surveys by service and dwelling types. As demonstrated, the number of customers in manufactured homes with gas service was very low, but this was to be expected, based on the population distribution (Table 1).

Table 5. Completed Survey Distribution Across Service and Dwelling Type

Service Type	Single Family		Multifamily		Manufactured		Total	
	Count	% of Completes	Count	% of Completes	Count	% of Completes	Count	% of Completes
Combo - Electric and Gas	145	28%	10	2%	2	0%	157	30%
Electric Only	99	19%	40	8%	38	7%	177	34%
Gas Only	169	33%	14	3%	0	0%	183	35%
Total	413	80%	64	12%	40	8%	517	100%

Analyzing Survey Responses

Upon survey completion, each question was analyzed for each segment and in aggregate. Frequency tables are provided in the appendices:

- A.1.3 – Survey Results by Service Type
- A.1.4 – Survey Results by Dwelling Type

Appendix A.1.2: Residential End Use Survey

February 2008
 Closed-ended:
 Other-Specified:

QAX. MOVE IN FUEL FROM SAMPLE

- 1 Puget Sound Energy (PSE)
-

QAY. MOVE IN SERVTYPE FROM SAMPLE

- 1 Electricity
 - 2 Natural Gas
 - 3 Electricity and Natural Gas
-

Hello, my name is _____, from Market Strategies and I'm calling on behalf of **Puget Sound Energy**. We are conducting a study about household energy use in Washington, and I'd like to ask you a few questions about the home at [address from sample]. I'm not selling anything, and your participation will help with future decisions regarding energy efficiency programs for consumers. [If necessary, refer customer to Bob Yetter, Market Research, at PSE. Dial 888-225-5773, select option 5, then dial ext. 81-3194.]

QA. First, can you verify that you are the person in your household who would be most likely to make decisions concerning your electric and gas utilities for the home at [Address from Sample]?

- 1 Yes {CONTINUE}
- 2 No {ASK TO SPEAK TO THIS PERSON; ARRANGE CALLBACK IF NECESSARY}
- DK {TERMINATE}
- REF {TERMINATE}

QB. Can you verify that PSE currently provides your [From Sample: Gas, Electricity, Gas AND Electricity] service?

- 1 Yes
- 2 No
 - a. If no, ask: What service is PSE providing to your home?

QC. Thank you. Do you own, rent, or lease this property?

- 1 Own
- 2 Rent
- 3 Lease
- 4 Other, Record
- 5 DK

QD. Which of the following best describes how the residence is occupied? [Prompt]

- 1 Year-round, full-time
- 2 Seasonal or part-time use – [Terminate]
- 3 Landlord of vacant unit– [Terminate]
- 4 Other [Specify]
- 5 Don't know – [Terminate]

NOTE: Residence Description

Q1. Which of the following best describes your home? (*READ CODES 1-4 AS NECESSARY*)

- 1 Single family **detached** house (on a separate lot) not connected to other living units
- 2 Single family **attached**, such as a duplex, **row- or townhouse** (*TECH NOTE: If necessary say: "It has adjacent walls to another residence with no units above or below."*)
- 3 A unit in a **condominium** or **apartment** building (*TECH NOTE: If necessary say: "The building has 4 or more attached units."*)
- 4 Manufactured home or house trailer, or
- 5 Something else [SPECIFY]
- DK {TERMINATE}
- REF {TERMINATE}

{ IF Q1=2 OR 3 ASK Q2, OTHERWISE GO TO Q3 }

Q2. How many living units or apartments are in the building where this residence is located? Please answer only for the building that contains this residence; do not consider other buildings that may exist in the complex.

[RECORD NUMBER 2-96]

DK
REF

Q3. How many levels or stories are there in this residence? Please do not include an unfinished attic, unfinished basement, garage, or other floors that are never heated and are not used for living space. [Do not prompt] (*IF Q1=2 OR 3, DISPLAY: "Please answer only for the portion of the building where your unit is located."*)

- 1 One story
- 2 One and a half stories
- 3 Split level or two stories
- 4 Two and a half stories
- 5 Tri level or three stories
- 6 More than three stories
- 4 Other [SPECIFY]

DK
REF

NOTE: Home Characteristics/Weatherization / Efficient Equipment

Q4. Is your home built on top of a foundation (a slab, with no basement), above a crawl space, above a unfinished basement, or above an finished basement? If different portions of your house have different configurations, please answer based on **the largest** portion of your home's footprint. (*READ CODES 1-4 AS NECESSARY*)

- 1 On a concrete slab or foundation
- 2 Above a crawl space
- 3 Above an unfinished basement
- 4 Above a finished basement

DK
REF

Q5. Approximately what percentage of this residence's windows are **double or triple-pane**?
[RECORD NUMBER 0-100]%

DK
REF

Q6. Approximately what percentage of your home's windows are equipped with **storm windows**? [Tech Note: If asked, A storm window is a secondary window, or perhaps a plastic sheet, that you place inside or outside your regular window to protect against the wind and cold. Storm windows are typically put on or pulled down before the winter, and removed or pulled up after the weather warms up each year.)

[RECORD NUMBER 0-100]%

DK
REF

- Q7. What is the approximate square footage of **heated floor space** in this residence? [If necessary, prompt with “Make a guess if you can”] (IF Q1=2 OR 3, DISPLAY: “Please indicate the number of square feet that pertains to your unit only.”)

[RECORD NUMBER OF SQUARE FEET 0-6000]

3001 More than 6,000 square feet
DK
REF

{ IF Q7=DK ASK Q8, OTHERWISE GO TO Q9 }

- Q8. Although you aren’t sure about the actual **heated floor space**, can you estimate the square footage of your home using these categories? (IF Q1=2 OR 3, DISPLAY: “Please indicate the category that pertains to your unit only.”) (READ CODES 1-7 AS NECESSARY)

1 Less than 500 square feet
2 501 to 1,000 square feet
3 1,001 to 1,500 square feet
4 1,501 to 2,000 square feet
5 2,001 to 2,500 square feet
6 2,501 to 3,000 square feet
7 3,001 to 4,000 square feet
8 4,001 to 5,000 square feet
9 5,001 to 6,000 square feet
More than 6,001 square feet
DK
REF

- Q9. How many heated rooms are in this residence? (Please include all heated areas. Do not include halls or foyers, bathrooms, closets, unheated porches, unheated garages, or unheated basement areas and rooms.)

[RECORD NUMBER]
DK
REF

- Q10. How many bathrooms are in this home? [If necessary: A full bath has a bathtub, toilet, and a sink; a $\frac{3}{4}$ bathroom has a toilet, shower, and sink; a half bath has a toilet and a sink; a $\frac{1}{4}$ bathroom has a toilet only.]?

1 None
2 One
3 1.25
4 1.5
5 1.75

6	2
7	2.25
8	2.5
9	2.75
10	3
11	3.25
12	3.5
13	3.75
14	4
15	More than 4
16	Other, record
17	DK
	REF

Q11. In what year was this residence built [If necessary, prompt with “Make a guess if you can”]
(*IF Q1=2 OR 3, DISPLAY: “Answer only for the building in which you live.”*)

[RECORD NUMBER 1800 - 2008]

DK

REF

{IF Q1 1=DK ASK Q11A, OTHERWISE GO TO INTRO BEFORE Q12}

Q11A. Although you aren’t sure about the actual **year your home was built**, can you identify which from this list the closest general time frame? (*IF Q1=2 OR 3, DISPLAY: “Answer only for the building in which you live.”*) Was it.... (*READ CODES 1-3 AS NECESSARY*)

1	Before 1940
2	1940 to 1959
3	1960 to 1979
4	1980 to 1985
5	1986 to 1990
6	1991 to 1995
7	1996 to 2000
8	2001 to 2002
9	2003 to 2004
10	2005
11	2006
12	2007
13	2008
	DK
	REF

NOTE: Home Heating Systems

In the next series of questions I'll be asking you about the **main heating system** in your home. Please answer the questions about the heating system that is used most.

{IF Q1=2 OR 3 ASK Q12, OTHERWISE GO TO FILTER BEFORE Q13}

Q12. Does the main heating system serve only this residence or does it serve more than one residence?

- 1 Only this residence
- 2 More than one residence
- DK
- REF

{IF Q1=1, 4, 5 OR Q12=1 ASK Q13, OTHERWISE GO TO INTRO BEFORE Q20}

Q13. What is the type of system that is used to heat the majority of your home? (*ASK AS OPEN END; ACCEPT ONE MENTION*) (*PROBE FOR SPECIFICS: For example, there are 2 different types of heat pumps.*)

- 1 Natural gas central forced air furnace
- 2 Natural gas hot water boiler (with radiators, baseboards or in the floor); also called natural gas hydronic heating
- 3 Electric hot water boiler (with radiators, baseboards or in the floor); also called electric hydronic heating
- 4 Natural gas steam boiler (with radiators)
- 5 Natural gas radiant floor heating
- 6 Natural gas fireplace or stove
- 7 Electric Baseboard, wall heaters (without fans), ceiling cables, or floor cables
- 8 Electric wall heaters with fans
- 9 Electric central forced air furnace
- 10 Air-source Heat pump (ELEC)
- 11 Ground-source heat pump (ELEC)
- 12 Portable heaters (ELEC)
- 13 Oil central forced air furnace
- 14 Oil hot water boiler (with radiators, baseboards, or in floor); also called oil hydronic heating
- 15 Oil steam boiler (with radiators)
- 16 Bottled gas central forced air (propane, butane, or kerosene)
- 17 Bottled gas portable heaters (propane, butane, or kerosene)
- 18 Wood or pellet stove – Skip to Q20
- 19 Wood fireplace – Skip to Q20
- 20 Solar
- 21 Other System & Fuel [SPECIFY]
- 22 None (No heating system) Skip to Q20
- DK
- REF

Q14. What type of temperature control is on the **main** heating system? (*TECH NOTE: If necessary say: "The one used most often."*) (*READ CODES 1-5 AS NECESSARY*)

- 1 Regular thermostat(s) with temperature settings
 - 2 Clock or programmable thermostat(s)
 - 3 Dial control **without** temperature settings
 - 4 Simple on/off switch or no temperature control, or
 - 5 Something else [SPECIFY]
 - DK
 - REF
-

Q15. Which of the following statements best describes how the main **heating** system is used? [NOTE: Select all that apply] (*If necessary, READ CODES 1-4*)

- 1 The thermostat(s) is kept at a constant setting or temperature
 - 2 The thermostat is adjusted when occupants are sleeping
 - 3 The thermostat is adjusted when occupants leave the house
 - 4 The heater is turned on only when someone is cold
 - DK
 - REF
-

{ IF Q15=1, 4, DK, REF ASK Q16, OTHERWISE GO TO FILTER BEFORE Q17 }

Q16. When you are **heating** your house, at what temperature do you normally keep your thermostat? (ASK AS OPEN END, ACCEPT ONE MENTION)

[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

- 97 97 degrees F or more
 - DK
 - REF
-

{ IF Q15=2 OR 3 ASK Q17-Q19, OTHERWISE GO TO Q20 }

When you are **heating** your house, at what **temperature** do you normally keep your thermostat set during these different periods of time?-

Q17. When one or more people in your household are at home and awake?

[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

- 97 97 degrees F or more
 - DK
 - REF
-

Q18. When one or more people in your household are at home and everyone is sleeping?
[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

97 97 degrees F or more
DK
REF

Q19. When no one is at home?
[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

97 97 degrees F or more
DK
REF

NOTE: Home Cooling Systems

Now, moving on to your home's cooling system...

{ IF Q1=2 OR 3 ASK Q20, OTHERWISE GO TO FILTER BEFORE Q21 }

Q20. Does the main **cooling** system serve only this residence or does it serve more than one residence?

1 Only this residence
2 More than one residence
3 Residence has no cooling system [VOL] [Go to Q30]
DK
REF

{ IF Q1=1, 4, 5 OR Q20=1 ASK Q21-Q24, OTHERWISE GO TO FILTER BEFORE Q29 }

Q21. Which of the following is the type of cooling system that is used to cool the majority of home? (*READ CODES 1-9 AS NECESSARY-select all that apply*)

1 Central air conditioner
2 Air-source heat pump
3 Ground-source heat pump
4 Room air conditioners
5 Ductless mini-split air conditioner
6 Evaporative cooler (Swamp cooler)
7 Portable fans
8 Whole-house fan, or
9 Ceiling fans
10 Something else [SPECIFY]
DK
REF

{ IF Q2 1=1-6, ASK Q22, OTHERWISE GO TO FILTER BEFORE Q29 }

Q22. What type of temperature control is on the main cooling system? (*TECH NOTE: If necessary say: "The one used most often."*) (*If necessary READ CODES 1-4*)

- 1 Regular thermostat(s) with temperature settings
- 2 Clock or programmable thermostat(s)
- 3 Dial control **without** temperature settings
- 4 Simple on/off switch or no temperature control
- 5 Other [SPECIFY]
- DK
- REF

Q23. Which of the following statements best describes how the main **cooling** system is used? [NOTE: Select all that apply] (*READ CODES 1-5*)

- 1 The thermostat(s) is kept at a constant setting or temperature
- 2 The thermostat is adjusted when occupants are sleeping
- 3 The thermostat is adjusted when occupants leave the house
- 4 The cooling system is turned on only when someone is warm
- 5 We rarely use this cooling system
- DK
- REF

{ IF Q23=1, 4, 5, DK, REF ASK Q24, OTHERWISE GO TO FILTER BEFORE Q25 }

Q24. When you are **cooling** your house, at what temperature do you normally keep your thermostat? (ASK AS OPEN END, ACCEPT ONE MENTION)

[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

- 97 97 degrees F or more
- DK
- REF

{ IF Q23=2, 3 ASK Q25-Q28, OTHERWISE GO TO Q29 }

Q25. When you are **cooling** your house, at what **temperature** do you normally keep your thermostat set during these different periods of time? –

Q26. When one or more people in your household are at home and awake?

[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

- 97 97 degrees F or more
- DK
- REF

Q27. When one or more people in your household are at home and everyone is sleeping?
[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

97 97 degrees F or more

DK

REF

Q28. When no one is at home?
[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

97 97 degrees F or more

DK

REF

NOTE: Water Heating

I'd like to now ask you some questions about the water heater that you use to heat water for dish-washing, bathing, etc.

{IF Q1=2 OR 3 ASK Q29, OTHERWISE GO TO FILTER BEFORE Q30}

Q29. Does the water heater, or the source of the hot water, serve only this residence or does it serve more than one residence?

1 Only this residence

2 Central water heating or tank for more than one residence

3 This residence has no hot water (Skip to Intro for Q38)

DK

REF

{IF Q1=1, 4, 5 OR Q29=1 ASK Q30, OTHERWISE GO TO INTRO BEFORE Q38}

Q30. How many water heaters are at this residence?

1 One

2 Two

3 Three or more

DK

REF

*(IF Q30=2 OR 3, RESTORE: "In the next series of questions I'll be asking you about the **primary** or **main** water heater for your house. Please answer these questions about the water heater that is used the most.")*

Q31. What type of water heater do you have? (*READ CODES 1-5 AS NECESSARY*)

- 1 Tank-type water heater. This is **the most common** type of water heater.
 - 2 Heat pump water heater
 - 3 Indirect water heater that uses the home's boiler as the heat source or an integrated water heater that is also used to heat the home.
 - 4 Solar water heater
 - 5 Tankless hotwater heater, also called Demand or instantaneous water heaters
- DK
REF
-

{IF Q3 1=4, ASK Q32-Q32A, OTHERWISE GO TO Q33}

Q32. What type of system is used in conjunction with your solar water heater? (*READ CODES 1-2*)

- 1 Tank-type water heater (this is the "standard" type, with a water storage tank)
 - 2 Tankless hotwater heater, also called Demand or Instantaneous water heaters
- DK
REF
-

Q32A. What is the secondary or back-up type of fuel you use to heat water at this residence? (*READ CODES 1-4 AS NECESSARY*)

- 1 Electricity
 - 2 Natural gas
 - 3 Propane or bottled gas (LP, propane, butane), or
 - 4 Something else [SPECIFY]
- DK
REF
-

{IF Q3 1=4, GO TO Q34}

Q33. What type of fuel or energy is used to heat the water used in this residence? (*READ CODES 1-4 AS NECESSARY*)

- 1 Electricity
 - 2 Natural gas
 - 3 Propane or bottled gas (LP, propane, butane), or
 - 4 Something else [SPECIFY]
- DK
REF
-

Q34. At what **specific temperature** is your water heater thermostat set? (*ASK AS OPEN END, ACCEPT ONE MENTION*)

[RECORD NUMBER OF DEGREES FAHRENHEIT 0-200]

DK
REF

{IF Q34=DK ASK Q34A, OTHERWISE GO TO INTRO BEFORE Q35}

Q34A. If not set at a specific temperature, then which of these statements best describes where your water heater thermostat is set? (*READ CODES 1-5 AS NECESSARY*)

- 1 On the “low” setting
- 2 Between the “low” and “medium” settings
- 3 On the “medium” setting
- 4 Between the “medium” and “high” settings
- 5 On the “high” setting

DK
REF

Which of the following items do you have for your **main** water heater? Do you have ...

Q35. A water heater tank wrap

- 1 Yes
- 2 No

DK
REF

Q36. Pipe insulation

- 1 Yes
- 2 No

DK
REF

Q37. A water heater timer

- 1 Yes
- 2 No

DK
REF

NOTE: Appliances & Other Equipment

In this section I will be asking about the appliances and other equipment you have in your home.

Now, about your refrigerator(s)...

Q38. How many refrigerators are in your home?

[RECORD NUMBER 0-10]

DK
REF

{IF Q38 > 0, ASK Q39, OTHERWISE GO TO INTRO BEFORE Q40}

Q39. How many years old is your (*IF Q38 > 1 RESTORE: "primary"*) refrigerator? ? (*READ CODES 1-3*)

1 6 or less years old
2 7 to 14 years old
3 15 or more years old

DK
REF

Now, about your freezer(s)...

Q40. How many stand-alone freezers are in your home?

[RECORD NUMBER 0-10]

DK
REF

{IF Q40 > 0, ASK Q41, OTHERWISE GO TO Q42}

Q41. How many years old is your (*IF Q40 > 1 RESTORE: "primary"*) stand-alone freezer? (*READ CODES 1-3*)

1 6 or less years old
2 7 to 14 years old
3 15 or more years old

DK
REF

Q42. How many dishwashers are in your home?

[RECORD NUMBER 0-10]

DK
REF

Now, about your clothes washer...

Q43. Do you have a private clothes washer that is used just by the people in your household?

- 1 Yes
 - 2 No
 - DK
 - REF
-

{ IF Q43=1 ASK Q44, OTHERWISE GO TO Q45 }

Q44 Which of the following best describes the type of clothes washer in your home? (*READ CODES 1-2*)

- 1 Front Load Washing Machine
 - 2 Top Load Washing Machine
 - 3 Other: Specify
 - DK
 - REF
-

Q45. Do you have a clothes dryer that is used just by the people in your household?

- 1 Yes
 - 2 No
 - DK
 - REF
-

{ IF Q45=1 ASK Q46, OTHERWISE GO TO Q47 }

Q46. What fuel or energy source do you use for your clothes dryer? (*READ CODES 1-4 AS NECESSARY*)

- 1 Electricity
 - 2 Natural gas
 - 3 Propane or bottled gas (LP, propane, butane)
 - 4 Something else [SPECIFY]
 - DK
 - REF
-

Q47. Do you have your own swimming pool? (*If necessary, clarify: A private pool that only your household has access to.*)

- 1 Yes
 - 2 No
 - DK
 - REF
-

{ IF Q47=1 ASK Q48-48B, OTHERWISE GO TO Q49 }

Q48. You probably use one fuel to “**run**” your pool and another to **heat** the water. What fuel or energy source do you use to **heat** your swimming pool? (*READ CODES 1-5 AS NECESSARY*)

- 1 Electricity
 - 2 Natural gas
 - 3 Solar
 - 4 Propane or bottled gas (LP, propane, butane)
 - 5 Not heated
 - 6 Something else [SPECIFY]
 - DK
 - REF
-

Q48A. How often do you operate your pool pump and filtration system? (*READ CODES 1-2 AS NECESSARY*)

- 1 All day and all night?
 - 2 Turned off at night? or
 - 3 Something else [SPECIFY]
 - DK
 - REF
-

Q48B. Do you own an insulating cover for your pool?

- 1 Yes
 - 2 No
 - DK
 - REF
-

Q49. Do you have your own hot tub or spa? (*If necessary, clarify: A private hot tub or spa that only your household has access to.*)

- 1 Yes
 - 2 No
 - DK
 - REF
-

{ IF Q49=1 ASK Q50, OTHERWISE GO TO Q51 }

Q50. What fuel or energy source do you use for your hot tub or spa? (*READ CODES 1-3 AS NECESSARY*)

- 1 Electricity
- 2 Natural gas
- 3 Propane or bottled gas (LP, propane, butane)
- 4 Something else [SPECIFY]
- DK
- REF

Q50A. Do you have your own sauna? *(If necessary, clarify: A private sauna that only your household has access to.)*

- 1 Yes
 - 2 No
 - DK
 - REF
-

{IF Q50A=1 ASK Q50B, OTHERWISE GO TO Q51}

Q50B. What fuel or energy source do you use for sauna? *(READ CODES 1-4 AS NECESSARY)*

- 1 Electricity
 - 2 Natural gas
 - 3 Propane or bottled gas (LP, propane, butane)
 - 4 Something else [SPECIFY]
 - DK
 - REF
-

Next, I'd like to ask about your cooking equipment. Some people have cook-tops that are separate from their ovens. Others have a range where the cook-top and oven are contained in one appliance. For the next few questions, please think of your cook-top and oven as two separate items

Q51. How many cook-top units do you have.

[RECORD NUMBER 0-2] {If more than two: "Note that you may have multiple burners in your cook-top, but only one unit" – recode as necessary }

- DK
 - REF
-

{IF Q51>0 ASK Q52, OTHERWISE GO TO Q53}

Q52. What fuel or energy source do you use for your cook-top(s)? *(READ CODES 1-4 AS NECESSARY)*

- 1 Electricity
 - 2 Natural gas
 - 3 Propane or bottled gas (LP, propane, butane)
 - 4 Something else [SPECIFY]
 - DK
 - REF
-

Q53. How many ovens do you have?

[RECORD NUMBER 0-10]

DK
REF

{ IF Q53>0 ASK Q54, OTHERWISE GO TO Q55 }

Q54. What fuel or energy source do you use for your oven(s)? (*READ CODES 1-4 AS NECESSARY*)

- 1 Electricity
- 2 Natural gas
- 3 Propane or bottled gas (LP, propane, butane)
- 4 Something else [SPECIFY]

DK
REF

Q55. How many microwave ovens do you have?

[RECORD NUMBER 0-10]

DK
REF

NOTE: Audio Visual Equipment

SCREEN DESIGN: RANDOMIZE QUESTIONS Q56–Q69

PROG. NOTE: BLOCK Q56-Q62, BLOCK Q56-Q57

PROG. NOTE: BLOCK Q64-Q69

Now, in order to get an idea of the way your home is using energy, I'd like to find out about your audio/video equipment and your home office equipment. For each piece of equipment I mention, please tell me how many of each you have in your home. What is the total number of ...

[RECORD NUMBER 0-96]

DK
REF

Q56. Televisions, **of all types**, in your home?

{ IF Q56=1-96 ASK Q57, OTHERWISE CONTINUE }

PROG. NOTE: IF Q57>Q56 DISPLAY: "*You have reported having a greater number of Flat Screen tvs than the total number of televisions of all types in your home.*"

Q57. Large flat screen tvs (over 32 inches)?

Q58. Game console (Playstation, Wii, Nintendo, xbox, xCube, etc)

- Q59. VCRs or DVD players (not a combo unit)
- Q60. Combination VCR and DVD unit
- Q61. Stand-alone DVR (not TIVO)
- Q62. TIVO, Cable or satellite TV set-top boxes or receivers in your home ?
- Q63. Stereo systems in your home?
- Q64. Personal computers, including laptops, in your home?
{IF Q64=1-96 ASK Q65, OTHERWISE GO TO Q66}
- Q65. Computer monitors in your home?
- Q66. Combination printer / fax / copiers in your home?
- Q67. Standalone Printers in your home?
- Q68. Standalone Fax machines in your home?
- Q69. Standalone Copiers in your home?
{ASK Q70 LAST}
- Q70. Surge protector strips for any of the audio/video or home office equipment mentioned above?
- Q71. Which, if any, of the appliances in your home are ENERGYSTAR rated? [RECORD APPLIANCE AND VERIFY COUNT]

NOTE: Occupancy Characteristics

- Q72. Including yourself, how many people usually live in this residence at least six months of the year? Please include all members of your household whether or not they are related to you, but do not include anyone who is just visiting or children who may be away at college or in the military.

[RECORD NUMBER 1-96]

DK

REF

We'd like to ask a few more questions to get a feel for your energy usage patterns: [If the respondent hesitates to answer Q73 or Q74: Your answers to these questions are kept anonymous, and will be handled with strict confidentiality. If you have any concerns, Bob Yetter at PSE can be reached using a toll free number. {Refer contact if requested - Dial 888-225-5773, select option 5, then dial ext. 81-3194}]

Q73. On a typical weekday, for what average length of time is your home occupied by at least one person [Do not read. If necessary, prompt with randomized option from list]?

- 1 23-24 hrs/day
 - 2 21-22 hrs/day
 - 3 19-20 hrs/day
 - 4 17-18 hrs/day
 - 5 15-16 hrs/day
 - 6 13-14 hrs/day
 - 7 11-12 hrs/day
 - 8 9-10 hrs/day
 - 9 7-8 hrs/day
 - 10 5-6 hrs/day
 - 11 3-4 hrs/day
 - 12 1-2 hrs/day
-

Q74. On a typical weekend, for what average length of time is your home occupied by at least one person [Do not read. If necessary, prompt with randomized option from list]?

- 1 23-24 hrs/day
 - 2 21-22 hrs/day
 - 3 19-20 hrs/day
 - 4 17-18 hrs/day
 - 5 15-16 hrs/day
 - 6 13-14 hrs/day
 - 7 11-12 hrs/day
 - 8 9-10 hrs/day
 - 9 7-8 hrs/day
 - 10 5-6 hrs/day
 - 11 3-4 hrs/day
 - 12 1-2 hrs/day
-

“Thank you very much for your cooperation and assistance!”

Appendix A.1.3 Survey Results by Service Type

The following tables present the results of the survey by service type. The actual number of responses in each customer segment have been extrapolated to the population to provide an estimate of the results across PSE’s entire service territory.

Table B.1

Question ax. Service type from sample	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Electric and Gas (combo)	341,000	0	0	341,000
	27.2%	0	0	27.2%
Electric only	0	578,030	0	578,030
	0	46.1%	0	46.1%
Gas only	0	0	334,709	334,709
	0	0	26.7%	26.7%

Table B.2

Question c. Do you own or rent or lease this property?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Own	307,625	392,820	294,761	995,206
	24.5%	31.3%	23.5%	79.4%
Rent	28,528	160,794	38,164	227,486
	2.3%	12.8%	3.0%	18.1%
Lease	4,847	21,293	1,785	27,924
	0.4%	1.7%	0.1%	2.2%
Refused	0	3,123	0	3,123
	0	0.2%	0	0.2%

Table B.3

Question d. Which of the following best describes how the residence is occupied?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Year-round, full-time	341,000	578,030	334,709	1,253,739
	27.2%	46.1%	26.7%	100.0%

Table B.4

Question 1. Which of the following best describes your home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Single family detached home	296,117	320,013	287,179	903,308
	23.6%	25.5%	22.9%	72.0%
Duplex, row- or townhouse	19,838	33,694	21,309	74,841
	1.6%	2.7%	1.7%	6.0%
Apartment or condo	21,687	171,267	24,437	217,390
	1.7%	13.7%	1.9%	17.3%
Manufactured home	3,359	53,056	1,785	58,199
	0.3%	4.2%	0.1%	4.6%

Table B.5

Question 1c. Which of the following best describes your home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Single family	296,117 23.6%	320,013 25.5%	287,179 22.9%	903,308 72.0%
Multi-family	41,524 3.3%	204,961 16.3%	45,746 3.6%	292,232 23.3%
Manufactured home	3,359 0.3%	53,056 4.2%	1,785 0.1%	58,199 4.6%

Table B.6

Question 2c. How many living units or apartments are in the building where this residence is located?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
2 units	9,254 0.7%	5,095 0.4%	17,068 1.4%	31,417 2.5%
3 units	2,085 0.2%	10,191 0.8%	0 0	12,276 1.0%
4 units	13,267 1.1%	25,476 2.0%	4,241 0.3%	42,984 3.4%
5 or more units	12,670 1.0%	159,104 12.7%	24,437 1.9%	196,210 15.7%
Don't know	4,249 0.3%	5,095 0.4%	0 0	9,345 0.7%
Not applicable	299,476 23.9%	373,069 29.8%	288,963 23.0%	961,507 76.7%

Table B.7

Question 3. How many levels or stories are there in this residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
One story	106,787 8.5%	264,413 21.1%	114,014 9.1%	485,213 38.7%
One and a half stories	8,657 0.7%	11,102 0.9%	5,354 0.4%	25,112 2.0%
Split level or two stories	178,340 14.2%	199,625 15.9%	155,763 12.4%	533,727 42.6%
Two and a half stories	15,149 1.2%	34,023 2.7%	12,828 1.0%	62,000 4.9%
Tri level or three stories	27,819 2.2%	55,554 4.4%	38,941 3.1%	122,314 9.8%
More than three stories	4,249 0.3%	13,313 1.1%	7,810 0.6%	25,373 2.0%

Table B.8

Question 4. On which of the following is your home built?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Concrete slab or foundation	89,937 7.2%	254,691 20.3%	101,310 8.1%	445,938 35.6%
Above a crawl space	185,260 14.8%	174,979 14.0%	122,479 9.8%	482,718 38.5%
Above an unfinished basement	16,343 1.3%	28,928 2.3%	51,555 4.1%	96,826 7.7%
Above a finished basement	41,040 3.3%	57,033 4.5%	55,460 4.4%	153,533 12.2%
Don't know	6,335 0.5%	47,352 3.8%	3,905 0.3%	57,592 4.6%
Refused	2,085 0.2%	15,047 1.2%	0 0	17,132 1.4%

Table B.9

Question 5c. Approximately what percentage of this residence’s windows are double or triple-pane?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
25% or less	34,175	115,132	42,526	191,833
	2.7%	9.2%	3.4%	15.3%
26% - 50%	17,234	20,709	16,061	54,005
	1.4%	1.7%	1.3%	4.3%
51% - 75%	4,328	11,102	7,367	22,798
	0.3%	0.9%	0.6%	1.8%
76% - 100%	266,912	407,821	250,238	924,971
	21.3%	32.5%	20.0%	73.8%
Don't know	15,588	23,265	18,517	57,371
	1.2%	1.9%	1.5%	4.6%
Refused	2,761	0	0	2,761
	0.2%	0	0	0.2%

Table B.10

Question 6c. Approximately what percentage of your home's windows are equipped with storm windows?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
25% or less	279,366	441,621	254,159	975,146
	22.3%	35.2%	20.3%	77.8%
26% - 50%	4,328	13,313	18,075	35,716
	0.3%	1.1%	1.4%	2.8%
51% - 75%	3,844	6,246	0	10,089
	0.3%	0.5%	0	0.8%
76% - 100%	29,735	74,026	43,959	147,719
	2.4%	5.9%	3.5%	11.8%
Don't know	23,727	42,824	18,517	85,068
	1.9%	3.4%	1.5%	6.8%

Table B.11

Question 7c. What is the approximate square footage of heated floor space in this residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Less than 500 square feet	0	37,490	0	37,490
	0	3.0%	0	3.0%
501 to 1,000 square feet	26,849	136,485	31,467	194,800
	2.1%	10.9%	2.5%	15.5%
1,001 to 1,500 square feet	40,589	126,218	77,317	244,124
	3.2%	10.1%	6.2%	19.5%
1,501 to 2,000 square feet	110,732	123,858	69,049	303,640
	8.8%	9.9%	5.5%	24.2%
2,001 to 2,500 square feet	51,940	54,822	63,146	169,908
	4.1%	4.4%	5.0%	13.6%
2,501 to 3,000 square feet	46,044	17,348	41,732	105,124
	3.7%	1.4%	3.3%	8.4%
3,001 to 4,000 square feet	47,611	15,614	16,397	79,622
	3.8%	1.2%	1.3%	6.4%
4,001 to 5,000 square feet	4,328	6,246	1,785	12,359
	0.3%	0.5%	0.1%	1.0%
More than 6,000 square feet	2,164	0	0	2,164
	0.2%	0	0	0.2%
Don't know	10,742	59,950	33,816	104,508
	0.9%	4.8%	2.7%	8.3%

Table B.12

Question 8. Although you aren't sure about the actual heated floor space can you estimate the square footage of your home using these categories?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Less than 500 square feet	0	13,658	0	13,658
	0	1.1%	0	1.1%
501 to 1,000 square feet	2,085	28,360	11,944	42,390
	0.2%	2.3%	1.0%	3.4%
1,001 to 1,500 square feet	2,164	7,979	7,138	17,282
	0.2%	0.6%	0.6%	1.4%
1,501 to 2,000 square feet	2,164	0	3,798	5,962
	0.2%	0	0.3%	0.5%
2,001 to 2,500 square feet	2,164	0	0	2,164
	0.2%	0	0	0.2%
Don't know	2,164	9,952	9,152	21,268
	0.2%	0.8%	0.7%	1.7%
Refused	0	0	1,785	1,785
	0	0	0.1%	0.1%
Not applicable	330,258	518,080	300,893	1,149,231
	26.3%	41.3%	24.0%	91.7%

Table B.13

Question 9. How many heated rooms are in this residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
1	0	8,218	3,798	12,016
	0	0.7%	0.3%	1.0%

Question 9. How many heated rooms are in this residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
2	2,164 0.2%	54,420 4.3%	3,905 0.3%	60,489 4.8%
3	8,420 0.7%	43,169 3.4%	15,955 1.3%	67,544 5.4%
4	27,413 2.2%	125,472 10.0%	36,592 2.9%	189,476 15.1%
5	27,603 2.2%	98,919 7.9%	47,864 3.8%	174,386 13.9%
6	65,443 5.2%	73,771 5.9%	58,235 4.6%	197,449 15.7%
7	43,801 3.5%	87,323 7.0%	56,237 4.5%	187,361 14.9%
8	60,112 4.8%	33,307 2.7%	47,085 3.8%	140,504 11.2%
9	45,447 3.6%	21,860 1.7%	20,195 1.6%	87,502 7.0%
10	28,134 2.2%	11,102 0.9%	18,075 1.4%	57,311 4.6%
11	8,657 0.7%	11,102 0.9%	8,923 0.7%	28,682 2.3%
12	8,657 0.7%	3,123 0.2%	7,138 0.6%	18,918 1.5%
13	2,164 0.2%	3,123 0.2%	5,354 0.4%	10,641 0.8%

Question 9. How many heated rooms are in this residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
14	6,492	0	0	6,492
	0.5%	0	0	0.5%
15	2,164	0	1,785	3,949
	0.2%	0	0.1%	0.3%
16	0	3,123	1,785	4,907
	0	0.2%	0.1%	0.4%
Don't know	4,328	0	1,785	6,113
	0.3%	0	0.1%	0.5%

Table B.14

Question 9c. How many heated rooms are in this residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
1	0	8,218	3,798	12,016
	0	0.7%	0.3%	1.0%
2	2,164	54,420	3,905	60,489
	0.2%	4.3%	0.3%	4.8%
3	8,420	43,169	15,955	67,544
	0.7%	3.4%	1.3%	5.4%
4	27,413	125,472	36,592	189,476
	2.2%	10.0%	2.9%	15.1%
5	27,603	98,919	47,864	174,386
	2.2%	7.9%	3.8%	13.9%
6	65,443	73,771	58,235	197,449
	5.2%	5.9%	4.6%	15.7%
7	43,801	87,323	56,237	187,361
	3.5%	7.0%	4.5%	14.9%
8	60,112	33,307	47,085	140,504
	4.8%	2.7%	3.8%	11.2%
9	45,447	21,860	20,195	87,502
	3.6%	1.7%	1.6%	7.0%
10	28,134	11,102	18,075	57,311
	2.2%	0.9%	1.4%	4.6%
More than 10 rooms	28,134	20,471	24,984	73,588
	2.2%	1.6%	2.0%	5.9%

Question 9c. How many heated rooms are in this residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Don't know	4,328	0	1,785	6,113
	0.3%	0	0.1%	0.5%

Table B.15

Question 10. How many bathrooms are in this home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
None	0	13,313	5,354	18,667
	0	1.1%	0.4%	1.5%
1	38,266	202,335	88,589	329,191
	3.1%	16.1%	7.1%	26.3%
1.25	4,328	6,246	0	10,574
	0.3%	0.5%	0	0.8%
1.5	17,910	32,395	18,533	68,838
	1.4%	2.6%	1.5%	5.5%
1.75	10,821	19,082	9,488	39,390
	0.9%	1.5%	0.8%	3.1%
2	78,947	196,166	85,461	360,574
	6.3%	15.6%	6.8%	28.8%
2.25	63,121	42,569	58,571	164,261
	5.0%	3.4%	4.7%	13.1%
2.5	0	3,123	7,138	10,261
	0	0.2%	0.6%	0.8%
2.75	108,129	53,433	52,317	213,878
	8.6%	4.3%	4.2%	17.1%
3	2,164	0	1,785	3,949
	0.2%	0	0.1%	0.3%
3.5	6,492	3,123	2,120	11,736
	0.5%	0.2%	0.2%	0.9%

Question 10. How many bathrooms are in this home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
4	10,821	6,246	5,354	22,420
	0.9%	0.5%	0.4%	1.8%

Table B.16

Question 11c. In what year was this residence built?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Before 1940	6,492 0.5%	33,201 2.6%	87,385 7.0%	127,078 10.1%
1940 to 1959	33,059 2.6%	29,839 2.4%	73,624 5.9%	136,523 10.9%
1960 to 1979	132,081 10.5%	206,294 16.5%	50,654 4.0%	389,029 31.0%
1980 to 1985	23,806 1.9%	50,432 4.0%	8,923 0.7%	83,160 6.6%
1986 to 1990	32,383 2.6%	60,278 4.8%	12,492 1.0%	105,153 8.4%
1991 to 1995	28,055 2.2%	39,208 3.1%	27,104 2.2%	94,367 7.5%
1996 to 2000	34,548 2.8%	37,490 3.0%	42,953 3.4%	114,991 9.2%
2001 to 2002	15,746 1.3%	9,952 0.8%	6,254 0.5%	31,952 2.5%
2003 to 2004	17,077 1.4%	9,713 0.8%	1,785 0.1%	28,574 2.3%
2005	2,164 0.2%	5,095 0.4%	3,569 0.3%	10,829 0.9%
2006	2,164 0.2%	4,035 0.3%	5,689 0.5%	11,888 0.9%

Question 11c. In what year was this residence built?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
2007	4,328	0	3,569	7,897
	0.3%	0	0.3%	0.6%
2008	0	3,467	0	3,467
	0	0.3%	0	0.3%
Don't know	9,096	89,026	10,707	108,830
	0.7%	7.1%	0.9%	8.7%

Table B.17

Question 11a. Although you aren't sure about the actual year your home was built can you identify which from this list is the closest general time frame?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Before 1940	2,761	0	1,785	4,546
	0.2%	0	0.1%	0.4%
1940 to 1959	0	3,123	1,785	4,907
	0	0.2%	0.1%	0.4%
1960 to 1979	2,085	40,523	3,569	46,178
	0.2%	3.2%	0.3%	3.7%
1980 to 1985	0	5,095	0	5,095
	0	0.4%	0	0.4%
1986 to 1990	0	1,734	1,785	3,518
	0	0.1%	0.1%	0.3%
1991 to 1995	0	1,734	1,785	3,518
	0	0.1%	0.1%	0.3%
1996 to 2000	2,085	10,191	0	12,276
	0.2%	0.8%	0	1.0%
Don't know	2,164	26,627	0	28,791
	0.2%	2.1%	0	2.3%
Not applicable	331,904	489,004	324,002	1,144,909
	26.5%	39.0%	25.8%	91.3%

Table B.18

Question 12. Does the main heating system serve only this residence or does it serve more than one residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Only this residence	41,524 3.3%	186,553 14.9%	35,480 2.8%	263,557 21.0%
More than one residence	0 0	13,313 1.1%	8,146 0.6%	21,459 1.7%
Don't know	0 0	5,095 0.4%	2,120 0.2%	7,216 0.6%
Not applicable	299,476 23.9%	373,069 29.8%	288,963 23.0%	961,507 76.7%

Table B.19

Question 13. What is the type of system that is used to heat the majority of your home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Natural Gas: Central forced air furnace	285,611 22.8%	98,647 7.9%	265,429 21.2%	649,688 51.8%
Natural Gas: Hot water boiler	8,172 0.7%	1,734 0.1%	7,474 0.6%	17,380 1.4%
Electric: Hot water boiler	0 0	26,494 2.1%	0 0	26,494 2.1%
Natural Gas: Steam boiler	0 0	0 0	3,569 0.3%	3,569 0.3%
Natural Gas: Radiant floor heating	0 0	0 0	1,785 0.1%	1,785 0.1%
Natural Gas: Fireplace or stove	4,249 0.3%	13,313 1.1%	14,841 1.2%	32,404 2.6%
Electric: Baseboard, wall heaters, ceiling cables, or floor cables	8,420 0.7%	172,941 13.8%	11,043 0.9%	192,404 15.3%
Electric: Wall heaters with fans	2,085 0.2%	20,709 1.7%	1,785 0.1%	24,579 2.0%
Electric: Central forced air furnace	8,657 0.7%	42,903 3.4%	2,120 0.2%	53,680 4.3%
Electric: Air-source heat pump	4,328 0.3%	25,672 2.0%	0 0	30,000 2.4%
Electric: Ground-source heat pump	2,164 0.2%	4,857 0.4%	0 0	7,021 0.6%

Question 13. What is the type of system that is used to heat the majority of your home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Electric: Portable heaters	0	7,979	0	7,979
	0	0.6%	0	0.6%
Oil: Central forced air furnace	0	23,593	0	23,593
	0	1.9%	0	1.9%
Oil: Hot water boiler (with radiators, baseboards, or in floor)	0	3,123	0	3,123
	0	0.2%	0	0.2%
Bottled Gas: Central forced air (propane, butane, kerosene)	0	12,836	1,785	14,620
	0	1.0%	0.1%	1.2%
Bottled Gas: Portable heaters (propane, butane, kerosene)	0	6,246	0	6,246
	0	0.5%	0	0.5%
Wood: Wood stove or pellet stove	6,492	22,443	1,785	30,720
	0.5%	1.8%	0.1%	2.5%
Wood: Fireplace	2,164	7,979	0	10,144
	0.2%	0.6%	0	0.8%
Other system and fuel	2,164	22,443	1,785	26,392
	0.2%	1.8%	0.1%	2.1%
None (No heating system)	0	0	1,785	1,785
	0	0	0.1%	0.1%
Don't know	6,492	42,585	9,259	58,336
	0.5%	3.4%	0.7%	4.7%
Refused	0	3,123	0	3,123
	0	0.2%	0	0.2%
Not applicable	0	18,409	10,266	28,675
	0	1.5%	0.8%	2.3%

Table B.20

Question 14. What type of temperature control is on the main heating system?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Regular thermostat(s) with temperature settings	109,829 8.8%	291,932 23.3%	98,625 7.9%	500,386 39.9%
Clock or programmable thermostat(s)	213,936 17.1%	136,572 10.9%	194,809 15.5%	545,317 43.5%
Dial control without temperature settings	2,085 0.2%	44,797 3.6%	14,276 1.1%	61,158 4.9%
Simple on/off switch or no temperature control	2,164 0.2%	10,191 0.8%	3,905 0.3%	16,260 1.3%
No response	0 0	33,800 2.7%	3,905 0.3%	37,705 3.0%
Not applicable	12,985 1.0%	60,739 4.8%	19,189 1.5%	92,913 7.4%

Table B.21

Question 15. Which of the following describes how the main heating system is used?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
The thermostat(s) is kept at a constant setting or temperature	68,046 6.1%	128,997 11.6%	87,017 7.8%	284,060 25.5%
The thermostat is adjusted when occupants are sleeping	236,242 21.2%	248,836 22.4%	167,034 15.0%	652,111 58.6%

The thermostat is adjusted when occupants leave the house	167,473	180,028	142,370	489,872
	15.0%	16.2%	12.8%	44.0%
The heater is turned on only when someone is cold	47,002	156,461	55,109	258,572
	4.2%	14.1%	5.0%	23.2%

Table B.22

Question 16. Home heating - at what temperature do you normally keep your thermostat?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	0	5,095	0	5,095
	0	0.4%	0	0.4%
50	0	8,218	0	8,218
	0	0.7%	0	0.7%
55	2,164	6,829	1,785	10,778
	0.2%	0.5%	0.1%	0.9%
58	2,164	5,095	3,569	10,829
	0.2%	0.4%	0.3%	0.9%
59	0	0	1,785	1,785
	0	0	0.1%	0.1%
60	8,578	26,388	3,569	38,535
	0.7%	2.1%	0.3%	3.1%
62	0	0	5,354	5,354
	0	0	0.4%	0.4%
63	2,085	6,246	1,785	10,115
	0.2%	0.5%	0.1%	0.8%
64	0	8,547	1,785	10,331
	0	0.7%	0.1%	0.8%
65	10,742	40,958	15,177	66,877
	0.9%	3.3%	1.2%	5.3%
66	2,164	0	1,785	3,949
	0.2%	0	0.1%	0.3%

Question 16. Home heating - at what temperature do you normally keep your thermostat?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
67	6,492	8,218	12,492	27,202
	0.5%	0.7%	1.0%	2.2%
68	33,499	37,835	36,927	108,261
	2.7%	3.0%	2.9%	8.6%
69	6,492	6,246	7,138	19,876
	0.5%	0.5%	0.6%	1.6%
70	22,239	54,032	32,580	108,851
	1.8%	4.3%	2.6%	8.7%
71	2,164	5,095	5,354	12,613
	0.2%	0.4%	0.4%	1.0%
72	0	24,416	3,569	27,985
	0	1.9%	0.3%	2.2%
73	0	3,123	0	3,123
	0	0.2%	0	0.2%
75	2,761	9,368	1,785	13,914
	0.2%	0.7%	0.1%	1.1%
76	2,164	0	2,120	4,285
	0.2%	0	0.2%	0.3%
Don't know	0	10,191	0	10,191
	0	0.8%	0	0.8%
Refused	2,164	8,218	0	10,382
	0.2%	0.7%	0	0.8%
Not applicable	235,127	303,913	196,152	735,192
	18.8%	24.2%	15.6%	58.6%

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Table B.23

Question 17. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and awake?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	0	10,191	0	10,191
	0	0.8%	0	0.8%
54	0	0	1,785	1,785
	0	0	0.1%	0.1%
55	0	5,095	0	5,095
	0	0.4%	0	0.4%
59	0	0	1,785	1,785
	0	0	0.1%	0.1%
60	4,249	3,123	1,785	9,157
	0.3%	0.2%	0.1%	0.7%
62	0	14,464	0	14,464
	0	1.2%	0	1.2%
63	0	0	3,798	3,798
	0	0	0.3%	0.3%
64	8,657	3,123	1,785	13,564
	0.7%	0.2%	0.1%	1.1%
65	21,484	33,784	11,379	66,647
	1.7%	2.7%	0.9%	5.3%
66	10,336	3,123	3,569	17,028
	0.8%	0.2%	0.3%	1.4%
67	21,642	23,593	28,143	73,378
	1.7%	1.9%	2.2%	5.9%

Question 17. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and awake?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
68	81,110 6.5%	72,875 5.8%	61,133 4.9%	215,118 17.2%
69	25,970 2.1%	9,368 0.7%	21,873 1.7%	57,211 4.6%
70	57,948 4.6%	55,766 4.4%	51,752 4.1%	165,465 13.2%
71	13,424 1.1%	8,324 0.7%	3,569 0.3%	25,317 2.0%
72	8,657 0.7%	19,665 1.6%	3,905 0.3%	32,226 2.6%
73	2,164 0.2%	0 0	0 0	2,164 0.2%
75	0 0	11,341 0.9%	2,120 0.2%	13,461 1.1%
Don't know	0 0	1,734 0.1%	3,569 0.3%	5,303 0.4%
Not applicable	85,360 6.8%	302,461 24.1%	132,762 10.6%	520,583 41.5%

Table B.24

Question 18. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	10,663 0.9%	23,265 1.9%	5,354 0.4%	39,282 3.1%
37	0 0	0 0	1,785 0.1%	1,785 0.1%
40	0 0	5,095 0.4%	0 0	5,095 0.4%
45	2,164 0.2%	5,095 0.4%	1,785 0.1%	9,044 0.7%
50	6,492 0.5%	9,368 0.7%	1,785 0.1%	17,645 1.4%
52	2,164 0.2%	0 0	0 0	2,164 0.2%
53	2,164 0.2%	0 0	0 0	2,164 0.2%
55	21,078 1.7%	22,788 1.8%	16,519 1.3%	60,385 4.8%
56	4,328 0.3%	0 0	1,785 0.1%	6,113 0.5%
57	2,164 0.2%	6,246 0.5%	0 0	8,410 0.7%
58	12,985 1.0%	9,952 0.8%	1,785 0.1%	24,721 2.0%

Question 18. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
59	4,328	6,246	0	10,574
	0.3%	0.5%	0	0.8%
60	43,722	43,603	32,580	119,905
	3.5%	3.5%	2.6%	9.6%
61	4,328	4,857	5,354	14,538
	0.3%	0.4%	0.4%	1.2%
62	23,806	14,225	32,687	70,717
	1.9%	1.1%	2.6%	5.6%
63	15,149	4,857	9,381	29,386
	1.2%	0.4%	0.7%	2.3%
64	10,336	12,491	7,367	30,195
	0.8%	1.0%	0.6%	2.4%
65	42,313	58,305	34,471	135,090
	3.4%	4.7%	2.7%	10.8%
66	15,070	4,857	11,272	31,199
	1.2%	0.4%	0.9%	2.5%
67	10,821	4,857	7,367	23,045
	0.9%	0.4%	0.6%	1.8%
68	17,234	11,102	23,199	51,536
	1.4%	0.9%	1.9%	4.1%
69	2,164	0	0	2,164
	0.2%	0	0	0.2%

Question 18. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
70	2,164 0.2%	13,313 1.1%	5,689 0.5%	21,167 1.7%
Don't know	0	11,924 1.0%	1,785 0.1%	13,709 1.1%
Refused	0	3,123 0.2%	0	3,123 0.2%
Not applicable	85,360 6.8%	302,461 24.1%	132,762 10.6%	520,583 41.5%

Table B.25

Question 19. Home heating - at what temperature do you normally keep your thermostat set when no one is at home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	19,241 1.5%	41,435 3.3%	16,061 1.3%	76,737 6.1%
40	0 0	1,734 0.1%	0 0	1,734 0.1%
45	2,164 0.2%	8,218 0.7%	1,785 0.1%	12,167 1.0%
50	12,906 1.0%	14,225 1.1%	3,569 0.3%	30,700 2.4%
52	2,164 0.2%	0 0	1,785 0.1%	3,949 0.3%
53	0 0	0 0	2,014 0.2%	2,014 0.2%
54	0 0	3,123 0.2%	0 0	3,123 0.2%
55	25,485 2.0%	26,149 2.1%	7,138 0.6%	58,773 4.7%
56	4,328 0.3%	8,218 0.7%	1,785 0.1%	14,331 1.1%
57	2,164 0.2%	3,123 0.2%	2,014 0.2%	7,301 0.6%
58	11,418 0.9%	8,218 0.7%	5,583 0.4%	25,219 2.0%

Question 19. Home heating - at what temperature do you normally keep your thermostat set when no one is at home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
59	0	3,123	0	3,123
	0	0.2%	0	0.2%
60	60,033	49,265	42,068	151,366
	4.8%	3.9%	3.4%	12.1%
61	2,164	0	0	2,164
	0.2%	0	0	0.2%
62	12,985	9,713	29,118	51,816
	1.0%	0.8%	2.3%	4.1%
63	10,821	6,829	7,367	25,017
	0.9%	0.5%	0.6%	2.0%
64	8,657	3,123	12,721	24,500
	0.7%	0.2%	1.0%	2.0%
65	22,757	42,108	26,768	91,633
	1.8%	3.4%	2.1%	7.3%
66	10,742	4,857	11,272	26,871
	0.9%	0.4%	0.9%	2.1%
67	6,492	4,857	0	11,349
	0.5%	0.4%	0	0.9%
68	21,642	1,734	8,923	32,298
	1.7%	0.1%	0.7%	2.6%
69	2,164	0	2,014	4,178
	0.2%	0	0.2%	0.3%
70	0	0	8,923	8,923
	0	0	0.7%	0.7%

Question 19. Home heating - at what temperature do you normally keep your thermostat set when no one is at home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
71	4,328 0.3%	0 0	1,785 0.1%	6,113 0.5%
72	0 0	3,123 0.2%	0 0	3,123 0.2%
Don't know	10,821 0.9%	24,416 1.9%	7,474 0.6%	42,710 3.4%
Refused	2,164 0.2%	7,979 0.6%	1,785 0.1%	11,928 1.0%
Not applicable	85,360 6.8%	302,461 24.1%	132,762 10.6%	520,583 41.5%

Table B.26

Question 20. Does the main cooling system serve only this residence or does it serve more than one residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Only this residence	17,674	10,191	11,715	39,579
	1.4%	0.8%	0.9%	3.2%
More than one residence	0	10,191	1,785	11,975
	0	0.8%	0.1%	1.0%
Residence has more than one cooling system	21,765	179,485	32,247	233,497
	1.7%	14.3%	2.6%	18.6%
Don't know	2,085	0	0	2,085
	0.2%	0	0	0.2%
Refused	0	5,095	0	5,095
	0	0.4%	0	0.4%
Not applicable	299,476	373,069	288,963	961,507
	23.9%	29.8%	23.0%	76.7%

Table B.27

Question 21. Which of the following is the type of cooling system that is used to cool the majority of home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Central air conditioner	71,338 10.0%	26,955 3.8%	23,535 3.3%	121,828 17.0%
Air-source heat pump	6,492 0.9%	43,020 6.0%	7,138 1.0%	56,650 7.9%
Ground-source heat pump	2,164 0.3%	14,570 2.0%	2,014 0.3%	18,747 2.6%
Room air conditioners	19,399 2.7%	26,255 3.7%	21,873 3.1%	67,526 9.4%
Ductless mini-split air conditioner	0 0%	0 0%	0 0%	0 0%
Evaporative cooler (swamp cooler)	0 0	7,979 1.1%	1,785 0.2%	9,764 1.4%
Portable fans	139,621 19.5%	114,834 16.1%	111,255 15.6%	365,710 51.1%
Whole-house fan	6,492 0.9%	20,815 2.9%	12,721 1.8%	40,029 5.6%
Ceiling fans	74,178 10.4%	82,439 11.5%	65,389 9.1%	222,007 31.0%
Something else (specify)	2,164 0.3%	0 0	0 0	2,164 0.3%

Table B.28

Question 22. What type of temperature control is on the main cooling system?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Regular thermostat(s) with temperature settings	19,477 1.6%	36,774 2.9%	17,845 1.4%	74,097 5.9%
Clock or programmable thermostat(s)	73,424 5.9%	52,627 4.2%	20,195 1.6%	146,245 11.7%
Dial control without temperature settings	2,164 0.2%	19,665 1.6%	3,569 0.3%	25,398 2.0%
Simple on/off switch or no temperature control	4,328 0.3%	6,590 0.5%	9,381 0.7%	20,299 1.6%
Don't know	0 0	0 0	3,569 0.3%	3,569 0.3%
Not applicable	241,606 19.3%	462,374 36.9%	280,150 22.3%	984,130 78.5%

Table B.29

Question 23. Which of the following statements best describes how the main cooling system is used?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
The thermostat(s) is kept at a constant setting or temperature	10,742 4.0%	26,255 9.9%	3,569 1.3%	40,566 15.3%
The thermostat is adjusted when occupants are sleeping	12,985 4.9%	19,665 7.4%	3,569 1.3%	36,219 13.6%
The thermostat is adjusted when occupants leave the house	8,657 3.3%	11,686 4.4%	1,785 0.7%	22,127 8.3%
The cooling system is turned on only when someone is warm	41,040 15.4%	37,357 14.1%	30,673 11.5%	109,071 41.0%
We rarely use this cooling system	32,462 30.8%	52,733 50.1%	20,088 19.1%	105,283 100.0%

Table B.30

Question 24. Home cooling - at what temperature do you normally keep your thermostat?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
50	4,328	0	0	4,328
	0.3%	0	0	0.3%
55	0	3,123	0	3,123
	0	0.2%	0	0.2%
60	0	6,829	5,354	12,183
	0	0.5%	0.4%	1.0%
62	2,164	0	0	2,164
	0.2%	0	0	0.2%
64	2,164	0	2,014	4,178
	0.2%	0	0.2%	0.3%
65	8,578	0	1,785	10,362
	0.7%	0	0.1%	0.8%
67	4,328	1,734	1,785	7,847
	0.3%	0.1%	0.1%	0.6%
68	2,164	6,246	7,138	15,548
	0.2%	0.5%	0.6%	1.2%
69	2,164	3,123	0	5,287
	0.2%	0.2%	0	0.4%
70	12,985	17,931	8,923	39,839
	1.0%	1.4%	0.7%	3.2%
71	2,164	1,734	0	3,898
	0.2%	0.1%	0	0.3%

Question 24. Home cooling - at what temperature do you normally keep your thermostat?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
72	8,657 0.7%	12,491 1.0%	5,354 0.4%	26,502 2.1%
73	2,164 0.2%	0 0	1,785 0.1%	3,949 0.3%
74	10,821 0.9%	3,123 0.2%	1,785 0.1%	15,728 1.3%
75	8,578 0.7%	8,324 0.7%	3,569 0.3%	20,471 1.6%
78	2,164 0.2%	1,734 0.1%	3,905 0.3%	7,803 0.6%
80	0 0	6,246 0.5%	0 0	6,246 0.5%
82	0 0	3,123 0.2%	0 0	3,123 0.2%
85	0 0	3,123 0.2%	0 0	3,123 0.2%
87	0 0	3,123 0.2%	0 0	3,123 0.2%
Don't know	10,821 0.9%	24,283 1.9%	7,596 0.6%	42,700 3.4%
Refused	0 0	3,123 0.2%	1,785 0.1%	4,907 0.4%
Not applicable	256,756 20.5%	468,620 37.4%	281,934 22.5%	1,007,309 80.3%

Table B.31

Question 26. Home cooling - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and awake?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
67	0	0	1,785	1,785
	0	0	4.6%	4.6%
68	2,164	0	0	2,164
	5.6%	0	0	5.6%
70	2,164	14,808	1,785	18,757
	5.6%	38.6%	4.6%	48.9%
71	2,164	0	0	2,164
	5.6%	0	0	5.6%
72	0	3,123	0	3,123
	0	8.1%	0	8.1%
73	2,164	0	0	2,164
	5.6%	0	0	5.6%
74	2,164	0	0	2,164
	5.6%	0	0	5.6%
75	0	1,734	0	1,734
	0	4.5%	0	4.5%
78	2,164	0	0	2,164
	5.6%	0	0	5.6%
Don't know	2,164	0	0	2,164
	5.6%	0	0	5.6%

Table B.32

Question 27. Home cooling - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	4,328	6,829	1,785	12,942
	0.3%	0.5%	0.1%	1.0%
60	0	1,734	0	1,734
	0	0.1%	0	0.1%
65	2,164	0	1,785	3,949
	0.2%	0	0.1%	0.3%
68	0	3,123	0	3,123
	0	0.2%	0	0.2%
70	2,164	3,123	0	5,287
	0.2%	0.2%	0	0.4%
72	0	3,123	0	3,123
	0	0.2%	0	0.2%
73	2,164	0	0	2,164
	0.2%	0	0	0.2%
75	2,164	0	0	2,164
	0.2%	0	0	0.2%
82	2,164	0	0	2,164
	0.2%	0	0	0.2%
Refused	0	1,734	0	1,734
	0	0.1%	0	0.1%
Not applicable	325,851	558,365	331,140	1,215,356
	26.0%	44.5%	26.4%	96.9%

Table B.33

Question 28. Home cooling - at what temperature do you normally keep your thermostat set when no one is at home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	4,328	9,952	0	14,280
	0.3%	0.8%	0	1.1%
60	0	1,734	0	1,734
	0	0.1%	0	0.1%
66	2,164	0	0	2,164
	0.2%	0	0	0.2%
67	0	0	1,785	1,785
	0	0	0.1%	0.1%
68	2,164	0	0	2,164
	0.2%	0	0	0.2%
70	0	0	1,785	1,785
	0	0	0.1%	0.1%
72	0	3,123	0	3,123
	0	0.2%	0	0.2%
73	2,164	0	0	2,164
	0.2%	0	0	0.2%
75	2,164	3,123	0	5,287
	0.2%	0.2%	0	0.4%
78	2,164	0	0	2,164
	0.2%	0	0	0.2%
Refused	0	1,734	0	1,734
	0	0.1%	0	0.1%

Question 28. Home cooling - at what temperature do you normally keep your thermostat set when no one is at home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Not applicable	325,851	558,365	331,140	1,215,356
	26.0%	44.5%	26.4%	96.9%

Table B.34

Question 29. Does the water heater or the source of the hot water serve only this residence or does it serve more than one residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Only this residence	39,360	186,553	35,480	261,393
	3.1%	14.9%	2.8%	20.8%
Central water heating or tank for more than one residence	2,164	13,313	8,481	23,959
	0.2%	1.1%	0.7%	1.9%
This residence has no hot water	0	5,095	0	5,095
	0	0.4%	0	0.4%
Don't know	0	0	1,785	1,785
	0	0	0.1%	0.1%
Not applicable	299,476	373,069	288,963	961,507
	23.9%	29.8%	23.0%	76.7%

Table B.35

Question 30. How many water heaters are at this residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
One	312,269 24.9%	525,837 41.9%	311,615 24.9%	1,149,722 91.7%
Two	22,239 1.8%	28,689 2.3%	11,043 0.9%	61,970 4.9%
Three or more	2,164 0.2%	5,095 0.4%	0 0	7,259 0.6%
Don't know	2,164 0.2%	0 0	1,785 0.1%	3,949 0.3%
Not applicable	2,164 0.2%	18,409 1.5%	10,266 0.8%	30,839 2.5%

Table B.36

Question 31. What type of water heater do you have?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Tank-type water heater	323,766	520,159	306,598	1,150,522
	25.8%	41.5%	24.5%	91.8%
Indirect water heater or integrated water heater	2,085	6,246	5,354	13,685
	0.2%	0.5%	0.4%	1.1%
Tankless hotwater heater aka demand or instantaneous water heater	10,821	13,075	8,923	32,818
	0.9%	1.0%	0.7%	2.6%
Don't know	2,164	20,142	3,569	25,876
	0.2%	1.6%	0.3%	2.1%
Not applicable	2,164	18,409	10,266	30,839
	0.2%	1.5%	0.8%	2.5%

Table B.37

Question 32. What type of system is used in conjunction with your solar water heater?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Not applicable	341,000	578,030	334,709	1,253,739
	27.2%	46.1%	26.7%	100.0%

Table B.38

Question 32a. What is the secondary or back-up type of fuel you use to heat water at this residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Not applicable	341,000	578,030	334,709	1,253,739
	27.2%	46.1%	26.7%	100.0%

Table B.39

Question 33. What type of fuel or energy is used to heat the water used in this residence?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Electricity	46,890	426,023	50,883	523,797
	3.7%	34.0%	4.1%	41.8%
Natural gas	285,532	88,129	266,086	639,746
	22.8%	7.0%	21.2%	51.0%
Propane or bottled gas (LP, propane, butane)	0	25,327	0	25,327
	0	2.0%	0	2.0%
Don't know	4,249	0	3,905	8,154
	0.3%	0	0.3%	0.7%
Not applicable	4,328	38,551	13,835	56,714
	0.3%	3.1%	1.1%	4.5%

Table B.40

Question 34. At what specific temperature is your water heater thermostat set?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
69	2,164	0	0	2,164
	0.2%	0	0	0.2%
70	2,164	0	1,785	3,949
	0.2%	0	0.1%	0.3%
72	0	5,095	0	5,095
	0	0.4%	0	0.4%
75	0	0	1,785	1,785
	0	0	0.1%	0.1%
80	0	3,123	0	3,123
	0	0.2%	0	0.2%
85	0	3,123	0	3,123
	0	0.2%	0	0.2%
90	4,328	0	0	4,328
	0.3%	0	0	0.3%
98	0	0	3,569	3,569
	0	0	0.3%	0.3%
100	8,657	14,464	5,354	28,474
	0.7%	1.2%	0.4%	2.3%
102	4,328	3,123	1,785	9,236
	0.3%	0.2%	0.1%	0.7%
105	0	3,123	0	3,123
	0	0.2%	0	0.2%

Question 34. At what specific temperature is your water heater thermostat set?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
109	0	0	1,785	1,785
	0	0	0.1%	0.1%
110	8,657	27,867	7,138	43,662
	0.7%	2.2%	0.6%	3.5%
114	0	0	1,785	1,785
	0	0	0.1%	0.1%
115	10,742	11,102	5,354	27,198
	0.9%	0.9%	0.4%	2.2%
118	0	1,734	0	1,734
	0	0.1%	0	0.1%
120	43,317	81,316	64,383	189,015
	3.5%	6.5%	5.1%	15.1%
125	10,821	9,368	11,165	31,355
	0.9%	0.7%	0.9%	2.5%
130	10,742	11,102	7,138	28,982
	0.9%	0.9%	0.6%	2.3%
135	0	4,857	1,785	6,641
	0	0.4%	0.1%	0.5%
140	17,313	27,061	3,798	48,172
	1.4%	2.2%	0.3%	3.8%
145	2,164	0	0	2,164
	0.2%	0	0	0.2%

Question 34. At what specific temperature is your water heater thermostat set?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
150	2,761	0	1,785	4,546
	0.2%	0	0.1%	0.4%
155	0	0	1,785	1,785
	0	0	0.1%	0.1%
160	2,164	1,734	0	3,898
	0.2%	0.1%	0	0.3%
165	2,164	6,246	0	8,410
	0.2%	0.5%	0	0.7%
170	0	4,857	0	4,857
	0	0.4%	0	0.4%
180	2,164	3,123	1,785	7,072
	0.2%	0.2%	0.1%	0.6%
185	0	1,734	0	1,734
	0	0.1%	0	0.1%
190	2,085	0	0	2,085
	0.2%	0	0	0.2%
Don't know	202,100	335,472	200,483	738,055
	16.1%	26.8%	16.0%	58.9%
Not applicable	2,164	18,409	10,266	30,839
	0.2%	1.5%	0.8%	2.5%

Table B.41

Question 34a. If not set at a specific temperature then which of these statements best describes where your water heater thermostat is set?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
On the 'low' setting	4,328	21,876	9,610	35,814
	0.3%	1.7%	0.8%	2.9%
Between the 'low' and 'medium' settings	12,500	36,340	18,304	67,144
	1.0%	2.9%	1.5%	5.4%
On the 'medium' setting	87,006	122,767	83,661	293,434
	6.9%	9.8%	6.7%	23.4%
Between the 'medium' and 'high' setting	58,714	52,882	59,455	171,051
	4.7%	4.2%	4.7%	13.6%
On the 'high' setting	15,746	6,246	1,785	23,776
	1.3%	0.5%	0.1%	1.9%
Don't know	23,806	95,362	27,669	146,836
	1.9%	7.6%	2.2%	11.7%
Not applicable	138,900	242,558	134,226	515,684
	11.1%	19.3%	10.7%	41.1%

Table B.42

Question 35. Which of the following items do you have for your main water heater? Do you have a water heater tank wrap?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Yes	127,234	189,364	87,475	404,073
	10.1%	15.1%	7.0%	32.2%
No	193,770	329,628	209,742	733,140
	15.5%	26.3%	16.7%	58.5%
Don't know	17,831	40,629	27,226	85,687
	1.4%	3.2%	2.2%	6.8%
Not applicable	2,164	18,409	10,266	30,839
	0.2%	1.5%	0.8%	2.5%

Table B.43

Question 36. Which of the following items do you have for your main water heater? Do you have pipe insulation?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Yes	207,038	284,099	150,957	642,094
	16.5%	22.7%	12.0%	51.2%
No	96,135	211,522	138,572	446,229
	7.7%	16.9%	11.1%	35.6%
Don't know	35,663	64,000	34,914	134,577
	2.8%	5.1%	2.8%	10.7%
Not applicable	2,164	18,409	10,266	30,839
	0.2%	1.5%	0.8%	2.5%

Table B.44

Question 37. Which of the following items do you have for your main water heater? Do you have a water heater timer?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Yes	34,548	58,528	21,415	114,490
	2.8%	4.7%	1.7%	9.1%
No	276,154	408,166	250,605	934,925
	22.0%	32.6%	20.0%	74.6%
Don't know	28,134	92,928	52,423	173,485
	2.2%	7.4%	4.2%	13.8%
Not applicable	2,164	18,409	10,266	30,839
	0.2%	1.5%	0.8%	2.5%

Table B.45

Question 38. How many refrigerators are in your home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
1	229,513	442,937	251,032	923,482
	18.3%	35.3%	20.0%	73.7%
2	104,995	131,970	80,108	317,073
	8.4%	10.5%	6.4%	25.3%
3	4,328	3,123	3,569	11,020
	0.3%	0.2%	0.3%	0.9%
4	2,164	0	0	2,164
	0.2%	0	0	0.2%

Table B.46

Question 39. How many years old is your primary refrigerator?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
6 or less years old	204,670	310,530	175,729	690,929
	16.3%	24.8%	14.0%	55.1%
7 to 14 years old	106,032	150,872	98,625	355,529
	8.5%	12.0%	7.9%	28.4%
15 or more years old	28,134	72,875	56,786	157,796
	2.2%	5.8%	4.5%	12.6%
Don't know	2,164	43,752	3,569	49,485
	0.2%	3.5%	0.3%	3.9%

Table B.47

Question 40. How many stand-alone freezers are in your home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	174,699	308,544	211,421	694,664
	13.9%	24.6%	16.9%	55.4%
1	152,719	250,404	114,366	517,488
	12.2%	20.0%	9.1%	41.3%
2	13,582	19,082	8,923	41,586
	1.1%	1.5%	0.7%	3.3%

Table B.48

Question 41. How many years old is your 'primary' stand-alone freezer?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
6 or less years old	49,697 4.0%	82,811 6.6%	39,718 3.2%	172,225 13.7%
7 to 14 years old	41,716 3.3%	82,705 6.6%	34,471 2.7%	158,892 12.7%
15 or more years old	72,724 5.8%	89,162 7.1%	49,099 3.9%	210,985 16.8%
Don't know	2,164 0.2%	14,808 1.2%	0 0	16,973 1.4%
Not applicable	174,699 13.9%	308,544 24.6%	211,421 16.9%	694,664 55.4%

Table B.49

Question 42. How many dishwashers are in your home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	19,996 1.6%	67,451 5.4%	46,415 3.7%	133,862 10.7%
1	321,004 25.6%	507,456 40.5%	280,820 22.4%	1,109,280 88.5%
2	0 0	3,123 0.2%	7,474 0.6%	10,597 0.8%

Table B.50

Question 43. Do you have a private clothes washer that is used just by the people in your household?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Yes	341,000	498,611	320,874	1,160,485
	27.2%	39.8%	25.6%	92.6%
No	0	79,419	13,835	93,254
	0	6.3%	1.1%	7.4%

Table B.51

Question 44. Which of the following best describes the type of clothes washer in your home?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Front load washing machine	120,956	93,807	118,606	333,370
	9.6%	7.5%	9.5%	26.6%
Top load washing machine	217,880	404,804	200,483	823,166
	17.4%	32.3%	16.0%	65.7%
Don't know	2,164	0	1,785	3,949
	0.2%	0	0.1%	0.3%
Not applicable	0	79,419	13,835	93,254
	0	6.3%	1.1%	7.4%

Table B.52

Question 45. Do you have a clothes dryer that is used just by the people in your household?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Yes	336,075	498,611	319,089	1,153,775
	26.8%	39.8%	25.5%	92.0%
No	4,925	79,419	15,620	99,964
	0.4%	6.3%	1.2%	8.0%

Table B.53

Question 46. What fuel or energy source do you use for your clothes dryer?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Electricity	262,054	444,595	254,052	960,701
	22.7%	38.5%	22.0%	83.3%
Natural gas	71,935	34,351	60,904	167,190
	6.2%	3.0%	5.3%	14.5%
Propane or bottled gas (LP, propane, butane)	0	12,836	0	12,836
	0	1.1%	0	1.1%
Something else (specify)	0	1,734	0	1,734
	0	0.2%	0	0.2%
Don't know	2,085	5,095	4,134	11,315
	0.2%	0.4%	0.4%	1.0%

Table B.54

Question 47. Do you have your own swimming pool?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Yes	8,172	11,102	9,152	28,426
	0.7%	0.9%	0.7%	2.3%
No	332,828	566,928	325,557	1,225,313
	26.5%	45.2%	26.0%	97.7%

Table B.55

Question 48. What fuel or energy source do you use to heat your swimming pool?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Electricity	0	1,734	3,569	5,303
	0	0.1%	0.3%	0.4%
Natural gas	6,492	0	5,583	12,075
	0.5%	0	0.4%	1.0%
Solar	0	6,246	0	6,246
	0	0.5%	0	0.5%
Not heated	0	3,123	0	3,123
	0	0.2%	0	0.2%
Don't know	1,680	0	0	1,680
	0.1%	0	0	0.1%
Not applicable	332,828	566,928	325,557	1,225,313
	26.5%	45.2%	26.0%	97.7%

Table B.56

Question 48a. How often do you operate your pool pump and filtration system?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
All day and all night	0	0	1,785	1,785
	0	0	0.1%	0.1%
Turned off at night	2,164	0	5,583	7,747
	0.2%	0	0.4%	0.6%
Something else (specify)	4,328	7,979	1,785	14,092
	0.3%	0.6%	0.1%	1.1%
Don't know	1,680	3,123	0	4,802
	0.1%	0.2%	0	0.4%
Not applicable	332,828	566,928	325,557	1,225,313
	26.5%	45.2%	26.0%	97.7%

Table B.57

Question 48b. Do you own an insulating cover for your pool?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Yes	0	7,979	5,583	13,562
	0	0.6%	0.4%	1.1%
No	8,172	3,123	3,569	14,864
	0.7%	0.2%	0.3%	1.2%
Not applicable	332,828	566,928	325,557	1,225,313
	26.5%	45.2%	26.0%	97.7%

Table B.58

Question 49. Do you have your own hot tub or spa?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Yes	38,955	28,795	32,580	100,329
	3.1%	2.3%	2.6%	8.0%
No	302,045	549,235	302,129	1,153,410
	24.1%	43.8%	24.1%	92.0%

Table B.59

Question 50. What fuel or energy source do you use for your hot tub or spa?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Electricity	32,462	25,672	25,213	83,347
	2.6%	2.0%	2.0%	6.6%
Natural gas	6,492	3,123	7,367	16,983
	0.5%	0.2%	0.6%	1.4%
Not applicable	302,045	549,235	302,129	1,153,410
	24.1%	43.8%	24.1%	92.0%

Table B.60

Question 50a. Do you have your own sauna?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Yes	4,328	17,587	3,569	25,484
	0.3%	1.4%	0.3%	2.0%
No	336,672	558,710	331,140	1,226,521
	26.9%	44.6%	26.4%	97.8%
Don't know	0	1,734	0	1,734
	0	0.1%	0	0.1%

Table B.61

Question 50b. What fuel or energy source do you use for your sauna?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Electricity	4,328	17,587	3,569	25,484
	0.3%	1.4%	0.3%	2.0%
Not applicable	336,672	560,443	331,140	1,228,255
	26.9%	44.7%	26.4%	98.0%

Table B.62

Question 51. How many cook-top units do you have?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	19,320	42,585	14,276	76,182
	1.5%	3.4%	1.1%	6.1%
1	315,672	501,077	306,156	1,122,906
	25.2%	40.0%	24.4%	89.6%
2	6,008	29,272	14,276	49,556
	0.5%	2.3%	1.1%	4.0%
Don't know	0	5,095	0	5,095
	0	0.4%	0	0.4%

Table B.63

Question 52. What fuel or energy source do you use for your cook-top(s)?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Electricity	195,720	436,781	180,975	813,476
	15.6%	34.8%	14.4%	64.9%
Natural gas	125,960	64,774	137,337	328,071
	10.0%	5.2%	11.0%	26.2%
Propane or bottled gas (LP, propane, butane)	0	28,795	0	28,795
	0	2.3%	0	2.3%
Don't know	0	0	2,120	2,120
	0	0	0.2%	0.2%
No response	0	5,095	0	5,095
	0	0.4%	0	0.4%

Not applicable	19,320	42,585	14,276	76,182
	1.5%	3.4%	1.1%	6.1%

Table B.64

Question 53. How many ovens do you have?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	0	6,246	0	6,246
	0	0.5%	0	0.5%
1	273,990	514,646	305,927	1,094,563
	21.9%	41.0%	24.4%	87.3%
2	67,010	45,798	28,782	141,590
	5.3%	3.7%	2.3%	11.3%
3	0	11,341	0	11,341
	0	0.9%	0	0.9%

Table B.65

Question 54. What fuel or energy source do you use for your oven(s)?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
Electricity	282,050	507,488	249,811	1,039,349
	22.5%	40.5%	19.9%	82.9%
Natural gas	56,786	48,338	82,778	187,901
	4.5%	3.9%	6.6%	15.0%
Propane or bottled gas (LP, propane, butane)	0	15,959	0	15,959
	0	1.3%	0	1.3%
Don't know	2,164	0	2,120	4,285
	0.2%	0	0.2%	0.3%
Not applicable	0	6,246	0	6,246
	0	0.5%	0	0.5%

Table B.66

Question 55. How many microwave ovens do you have?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	2,085 0.2%	23,265 1.9%	11,272 0.9%	36,623 2.9%
1	317,352 25.3%	532,560 42.5%	305,591 24.4%	1,155,504 92.2%
2	21,563 1.7%	19,082 1.5%	17,845 1.4%	58,490 4.7%
3	0 0	3,123 0.2%	0 0	3,123 0.2%

Table B.67

Question 56. Number of televisions of all types in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	4,328	16,436	7,474	28,239
	0.3%	1.3%	0.6%	2.3%
1	47,408	156,329	91,823	295,560
	3.8%	12.5%	7.3%	23.6%
2	108,005	209,672	106,573	424,249
	8.6%	16.7%	8.5%	33.8%
3	82,080	121,912	76,416	280,409
	6.5%	9.7%	6.1%	22.4%
4	56,268	44,409	29,224	129,901
	4.5%	3.5%	2.3%	10.4%
5	25,000	21,293	14,276	60,569
	2.0%	1.7%	1.1%	4.8%
6	4,328	7,979	3,569	15,877
	0.3%	0.6%	0.3%	1.3%
7	2,761	0	1,785	4,546
	0.2%	0	0.1%	0.4%
8	2,164	0	1,785	3,949
	0.2%	0	0.1%	0.3%
Refused	8,657	0	1,785	10,441
	0.7%	0	0.1%	0.8%

Table B.68

Question 57. Number of large flat-screen tvs (over 32 inches) in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	190,197 15.5%	420,106 34.3%	192,812 15.7%	803,116 65.5%
1	109,684 9.0%	115,338 9.4%	116,577 9.5%	341,599 27.9%
2	23,806 1.9%	17,931 1.5%	14,276 1.2%	56,013 4.6%
3	0 0	3,123 0.3%	1,785 0.1%	4,907 0.4%
4	2,164 0.2%	0 0	0 0	2,164 0.2%
5	0 0	5,095 0.4%	0 0	5,095 0.4%
Refused	2,164 0.2%	0 0	0 0	2,164 0.2%
Not applicable	8,657 0.7%	0 0	1,785 0.1%	10,441 0.9%

Table B.69

Question 58. Number of game consoles (Playstation Wii Nintendo xbox xCube etc) in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	204,671 16.3%	443,938 35.4%	206,844 16.5%	855,453 68.2%
1	75,215 6.0%	70,363 5.6%	80,108 6.4%	225,685 18.0%
2	32,981 2.6%	36,430 2.9%	30,902 2.5%	100,312 8.0%
3	8,657 0.7%	11,102 0.9%	9,488 0.8%	29,246 2.3%
4	4,328 0.3%	8,218 0.7%	0 0	12,546 1.0%
5	0 0	7,979 0.6%	3,569 0.3%	11,548 0.9%
6	4,328 0.3%	0 0	0 0	4,328 0.3%
Don't know	2,164 0.2%	0 0	0 0	2,164 0.2%
Refused	8,657 0.7%	0 0	3,798 0.3%	12,455 1.0%

Table B.70

Question 59. Number of VCRs or DVD players (not a combo unit) in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	70,808 5.6%	147,272 11.7%	86,469 6.9%	304,549 24.3%
1	124,236 9.9%	234,044 18.7%	126,080 10.1%	484,361 38.6%
2	68,046 5.4%	133,419 10.6%	89,244 7.1%	290,709 23.2%
3	38,955 3.1%	43,736 3.5%	21,979 1.8%	104,670 8.3%
4	15,149 1.2%	13,313 1.1%	5,583 0.4%	34,045 2.7%
5	4,328 0.3%	3,123 0.2%	1,785 0.1%	9,236 0.7%
6	2,164 0.2%	0 0	0 0	2,164 0.2%
7	2,164 0.2%	0 0	0 0	2,164 0.2%
9	2,164 0.2%	0 0	0 0	2,164 0.2%
Don't know	2,164 0.2%	3,123 0.2%	1,785 0.1%	7,072 0.6%
Refused	10,821 0.9%	0 0	1,785 0.1%	12,605 1.0%

Table B.71

Question 60. Number of combination VCR and DVD units in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	181,574 14.5%	309,979 24.7%	170,268 13.6%	661,821 52.8%
1	107,487 8.6%	191,936 15.3%	117,249 9.4%	416,671 33.2%
2	38,955 3.1%	52,283 4.2%	30,902 2.5%	122,139 9.7%
3	6,492 0.5%	20,709 1.7%	9,152 0.7%	36,354 2.9%
4	0	0	1,785	1,785
	0	0	0.1%	0.1%
5	0	0	1,785	1,785
	0	0	0.1%	0.1%
23	0	3,123	0	3,123
	0	0.2%	0	0.2%
Don't know	0	0	1,785	1,785
	0	0	0.1%	0.1%
Refused	6,492	0	1,785	8,277
	0.5%	0	0.1%	0.7%

Table B.72

Question 61. Number of stand-alone DVR units (not TIVO) in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	247,063 19.7%	421,028 33.6%	239,317 19.1%	907,408 72.4%
1	61,036 4.9%	109,798 8.8%	71,857 5.7%	242,691 19.4%
2	15,746 1.3%	39,224 3.1%	12,828 1.0%	67,798 5.4%
3	2,085 0.2%	1,734 0.1%	5,354 0.4%	9,173 0.7%
Don't know	6,414 0.5%	6,246 0.5%	3,569 0.3%	16,228 1.3%
Refused	8,657 0.7%	0 0	1,785 0.1%	10,441 0.8%

Table B.73

Question 62. Number of TIVO or cable or satellite TV set-top boxes or receivers in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	121,745 9.7%	243,201 19.4%	121,169 9.7%	486,115 38.8%
1	117,698 9.4%	193,803 15.5%	121,398 9.7%	432,899 34.5%
2	43,204 3.4%	89,311 7.1%	58,235 4.6%	190,751 15.2%
3	36,712 2.9%	33,545 2.7%	24,984 2.0%	95,241 7.6%
4	4,328 0.3%	18,170 1.4%	5,354 0.4%	27,852 2.2%
5	4,328 0.3%	0 0	1,785 0.1%	6,113 0.5%
Don't know	4,328 0.3%	0 0	1,785 0.1%	6,113 0.5%
Refused	8,657 0.7%	0 0	0 0	8,657 0.7%

Table B.74

Question 63. Number of stereo systems in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	68,238 5.4%	190,219 15.2%	99,877 8.0%	358,333 28.6%

Question 63. Number of stereo systems in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
1	188,360	324,066	182,515	694,942
	15.0%	25.8%	14.6%	55.4%
2	47,611	46,859	35,920	130,390
	3.8%	3.7%	2.9%	10.4%
3	19,477	11,686	10,707	41,870
	1.6%	0.9%	0.9%	3.3%
4	4,328	3,467	1,785	9,580
	0.3%	0.3%	0.1%	0.8%
6	0	1,734	0	1,734
	0	0.1%	0	0.1%
13	0	0	2,120	2,120
	0	0	0.2%	0.2%
Refused	12,985	0	1,785	14,769
	1.0%	0	0.1%	1.2%

Table B.75

Question 64. Number of personal computers - including laptops - in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	28,010	96,501	29,011	153,522
	2.2%	7.7%	2.3%	12.2%
1	128,000	283,247	147,939	559,186
	10.2%	22.6%	11.8%	44.6%

Question 64. Number of personal computers - including laptops - in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
2	97,905 7.8%	108,287 8.6%	82,350 6.6%	288,543 23.0%
3	45,965 3.7%	63,862 5.1%	46,856 3.7%	156,684 12.5%
4	17,313 1.4%	14,792 1.2%	17,845 1.4%	49,951 4.0%
5	6,492 0.5%	6,246 0.5%	7,138 0.6%	19,876 1.6%
7	2,164 0.2%	0 0	0 0	2,164 0.2%
8	2,164 0.2%	0 0	1,785 0.1%	3,949 0.3%
Don't know	0 0	5,095 0.4%	0 0	5,095 0.4%
Refused	12,985 1.0%	0 0	1,785 0.1%	14,769 1.2%

Table B.76

Question 65. Number of computer monitors in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	23,727 2.2%	59,605 5.4%	42,510 3.9%	125,842 11.4%

Question 65. Number of computer monitors in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
1	176,209 16.0%	313,325 28.5%	183,981 16.7%	673,514 61.2%
2	69,174 6.3%	69,391 6.3%	45,301 4.1%	183,866 16.7%
3	22,239 2.0%	27,867 2.5%	24,984 2.3%	75,089 6.8%
4	4,328 0.4%	6,246 0.6%	5,354 0.5%	15,928 1.4%
5	2,164 0.2%	0 0	0 0	2,164 0.2%
6	0 0	0 0	1,785 0.2%	1,785 0.2%
Don't know	2,164 0.2%	0 0	0 0	2,164 0.2%
Not applicable	12,985 1.2%	5,095 0.5%	1,785 0.2%	19,865 1.8%

Table B.77

Question 66. Number of combination printer / fax / copiers in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	133,523 10.6%	309,863 24.7%	172,266 13.7%	615,652 49.1%

1	181,507	226,642	142,813	550,962
	14.5%	18.1%	11.4%	43.9%
2	15,149	31,573	16,061	62,783
	1.2%	2.5%	1.3%	5.0%
3	2,164	3,123	1,785	7,072
	0.2%	0.2%	0.1%	0.6%
Don't know	0	6,829	0	6,829
	0	0.5%	0	0.5%
Refused	8,657	0	1,785	10,441
	0.7%	0	0.1%	0.8%

Table B.78

Question 67. Number of stand- alone printers in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	138,855 11.1%	293,199 23.4%	142,265 11.3%	574,318 45.8%
1	153,937 12.3%	246,429 19.7%	158,309 12.6%	558,675 44.6%
2	37,388 3.0%	36,668 2.9%	26,997 2.2%	101,053 8.1%
3	0	1,734 0.1%	1,785 0.1%	3,518 0.3%
4	0	0	1,785 0.1%	1,785 0.1%
10	0	0	1,785 0.1%	1,785 0.1%
Don't know	2,164 0.2%	0	0	2,164 0.2%
Refused	8,657 0.7%	0	1,785 0.1%	10,441 0.8%

Table B.79

Question 68. Number of stand-alone fax machines in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	282,568	502,483	293,329	1,078,379
	22.5%	40.1%	23.4%	86.0%
1	47,611	67,329	36,027	150,968
	3.8%	5.4%	2.9%	12.0%
2	2,164	8,218	3,569	13,951
	0.2%	0.7%	0.3%	1.1%
Refused	8,657	0	1,785	10,441
	0.7%	0	0.1%	0.8%

Table B.80

Question 69. Number of stand-alone copiers in your home.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	264,894	458,985	283,841	1,007,721
	21.1%	36.6%	22.6%	80.4%
1	62,524	94,629	45,514	202,667
	5.0%	7.5%	3.6%	16.2%
2	7,090	19,559	1,785	28,433
	0.6%	1.6%	0.1%	2.3%
11	0	0	1,785	1,785
	0	0	0.1%	0.1%
Don't know	0	4,857	0	4,857
	0	0.4%	0	0.4%
Refused	6,492	0	1,785	8,277
	0.5%	0	0.1%	0.7%

Table B.81

Question 70. Number of surge protector strips in your home for any of the audio/video or home office mentioned above.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
0	32,823 2.6%	81,454 6.5%	42,403 3.4%	156,680 12.5%
1	64,879 5.2%	125,201 10.0%	73,748 5.9%	263,828 21.0%
2	65,882 5.3%	145,104 11.6%	80,673 6.4%	291,659 23.3%
3	81,596 6.5%	75,547 6.0%	65,816 5.2%	222,959 17.8%
4	21,642 1.7%	65,612 5.2%	32,351 2.6%	119,604 9.5%
5	21,642 1.7%	34,113 2.7%	14,505 1.2%	70,260 5.6%
6	20,074 1.6%	30,184 2.4%	7,367 0.6%	57,625 4.6%
7	10,821 0.9%	3,123 0.2%	3,569 0.3%	17,513 1.4%
8	4,328 0.3%	7,979 0.6%	0 0	12,308 1.0%
9	2,164 0.2%	1,734 0.1%	1,785 0.1%	5,682 0.5%
10	4,328 0.3%	3,123 0.2%	3,569 0.3%	11,020 0.9%

Question 70. Number of surge protector strips in your home for any of the audio/video or home office mentioned above.	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
12	0	0	1,785	1,785
	0	0	0.1%	0.1%
20	2,164	0	0	2,164
	0.2%	0	0	0.2%
Don't know	2,164	3,123	5,354	10,641
	0.2%	0.2%	0.4%	0.8%
Refused	6,492	1,734	1,785	10,011
	0.5%	0.1%	0.1%	0.8%

Table B.82

Question 71. Which, if any, of the appliances in your home are Energy Star rated?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
all of them/everything	10,821 1.5%	30,078 4.1%	8,923 1.2%	49,821 6.8%
air conditioning	0 0	0 0	5,354 0.7%	5,354 0.7%
computer monitor	6,414 0.9%	0 0	7,138 1.0%	13,552 1.9%
computer	12,985 1.8%	36,579 5.0%	10,707 1.5%	60,271 8.3%
dishwasher	83,872 11.5%	85,006 11.6%	68,746 9.4%	237,624 32.6%
dryer	104,916 14.4%	79,343 10.9%	94,310 12.9%	278,569 38.2%
freezer	34,627 4.7%	17,931 2.5%	12,492 1.7%	65,050 8.9%
furnace	6,492 0.9%	3,123 0.4%	12,721 1.7%	22,336 3.1%
microwave	21,157 2.9%	30,422 4.2%	12,828 1.8%	64,407 8.8%
oven	25,485 3.5%	14,225 1.9%	9,381 1.3%	49,091 6.7%
refrigerator	144,953 19.9%	181,623 24.9%	121,398 16.6%	447,975 61.4%

Question 71. Which, if any, of the appliances in your home are Energy Star rated?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
stove	47,533 6.5%	69,063 9.5%	35,036 4.8%	151,632 20.8%
television	19,477 2.7%	30,094 4.1%	18,075 2.5%	67,646 9.3%
washing machine	122,150 16.7%	93,568 12.8%	105,017 14.4%	320,736 44.0%
water heater	19,477 2.7%	75,892 10.4%	47,986 6.6%	143,355 19.6%
asked/answered	293,546 23.4%	468,905 37.4%	276,474 22.1%	1,038,925 82.9%
Don't know	47,454 3.8%	109,125 8.7%	56,451 4.5%	213,030 17.0%
Refused	0 0	0 0	1,785 0.1%	1,785 0.1%

Table B.83

Question 72. How many people - including yourself - usually live in this residence at least six months of the year?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
1	45,244 3.6%	185,644 14.8%	57,353 4.6%	288,241 23.0%
2	123,233 9.8%	235,867 18.8%	112,001 8.9%	471,101 37.6%
3	67,528 5.4%	65,357 5.2%	76,890 6.1%	209,775 16.7%
4	51,861 4.1%	55,988 4.5%	57,899 4.6%	165,749 13.2%
5	27,164 2.2%	32,050 2.6%	18,075 1.4%	77,289 6.2%
6	8,657 0.7%	0 0	8,923 0.7%	17,579 1.4%
7	2,164 0.2%	0 0	1,785 0.1%	3,949 0.3%
8	4,328 0.3%	3,123 0.2%	0 0	7,451 0.6%
Refused	10,821 0.9%	0 0	1,785 0.1%	12,605 1.0%

Table B.84

Question 73. For what average length of time is your home occupied by at least one person on a typical weekday ?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
23-24 hrs/day	137,412	243,831	116,928	498,171
	11.0%	19.4%	9.3%	39.7%
21-22 hrs/day	15,746	42,930	21,750	80,427
	1.3%	3.4%	1.7%	6.4%
19-20 hrs/day	39,394	40,613	26,768	106,775
	3.1%	3.2%	2.1%	8.5%
17-18 hrs/day	30,298	42,824	40,512	113,634
	2.4%	3.4%	3.2%	9.1%
15-16 hrs/day	28,055	70,363	38,605	137,023
	2.2%	5.6%	3.1%	10.9%
13-14 hrs/day	32,305	26,255	28,005	86,564
	2.6%	2.1%	2.2%	6.9%
11-12 hrs/day	30,219	60,650	24,100	114,969
	2.4%	4.8%	1.9%	9.2%
9-10 hrs/day	4,249	4,857	5,354	14,460
	0.3%	0.4%	0.4%	1.2%
7-8 hrs/day	2,164	27,777	13,057	42,998
	0.2%	2.2%	1.0%	3.4%
5-6 hrs/day	4,328	1,734	7,138	13,200
	0.3%	0.1%	0.6%	1.1%
3-4 hrs/day	2,164	3,123	0	5,287
	0.2%	0.2%	0	0.4%

Question 73. For what average length of time is your home occupied by at least one person on a typical weekday ?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
1-2 hrs/day	0	0	3,569	3,569
	0	0	0.3%	0.3%
Don't know	3,844	4,857	3,569	12,269
	0.3%	0.4%	0.3%	1.0%
Refused	10,821	8,218	5,354	24,393
	0.9%	0.7%	0.4%	1.9%

Table B.85

Question 74. For what average length of time is your home occupied by at least one person on a typical weekend?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
23-24 hrs/day	182,780	303,674	162,565	649,020
	14.6%	24.2%	13.0%	51.8%
21-22 hrs/day	17,910	39,807	9,152	66,869
	1.4%	3.2%	0.7%	5.3%
19-20 hrs/day	54,137	68,496	52,882	175,515
	4.3%	5.5%	4.2%	14.0%
17-18 hrs/day	27,897	39,701	25,319	92,918
	2.2%	3.2%	2.0%	7.4%
15-16 hrs/day	12,985	41,435	31,467	85,887
	1.0%	3.3%	2.5%	6.9%
13-14 hrs/day	10,742	15,047	11,272	37,061
	0.9%	1.2%	0.9%	3.0%
11-12 hrs/day	8,657	25,805	16,733	51,194
	0.7%	2.1%	1.3%	4.1%
9-10 hrs/day	4,328	20,471	7,138	31,937
	0.3%	1.6%	0.6%	2.5%
7-8 hrs/day	0	9,368	7,474	16,842
	0	0.7%	0.6%	1.3%
5-6 hrs/day	6,492	0	3,569	10,062
	0.5%	0	0.3%	0.8%
3-4 hrs/day	2,085	0	0	2,085
	0.2%	0	0	0.2%

Question 74. For what average length of time is your home occupied by at least one person on a typical weekend?	Service Type			Total
	Electric and Gas (combo)	Electric only	Gas only	
1-2 hrs/day	0	0	1,785	1,785
	0	0	0.1%	0.1%
Don't know	8,657	11,102	1,785	21,543
	0.7%	0.9%	0.1%	1.7%
Refused	4,328	3,123	3,569	11,020
	0.3%	0.2%	0.3%	0.9%

Appendix A.1.4 Survey Results by Dwelling Type

The following tables present the results of the survey by dwelling type. The actual number of responses in each customer segment have been extrapolated to the population to provide an estimate of the results across PSE’s entire service territory.

Table C.1

Question ax. Service type from sample	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Electric and Gas (combo)	296,117	19,838	21,687	3,359	341,000
	23.6%	1.6%	1.7%	0.3%	27.2%
Electric only	320,013	33,694	171,267	53,056	578,030
	25.5%	2.7%	13.7%	4.2%	46.1%
Gas only	287,179	21,309	24,437	1,785	334,709
	22.9%	1.7%	1.9%	0.1%	26.7%

Table C.2

Question c. Do you own or rent or lease this property?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Own	832,148	49,387	67,553	46,118	995,206
	66.4%	3.9%	5.4%	3.7%	79.4%
Rent	56,884	22,693	137,561	10,348	227,486
	4.5%	1.8%	11.0%	0.8%	18.1%
Lease	11,153	2,761	12,276	1,734	27,924
	0.9%	0.2%	1.0%	0.1%	2.2%
Refused	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%

Table C.3

Question d. Which of the following best describes how the residence is occupied?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Year-round, full-time	903,308	74,841	217,390	58,199	1,253,739
	72.0%	6.0%	17.3%	4.6%	100.0%

Table C.4

Question 1. Which of the following best describes your home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Single family detached home	903,308	0	0	0	903,308
	72.0%	0	0	0	72.0%
Duplex, row- or townhouse	0	74,841	0	0	74,841
	0	6.0%	0	0	6.0%
Apartment or condo	0	0	217,390	0	217,390
	0	0	17.3%	0	17.3%
Manufactured home	0	0	0	58,199	58,199
	0	0	0	4.6%	4.6%

Table C.5

Question1c. Which of the following best describes your home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Single family	903,308	0	0	0	903,308
	72.0%	0	0	0	72.0%
Multi-family	0	74,841	217,390	0	292,232
	0	6.0%	17.3%	0	23.3%
Manufactured home	0	0	0	58,199	58,199
	0	0	0	4.6%	4.6%

Table C.6

Question 2c. How many living units or apartments are in the building where this residence is located?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
2 units	0	31,417	0	0	31,417
	0	2.5%	0	0	2.5%
3 units	0	2,085	10,191	0	12,276
	0	0.2%	0.8%	0	1.0%
4 units	0	11,465	31,519	0	42,984
	0	0.9%	2.5%	0	3.4%
5 or more units	0	27,710	168,501	0	196,210
	0	2.2%	13.4%	0	15.7%
Don't know	0	2,164	7,181	0	9,345
	0	0.2%	0.6%	0	0.7%
Not applicable	903,308	0	0	58,199	961,507
	72.0%	0	0	4.6%	76.7%

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Table C.7

Question 3. How many levels or stories are there in this residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
One story	345,487 27.6%	15,754 1.3%	65,773 5.2%	58,199 4.6%	485,213 38.7%
One and a half stories	22,948 1.8%	0 0	2,164 0.2%	0 0	25,112 2.0%
Split level or two stories	409,291 32.6%	44,691 3.6%	79,745 6.4%	0 0	533,727 42.6%
Two and a half stories	44,593 3.6%	5,095 0.4%	12,311 1.0%	0 0	62,000 4.9%
Tri level or three stories	77,040 6.1%	7,216 0.6%	38,058 3.0%	0 0	122,314 9.8%
More than three stories	3,949 0.3%	2,085 0.2%	19,339 1.5%	0 0	25,373 2.0%

Table C.8

Question 4. On which of the following is your home built?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Concrete slab or foundation	272,838 21.8%	48,966 3.9%	100,210 8.0%	23,924 1.9%	445,938 35.6%
Above a crawl space	404,961 32.3%	23,755 1.9%	24,927 2.0%	29,074 2.3%	482,718 38.5%
Above an unfinished basement	82,395 6.6%	0 0	14,431 1.2%	0 0	96,826 7.7%
Above a finished basement	132,920 10.6%	0 0	20,613 1.6%	0 0	153,533 12.2%
Don't know	7,072 0.6%	2,120 0.2%	44,933 3.6%	3,467 0.3%	57,592 4.6%
Refused	3,123 0.2%	0 0	12,276 1.0%	1,734 0.1%	17,132 1.4%

Table C.9

Question 5c. Approximately what percentage of this residence's windows are double or triple-pane?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
25% or less	108,856	17,450	46,564	18,962	191,833
	8.7%	1.4%	3.7%	1.5%	15.3%
26% - 50%	42,496	6,414	5,095	0	54,005
	3.4%	0.5%	0.4%	0	4.3%
51% - 75%	21,064	0	0	1,734	22,798
	1.7%	0	0	0.1%	1.8%
76% - 100%	707,877	42,148	139,228	35,719	924,971
	56.5%	3.4%	11.1%	2.8%	73.8%
Don't know	23,015	8,830	23,741	1,785	57,371
	1.8%	0.7%	1.9%	0.1%	4.6%
Refused	0	0	2,761	0	2,761
	0	0	0.2%	0	0.2%

Table C.10

Question 6c. Approximately what percentage of your home’s windows are equipped with storm windows?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
25% or less	719,551	45,712	170,302	39,582	975,146
	57.4%	3.6%	13.6%	3.2%	77.8%
26% - 50%	25,526	0	10,191	0	35,716
	2.0%	0	0.8%	0	2.8%
51% - 75%	8,410	0	0	1,680	10,089
	0.7%	0	0	0.1%	0.8%
76% - 100%	102,238	15,880	14,396	15,205	147,719
	8.2%	1.3%	1.1%	1.2%	11.8%
Don't know	47,583	13,250	22,501	1,734	85,068
	3.8%	1.1%	1.8%	0.1%	6.8%

Table C.11

Question 7c. What is the approximate square footage of heated floor space in this residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Less than 500 square feet	15,614 1.2%	0 0	18,409 1.5%	3,467 0.3%	37,490 3.0%
501 to 1,000 square feet	56,170 4.5%	23,290 1.9%	104,938 8.4%	10,402 0.8%	194,800 15.5%
1,001 to 1,500 square feet	161,437 12.9%	13,285 1.1%	49,001 3.9%	20,402 1.6%	244,124 19.5%
1,501 to 2,000 square feet	248,045 19.8%	31,387 2.5%	7,216 0.6%	16,993 1.4%	303,640 24.2%
2,001 to 2,500 square feet	169,908 13.6%	0 0	0 0	0 0	169,908 13.6%
2,501 to 3,000 square feet	105,124 8.4%	0 0	0 0	0 0	105,124 8.4%
3,001 to 4,000 square feet	77,502 6.2%	0 0	2,120 0.2%	0 0	79,622 6.4%
4,001 to 5,000 square feet	12,359 1.0%	0 0	0 0	0 0	12,359 1.0%
More than 6,000 square feet	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
Don't know	54,986 4.4%	6,880 0.5%	35,707 2.8%	6,935 0.6%	104,508 8.3%

Table C.12

Question 8. Although you aren't sure about the actual heated floor space can you estimate the square footage of your home using these categories?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Less than 500 square feet	0	0	10,191	3,467	13,658
	0	0	0.8%	0.3%	1.1%
501 to 1,000 square feet	10,044	5,095	25,517	1,734	42,390
	0.8%	0.4%	2.0%	0.1%	3.4%
1,001 to 1,500 square feet	17,282	0	0	0	17,282
	1.4%	0	0	0	1.4%
1,501 to 2,000 square feet	5,962	0	0	0	5,962
	0.5%	0	0	0	0.5%
2,001 to 2,500 square feet	2,164	0	0	0	2,164
	0.2%	0	0	0	0.2%
Don't know	17,749	1,785	0	1,734	21,268
	1.4%	0.1%	0	0.1%	1.7%
Refused	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
Not applicable	848,322	67,962	181,683	51,265	1,149,231
	67.7%	5.4%	14.5%	4.1%	91.7%

Table C.13

Question 9. How many heated rooms are in this residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
1	5,136	0	6,880	0	12,016
	0.4%	0	0.5%	0	1.0%

Question 9. How many heated rooms are in this residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
2	9,044 0.7%	5,095 0.4%	42,883 3.4%	3,467 0.3%	60,489 4.8%
3	19,958 1.6%	3,905 0.3%	40,214 3.2%	3,467 0.3%	67,544 5.4%
4	66,186 5.3%	20,573 1.6%	88,902 7.1%	13,815 1.1%	189,476 15.1%
5	104,897 8.4%	26,796 2.1%	29,512 2.4%	13,180 1.1%	174,386 13.9%
6	174,177 13.9%	14,603 1.2%	0 0	8,669 0.7%	197,449 15.7%
7	169,676 13.5%	2,085 0.2%	6,880 0.5%	8,719 0.7%	187,361 14.9%
8	133,572 10.7%	1,785 0.1%	0 0	5,147 0.4%	140,504 11.2%
9	85,382 6.8%	0 0	2,120 0.2%	0 0	87,502 7.0%
10	55,577 4.4%	0 0	0 0	1,734 0.1%	57,311 4.6%
11	28,682 2.3%	0 0	0 0	0 0	28,682 2.3%
12	18,918 1.5%	0 0	0 0	0 0	18,918 1.5%
13	10,641 0.8%	0 0	0 0	0 0	10,641 0.8%

Question 9. How many heated rooms are in this residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
14	6,492	0	0	0	6,492
	0.5%	0	0	0	0.5%
15	3,949	0	0	0	3,949
	0.3%	0	0	0	0.3%
16	4,907	0	0	0	4,907
	0.4%	0	0	0	0.4%
Don't know	6,113	0	0	0	6,113
	0.5%	0	0	0	0.5%

Table C.14

Question 9c. How many heated rooms are in this residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
1	5,136 0.4%	0 0	6,880 0.5%	0 0	12,016 1.0%
2	9,044 0.7%	5,095 0.4%	42,883 3.4%	3,467 0.3%	60,489 4.8%
3	19,958 1.6%	3,905 0.3%	40,214 3.2%	3,467 0.3%	67,544 5.4%
4	66,186 5.3%	20,573 1.6%	88,902 7.1%	13,815 1.1%	189,476 15.1%
5	104,897 8.4%	26,796 2.1%	29,512 2.4%	13,180 1.1%	174,386 13.9%
6	174,177 13.9%	14,603 1.2%	0 0	8,669 0.7%	197,449 15.7%
7	169,676 13.5%	2,085 0.2%	6,880 0.5%	8,719 0.7%	187,361 14.9%
8	133,572 10.7%	1,785 0.1%	0 0	5,147 0.4%	140,504 11.2%
9	85,382 6.8%	0 0	2,120 0.2%	0 0	87,502 7.0%
10	55,577 4.4%	0 0	0 0	1,734 0.1%	57,311 4.6%
More than 10 rooms	73,588 5.9%	0 0	0 0	0 0	73,588 5.9%

Question 9c. How many heated rooms are in this residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Don't know	6,113	0	0	0	6,113
	0.5%	0	0	0	0.5%

Table C.15

Question 10. How many bathrooms are in this home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
None	6,692	6,880	5,095	0	18,667
	0.5%	0.5%	0.4%	0	1.5%
1	136,885	10,191	162,994	19,122	329,191
	10.9%	0.8%	13.0%	1.5%	26.3%
1.25	10,574	0	0	0	10,574
	0.8%	0	0	0	0.8%
1.5	54,152	7,856	5,095	1,734	68,838
	4.3%	0.6%	0.4%	0.1%	5.5%
1.75	33,802	2,120	0	3,467	39,390
	2.7%	0.2%	0	0.3%	3.1%
2	268,038	18,659	40,001	33,877	360,574
	21.4%	1.5%	3.2%	2.7%	28.8%
2.25	140,816	21,360	2,085	0	164,261
	11.2%	1.7%	0.2%	0	13.1%
2.5	10,261	0	0	0	10,261
	0.8%	0	0	0	0.8%
2.75	206,104	7,775	0	0	213,878
	16.4%	0.6%	0	0	17.1%
3	3,949	0	0	0	3,949
	0.3%	0	0	0	0.3%
3.5	9,615	0	2,120	0	11,736
	0.8%	0	0.2%	0	0.9%

Question 10. How many bathrooms are in this home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
4	22,420	0	0	0	22,420
	1.8%	0	0	0	1.8%

Table C.16

Question 11c. In what year was this residence built?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Before 1940	106,474	0	20,604	0	127,078
	8.5%	0	1.6%	0	10.1%
1940 to 1959	126,295	2,164	4,546	3,518	136,523
	10.1%	0.2%	0.4%	0.3%	10.9%
1960 to 1979	285,927	29,368	53,038	20,696	389,029
	22.8%	2.3%	4.2%	1.7%	31.0%
1980 to 1985	64,301	0	10,191	8,669	83,160
	5.1%	0	0.8%	0.7%	6.6%
1986 to 1990	70,414	3,949	22,466	8,324	105,153
	5.6%	0.3%	1.8%	0.7%	8.4%
1991 to 1995	84,874	4,206	2,164	3,123	94,367
	6.8%	0.3%	0.2%	0.2%	7.5%
1996 to 2000	79,551	9,974	23,732	1,734	114,991
	6.3%	0.8%	1.9%	0.1%	9.2%
2001 to 2002	20,883	2,120	7,216	1,734	31,952
	1.7%	0.2%	0.6%	0.1%	2.5%
2003 to 2004	16,687	2,085	6,335	3,467	28,574
	1.3%	0.2%	0.5%	0.3%	2.3%

Question 11c. In what year was this residence built?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
2005	5,733 0.5%	0 0	5,095 0.4%	0 0	10,829 0.9%
2006	7,983 0.6%	3,905 0.3%	0 0	0 0	11,888 0.9%
2007	6,113 0.5%	1,785 0.1%	0 0	0 0	7,897 0.6%
2008	1,734 0.1%	0 0	0 0	1,734 0.1%	3,467 0.3%
Don't know	26,339 2.1%	15,286 1.2%	62,003 4.9%	5,201 0.4%	108,830 8.7%

Table C.17

Question 11a. Although you aren't sure about the actual year your home was built can you identify which from this list is the closest general time frame?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Before 1940	4,546 0.4%	0 0	0 0	0 0	4,546 0.4%
1940 to 1959	4,907 0.4%	0 0	0 0	0 0	4,907 0.4%
1960 to 1979	6,692 0.5%	10,191 0.8%	27,562 2.2%	1,734 0.1%	46,178 3.7%
1980 to 1985	0 0	0 0	5,095 0.4%	0 0	5,095 0.4%
1986 to 1990	0 0	0 0	1,785 0.1%	1,734 0.1%	3,518 0.3%
1991 to 1995	1,785 0.1%	0 0	0 0	1,734 0.1%	3,518 0.3%
1996 to 2000	0 0	0 0	12,276 1.0%	0 0	12,276 1.0%
Don't know	8,410 0.7%	5,095 0.4%	15,286 1.2%	0 0	28,791 2.3%
Not applicable	876,968 69.9%	59,556 4.8%	155,387 12.4%	52,998 4.2%	1,144,909 91.3%

Table C.18

Question 12. Does the main heating system serve only this residence or does it serve more than one residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Only this residence	0	74,841	188,716	0	263,557
	0	6.0%	15.1%	0	21.0%
More than one residence	0	0	21,459	0	21,459
	0	0	1.7%	0	1.7%
Don't know	0	0	7,216	0	7,216
	0	0	0.6%	0	0.6%
Not applicable	903,308	0	0	58,199	961,507
	72.0%	0	0	4.6%	76.7%

Table C.19

Question 13. What is the type of system that is used to heat the majority of your home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Natural Gas: Central forced air furnace	587,469	29,167	24,387	8,665	649,688
	46.9%	2.3%	1.9%	0.7%	51.8%
Natural Gas: Hot water boiler	11,846	0	2,120	3,413	17,380
	0.9%	0	0.2%	0.3%	1.4%
Electric: Hot water boiler	12,836	0	10,191	3,467	26,494
	1.0%	0	0.8%	0.3%	2.1%
Natural Gas: Steam boiler	3,569	0	0	0	3,569
	0.3%	0	0	0	0.3%
Natural Gas: Radiant floor heating	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%

Question 13. What is the type of system that is used to heat the majority of your home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Natural Gas: Fireplace or stove	18,008 1.4%	0 0	14,396 1.1%	0 0	32,404 2.6%
Electric: Baseboard, wall heaters, ceiling cables, or floor cables	51,046 4.1%	22,278 1.8%	112,145 8.9%	6,935 0.6%	192,404 15.3%
Electric: Wall heaters with fans	17,399 1.4%	2,085 0.2%	5,095 0.4%	0 0	24,579 2.0%
Electric: Central forced air furnace	29,127 2.3%	7,216 0.6%	0 0	17,337 1.4%	53,680 4.3%
Electric: Air-source heat pump	21,676 1.7%	0 0	0 0	8,324 0.7%	30,000 2.4%
Electric: Ground-source heat pump	7,021 0.6%	0 0	0 0	0 0	7,021 0.6%
Electric: Portable heaters	6,246 0.5%	0 0	0 0	1,734 0.1%	7,979 0.6%
Oil: Central forced air furnace	23,593 1.9%	0 0	0 0	0 0	23,593 1.9%
Oil: Hot water boiler (with radiators, baseboards, or in floor)	3,123 0.2%	0 0	0 0	0 0	3,123 0.2%
Bottled Gas: Central forced air (propane, butane, kerosene)	14,620 1.2%	0 0	0 0	0 0	14,620 1.2%
Bottled Gas: Portable heaters (propane, butane, kerosene)	6,246 0.5%	0 0	0 0	0 0	6,246 0.5%
Wood: Wood stove or pellet stove	22,502 1.8%	5,095 0.4%	0 0	3,123 0.2%	30,720 2.5%

Question 13. What is the type of system that is used to heat the majority of your home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Wood: Fireplace	8,410 0.7%	0 0	0 0	1,734 0.1%	10,144 0.8%
Other system and fuel	21,297 1.7%	0 0	5,095 0.4%	0 0	26,392 2.1%
None (No heating system)	1,785 0.1%	0 0	0 0	0 0	1,785 0.1%
Don't know	30,583 2.4%	9,000 0.7%	15,286 1.2%	3,467 0.3%	58,336 4.7%
Refused	3,123 0.2%	0 0	0 0	0 0	3,123 0.2%
Not applicable	0 0	0 0	28,675 2.3%	0 0	28,675 2.3%

Table C.20

Question 14. What type of temperature control is on the main heating system?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Regular thermostat(s) with temperature settings	305,281 24.3%	37,178 3.0%	123,361 9.8%	34,566 2.8%	500,386 39.9%
Clock or programmable thermostat(s)	503,072 40.1%	18,473 1.5%	10,196 0.8%	13,576 1.1%	545,317 43.5%
Dial control without temperature settings	26,768 2.1%	5,095 0.4%	27,562 2.2%	1,734 0.1%	61,158 4.9%
Simple on/off switch or no temperature control	3,949 0.3%	0 0	12,311 1.0%	0 0	16,260 1.3%
No response	0 0	14,095 1.1%	15,286 1.2%	8,324 0.7%	37,705 3.0%
Not applicable	64,238 5.1%	0 0	28,675 2.3%	0 0	92,913 7.4%

Question 15. Which of the following describes how the main heating system is used?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
The thermostat(s) is kept at a constant setting or temperature	209,189 18.8%	22,847 2.1%	39,838 3.6%	12,187 1.1%	284,060 25.5%
The thermostat is adjusted when occupants are sleeping	536,186 48.2%	28,328 2.5%	60,312 5.4%	27,286 2.5%	652,111 58.6%
The thermostat is adjusted when occupants leave the house	367,194 33.0%	29,130 2.6%	64,473 5.8%	29,074 2.6%	489,872 44.0%
The heater is turned on only when someone is cold	145,437 13.1%	11,578 1.0%	89,421 8.0%	12,136 1.1%	258,572 23.2%

Table C.21

Question 16. Home heating - at what temperature do you normally keep your thermostat?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	0	0	5,095	0	5,095
	0	0	0.4%	0	0.4%
50	3,123	0	5,095	0	8,218
	0.2%	0	0.4%	0	0.7%
55	3,949	0	5,095	1,734	10,778
	0.3%	0	0.4%	0.1%	0.9%
58	5,733	0	5,095	0	10,829
	0.5%	0	0.4%	0	0.9%
59	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
60	17,645	0	19,156	1,734	38,535
	1.4%	0	1.5%	0.1%	3.1%
62	5,354	0	0	0	5,354
	0.4%	0	0	0	0.4%
63	8,030	2,085	0	0	10,115
	0.6%	0.2%	0	0	0.8%
64	10,331	0	0	0	10,331
	0.8%	0	0	0	0.8%
65	38,279	11,085	12,311	5,201	66,877
	3.1%	0.9%	1.0%	0.4%	5.3%
66	3,949	0	0	0	3,949
	0.3%	0	0	0	0.3%

Question 16. Home heating - at what temperature do you normally keep your thermostat?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
67	22,107 1.8%	0 0	5,095 0.4%	0 0	27,202 2.2%
68	76,812 6.1%	6,405 0.5%	21,577 1.7%	3,467 0.3%	108,261 8.6%
69	19,876 1.6%	0 0	0 0	0 0	19,876 1.6%
70	78,566 6.3%	6,880 0.5%	12,952 1.0%	10,453 0.8%	108,851 8.7%
71	5,354 0.4%	2,164 0.2%	5,095 0.4%	0 0	12,613 1.0%
72	16,060 1.3%	0 0	10,191 0.8%	1,734 0.1%	27,985 2.2%
73	3,123 0.2%	0 0	0 0	0 0	3,123 0.2%
75	8,030 0.6%	5,884 0.5%	0 0	0 0	13,914 1.1%
76	2,164 0.2%	0 0	2,120 0.2%	0 0	4,285 0.3%
Don't know	0 0	0 0	10,191 0.8%	0 0	10,191 0.8%
Refused	5,287 0.4%	0 0	5,095 0.4%	0 0	10,382 0.8%
Not applicable	567,751 45.3%	40,338 3.2%	93,227 7.4%	33,877 2.7%	735,192 58.6%

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Table C.22

Question 17. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and awake?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	0	0	10,191	0	10,191
	0	0	0.8%	0	0.8%
54	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
55	0	0	5,095	0	5,095
	0	0	0.4%	0	0.4%
59	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
60	7,072	0	2,085	0	9,157
	0.6%	0	0.2%	0	0.7%
62	9,368	5,095	0	0	14,464
	0.7%	0.4%	0	0	1.2%
63	3,798	0	0	0	3,798
	0.3%	0	0	0	0.3%
64	13,564	0	0	0	13,564
	1.1%	0	0	0	1.1%
65	46,311	16,517	2,085	1,734	66,647
	3.7%	1.3%	0.2%	0.1%	5.3%
66	13,184	2,164	0	1,680	17,028
	1.1%	0.2%	0	0.1%	1.4%

Question 17. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and awake?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
67	71,593 5.7%	1,785 0.1%	0 0	0 0	73,378 5.9%
68	183,475 14.6%	1,785 0.1%	19,456 1.6%	10,402 0.8%	215,118 17.2%
69	53,262 4.2%	3,949 0.3%	0 0	0 0	57,211 4.6%
70	133,288 10.6%	2,164 0.2%	21,399 1.7%	8,614 0.7%	165,465 13.2%
71	19,413 1.5%	2,085 0.2%	2,085 0.2%	1,734 0.1%	25,317 2.0%
72	18,421 1.5%	0 0	7,216 0.6%	6,590 0.5%	32,226 2.6%
73	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
75	6,246 0.5%	0 0	7,216 0.6%	0 0	13,461 1.1%
Don't know	3,569 0.3%	0 0	0 0	1,734 0.1%	5,303 0.4%
Not applicable	315,010 25.1%	39,298 3.1%	140,562 11.2%	25,712 2.1%	520,583 41.5%

Table C.23

Question 18. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	18,092 1.4%	5,095 0.4%	14,361 1.1%	1,734 0.1%	39,282 3.1%
37	1,785 0.1%	0 0	0 0	0 0	1,785 0.1%
40	5,095 0.4%	0 0	0 0	0 0	5,095 0.4%
45	1,785 0.1%	2,164 0.2%	5,095 0.4%	0 0	9,044 0.7%
50	17,645 1.4%	0 0	0 0	0 0	17,645 1.4%
52	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
53	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
55	48,057 3.8%	0 0	7,181 0.6%	5,147 0.4%	60,385 4.8%
56	6,113 0.5%	0 0	0 0	0 0	6,113 0.5%
57	8,410 0.7%	0 0	0 0	0 0	8,410 0.7%

Question 18. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
58	17,892 1.4%	5,095 0.4%	0 0	1,734 0.1%	24,721 2.0%
59	10,574 0.8%	0 0	0 0	0 0	10,574 0.8%
60	100,136 8.0%	8,965 0.7%	3,870 0.3%	6,935 0.6%	119,905 9.6%
61	12,805 1.0%	0 0	0 0	1,734 0.1%	14,538 1.2%
62	66,863 5.3%	2,120 0.2%	0 0	1,734 0.1%	70,717 5.6%
63	27,653 2.2%	0 0	0 0	1,734 0.1%	29,386 2.3%
64	28,515 2.3%	0 0	0 0	1,680 0.1%	30,195 2.4%
65	107,145 8.5%	6,069 0.5%	15,286 1.2%	6,590 0.5%	135,090 10.8%
66	20,931 1.7%	4,249 0.3%	4,285 0.3%	1,734 0.1%	31,199 2.5%
67	23,045 1.8%	0 0	0 0	0 0	23,045 1.8%
68	45,932 3.7%	1,785 0.1%	2,085 0.2%	1,734 0.1%	51,536 4.1%

Question 18. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
69	2,164	0	0	0	2,164
	0.2%	0	0	0	0.2%
70	6,692	0	14,475	0	21,167
	0.5%	0	1.2%	0	1.7%
Don't know	3,518	0	10,191	0	13,709
	0.3%	0	0.8%	0	1.1%
Refused	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
Not applicable	315,010	39,298	140,562	25,712	520,583
	25.1%	3.1%	11.2%	2.1%	41.5%

Table C.24

Question 19. Home heating - at what temperature do you normally keep your thermostat set when no one is at home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	44,468	5,095	23,706	3,467	76,737
	3.5%	0.4%	1.9%	0.3%	6.1%
40	1,734	0	0	0	1,734
	0.1%	0	0	0	0.1%
45	4,907	2,164	5,095	0	12,167
	0.4%	0.2%	0.4%	0	1.0%

Question 19. Home heating - at what temperature do you normally keep your thermostat set when no one is at home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
50	26,881	0	2,085	1,734	30,700
	2.1%	0	0.2%	0.1%	2.4%
52	3,949	0	0	0	3,949
	0.3%	0	0	0	0.3%
53	2,014	0	0	0	2,014
	0.2%	0	0	0	0.2%
54	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
55	43,435	0	10,191	5,147	58,773
	3.5%	0	0.8%	0.4%	4.7%
56	9,236	5,095	0	0	14,331
	0.7%	0.4%	0	0	1.1%
57	7,301	0	0	0	7,301
	0.6%	0	0	0	0.6%
58	20,123	5,095	0	0	25,219
	1.6%	0.4%	0	0	2.0%
59	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
60	132,382	3,949	8,154	6,881	151,366
	10.6%	0.3%	0.7%	0.5%	12.1%
61	2,164	0	0	0	2,164
	0.2%	0	0	0	0.2%

Question 19. Home heating - at what temperature do you normally keep your thermostat set when no one is at home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
62	47,962 3.8%	2,120 0.2%	0 0	1,734 0.1%	51,816 4.1%
63	18,188 1.5%	0 0	5,095 0.4%	1,734 0.1%	25,017 2.0%
64	24,500 2.0%	0 0	0 0	0 0	24,500 2.0%
65	70,982 5.7%	3,870 0.3%	10,191 0.8%	6,590 0.5%	91,633 7.3%
66	18,767 1.5%	4,249 0.3%	2,120 0.2%	1,734 0.1%	26,871 2.1%
67	9,615 0.8%	0 0	0 0	1,734 0.1%	11,349 0.9%
68	30,513 2.4%	1,785 0.1%	0 0	0 0	32,298 2.6%
69	4,178 0.3%	0 0	0 0	0 0	4,178 0.3%
70	8,923 0.7%	0 0	0 0	0 0	8,923 0.7%
71	6,113 0.5%	0 0	0 0	0 0	6,113 0.5%
72	3,123 0.2%	0 0	0 0	0 0	3,123 0.2%

Question 19. Home heating - at what temperature do you normally keep your thermostat set when no one is at home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Don't know	30,399 2.4%	2,120 0.2%	10,191 0.8%	0 0	42,710 3.4%
Refused	10,194 0.8%	0 0	0 0	1,734 0.1%	11,928 1.0%
Not applicable	315,010 25.1%	39,298 3.1%	140,562 11.2%	25,712 2.1%	520,583 41.5%

Table C.25

Question 20. Does the main cooling system serve only this residence or does it serve more than one residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Only this residence	0 0	28,114 2.2%	11,465 0.9%	0 0	39,579 3.2%
More than one residence	0 0	0 0	11,975 1.0%	0 0	11,975 1.0%
Residence has more than one cooling system	0 0	46,728 3.7%	186,770 14.9%	0 0	233,497 18.6%
Don't know	0 0	0 0	2,085 0.2%	0 0	2,085 0.2%
Refused	0 0	0 0	5,095 0.4%	0 0	5,095 0.4%

Not applicable	903,308	0	0	58,199	961,507
	72.0%	0	0	4.6%	76.7%

Table C.26

Question 21. Which of the following is the type of cooling system that is used to cool the majority of home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Central air conditioner	102,466 14.3%	12,147 1.7%	7,216 1.0%	0 0	121,828 17.0%
Air-source heat pump	46,593 6.5%	0 0	0 0	10,058 1.4%	56,650 7.9%
Ground-source heat pump	17,014 2.4%	0 0	0 0	1,734 0.2%	18,747 2.6%
Room air conditioners	51,626 7.2%	7,181 1.0%	0 0	8,719 1.2%	67,526 9.4%
Ductless mini-split air conditioner	0 0	0 0	0 0	0 0	0 0
Evaporative cooler (swamp cooler)	4,907 0.7%	0 0	0 0	4,857 0.7%	9,764 1.4%
Portable fans	336,802 47.1%	4,206 0.6%	2,164 0.3%	22,538 3.2%	365,710 51.1%
Whole-house fan	34,827 4.9%	0 0	0 0	5,201 0.7%	40,029 5.6%
Ceiling fans	204,619 28.6%	1,785 0.2%	0 0	15,603 2.2%	222,007 31.0%
Something else (specify)	2,164 0.3%	0 0	0 0	0 0	2,164 0.3%

Table C.27

Question 22. What type of temperature control is on the main cooling system?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Regular thermostat(s) with temperature settings	62,783 5.0%	6,113 0.5%	0 0	5,201 0.4%	74,097 5.9%
Clock or programmable thermostat(s)	122,586 9.8%	8,119 0.6%	7,216 0.6%	8,324 0.7%	146,245 11.7%
Dial control without temperature settings	15,102 1.2%	5,095 0.4%	0 0	5,201 0.4%	25,398 2.0%
Simple on/off switch or no temperature control	15,443 1.2%	0 0	0 0	4,857 0.4%	20,299 1.6%
Don't know	1,785 0.1%	0 0	0 0	1,785 0.1%	3,569 0.3%
Not applicable	685,609 54.7%	55,514 4.4%	210,175 16.8%	32,832 2.6%	984,130 78.5%

Table C.28

Question 23. Which of the following statements best describes how the main cooling system is used?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
The thermostat(s) is kept at a constant setting or temperature	28,184 10.6%	7,181 2.7%	0 0	5,201 2.0%	40,566 15.3%
The thermostat is adjusted when occupants are sleeping	24,138 9.1%	0 0	5,095 1.9%	6,986 2.6%	36,219 13.6%
The thermostat is adjusted when occupants leave the house	11,400 4.3%	2,164 0.8%	5,095 1.9%	3,467 1.3%	22,127 8.3%
The cooling system is turned on only when someone is warm	87,927 33.1%	3,870 1.5%	7,216 2.7%	10,058 3.8%	109,071 41.0%
We rarely use this cooling system	87,379 83.0%	6,113 5.8%	0 0	11,791 11.2%	105,283 100.0%

Table C.29

Question 24. Home cooling - at what temperature do you normally keep your thermostat?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
50	4,328	0	0	0	4,328
	0.3%	0	0	0	0.3%
55	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
60	5,354	5,095	0	1,734	12,183
	0.4%	0.4%	0	0.1%	1.0%
62	2,164	0	0	0	2,164
	0.2%	0	0	0	0.2%
64	4,178	0	0	0	4,178
	0.3%	0	0	0	0.3%
65	6,492	3,870	0	0	10,362
	0.5%	0.3%	0	0	0.8%
67	5,682	2,164	0	0	7,847
	0.5%	0.2%	0	0	0.6%
68	15,548	0	0	0	15,548
	1.2%	0	0	0	1.2%
69	5,287	0	0	0	5,287
	0.4%	0	0	0	0.4%
70	31,276	0	5,095	3,467	39,839
	2.5%	0	0.4%	0.3%	3.2%
71	3,898	0	0	0	3,898
	0.3%	0	0	0	0.3%

Question 24. Home cooling - at what temperature do you normally keep your thermostat?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
72	26,502	0	0	0	26,502
	2.1%	0	0	0	2.1%
73	3,949	0	0	0	3,949
	0.3%	0	0	0	0.3%
74	13,564	2,164	0	0	15,728
	1.1%	0.2%	0	0	1.3%
75	13,184	2,085	0	5,201	20,471
	1.1%	0.2%	0	0.4%	1.6%
78	3,949	0	2,120	1,734	7,803
	0.3%	0	0.2%	0.1%	0.6%
80	6,246	0	0	0	6,246
	0.5%	0	0	0	0.5%
82	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
85	0	0	0	3,123	3,123
	0	0	0	0.2%	0.2%
87	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
Don't know	32,591	1,785	0	8,324	42,700
	2.6%	0.1%	0	0.7%	3.4%
Refused	4,907	0	0	0	4,907
	0.4%	0	0	0	0.4%
Not applicable	704,840	57,678	210,175	34,617	1,007,309
	56.2%	4.6%	16.8%	2.8%	80.3%

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Table C.30

Question 26. Home cooling - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and awake?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
67	1,785	0	0	0	1,785
	4.6%	0	0	0	4.6%
68	2,164	0	0	0	2,164
	5.6%	0	0	0	5.6%
70	6,246	2,164	5,095	5,252	18,757
	16.3%	5.6%	13.3%	13.7%	48.9%
71	2,164	0	0	0	2,164
	5.6%	0	0	0	5.6%
72	3,123	0	0	0	3,123
	8.1%	0	0	0	8.1%
73	2,164	0	0	0	2,164
	5.6%	0	0	0	5.6%
74	2,164	0	0	0	2,164
	5.6%	0	0	0	5.6%
75	0	0	0	1,734	1,734
	0	0	0	4.5%	4.5%
78	2,164	0	0	0	2,164
	5.6%	0	0	0	5.6%
Don't know	2,164	0	0	0	2,164
	5.6%	0	0	0	5.6%

Table C.31

Question 27. Home cooling - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	6,113 0.5%	0 0	5,095 0.4%	1,734 0.1%	12,942 1.0%
60	0 0	0 0	0 0	1,734 0.1%	1,734 0.1%
65	2,164 0.2%	0 0	0 0	1,785 0.1%	3,949 0.3%
68	3,123 0.2%	0 0	0 0	0 0	3,123 0.2%
70	3,123 0.2%	2,164 0.2%	0 0	0 0	5,287 0.4%
72	3,123 0.2%	0 0	0 0	0 0	3,123 0.2%
73	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
75	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
82	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
Refused	0 0	0 0	0 0	1,734 0.1%	1,734 0.1%
Not applicable	879,170 70.1%	72,677 5.8%	212,295 16.9%	51,214 4.1%	1,215,356 96.9%

Table C.32

Question 28. Home cooling - at what temperature do you normally keep your thermostat set when no one is at home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	7,451 0.6%	0 0	5,095 0.4%	1,734 0.1%	14,280 1.1%
60	0 0	0 0	0 0	1,734 0.1%	1,734 0.1%
66	0 0	2,164 0.2%	0 0	0 0	2,164 0.2%
67	1,785 0.1%	0 0	0 0	0 0	1,785 0.1%
68	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
70	0 0	0 0	0 0	1,785 0.1%	1,785 0.1%
72	3,123 0.2%	0 0	0 0	0 0	3,123 0.2%
73	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
75	5,287 0.4%	0 0	0 0	0 0	5,287 0.4%
78	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
Refused	0 0	0 0	0 0	1,734 0.1%	1,734 0.1%

Question 28. Home cooling - at what temperature do you normally keep your thermostat set when no one is at home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Not applicable	879,170	72,677	212,295	51,214	1,215,356
	70.1%	5.8%	16.9%	4.1%	96.9%

Table C.33

Question29. Does the water heater or the source of the hot water serve only this residence or does it serve more than one residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Only this residence	0	74,841	186,552	0	261,393
	0	6.0%	14.9%	0	20.8%
Central water heating or tank for more than one residence	0	0	23,959	0	23,959
	0	0	1.9%	0	1.9%
This residence has no hot water	0	0	5,095	0	5,095
	0	0	0.4%	0	0.4%
Don't know	0	0	1,785	0	1,785
	0	0	0.1%	0	0.1%
Not applicable	903,308	0	0	58,199	961,507
	72.0%	0	0	4.6%	76.7%

Table C.34

Question30. How many water heaters are at this residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
One	837,345	74,841	179,336	58,199	1,149,722
	66.8%	6.0%	14.3%	4.6%	91.7%
Two	59,850	0	2,120	0	61,970
	4.8%	0	0.2%	0	4.9%
Three or more	2,164	0	5,095	0	7,259
	0.2%	0	0.4%	0	0.6%
Don't know	3,949	0	0	0	3,949
	0.3%	0	0	0	0.3%
Not applicable	0	0	30,839	0	30,839
	0	0	2.5%	0	2.5%

Table C.35

Question 31. What type of water heater do you have?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Tank-type water heater	858,648 68.5%	67,962 5.4%	169,180 13.5%	54,732 4.4%	1,150,522 91.8%
Indirect water heater or integrated water heater	11,599 0.9%	0 0	2,085 0.2%	0 0	13,685 1.1%
Tankless hotwater heater aka demand or instantaneous water heater	25,989 2.1%	0 0	5,095 0.4%	1,734 0.1%	32,818 2.6%
Don't know	7,072 0.6%	6,880 0.5%	10,191 0.8%	1,734 0.1%	25,876 2.1%
Not applicable	0 0	0 0	30,839 2.5%	0 0	30,839 2.5%

Table C.36

Question 32. What type of system is used in conjunction with your solar water heater?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Not applicable	903,308 72.0%	74,841 6.0%	217,390 17.3%	58,199 4.6%	1,253,739 100.0%

Table C.37

Question 32a. What is the secondary or back-up type of fuel you use to heat water at this residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Not applicable	903,308	74,841	217,390	58,199	1,253,739
	72.0%	6.0%	17.3%	4.6%	100.0%

Table C.38

Question 33. What type of fuel or energy is used to heat the water used in this residence?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Electricity	304,336	30,763	140,897	47,800	523,797
	24.3%	2.5%	11.2%	3.8%	41.8%
Natural gas	564,409	35,113	31,559	8,665	639,746
	45.0%	2.8%	2.5%	0.7%	51.0%
Propane or bottled gas (LP, propane, butane)	25,327	0	0	0	25,327
	2.0%	0	0	0	2.0%
Don't know	2,164	2,085	3,905	0	8,154
	0.2%	0.2%	0.3%	0	0.7%
Not applicable	7,072	6,880	41,029	1,734	56,714
	0.6%	0.5%	3.3%	0.1%	4.5%

Table C.39

Question 34. At what specific temperature is your water heater thermostat set?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
69	0	2,164	0	0	2,164
	0	0.2%	0	0	0.2%
70	3,949	0	0	0	3,949
	0.3%	0	0	0	0.3%
72	0	0	5,095	0	5,095
	0	0	0.4%	0	0.4%
75	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
80	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
85	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
90	4,328	0	0	0	4,328
	0.3%	0	0	0	0.3%
98	3,569	0	0	0	3,569
	0.3%	0	0	0	0.3%
100	20,256	0	5,095	3,123	28,474
	1.6%	0	0.4%	0.2%	2.3%
102	9,236	0	0	0	9,236
	0.7%	0	0	0	0.7%

Question 34. At what specific temperature is your water heater thermostat set?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
105	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
109	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
110	38,566	0	5,095	0	43,662
	3.1%	0	0.4%	0	3.5%
114	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
115	25,112	2,085	0	0	27,198
	2.0%	0.2%	0	0	2.2%
118	0	0	0	1,734	1,734
	0	0	0	0.1%	0.1%
120	158,641	11,569	10,191	8,614	189,015
	12.7%	0.9%	0.8%	0.7%	15.1%
125	29,190	2,164	0	0	31,355
	2.3%	0.2%	0	0	2.5%
130	25,163	0	2,085	1,734	28,982
	2.0%	0	0.2%	0.1%	2.3%
135	4,907	0	0	1,734	6,641
	0.4%	0	0	0.1%	0.5%
140	43,316	0	0	4,857	48,172
	3.5%	0	0	0.4%	3.8%

Question 34. At what specific temperature is your water heater thermostat set?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
145	2,164	0	0	0	2,164
	0.2%	0	0	0	0.2%
150	4,546	0	0	0	4,546
	0.4%	0	0	0	0.4%
155	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
160	2,164	0	0	1,734	3,898
	0.2%	0	0	0.1%	0.3%
165	8,410	0	0	0	8,410
	0.7%	0	0	0	0.7%
170	3,123	0	0	1,734	4,857
	0.2%	0	0	0.1%	0.4%
180	7,072	0	0	0	7,072
	0.6%	0	0	0	0.6%
185	0	0	0	1,734	1,734
	0	0	0	0.1%	0.1%
190	0	0	2,085	0	2,085
	0	0	0.2%	0	0.2%
Don't know	493,088	56,859	156,905	31,203	738,055
	39.3%	4.5%	12.5%	2.5%	58.9%
Not applicable	0	0	30,839	0	30,839
	0	0	2.5%	0	2.5%

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Table C.40

Question 34a. If not set at a specific temperature then which of these statements best describes where your water heater thermostat is set?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
On the 'low' setting	15,276 1.2%	1,785 0.1%	15,286 1.2%	3,467 0.3%	35,814 2.9%
Between the 'low' and 'medium' settings	41,565 3.3%	15,286 1.2%	6,880 0.5%	3,413 0.3%	67,144 5.4%
On the 'medium' setting	211,363 16.9%	7,216 0.6%	60,935 4.9%	13,921 1.1%	293,434 23.4%
Between the 'medium' and 'high' setting	116,661 9.3%	13,172 1.1%	36,017 2.9%	5,201 0.4%	171,051 13.6%
On the 'high' setting	18,851 1.5%	4,925 0.4%	0 0	0 0	23,776 1.9%
Don't know	89,373 7.1%	14,475 1.2%	37,787 3.0%	5,201 0.4%	146,836 11.7%
Not applicable	410,219 32.7%	17,983 1.4%	60,486 4.8%	26,996 2.2%	515,684 41.1%

Table C.41

Question 35. Which of the following items do you have for your main water heater? Do you have a water heater tank wrap?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Yes	325,856	14,139	41,993	22,085	404,073
	26.0%	1.1%	3.3%	1.8%	32.2%
No	537,090	51,737	115,134	29,179	733,140
	42.8%	4.1%	9.2%	2.3%	58.5%
Don't know	40,362	8,965	29,425	6,935	85,687
	3.2%	0.7%	2.3%	0.6%	6.8%
Not applicable	0	0	30,839	0	30,839
	0	0	2.5%	0	2.5%

Table C.42

Question 36. Which of the following items do you have for your main water heater? Do you have pipe insulation?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Yes	526,110	31,294	52,148	32,542	642,094
	42.0%	2.5%	4.2%	2.6%	51.2%
No	313,408	29,701	87,864	15,255	446,229
	25.0%	2.4%	7.0%	1.2%	35.6%
Don't know	63,789	13,847	46,539	10,402	134,577
	5.1%	1.1%	3.7%	0.8%	10.7%
Not applicable	0	0	30,839	0	30,839
	0	0	2.5%	0	2.5%

Table C.43

Question 37. Which of the following items do you have for your main water heater? Do you have a water heater timer?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Yes	101,248	4,328	7,181	1,734	114,490
	8.1%	0.3%	0.6%	0.1%	9.1%
No	701,360	54,633	132,919	46,013	934,925
	55.9%	4.4%	10.6%	3.7%	74.6%
Don't know	100,701	15,880	46,452	10,453	173,485
	8.0%	1.3%	3.7%	0.8%	13.8%
Not applicable	0	0	30,839	0	30,839
	0	0	2.5%	0	2.5%

Table C.44

Question 38. How many refrigerators are in your home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
1	604,450	57,643	208,390	52,998	923,482
	48.2%	4.6%	16.6%	4.2%	73.7%
2	285,673	17,198	9,000	5,201	317,073
	22.8%	1.4%	0.7%	0.4%	25.3%
3	11,020	0	0	0	11,020
	0.9%	0	0	0	0.9%
4	2,164	0	0	0	2,164
	0.2%	0	0	0	0.2%

Table C.45

Question 39. How many years old is your primary refrigerator?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
6 or less years old	515,265	42,357	112,451	20,855	690,929
	41.1%	3.4%	9.0%	1.7%	55.1%
7 to 14 years old	260,132	20,509	58,004	16,884	355,529
	20.7%	1.6%	4.6%	1.3%	28.4%
15 or more years old	119,054	6,880	21,459	10,402	157,796
	9.5%	0.5%	1.7%	0.8%	12.6%
Don't know	8,856	5,095	25,476	10,058	49,485
	0.7%	0.4%	2.0%	0.8%	3.9%

Table C.46

Question 40. How many stand-alone freezers are in your home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	403,027	58,831	207,200	25,607	694,664
	32.1%	4.7%	16.5%	2.0%	55.4%
1	460,428	16,011	10,191	30,859	517,488
	36.7%	1.3%	0.8%	2.5%	41.3%
2	39,853	0	0	1,734	41,586
	3.2%	0	0	0.1%	3.3%

Table C.47

Question 41. How many years old is your 'primary' stand-alone freezer?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
6 or less years old	152,428 12.2%	9,345 0.7%	0 0	10,453 0.8%	172,225 13.7%
7 to 14 years old	140,196 11.2%	6,666 0.5%	5,095 0.4%	6,935 0.6%	158,892 12.7%
15 or more years old	197,514 15.8%	0 0	0 0	13,471 1.1%	210,985 16.8%
Don't know	10,144 0.8%	0 0	5,095 0.4%	1,734 0.1%	16,973 1.4%
Not applicable	403,027 32.1%	58,831 4.7%	207,200 16.5%	25,607 2.0%	694,664 55.4%

Table C.48

Question 42. How many dishwashers are in your home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	74,117 5.9%	2,164 0.2%	43,712 3.5%	13,870 1.1%	133,862 10.7%
1	820,715 65.5%	72,677 5.8%	171,558 13.7%	44,330 3.5%	1,109,280 88.5%
2	8,476 0.7%	0 0	2,120 0.2%	0 0	10,597 0.8%

Table C.49

Question 43. Do you have a private clothes washer that is used just by the people in your household?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Yes	901,523	71,719	135,978	51,265	1,160,485
	71.9%	5.7%	10.8%	4.1%	92.6%
No	1,785	3,123	81,412	6,935	93,254
	0.1%	0.2%	6.5%	0.6%	7.4%

Table C.50

Question 44. Which of the following best describes the type of clothes washer in your home?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Front load washing machine	289,782	12,024	26,707	4,857	333,370
	23.1%	1.0%	2.1%	0.4%	26.6%
Top load washing machine	607,793	59,694	109,271	46,408	823,166
	48.5%	4.8%	8.7%	3.7%	65.7%
Don't know	3,949	0	0	0	3,949
	0.3%	0	0	0	0.3%
Not applicable	1,785	3,123	81,412	6,935	93,254
	0.1%	0.2%	6.5%	0.6%	7.4%

Table C.51

Question 45. Do you have a clothes dryer that is used just by the people in your household?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Yes	897,575	68,957	135,978	51,265	1,153,775
	71.6%	5.5%	10.8%	4.1%	92.0%
No	5,733	5,884	81,412	6,935	99,964
	0.5%	0.5%	6.5%	0.6%	8.0%

Table C.52

Question 46. What fuel or energy source do you use for your clothes dryer?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Electricity	721,949	57,413	131,808	49,531	960,701
	62.6%	5.0%	11.4%	4.3%	83.3%
Natural gas	160,776	4,328	2,085	0	167,190
	13.9%	0.4%	0.2%	0	14.5%
Propane or bottled gas (LP, propane, butane)	11,102	0	0	1,734	12,836
	1.0%	0	0	0.2%	1.1%
Something else (specify)	1,734	0	0	0	1,734
	0.2%	0	0	0	0.2%
Don't know	2,014	7,216	2,085	0	11,315
	0.2%	0.6%	0.2%	0	1.0%

Table C.53

Question 47. Do you have your own swimming pool?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Yes	26,746	0	0	1,680	28,426
	2.1%	0	0	0.1%	2.3%
No	876,561	74,841	217,390	56,520	1,225,313
	69.9%	6.0%	17.3%	4.5%	97.7%

Table C.54

Question 48. What fuel or energy source do you use to heat your swimming pool?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Electricity	5,303	0	0	0	5,303
	0.4%	0	0	0	0.4%
Natural gas	12,075	0	0	0	12,075
	1.0%	0	0	0	1.0%
Solar	6,246	0	0	0	6,246
	0.5%	0	0	0	0.5%
Not heated	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
Don't know	0	0	0	1,680	1,680
	0	0	0	0.1%	0.1%
Not applicable	876,561	74,841	217,390	56,520	1,225,313
	69.9%	6.0%	17.3%	4.5%	97.7%

Table C.55

Question 48a. How often do you operate your pool pump and filtration system?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
All day and all night	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
Turned off at night	7,747	0	0	0	7,747
	0.6%	0	0	0	0.6%
Something else (specify)	14,092	0	0	0	14,092
	1.1%	0	0	0	1.1%
Don't know	3,123	0	0	1,680	4,802
	0.2%	0	0	0.1%	0.4%
Not applicable	876,561	74,841	217,390	56,520	1,225,313
	69.9%	6.0%	17.3%	4.5%	97.7%

Table C.56

Question 48b. Do you own an insulating cover for your pool?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Yes	13,562	0	0	0	13,562
	1.1%	0	0	0	1.1%
No	13,184	0	0	1,680	14,864
	1.1%	0	0	0.1%	1.2%
Not applicable	876,561	74,841	217,390	56,520	1,225,313
	69.9%	6.0%	17.3%	4.5%	97.7%

Table C.57

Question 49. Do you have your own hot tub or spa?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Yes	94,698	2,164	0	3,467	100,329
	7.6%	0.2%	0	0.3%	8.0%
No	808,610	72,677	217,390	54,732	1,153,410
	64.5%	5.8%	17.3%	4.4%	92.0%

Table C.58

Question 50. What fuel or energy source do you use for your hot tub or spa?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Electricity	77,715	2,164	0	3,467	83,347
	6.2%	0.2%	0	0.3%	6.6%
Natural gas	16,983	0	0	0	16,983
	1.4%	0	0	0	1.4%
Not applicable	808,610	72,677	217,390	54,732	1,153,410
	64.5%	5.8%	17.3%	4.4%	92.0%

Table C.59

Question 50a. Do you have your own sauna?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Yes	20,389 1.6%	0 0	5,095 0.4%	0 0	25,484 2.0%
No	882,919 70.4%	74,841 6.0%	212,295 16.9%	56,466 4.5%	1,226,521 97.8%
Don't know	0 0	0 0	0 0	1,734 0.1%	1,734 0.1%

Table C.60

Question 50b. What fuel or energy source do you use for your sauna?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Electricity	20,389 1.6%	0 0	5,095 0.4%	0 0	25,484 2.0%
Not applicable	882,919 70.4%	74,841 6.0%	212,295 16.9%	58,199 4.6%	1,228,255 98.0%

Table C.61

Question 51. How many cook-top units do you have?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	48,162 3.8%	5,095 0.4%	19,456 1.6%	3,467 0.3%	76,182 6.1%
1	817,616 65.2%	69,746 5.6%	187,743 15.0%	47,800 3.8%	1,122,906 89.6%
2	32,434 2.6%	0 0	10,191 0.8%	6,931 0.6%	49,556 4.0%
Don't know	5,095 0.4%	0 0	0 0	0 0	5,095 0.4%

Table C.62

Question 52. What fuel or energy source do you use for your cook-top(s)?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Electricity	536,684 42.8%	59,136 4.7%	166,392 13.3%	51,265 4.1%	813,476 64.9%
Natural gas	286,305 22.8%	8,490 0.7%	31,542 2.5%	1,734 0.1%	328,071 26.2%
Propane or bottled gas (LP, propane, butane)	27,061 2.2%	0 0	0 0	1,734 0.1%	28,795 2.3%
Don't know	0 0	2,120 0.2%	0 0	0 0	2,120 0.2%
No response	5,095 0.4%	0 0	0 0	0 0	5,095 0.4%

Not applicable	48,162	5,095	19,456	3,467	76,182
	3.8%	0.4%	1.6%	0.3%	6.1%

Table C.63

Question 53. How many ovens do you have?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	6,246 0.5%	0 0	0 0	0 0	6,246 0.5%
1	756,995 60.4%	72,677 5.8%	210,210 16.8%	54,681 4.4%	1,094,563 87.3%
2	133,822 10.7%	2,164 0.2%	2,085 0.2%	3,518 0.3%	141,590 11.3%
3	6,246 0.5%	0 0	5,095 0.4%	0 0	11,341 0.9%

Table C.64

Question 54. What fuel or energy source do you use for your oven(s)?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
Electricity	716,243 57.1%	68,480 5.5%	198,159 15.8%	56,466 4.5%	1,039,349 82.9%
Natural gas	162,696 13.0%	4,241 0.3%	19,231 1.5%	1,734 0.1%	187,901 15.0%
Propane or bottled gas (LP, propane, butane)	15,959 1.3%	0 0	0 0	0 0	15,959 1.3%
Don't know	2,164 0.2%	2,120 0.2%	0 0	0 0	4,285 0.3%
Not applicable	6,246 0.5%	0 0	0 0	0 0	6,246 0.5%

Table C.65

Question 55. How many microwave ovens do you have?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	17,131 1.4%	0 0	19,491 1.6%	0 0	36,623 2.9%
1	830,547 66.2%	70,592 5.6%	197,899 15.8%	56,466 4.5%	1,155,504 92.2%
2	52,507 4.2%	4,249 0.3%	0 0	1,734 0.1%	58,490 4.7%
3	3,123 0.2%	0 0	0 0	0 0	3,123 0.2%

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Table C.66

Question 56. Number of televisions of all types in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	15,928 1.3%	0 0	12,311 1.0%	0 0	28,239 2.3%
1	172,072 13.7%	10,829 0.9%	89,130 7.1%	23,529 1.9%	295,560 23.6%
2	287,041 22.9%	35,899 2.9%	78,825 6.3%	22,484 1.8%	424,249 33.8%
3	243,947 19.5%	10,240 0.8%	17,554 1.4%	8,669 0.7%	280,409 22.4%
4	105,788 8.4%	10,018 0.8%	12,311 1.0%	1,785 0.1%	129,901 10.4%
5	45,883 3.7%	7,856 0.6%	5,095 0.4%	1,734 0.1%	60,569 4.8%
6	15,877 1.3%	0 0	0 0	0 0	15,877 1.3%
7	4,546 0.4%	0 0	0 0	0 0	4,546 0.4%
8	3,949 0.3%	0 0	0 0	0 0	3,949 0.3%
Refused	8,277 0.7%	0 0	2,164 0.2%	0 0	10,441 0.8%

Table C.67

Question 57. Number of large flat-screen tvs (over 32 inches) in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	550,928	39,970	169,328	42,890	803,116
	45.0%	3.3%	13.8%	3.5%	65.5%
1	273,704	32,707	23,396	11,791	341,599
	22.3%	2.7%	1.9%	1.0%	27.9%
2	45,236	2,164	5,095	3,518	56,013
	3.7%	0.2%	0.4%	0.3%	4.6%
3	4,907	0	0	0	4,907
	0.4%	0	0	0	0.4%
4	2,164	0	0	0	2,164
	0.2%	0	0	0	0.2%
5	0	0	5,095	0	5,095
	0	0	0.4%	0	0.4%
Refused	2,164	0	0	0	2,164
	0.2%	0	0	0	0.2%
Not applicable	8,277	0	2,164	0	10,441
	0.7%	0	0.2%	0	0.9%

Table C.68

Question 58. Number of game consoles (Playstation Wii Nintendo xbox xCube etc) in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	592,634 47.3%	44,312 3.5%	167,243 13.3%	51,265 4.1%	855,453 68.2%
1	173,760 13.9%	21,699 1.7%	28,492 2.3%	1,734 0.1%	225,685 18.0%
2	77,903 6.2%	6,666 0.5%	12,276 1.0%	3,467 0.3%	100,312 8.0%
3	25,392 2.0%	0 0	2,120 0.2%	1,734 0.1%	29,246 2.3%
4	5,287 0.4%	2,164 0.2%	5,095 0.4%	0 0	12,546 1.0%
5	11,548 0.9%	0 0	0 0	0 0	11,548 0.9%
6	4,328 0.3%	0 0	0 0	0 0	4,328 0.3%
Don't know	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
Refused	10,291 0.8%	0 0	2,164 0.2%	0 0	12,455 1.0%

Table C.69

Question 59. Number of VCRs or DVD players (not a combo unit) in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	211,631 16.9%	14,579 1.2%	62,684 5.0%	15,654 1.2%	304,549 24.3%
1	343,973 27.4%	27,181 2.2%	80,719 6.4%	32,487 2.6%	484,361 38.6%
2	210,365 16.8%	20,726 1.7%	51,294 4.1%	8,324 0.7%	290,709 23.2%
3	83,366 6.6%	12,355 1.0%	7,216 0.6%	1,734 0.1%	104,670 8.3%
4	20,732 1.7%	0 0	13,313 1.1%	0 0	34,045 2.7%
5	9,236 0.7%	0 0	0 0	0 0	9,236 0.7%
6	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
7	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
9	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
Don't know	7,072 0.6%	0 0	0 0	0 0	7,072 0.6%
Refused	10,441 0.8%	0 0	2,164 0.2%	0 0	12,605 1.0%

Table C.70

Question 60. Number of combination VCR and DVD units in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	467,314	46,375	117,669	30,463	661,821
	37.3%	3.7%	9.4%	2.4%	52.8%
1	296,002	17,302	79,149	24,218	416,671
	23.6%	1.4%	6.3%	1.9%	33.2%
2	95,102	6,069	17,450	3,518	122,139
	7.6%	0.5%	1.4%	0.3%	9.7%
3	28,136	5,095	3,123	0	36,354
	2.2%	0.4%	0.2%	0	2.9%
4	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
5	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
23	3,123	0	0	0	3,123
	0.2%	0	0	0	0.2%
Don't know	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%
Refused	8,277	0	0	0	8,277
	0.7%	0	0	0	0.7%

Table C.71

Question 61. Number of stand-alone DVR units (not TIVO) in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	663,946	37,824	163,043	42,596	907,408
	53.0%	3.0%	13.0%	3.4%	72.4%
1	166,500	29,278	34,777	12,136	242,691
	13.3%	2.3%	2.8%	1.0%	19.4%
2	46,873	1,785	17,406	1,734	67,798
	3.7%	0.1%	1.4%	0.1%	5.4%
3	5,354	2,085	0	1,734	9,173
	0.4%	0.2%	0	0.1%	0.7%
Don't know	12,359	3,870	0	0	16,228
	1.0%	0.3%	0	0	1.3%
Refused	8,277	0	2,164	0	10,441
	0.7%	0	0.2%	0	0.8%

Table C.72

Question 62. Number of TIVO or cable or satellite TV set-top boxes or receivers in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	342,204 27.3%	16,595 1.3%	100,319 8.0%	26,996 2.2%	486,115 38.8%
1	299,964 23.9%	24,823 2.0%	87,311 7.0%	20,801 1.7%	432,899 34.5%
2	144,496 11.5%	19,750 1.6%	19,570 1.6%	6,935 0.6%	190,751 15.2%
3	79,834 6.4%	8,578 0.7%	5,095 0.4%	1,734 0.1%	95,241 7.6%
4	15,928 1.3%	5,095 0.4%	5,095 0.4%	1,734 0.1%	27,852 2.2%
5	6,113 0.5%	0 0	0 0	0 0	6,113 0.5%
Don't know	6,113 0.5%	0 0	0 0	0 0	6,113 0.5%
Refused	8,657 0.7%	0 0	0 0	0 0	8,657 0.7%

Table C.73

Question 63. Number of stereo systems in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	219,457 17.5%	20,374 1.6%	94,629 7.5%	23,873 1.9%	358,333 28.6%
1	514,988 41.1%	42,156 3.4%	110,406 8.8%	27,391 2.2%	694,942 55.4%
2	113,371 9.0%	10,191 0.8%	5,095 0.4%	1,734 0.1%	130,390 10.4%
3	35,041 2.8%	0 0	5,095 0.4%	1,734 0.1%	41,870 3.3%
4	7,847 0.6%	0 0	0 0	1,734 0.1%	9,580 0.8%
6	0 0	0 0	0 0	1,734 0.1%	1,734 0.1%
13	0 0	2,120 0.2%	0 0	0 0	2,120 0.2%
Refused	12,605 1.0%	0 0	2,164 0.2%	0 0	14,769 1.2%

Table C.74

Question 64. Number of personal computers - including laptops - in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	68,990	6,034	57,697	20,801	153,522
	5.5%	0.5%	4.6%	1.7%	12.2%
1	374,073	48,678	112,562	23,873	559,186
	29.8%	3.9%	9.0%	1.9%	44.6%
2	235,905	18,345	22,501	11,791	288,543
	18.8%	1.5%	1.8%	0.9%	23.0%
3	135,794	1,785	17,371	1,734	156,684
	10.8%	0.1%	1.4%	0.1%	12.5%
4	49,951	0	0	0	49,951
	4.0%	0	0	0	4.0%
5	19,876	0	0	0	19,876
	1.6%	0	0	0	1.6%
7	2,164	0	0	0	2,164
	0.2%	0	0	0	0.2%
8	3,949	0	0	0	3,949
	0.3%	0	0	0	0.3%
Don't know	0	0	5,095	0	5,095
	0	0	0.4%	0	0.4%
Refused	12,605	0	2,164	0	14,769
	1.0%	0	0.2%	0	1.2%

Table C.75

Question 65. Number of computer monitors in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	71,620 6.5%	14,579 1.3%	34,441 3.1%	5,201 0.5%	125,842 11.4%
1	486,765 44.2%	52,064 4.7%	110,812 10.1%	23,873 2.2%	673,514 61.2%
2	173,027 15.7%	2,164 0.2%	2,085 0.2%	6,590 0.6%	183,866 16.7%
3	68,260 6.2%	0 0	5,095 0.5%	1,734 0.2%	75,089 6.8%
4	15,928 1.4%	0 0	0 0	0 0	15,928 1.4%
5	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
6	1,785 0.2%	0 0	0 0	0 0	1,785 0.2%
Don't know	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
Not applicable	12,605 1.1%	0 0	7,259 0.7%	0 0	19,865 1.8%

Table C.76

Question 66. Number of combination printer / fax / copiers in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	399,793 31.9%	31,460 2.5%	146,605 11.7%	37,794 3.0%	615,652 49.1%
1	435,143 34.7%	33,191 2.6%	65,690 5.2%	16,938 1.4%	550,962 43.9%
2	50,859 4.1%	5,095 0.4%	5,095 0.4%	1,734 0.1%	62,783 5.0%
3	7,072 0.6%	0 0	0 0	0 0	7,072 0.6%
Don't know	0 0	5,095 0.4%	0 0	1,734 0.1%	6,829 0.5%
Refused	10,441 0.8%	0 0	0 0	0 0	10,441 0.8%

Table C.77

Question 67. Number of stand-alone printers in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	369,469 29.5%	29,408 2.3%	149,492 11.9%	25,948 2.1%	574,318 45.8%
1	425,553 33.9%	40,338 3.2%	65,734 5.2%	27,050 2.2%	558,675 44.6%
2	92,490 7.4%	5,095 0.4%	0 0	3,467 0.3%	101,053 8.1%
3	1,785 0.1%	0 0	0 0	1,734 0.1%	3,518 0.3%
4	1,785 0.1%	0 0	0 0	0 0	1,785 0.1%
10	1,785 0.1%	0 0	0 0	0 0	1,785 0.1%
Don't know	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
Refused	8,277 0.7%	0 0	2,164 0.2%	0 0	10,441 0.8%

Table C.78

Question 68. Number of stand-alone fax machines in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	758,057 60.5%	63,633 5.1%	205,079 16.4%	51,609 4.1%	1,078,379 86.0%
1	128,118 10.2%	9,044 0.7%	7,216 0.6%	6,590 0.5%	150,968 12.0%
2	6,692 0.5%	2,164 0.2%	5,095 0.4%	0 0	13,951 1.1%
Refused	10,441 0.8%	0 0	0 0	0 0	10,441 0.8%

Table C.79

Question 69. Number of stand-alone copiers in your home.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	711,934 56.8%	58,360 4.7%	191,019 15.2%	46,408 3.7%	1,007,721 80.4%
1	159,947 12.8%	11,386 0.9%	21,276 1.7%	10,058 0.8%	202,667 16.2%
2	18,243 1.5%	5,095 0.4%	5,095 0.4%	0 0	28,433 2.3%
11	1,785 0.1%	0 0	0 0	0 0	1,785 0.1%
Don't know	3,123 0.2%	0 0	0 0	1,734 0.1%	4,857 0.4%
Refused	8,277 0.7%	0 0	0 0	0 0	8,277 0.7%

Table C.80

Question 70. Number of surge protector strips in your home for any of the audio/video or home office mentioned above.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
0	82,470 6.6%	10,283 0.8%	46,539 3.7%	17,388 1.4%	156,680 12.5%
1	184,462 14.7%	10,571 0.8%	63,649 5.1%	5,147 0.4%	263,828 21.0%
2	193,972 15.5%	35,598 2.8%	43,707 3.5%	18,382 1.5%	291,659 23.3%
3	182,564 14.6%	4,249 0.3%	32,732 2.6%	3,413 0.3%	222,959 17.8%
4	85,565 6.8%	10,191 0.8%	20,381 1.6%	3,467 0.3%	119,604 9.5%
5	61,266 4.9%	2,164 0.2%	5,095 0.4%	1,734 0.1%	70,260 5.6%
6	47,137 3.8%	0 0	5,287 0.4%	5,201 0.4%	57,625 4.6%
7	17,513 1.4%	0 0	0 0	0 0	17,513 1.4%
8	10,574 0.8%	0 0	0 0	1,734 0.1%	12,308 1.0%
9	5,682 0.5%	0 0	0 0	0 0	5,682 0.5%
10	11,020 0.9%	0 0	0 0	0 0	11,020 0.9%

Question 70. Number of surge protector strips in your home for any of the audio/video or home office mentioned above.	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
12	1,785 0.1%	0 0	0 0	0 0	1,785 0.1%
20	2,164 0.2%	0 0	0 0	0 0	2,164 0.2%
Don't know	8,856 0.7%	1,785 0.1%	0 0	0 0	10,641 0.8%
Refused	8,277 0.7%	0 0	0 0	1,734 0.1%	10,011 0.8%

Table C.81

Question 71. Energy Star equipment	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
all of them/everything	39,819 5.5%	1,785 0.2%	5,095 0.7%	3,123 0.4%	49,821 6.8%
air conditioning	5,354 0.7%	0 0	0 0	0 0	5,354 0.7%
computer monitor	11,466 1.6%	0 0	2,085 0.3%	0 0	13,552 1.9%
computer	34,794 4.8%	0 0	25,476 3.5%	0 0	60,271 8.3%
dishwasher	201,893 27.7%	19,990 2.7%	7,181 1.0%	8,560 1.2%	237,624 32.6%
dryer	250,651 34.3%	17,621 2.4%	5,095 0.7%	5,201 0.7%	278,569 38.2%
freezer	56,436 7.7%	5,095 0.7%	0 0	3,518 0.5%	65,050 8.9%
furnace	22,336 3.1%	0 0	0 0	0 0	22,336 3.1%
microwave	51,614 7.1%	4,285 0.6%	5,095 0.7%	3,413 0.5%	64,407 8.8%
oven	47,412 6.5%	0 0	0 0	1,680 0.2%	49,091 6.7%
refrigerator	355,294 48.7%	35,088 4.8%	41,993 5.8%	15,600 2.1%	447,975 61.4%

Question 71. Energy Star equipment	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
stove	117,368	14,667	14,396	5,201	151,632
	16.1%	2.0%	2.0%	0.7%	20.8%
television	41,583	9,044	15,286	1,734	67,646
	5.7%	1.2%	2.1%	0.2%	9.3%
washing machine	290,682	19,406	7,181	3,467	320,736
	39.8%	2.7%	1.0%	0.5%	44.0%
water heater	106,841	19,003	12,311	5,201	143,355
	14.6%	2.6%	1.7%	0.7%	19.6%
asked/answered	776,935	63,633	152,293	46,063	1,038,925
	62.0%	5.1%	12.1%	3.7%	82.9%
Don't know	124,588	11,208	65,097	12,136	213,030
	9.9%	0.9%	5.2%	1.0%	17.0%
Refused	1,785	0	0	0	1,785
	0.1%	0	0	0	0.1%

Table C.82

Question 72. How many people - including yourself - usually live in this residence at least six months of the year?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
1	109,701 8.7%	28,018 2.2%	136,706 10.9%	13,815 1.1%	288,241 23.0%
2	366,864 29.3%	29,839 2.4%	38,682 3.1%	35,715 2.8%	471,101 37.6%
3	181,213 14.5%	5,990 0.5%	17,371 1.4%	5,201 0.4%	209,775 16.7%
4	143,936 11.5%	6,069 0.5%	12,276 1.0%	3,467 0.3%	165,749 13.2%
5	62,173 5.0%	4,925 0.4%	10,191 0.8%	0 0	77,289 6.2%
6	17,579 1.4%	0 0	0 0	0 0	17,579 1.4%
7	3,949 0.3%	0 0	0 0	0 0	3,949 0.3%
8	7,451 0.6%	0 0	0 0	0 0	7,451 0.6%
Refused	10,441 0.8%	0 0	2,164 0.2%	0 0	12,605 1.0%

Table C.83

Question 73. For what average length of time is your home occupied by at least one person on a typical weekday ?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
23-24 hrs/day	400,195 31.9%	23,928 1.9%	43,189 3.4%	30,859 2.5%	498,171 39.7%
21-22 hrs/day	44,676 3.6%	5,095 0.4%	25,454 2.0%	5,201 0.4%	80,427 6.4%
19-20 hrs/day	76,400 6.1%	4,249 0.3%	19,535 1.6%	6,590 0.5%	106,775 8.5%
17-18 hrs/day	78,950 6.3%	9,000 0.7%	23,950 1.9%	1,734 0.1%	113,634 9.1%
15-16 hrs/day	91,512 7.3%	1,785 0.1%	41,993 3.3%	1,734 0.1%	137,023 10.9%
13-14 hrs/day	59,674 4.8%	10,654 0.8%	9,301 0.7%	6,935 0.6%	86,564 6.9%
11-12 hrs/day	71,191 5.7%	11,085 0.9%	32,692 2.6%	0 0	114,969 9.2%
9-10 hrs/day	10,641 0.8%	0 0	2,085 0.2%	1,734 0.1%	14,460 1.2%
7-8 hrs/day	23,807 1.9%	5,095 0.4%	14,095 1.1%	0 0	42,998 3.4%
5-6 hrs/day	9,302 0.7%	2,164 0.2%	0 0	1,734 0.1%	13,200 1.1%
3-4 hrs/day	5,287 0.4%	0 0	0 0	0 0	5,287 0.4%

Question 73. For what average length of time is your home occupied by at least one person on a typical weekday ?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
1-2 hrs/day	1,785 0.1%	1,785 0.1%	0 0	0 0	3,569 0.3%
Don't know	10,590 0.8%	0 0	0 0	1,680 0.1%	12,269 1.0%
Refused	19,297 1.5%	0 0	5,095 0.4%	0 0	24,393 1.9%

Table C.84

Question 74. For what average length of time is your home occupied by at least one person on a typical weekend?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
23-24 hrs/day	497,885 39.7%	34,945 2.8%	80,130 6.4%	36,060 2.9%	649,020 51.8%
21-22 hrs/day	40,260 3.2%	0 0	23,142 1.8%	3,467 0.3%	66,869 5.3%
19-20 hrs/day	126,688 10.1%	9,449 0.8%	27,641 2.2%	11,737 0.9%	175,515 14.0%
17-18 hrs/day	50,260 4.0%	8,455 0.7%	32,469 2.6%	1,734 0.1%	92,918 7.4%
15-16 hrs/day	48,703 3.9%	10,829 0.9%	24,622 2.0%	1,734 0.1%	85,887 6.9%
13-14 hrs/day	20,931 1.7%	5,095 0.4%	9,301 0.7%	1,734 0.1%	37,061 3.0%
11-12 hrs/day	34,978 2.8%	2,120 0.2%	14,095 1.1%	0 0	51,194 4.1%
9-10 hrs/day	30,203 2.4%	0 0	0 0	1,734 0.1%	31,937 2.5%
7-8 hrs/day	14,722 1.2%	0 0	2,120 0.2%	0 0	16,842 1.3%
5-6 hrs/day	6,113 0.5%	2,164 0.2%	1,785 0.1%	0 0	10,062 0.8%
3-4 hrs/day	0 0	0 0	2,085 0.2%	0 0	2,085 0.2%

Question 74. For what average length of time is your home occupied by at least one person on a typical weekend?	Dwelling Type				Total
	Single family detached home	Duplex, row- or townhouse	Apartment or condo	Manufactured home	
1-2 hrs/day	0	1,785	0	0	1,785
	0	0.1%	0	0	0.1%
Don't know	21,543	0	0	0	21,543
	1.7%	0	0	0	1.7%
Refused	11,020	0	0	0	11,020
	0.9%	0	0	0	0.9%

Appendix A.2 – Commercial Building Stock Assessment

Background and Objectives

This report characterizes the 2008 commercial building stock in Puget Sound Energy's (PSE) service territory. The study is intended to:

1. Augment and update the results of 2003 Commercial Building Stock Assessment (CBSA) conducted for the Pacific Northwest, and
2. Develop energy-use intensity (EUI) values, fuel shares, and penetration of energy-efficient technologies and practices for use in the Comprehensive Assessment of Demand-Side Resource Potentials (2010-2029).

The results of this study are expected to serve as a basis for current planning, forecasting, and program development initiatives by PSE. Site information from the 2003 CBSA was updated during Winter 2009 and is currently being processed; these results will be incorporated into the database during May/June 2009.

Study Approach

Sample Development

This study augments commercial building data collected during the 2003 CBSA study. Because auxiliary data collection activities such as the new construction study and supplemental site visits for the 1998-2000 cohort provided adequate data for newer buildings, only buildings constructed before 1995 were included in this study. PSE provided a database of all current commercial accounts. To build a sample frame, Cadmus classified accounts into building type categories (see Table 1) by NAICS code, and screened for vintage (pre-1995). The building type sample distribution was determined according to the building type percentage kWh usage for PSE. Offices make up the largest part of the commercial electricity load and thus, had the highest site visit target. Within each building type, buildings were sorted into quartiles based on the annual electricity (kWh) consumption, and site visit targets were evenly distributed across the quartiles, shown in Table 1. Buildings were randomly selected from the screened customer database for each quartile.

Table 1. Initial Sample Frame, Oversample

Building Type	Q1 sample	Q2 Sample	Q3 Sample	Q4 Sample	Desired Sample
Dry Goods Retail	5	5	6	6	22
Grocery	1	2	2	2	7
Office	10	10	11	11	42
Restaurant	1	2	3	3	9
Warehouse	-	-	-	1	1
Health	1	1	2	2	6
Hotel/Motel	-	1	1	1	3
Schools	2	2	3	3	10
Total	20	23	28	29	100

To preemptively address sample attrition during the recruitment and auditing process, the initial sample frame targeted 100 buildings, with the goal of completing a minimum of 80 audits at the conclusion of field work. The actual sample of site visits conducted by building segmentation is shown in Table 2. Buildings classified as “Health” were harder to recruit due to privacy and timing issues.

Table 2. Actual Building Sample

Building Type	Q1	Q2	Q3	Q4	Total
Dry Goods Retail	5	4	5	6	20
Grocery	1	-	3	5	9
Office	1	6	11	10	28
Restaurant	1	3	4	4	12
Warehouse	-	-	-	1	1
Health	1	1	-	-	2
Hotel/Motel	1	1	-	1	3
Schools	1	1	3	3	8
Total	11	16	26	30	83

Sample Recruitment and Data Collection

Given the dated and often incorrect contact information in the sample frame, it was necessary to design recruitment and scheduling procedures which would result in reaching as many sites as possible. Project staff called contacts at the commercial buildings listed in the sample frame to recruit buildings for in-person audits. In cases where contact information was wrong or unavailable, staff performed Internet research to determine the correct information. Once the targeted number of site visits for a given quartile and building type were recruited, the callers moved forward with recruitment of other quartiles or building types.

After a building had committed to participate, an auditor followed up and scheduled an on-site audit. During the walk-through, the auditor collected information on square footage, building use

and general characteristics, HVAC systems, lighting, envelope, and refrigeration (if applicable). The site visit data collection instrument is located in Appendix A.2.2.

Recruited contacts were uploaded into a Web interface designed for organizing and tracking data collection from site visits. The web database mirrored the field data collection instrument and auditors could access the database in the field and input information. Recruitment began in May 2008 and concluded in July 2008. Auditors conducted site visits from June 2008 through August 2008.

Data Analysis

Case weights for the PSE sample were defined as the PSE population floor space divided by the sample floor space. The weighting was performed at the following levels: building type, four cohorts (pre 1988, 1988-1994, 1995-2001, 2002-2007), and three building size bins (<20,000, 20,000-100,000, >100,000). Population floor space totals were obtained from PNNRES for pre-1988 cohorts and Dodge for post-1988 cohorts.

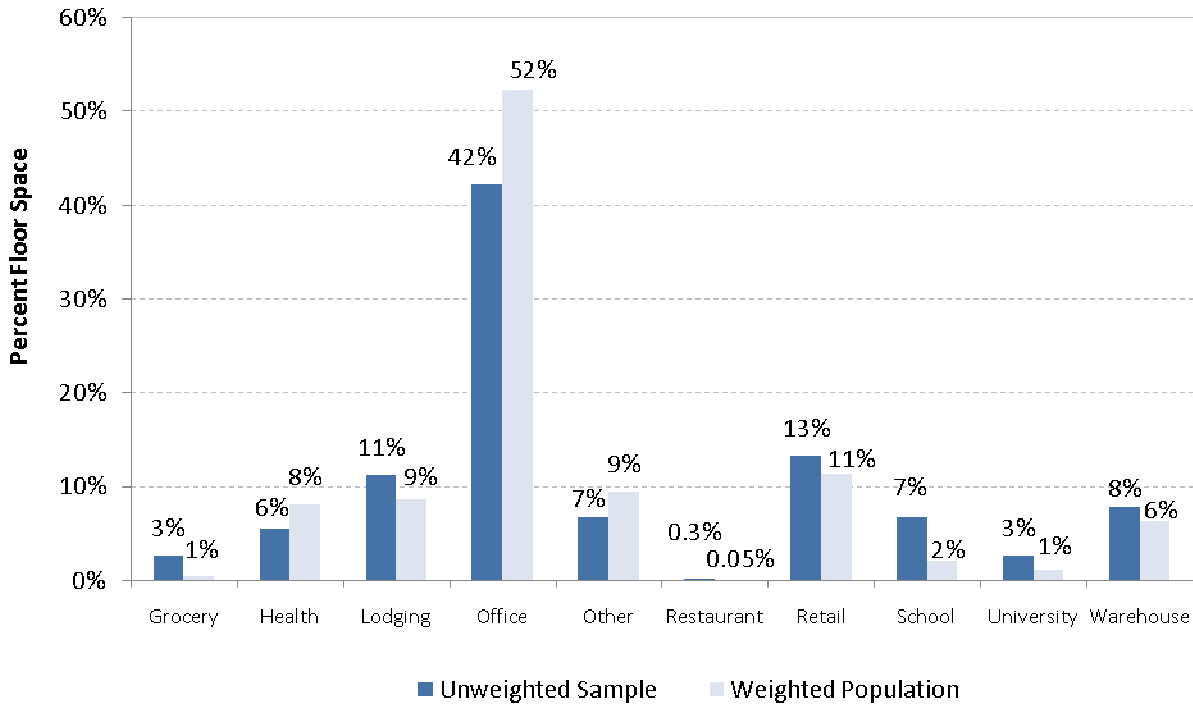
Information on how this data was used in the potential study is included in Appendix C. A summary of basic characteristics is provided in the next section. The potential study data inputs and summarization may differ from the general summary of data, as the inputs took into account the differences among gas only, electricity only, and dual fuel customers.

Appendix A.2.2 – CBSA Key Findings

Building Type

Floor space by building type is shown in Figure 1. The un-weighted totals show the actual floor space distribution based on the sample. The weighted totals show the floor space in the population weighted by each building type’s usage distribution.

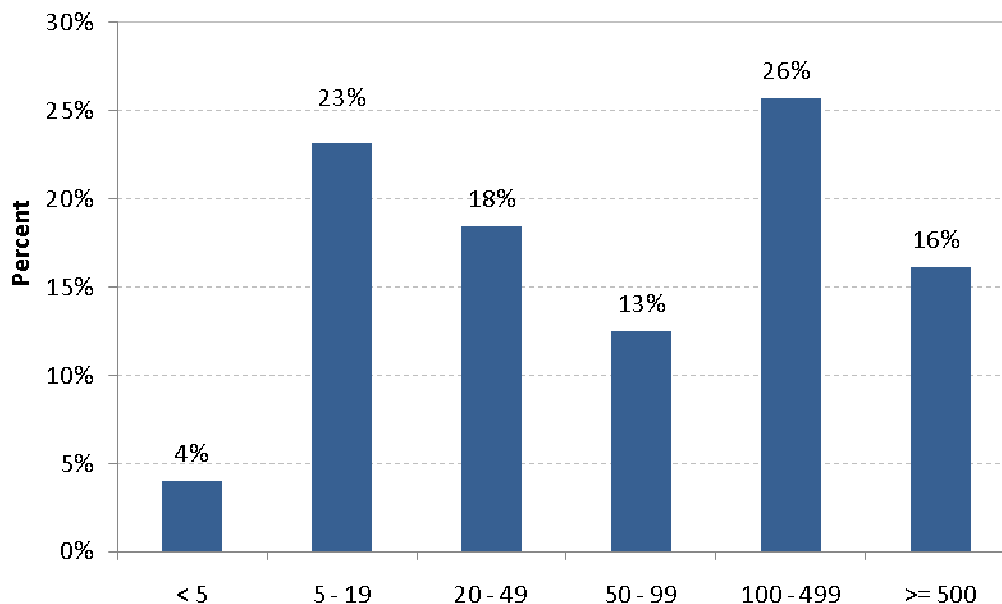
Figure 1. Building Type by Percentage Floor Space



Building Size

Commercial building size is split fairly evenly at 50,000 square feet; approximately half of the buildings are larger than 50,000 (55%) and half are smaller than 50,000 square feet. Most buildings fall under the 100,000-499,000 square feet category (26%) or the 5,000-19,000 square feet category (23%). buildings smaller than 5,000 square feet make up only 4% of the commercial floor space.

Figure 2. Building Size Distribution (1000 sq.ft.)



Heating and Cooling

Natural gas is the primary heating fuel for about 51% of commercial building floor space; electricity is the primary heating source for about 38% of building floor, as shown in Figure 3. Other commercial building heating sources are wood stoves and waste oil burners.

Figure 4 and Figure 5 show the distribution of primary heating and cooling system types; the data indicate that the majority of buildings are served by packaged (rooftop) HVAC units. Boilers and chillers serve approximately a quarter of the heated/cooled commercial floor space while heat pumps serve 13% of the building population.

Figure 3. Predominant Fuel Type

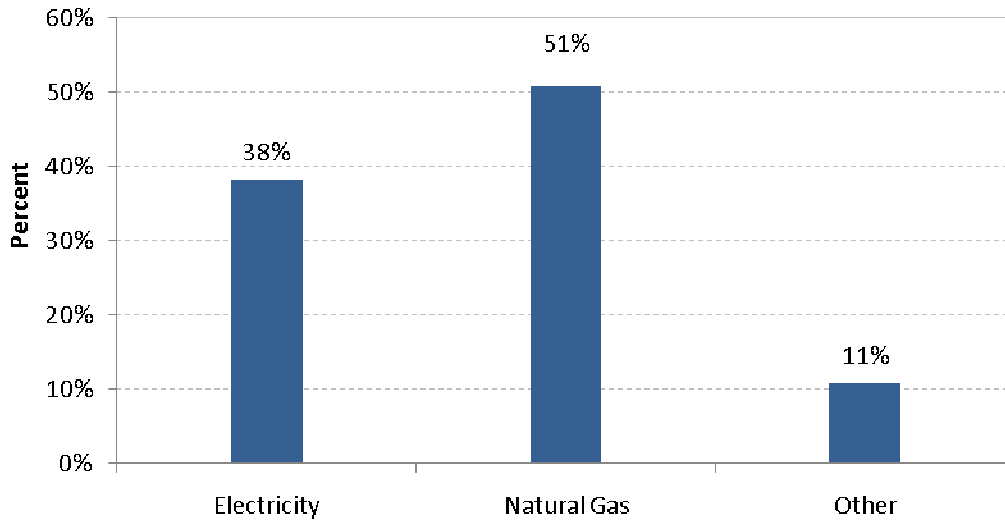


Figure 4. Primary Heating Equipment

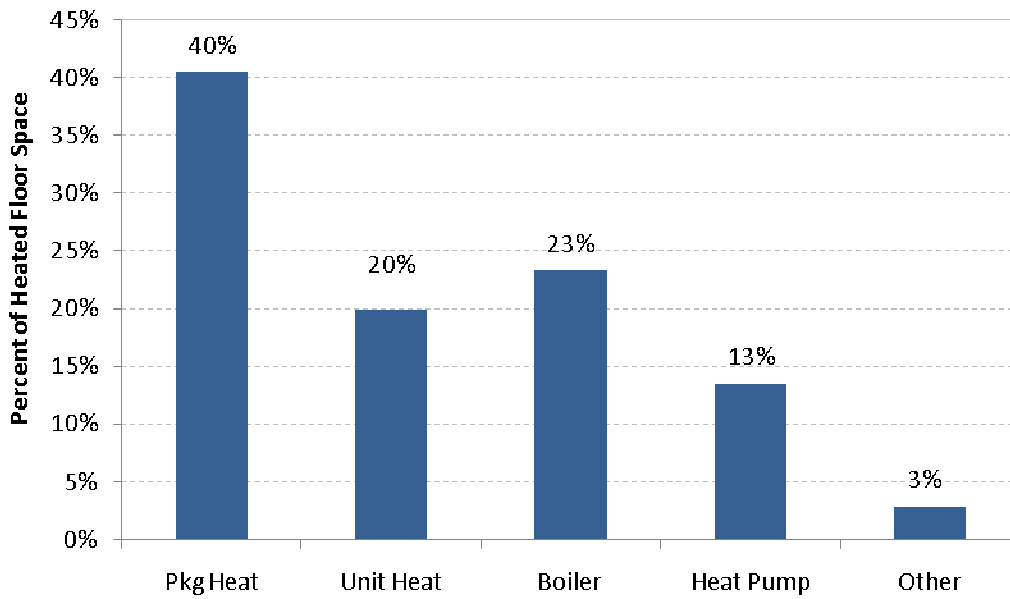
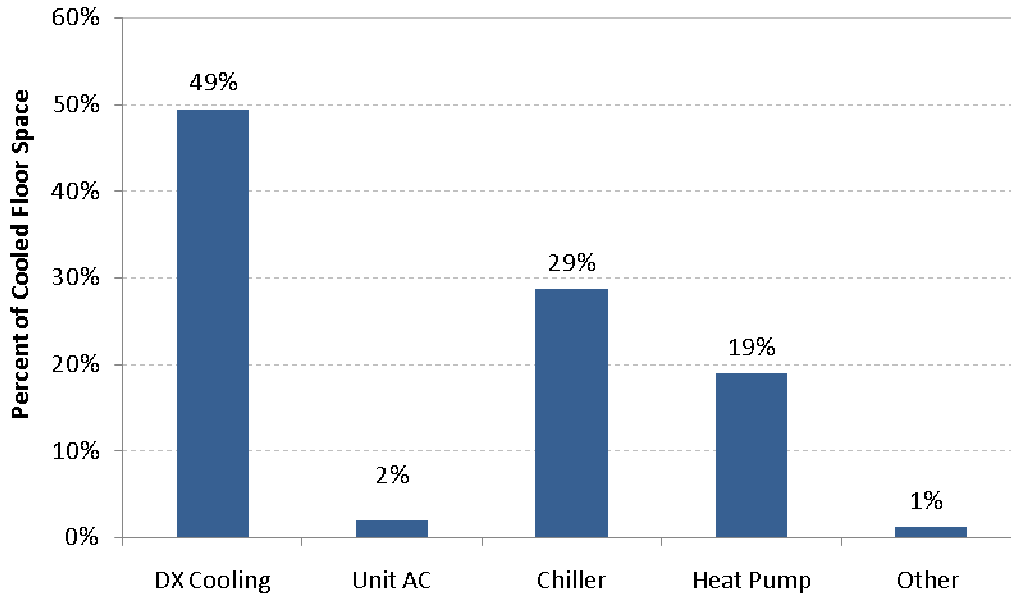


Figure 5. Primary Cooling Equipment



Lighting

The overall indoor lighting power density (LPD) for all commercial floor space is 1.06 W/sf. Figure 6 shows the LPD for each building type as well as the overall commercial building LPD.

The majority of commercial lighting wattage is in fluorescent lamps (62%). The fluorescent category includes T-12, T-8, T-5, and compact fluorescent lamps. As shown in Figure 7, T-8 fluorescent lamps account for nearly 40% of the installed lighting wattage, and T-12 lamps account for about 11%. HID lights make up 25% of the indoor lighting wattages.

Figure 6. Interior Lighting Power Density

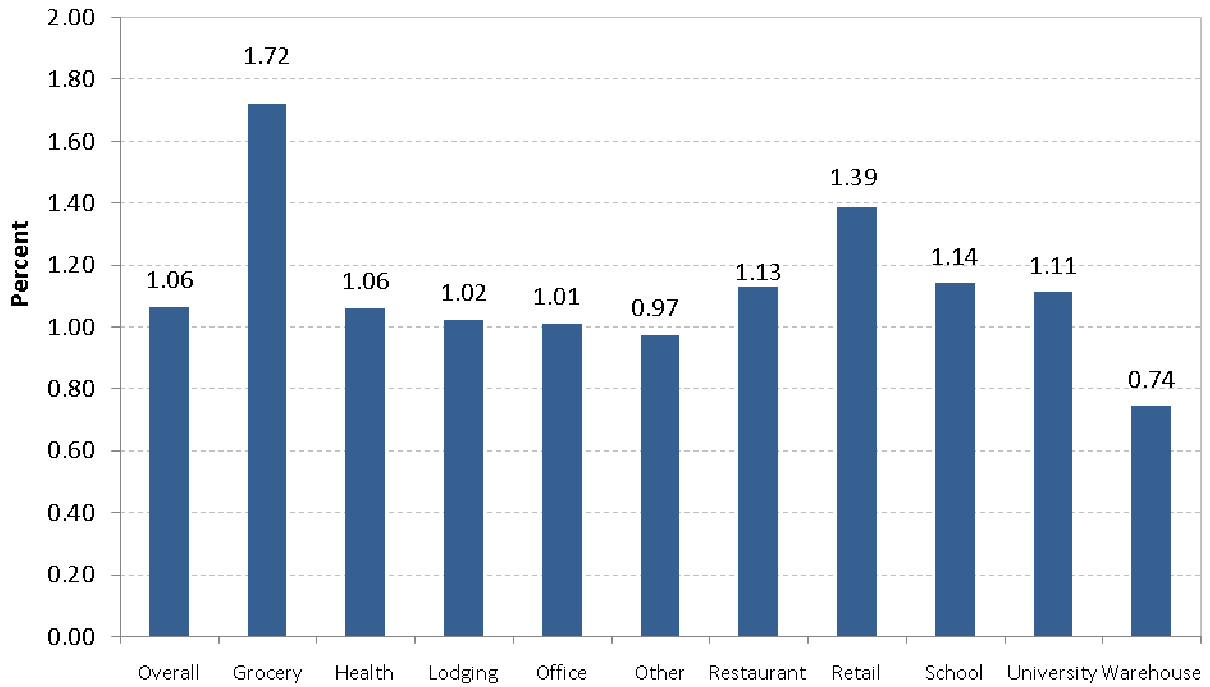
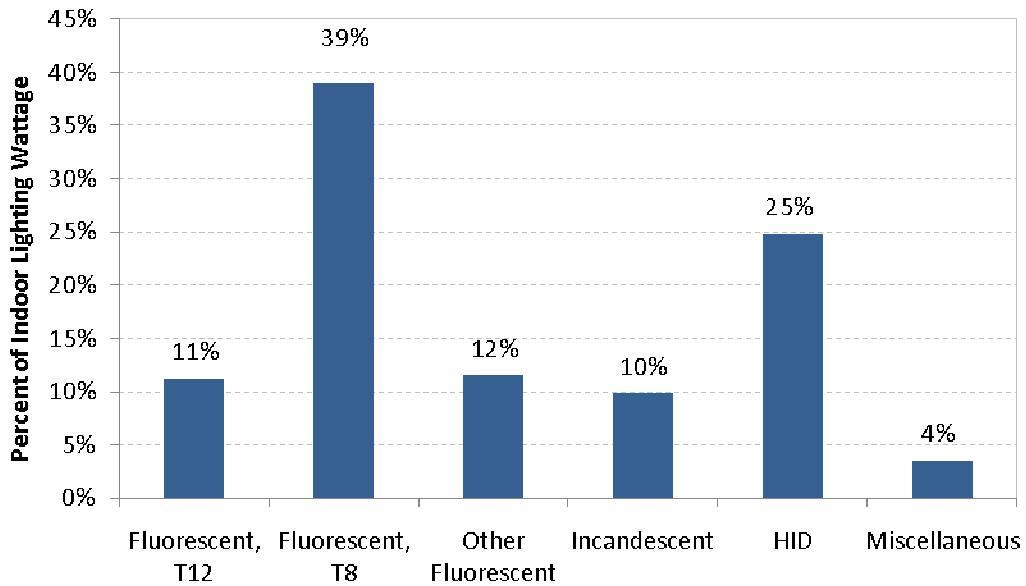


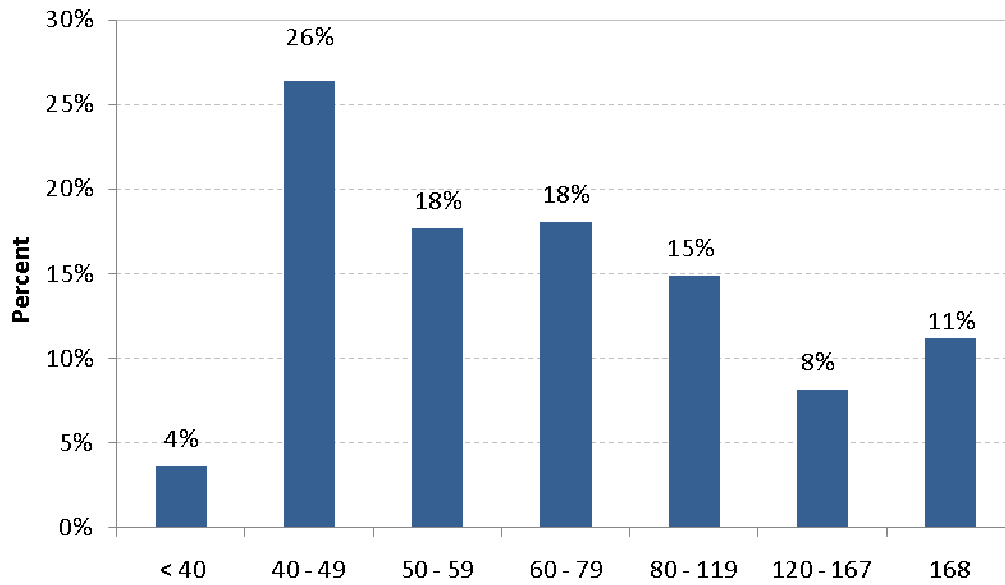
Figure 7. Percent Wattage by Indoor Lamp Type



Operating Hours

Most commercial buildings (62%) operate between 40 to 80 hours per week, shown in Figure 8. Approximately 11% of commercial buildings are on a continuous operation schedule and only 4% operate less than 40 hours a week.

Figure 8. Building Hours of Operation



Appendix A.2.3 – Data Collection Instrument

Site Visit Data Collection Instrument

Building Occupancy & Management

What percentage of the building/complex is occupied by the Owner and/or Tenants?				%owner	%tenant
Original Construction		Original Total Floor Area			
Is a renovation/upgrade planned in the next 2 years?					
If yes, which systems? Lighting, HVAC, HVAC Controls, Refrigeration, Windows				L	H C R W Ro
Is a staff person whose duties include energy conservation and/or management?					
Is maintenance/repair work done In -house, or by an Outside party?					
General O&M	I	O	HVAC Controls	I	O
Lighting	I	O	HVAC Equipment	I	O
			Refrigeration	I	O

General Space Information

	Primary Space	Secondary Space	Tertiary Space	Common Space	Indoor Parking
	Space ID: 1	Space ID: 2	Space ID: 3	Space ID: C	Space ID: P
Functional Use (table below)					
% Of Total Building SQFT					
Space Cooled?	Y N	Y N	Y N	Y N	
After Hours Shutoff/Setup?	Y N	Y N	Y N	Y N	Y N
Space Heated?	Y N	Y N	Y N	Y N	
After Hours Shutoff/Setback?	Y N	Y N	Y N	Y N	Y N

Functional Use Codes (Space Type)	
1 Assembly / Recreation	7 Office
2 Classroom	8 Sales
3 Dining	9 Storage - Low bay
4 Guest room	10 Vacant
5 Kitchen	11 Warehouse - High bay
6 Laundry / Housekeeping	

Utility Information

Electric Accounts	ID:	E1	E2	E3
Electric Utility Name:				
Meter #				

Gas Accounts	ID:	G1	G2	G3
Gas Utility Name:				
Meter #				

2a. Business Schedules

Primary Schedule For Space ID 1

Day Type	Business Hours (1-24)	Closed All Day?	Open 24 Hours?
Weekday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>
Saturday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>
Sunday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>

Primary Schedule For Space ID 2

Day Type	Business Hours (1-24)	Closed All Day?	Open 24 Hours?
Weekday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>
Saturday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>
Sunday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>

Primary Schedule For Space ID 3

Day Type	Business Hours (1-24)	Closed All Day?	Open 24 Hours?
Weekday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>
Saturday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>
Sunday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>

Primary Schedule For Space ID **Common**

Day Type	Business Hours (1-24)	Closed All Day?	Open 24 Hours?
Weekday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>
Saturday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>
Sunday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>

Primary Schedule For Space ID **Indoor Parking**

Day Type	Business Hours (1-24)	Closed All Day?	Open 24 Hours?
Weekday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>
Saturday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>
Sunday	from _____ To _____	<input type="checkbox"/>	<input type="checkbox"/>

3. Building Envelope

WALLS	Space 1	Space 2	Space 3	Space C
Surface Type: B = Brick C = Concrete CB = Concrete Block F = Wood M = Metal	B C CB F M	B C CB F M	B C CB F M	B C CB F M
Framing Type: M = Metal W = Wood	M W	M W	M W	M W

WINDOWS	Space 1	Space 2	Space 3	Space C
% of Wall Area				
Layers of Glazing	1 2 3	1 2 3	1 2 3	1 2 3
Glazing Material: C = Clear O = Opaque R = Reflective T = Tinted	C O R T	C O R T	C O R T	C O R T
Frame Type: M = Metal V = Vinyl W = Wood	M V W	M V W	M V W	M V W
Window Type: F = Fixed O = Operable	F O	F O	F O	F O

ROOFS	Space 1	Space 2	Space 3	Space C
Roof Type: F = Flat P = Pitched	F P	F P	F P	F P
Surface Material: B = Built-up C = Cool Roof E = Membrane M = Metal S = Shingles/Felt	B C E M S	B C E M S	B C E M S	B C E M S
Deck Material: C = Concrete M = Metal W = Wood	C M W	C M W	C M W	C M W
Roof Area (SF): [Flat Roof Only]				

FLOORS	Space 1	Space 2	Space 3	Space C
Floor Type: B = Basement C = Crawl S = Slab U = Unconditioned	B C S U	B C S U	B C S U	B C S U

SKYLIGHTS	Space 1	Space 2	Space 3	Space C
Skylights?	Y N	Y N	Y N	Y N
Skylight Area (SF):				
Lighting Dimming Control?	Y N	Y N	Y N	Y N

4. Unitary HVAC System

Packaged System ID: **PS1** **PS2** **PS3**

Space ID (s) Served	C 1 2 3	C 1 2 3	C 1 2 3
Packaged HVAC System Type (Table below)			
Number of Identical Units			
Age of Units (Years)			
Manufacturer			
Model Name/Number			
Rated Cooling Capacity (Tons)			
Performance Rating (Circle one)	<i>EER SEER</i>	<i>EER SEER</i>	<i>EER SEER</i>
Performance Rating Value			
Temperature Control Type (Table below)			
Supply Fans: Volume Control: [VAV systems only] Discharge Damper Inlet Vane VFD	D I V	D I V	D I V
Return Fans?	Y N	Y N	Y N
Economizer: Air Water None	A W N	A W N	A W N
Primary Heat: Fuel Type (Table below)			
Heating Type (Table below)			
<i>Rated Efficiency (%) (may be > 100)</i>			
Supp. Heat Fuel Type (Table below)			
Heating Type (Table below)			
<i>Rated Efficiency (%) (may be > 100)</i>			

Packaged HVAC System Type Codes	
0 Packaged Single Zone - HEAT only	7 Heat Pump, ground source
1 Packaged Single Zone - A/C only	8 Heat pump, water source
2 Packaged Single Zone - A/C w/ heat	9 Split System
3 Packaged Multi Zone	10 Unit Heater
4 Packaged VAV	11 Unit Ventilator
5 Evaporative Cooler	12 Window / Wall A/C unit
6 Heat Pump, air source	13 Window / Wall Heat Pump

Temperature Control Type Codes	
1	Thermostat - Programmable
2	Thermostat - Manual
3	EMS
4	Always On
5	Manual on/off
6	Time clock

Fuel Type Codes	
1	Electricity
2	Natural Gas
3	Fuel Oil
4	Propane
5	Other

Heating Type Codes	
1	Forced Air Furnace
2	Resistance
3	Central Boiler
4	Other

5b. Central HVAC System - Chiller

Chiller ID:	C1	C2	C3
Chiller Type (Table below)			
Number of Identical Chillers			
Age of Chiller(s) (Years)			
Manufacturer			
Model Name/Number			
Rated Cooling Capacity (Tons)			
Compressor: Design Full Load kW			
EMS Control?	Y N	Y N	Y N

HEAT REJECTION SYSTEM

Condenser Type (Table below)			
Fan Control: CO nstant P ony motor V ariable Speed CY cle T wo-Speed	CO P CY T V	CO P CY T V	CO P CY T V
Condenser Fans: Quantity			
HP			
EMS Control?	Y N	Y N	Y N

CHILLED WATER PUMPS

Pump Use: Primary Secondary	P S	P S	P S
Quantity			
Motor HP			
Motor Efficiency (% or S, H, P)			
Capacity Control: 1 speed 2 speed Variable	1 2 V	1 2 V	1 2 V
EMS Control?	Y N	Y N	Y N

CONDENSER WATER PUMPS

Quantity			
Motor HP			
Motor Efficiency (% or S, H, P)			
Capacity Control: 1 speed 2 speed Variable	1 2 V	1 2 V	1 2 V
EMS Control?	Y N	Y N	Y N

Chiller Type Codes		Condenser Type Codes	
1 Centrifugal	4 Absorption, hot water	1 Air Cooled Condenser	
2 Reciprocating	5 Absorption, natural gas	2 Cooling Tower	
3 Rotary	6 Absorption, steam	3 Evaporative Cooler	
		4 Other	

5c. Central HVAC System – Air Handler

Air Handler ID:	AH1	AH2	AH3
Air Distribution System Type (Table below)			
Temperature Control Type (Table below)			
Age of Air Handler (Years)			
Supply Fans: Volume Control: None Inlet Vane VFD	N I V	N I V	N I V
Motor HP			
Motor Efficiency (% or S, H, P)			
Return Fans?	Y N	Y N	Y N
Motor HP			
Motor Efficiency (% or S, H, P)	/ /	/ /	/ /
Economizer?	Y N	Y N	Y N
Terminal Reheat: Electric Water Steam None	E S W N	E S W N	E S W N

Air Distribution System Type Codes	
1 CV - Single Zone	8 VAV – Terminal Reheat
2 CV - Multi Zone	9 VAV – Dual Duct
3 CV - Dual Duct	10 Fan Coil
4 CV - Terminal Reheat	11 Baseboard
5 FPS – Fan Powered VAV - Series	12 Heat & Vent
6 FPP – Fan Powered VAV - Parallel	13 Hydronic Heat Pump
7 VAV – Cooling Only	14 Induction

Temperature Control Type Codes	
1 Thermostat – Programmable	
2 Thermostat - Manual	
3 EMS	
4 Always On	
5 Manual on/off	
6 Time clock	

6. Domestic Water Heating

	Water Heater ID:	WH1	WH2	WH3	WH4
Water Heater Type (Table below)					
Fuel Type (Table below)					
Number of Identical Units					
Age Of Water Heater (years)					
Tank Capacity (Gallons)					
Input Capacity (kW or kBtu/hr)					
Tank Wrap?	Y N	Y N	Y N	Y N	Y N
Recirculation Pump?	Y N	Y N	Y N	Y N	Y N

Water Heater Type Codes	
1	Heat Pump
2	Heat Recovery
3	Instantaneous (tankless)
4	Self-Contained
5	Storage Tank (Central Boiler)
6	Other

Fuel Type Codes	
1	Electricity
2	Natural Gas
3	Fuel Oil
4	Propane
5	Other

8a. Indoor Lighting

Lighting Group ID# (multiple pages OK)	IL-_____	IL-_____	IL-_____	IL-_____	IL-_____	IL-_____
Usage: General Area Retail Display Task	G R T	G R T	G R T	G R T	G R T	G R T

FLUORESCENT

F = Standard Tube	F	F	F	F	F	F
U = U-tube	U	U	U	U	U	U
Length (1.5' 2' 3' 4' 6' 8')						
Diameter (T5 T8 T10 T12)						
CF = Compact Fluorescent	CF	CF	CF	CF	CF	CF
CIR = Circline Fluorescent	CIR	CIR	CIR	CIR	CIR	CIR

HID

MH = Metal Halide	MH	MH	MH	MH	MH	MH
H = High Pressure Sodium	H	H	H	H	H	H

MISC.

I = Incandescent	I	I	I	I	I	I
Q = Quartz/Halogen	Q	Q	Q	Q	Q	Q
XI = Exit Incandescent	XI	XI	XI	XI	XI	XI
XCF = Exit CF	XCF	XCF	XCF	XCF	XCF	XCF
LED = Exit LED	LED	LED	LED	LED	LED	LED

Watts per lamp:						
Number of lamps per fixture:						
Total number of fixtures:						
Ballast Type: ES = ES Magnetic	ES	ES	ES	ES	ES	ES
E = Electronic	E	E	E	E	E	E
Control Type: E = EMS	E	E	E	E	E	E
DC = Daylighting - Continuous dimming	DC	DC	DC	DC	DC	DC
DS = Daylighting - Step dimming	DS	DS	DS	DS	DS	DS
MB = Manual - circuit breaker	MB	MB	MB	MB	MB	MB
MS = Manual - wall switch	MS	MS	MS	MS	MS	MS
OS = Occupancy sensor	OS	OS	OS	OS	OS	OS
P = Photocell	P	P	P	P	P	P
T = Timeclock	T	T	T	T	T	T
N = None (continuous)	N	N	N	N	N	N
% of Lighting load controlled:						
Are controls functional and used?	Y N	Y N	Y N	Y N	Y N	Y N

9. Outdoor Lighting

Outdoor Lighting ID#	OL-_____	OL-_____	OL-_____	OL-_____	OL-_____	OL-_____				
Use type: Advertising Bldg Façade Other	A F G	P D S	A F G	P D S	A F G	P D S	A F G	P D S	A F G	P D S
Parking Lot Display Safety/Security										

FLUORESCENT

F = Standard Tube	F	F	F	F	F	F
U = U-tube	U	U	U	U	U	U
Length (1.5' 2' 3' 4' 6' 8')						
Diameter (T5 T8 T10 T12)						
CF = Compact Fluorescent	CF	CF	CF	CF	CF	CF
CIR = Circline Fluorescent	CIR	CIR	CIR	CIR	CIR	CIR

HID

MH = Metal Halide	MH	MH	MH	MH	MH	MH
H = High Pressure Sodium	H	H	H	H	H	H
N = Neon	N	N	N	N	N	N

MISC.

Q = Quartz/Halogen	Q	Q	Q	Q	Q	Q
I = Incandescent	I	I	I	I	I	I

Watts per lamp (Enter 10 if Neon)						
-- Check if lamp watts were estimated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Number of lamps per fixture (Enter 1 if Neon)						
Total number of fixtures (Total length if Neon)						
Ballast Type: ES = ES Magnetic	ES	ES	ES	ES	ES	ES
E = Electronic	E	E	E	E	E	E
Control Type: E = EMS	E	E	E	E	E	E
MB = Manual - circuit breaker	MB	MB	MB	MB	MB	MB
MS = Manual on/off switch	MS	MS	MS	MS	MS	MS
OS = Occupancy sensor	OS	OS	OS	OS	OS	OS
P = Photocell	P	P	P	P	P	P
PT = Photocell/Timeclock	PT	PT	PT	PT	PT	PT
T = Timeclock	T	T	T	T	T	T
N = None (continuous)	N	N	N	N	N	N
Are controls functional and used?	Y N	Y N	Y N	Y N	Y N	Y N

10. Miscellaneous Equipment

Economic Use Type	Equipment	
Grocery	Point-of-use terminals	(#)
	Food Prep – Meat Dept.	(1=Yes, 0=No)
	Food Prep – Deli	(1=Yes, 0=No)
Hotel/Motel	Rooms	(#)
	Annual Average occupancy	(%)
	Kitchen – Full Service (below)	(1=Yes, 0=No)
	Kitchen – Warming	(1=Yes, 0=No)
	Laundry Facility (see below)	(1=Yes, 0=No)
Office	PCs	(#)
Other Health	Beds	(#)
	Laundry Facility (see below)	(1=Yes, 0=No)
Restaurant	Meals per day	(#)
	Kitchen – Full Service (below)	(1=Yes, 0=No)
	Kitchen – Warming	(1=Yes, 0=No)
Retail	Point-of-use terminals	(#)
School	Classrooms	(#)
	Kitchen – Full Service (below)	(1=Yes, 0=No)
	Kitchen – Warming	(1=Yes, 0=No)
	Laundry Facility (see below)	(1=Yes, 0=No)
Warehouse	Forklifts (electric only)	(#)

Food Service Equipment		Electric / Gas	
If Kitchen–Full Service	Broilers / Fryers	E	G
	Griddle / Grill	E	G
	Oven	E	G
	Range	E	G
If Laundry	Dishwasher Booster	E	G
	Clothes Dryer – Commercial	E	G
	Clothes Dryer – Residential	E	G

Packaged Refrigeration Equipment	Count
Vending Machines	
Beverage Merchandizers	
Ice Machines	
Refrigerators	
Freezers	

11. Refrigeration Equipment

			Space ID:			C			C			C			C			C		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Compressors			ID #:			Cp-1			Cp-2			Cp-3			Cp-4			Cp-5		
Type:	Reciprocating Two-stage multiplex Other	Screw Multiplex	R	S		R	S		R	S		R	S		R	S		R	S	
			T	M	O	T	M	O	T	M	O	T	M	O	T	M	O	T	M	O
Temp:	Low Medium High	(0 to -10 °F) (30 to 40 °F) (50 to 55 °F)	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
Total HP:																				
Quantity:																				
Unloaders or VSD compressors?	U V NA U V NA U V NA U V NA U V NA																			
Heat Recovery Type:	None Space Heating/Reheat Water heating Other		N	S		N	S		N	S		N	S		N	S		N	S	
			W	O		W	O		W	O		W	O		W	O		W	O	

			ID #:			Cn-1			Cn-2			Cn-3			Cn-4			Cn-5		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Type:	Air-cooled Close-approach Water-cooled	Air-cooled w/Pre-cooler Evap-cooled	A	P		A	P		A	P		A	P		A	P		A	P	
			C	E	W	C	E	W	C	E	W	C	E	W	C	E	W	C	E	W
Total Fan HP:	(all types)																			
Fan VSD?	Y N Y N Y N Y N Y N																			
Pump Motor HP	(water-cooled units only)																			
Pump VSD?	Y N Y N Y N Y N Y N																			

			ID #:			DC-1			DC-2			DC-3			DC-4			DC-5		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Case Length:	(LF)																			
Do the cases have doors?	Y N Y N Y N Y N Y N																			
Anti-sweat heater control?	Y N Y N Y N Y N Y N																			
Lighting Type:	T12 T8 T5 LED T12 T8 T5 LED T12 T8 T5 LED T12 T8 T5 LED T12 T8 T5 LED																			
Watts per lamp:																				
Total number of lamps:																				

12. Server Rooms

Number of Hardware in Use:	Less than 3 years old	4-10 years old	11-15 years old
Servers			
Storage Devices			
Backup Devices			
Routers, switches			

Total Floor Area:			
Separate electric meter:	[Y]	[N]	[?]
Total electrical load: (kW)			
Number of servers with power management system installed:			
Is power management system activated:	[Y]	[N]	[?]
Does space have it's own conditioning:	[Y]	[N]	[?]
Cooling capacity: (tons)			
Lighting power density: (W/sf)			
UPS Electrical capacity:			
UPS Current load:			
Size of Backup generator on site: (MW)			

Appendix A.3: Fuel Conversion Survey

Appendix A.3-1 Summary of Results

Fuel conversion, from electricity to natural gas, is a potential option for managing energy demand within Puget Sound Energy's service territory. To examine the viability of this management strategy, The Cadmus Group conducted a survey among PSE's residential customers to determine how receptive households are to converting from electric to gas home heating at different incentive levels. Other information collected in the survey included: home size, perceptions of natural gas, likelihood of switching to a gas water heater, and a battery of segmentation questions which touched on environmental values, energy product purchasing decisions, utility service expectations, and energy use. A copy of the survey instrument is located in Appendix A.3-2.

Consumer Contact administered the survey via telephone on June 20 through July 7, 2008. The sample frame consisted of PSE residential customers that receive electricity service only. Some PSE electricity customers overlap with Cascade Natural or other natural gas provider territory, and those respondents were screened out at the beginning of the survey. A total of 1,932 households were successfully contacted and 317 responded to the full survey, yielding a response rate of 16.4 percent. Of the 1,932 contacted households, 421 (21.8 percent) were ineligible for the survey because they receive natural gas from an alternate provider. A summary of responses for each question is located in Appendix A.3-3. Basic analysis on fuel conversion potential is presented in this memo; however, the analysis can be expanded to other items as needed.

Fuel Conversion Market Potential Assessment

Before responding to questions about fuel conversion, each respondent was informed that it will cost the average homeowner \$6000 to convert their heating system from electricity to gas and that it will save them approximately \$600 annually on their energy bill. Respondents then answered the following question:

“Given the cost of converting, how likely would you be to convert to [a gas heating system] for your home in the next five years?”

Response categories were based on a 5-point Likert scale, including “very likely” (5), “somewhat likely” (4), “neutral” (3), “somewhat unlikely” (2), and “very unlikely” (1). Respondents who answered 1, 2, 3, or 4, were also asked how likely they would be to switch if they were offered an incentive of \$1500, \$3000, \$4500, or \$6000 (equivalents of 25, 50, 75, and 100 percent of total conversion cost, respectively). Each respondent answered for one randomly drawn incentive level. If a respondent indicated that s/he was “highly likely” to switch without an incentive, it was assumed s/he would also switch at any incentive level.

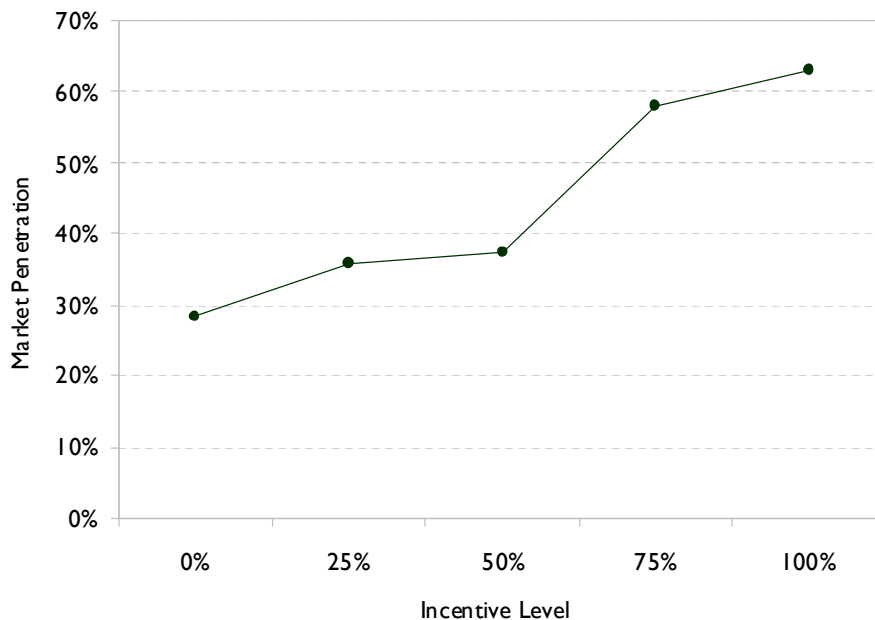
Data for the fuel conversion questions are shown in Table 1. In order to calculate the market penetration for fuel conversion, each point on the 5-point scale was assigned a probability of switching, see row 2, Table 1.

Table 1. Fuel Switching Responses At Different Incentive Levels

Incentive Level	5-Point Scale (Probability of Switching)					Total Responses	Market Penetration
	1 (0.0)	2 (0.25)	3 (0.50)	4 (0.75)	5 (1.0)		
None	133	47	42	25	26	273	28%
25%	23	6	11	12	4	56	36%
50%	26	12	7	14	8	67	37%
75%	13	6	15	16	19	69	58%
100%	10	7	4	11	22	54	63%

We calculated market potential by taking the weighted average of the conversion probability at each incentive level. The probability of switching is markedly higher at the 100 percent subsidy (63%) compared to no subsidy (28%). Figure 1 displays the market penetration at each incentive level.

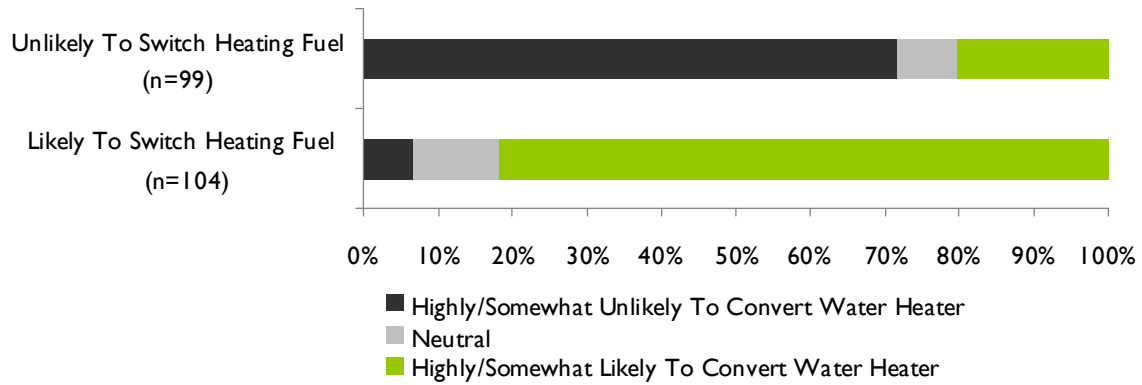
Figure 1. Market Penetration of Fuel Conversion At Different Incentive Levels



Water Heater Replacement

Homeowners who said they were highly or somewhat likely to convert their heating system indicated they would also be likely to change their hot water heater at the same time. The majority of respondents that said they were highly or somewhat unlikely to convert their heating system also indicated they would be unlikely to change their hot water heater at the same time. Figure 2 shows the likelihood of switching a gas water heat at the same time as a heating system.

Figure 2. Likeliness To Convert Water Heater At Same Time As Heating Source



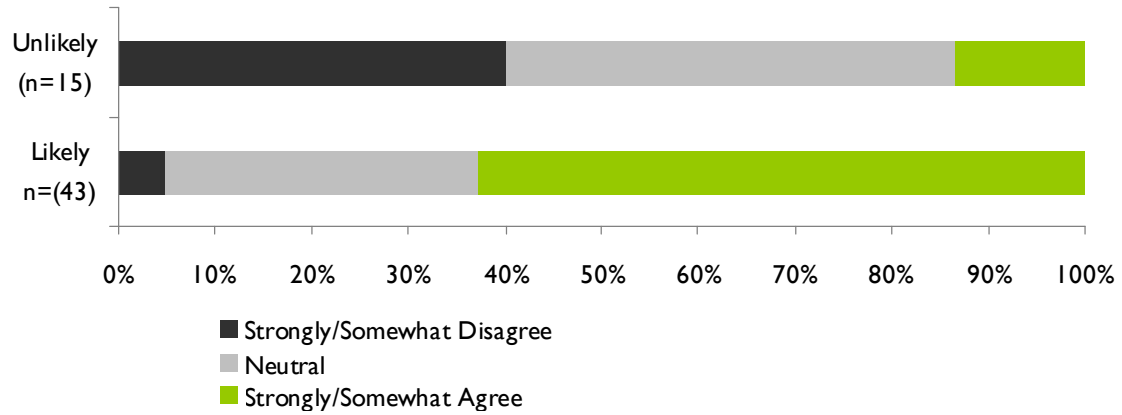
Perceptions Regarding Natural Gas

In order to examine the motivating reasons for willingness to convert fuel sources, we compared two types of respondents: those that were somewhat likely or highly likely to switch without an incentive (“Likely” group) and those that were highly unlikely or somewhat unlikely to switch with a 100 percent incentive (“Unlikely” group).

In particular, we compared the two groups’ natural gas awareness. Survey respondents were asked to rate their level of agreement with seven statements about natural gas, and the responses between the “Likely” and “Unlikely” groups were significantly different for all seven statements, as indicated by χ^2 , a statistical measure of correspondence between the two groups’ responses.¹ One of the most notable differences between the two groups’ perception of natural gas was whether or not they thought it was a more economical energy source. As shown in Figure 3, the “Likely” group generally agreed that natural gas is more economical, while the “Unlikely” group disagreed or indicated neutrality.

¹ The chi-squared value and probability (p-value) is given for each statement. A p-value <0.05 is significant at the 95% confidence level. Q12_1 ($\chi^2 = 21.41, p=0.0003$); Q12_2 ($\chi^2 = 26.59, p<0.0001$); Q12_3 ($\chi^2 = 18.27, p=0.0011$); Q12_4 ($\chi^2 = 17.59, p=0.0015$); Q12_5 ($\chi^2 = 23.34, p=0.001$); Q12_6 ($\chi^2 = 16.68, p=0.0022$); Q12_7 ($\chi^2 = 15.65, p=0.0035$)

Figure 3. Agreement With the Statement “Natural Gas is more economical than other fuel sources.”



Note: Unlikely “n” is smaller because only a quarter of the respondents were asked if they would switch with a 100 percent incentive; every respondent was asked if they would be willing to switch without an incentive.

Appendix A.3-2 Survey Instrument

Puget Sound Energy Residential Fuel Conversion Survey
June 18, 2008 FINAL

Introduction/Screening
com:[REVISED 06/18/08]

My name is _____, and I am from Consumer Contact, calling on behalf of Puget (PEW-JIT) Sound Energy, your electricity provider. We are conducting a study to better understand whether our customers would consider switching to gas appliances when appropriate. This survey is for research purposes only and is not a marketing call. All survey results will be aggregated and only used by your utility in their planning efforts.

(Q1.) First of all, do you own your home?
(DO NOT READ LIST) **com:[SINGLE MENTION]**

- 1 YES
- 2 NO

com:[IF Q1=1 CONTINUE,OTHERWISE TERMINATE]

~

(Q2.) Which of the following best describes your home?
(READ LIST IF NECESSARY) **com:[SINGLE MENTION]**

- 1 Single family detached (on a separate lot) not connected to other living units
- 2 Duplex or Triplex with 2 or 3 total living units (IF NECESSARY SAY "It has one adjacent wall to another residence with no units above or below")
- 3 Unit in Condominium or Apartment building with 4 or more attached units
- 4 Manufactured or mobile home

com:[IF Q2=3,4,? OR ! TERMINATE, OTHERWISE CONTINUE]

~

(Q3.) Can you verify that you are the person in your household who would be most likely to make decisions concerning appliance purchases for the home at **com:[ADDRESS FROM SAMPLE]**? (IF RESPONDENT NEEDS CLARIFICATION: "For example, if your water heater were to break down today, would you be the person who decides how to replace it?")

- 1 YES
- 2 NO (ASK TO SPEAK TO THIS PERSON OR ARRANGE CALLBACK IF NECESSARY)

com:[IF Q3=? OR ! TERMINATE, OTHERWISE CONTINUE]

~

(Q4.) Who provides your electricity service?
(DO NOT READ LIST) **com:[SINGLE MENTION]**

(INTERVIEWER NOTE: IF RESPONDENT IS UNSURE, OFFER SUGGESTIONS SUCH AS:
SNOHOMISH PUD, SEATTLE CITY LIGHT, TACOMA POWER. IF
ANSWER IS GIVEN RECORD UNDER 'OTHER PLEASE SPECIFY')

- 1 PUGET SOUND ENERGY (PSE OR PUGET POWER)
- 2 OTHER (PLEASE SPECIFY): _____

com:[IF Q4=! TERMINATE, OTHERWISE CONTINUE]

~

com:[REVISED 06/18/08]

(Q5.) What is your primary source of heating fuel?
(DO NOT READ LIST) **com:[SINGLE MENTION]**

(INTERVIEWER NOTE: READ IF NECESSARY "What fuel is used most to heat your home?")

- 1 NATURAL GAS
- 2 ELECTRIC
- 3 PROPANE
- 4 OIL
- 91 OTHER (PLEASE SPECIFY): _____

com:[IF Q5=1 CONTINUE, OTHERWISE SKIP TO Q7]

~

com:[REVISED 06/18/08]

(Q6.) Who provides your natural gas service?
(DO NOT READ LIST) **com:[SINGLE MENTION]**

- 1 PUGET SOUND ENERGY/WASHINGTON NATURAL GAS
- 2 CASCADE NATURAL GAS
- 3 AMERIGAS
- 4 FERRELLGAS
- 5 NORTH WEST PROPANE
- 6 PERMAGAS
- 7 SUBURBAN PROPANE
- 91 OTHER (PLEASE SPECIFY): _____

com:[IF Q6=1 OR 2 OR 91 TERMINATE, OTHERWISE CONTINUE TO Q6A]

~

com:[REVISED 06/18/08]

(Q6a.) It is to my understanding that **com:[INSERT ANSWER FROM Q6]** is a propane company. Do you buy or fill a tank for fuel?

- 1 YES
- 2 NO

com:[IF YES AUTO RECODE Q5 WITH CODE 3 AND CONTINUE WITH SURVEY, OTHERWISE TERMINATE]

~

This call may be monitored or recorded for quality control purposes.

com:[REVISED 06/18/08]

(Q7.) What type of heating system does your home have?
(READ LIST) **com:[SINGLE MENTION]**

- 1 Central forced air heating [IF RESPONDENT IS UNSURE
ASK: "Do you have a central heating unit that
circulates hot air through a duct system?]
com:[INSERT HEATING TYPE "A GAS FURNACE" IN Q16-Q18]
- 2 Resistance heating, such as baseboard, ceiling,
floor, zone, or wall heaters **com:[INSERT HEATING TYPE
"GAS WALL HEATERS" IN Q16]**
- 3 Portable heaters **com:[INSERT HEATING TYPE "GAS WALL
HEATERS" IN Q16-Q18]**
- 4 Heat pump
- ? DON'T KNOW **com:[INSERT HEATING TYPE "A GAS HEATING
SYSTEM" IN Q16-Q18]**
- ! REFUSED **com:[INSERT HEATING TYPE "A GAS HEATING
SYSTEM" IN Q16-Q18]**

com:[IF Q7=4 SKIP TO Q19, OTHERWISE CONTINUE]

~

(Q8.) Do any of your close neighbors have gas heating and/or
appliances?
(DO NOT READ LIST) **com:[SINGLE MENTION]**

- 1 YES
- 2 NO

~

com:[REVISED 06/18/08]

(Q9.) What is the square footage of your home?
(DO NOT READ LIST) **com:[SINGLE MENTION]**

_____ (RECORD SQUARE FOOTAGE)

com:[IF ? OR ! CONTINUE, OTHERWISE SKIP TO Q11]

**com:[INSERT CHECK RANGE OF MIN 300 AND MAX 8000 SQUARE FOOTAGE; ALLOW SPECIAL
INPUT]**

~

(Q10.) Which of the following categories do you feel best describes the
square footage of your home? Your best guess is fine.
(READ LIST) **com:[SINGLE MENTION]**

- 1 1000 or less
- 2 1001-1500
- 3 1501-2000

- 4 2001-2500
- 5 More than 2500

~

(Q11.) How many bedrooms are there in your home?
 (DO NOT READ LIST) **com: [SINGLE MENTION]**

- 1 ONE
- 2 TWO
- 3 THREE
- 4 FOUR
- 5 FIVE OR MORE

~

NG AWARENESS QUESTIONS

(Q12.) Please rate your level of agreement with the following statements about natural gas using a 5-point scale where "1" is strongly disagree and "5" is strongly agree?
 (READ LIST) **com: [SINGLE MENTION FOR EACH STATEMENT]**

- | | | | | | |
|-----------|---|---|---|----------|-------|
| 1 | 2 | 3 | 4 | 5 | ? |
| STRONGLY | | | | STRONGLY | DON'T |
| DIASAGREE | | | | AGREE | KNOW |

com: [RANDOMIZE]

- 1 Natural gas is more economical than other energy sources.
- 2 Natural gas heats your residence more comfortably than other heat sources.
- 3 Natural gas has remained more stable in price than other sources of energy over the last 3 years.
- 4 Natural gas is cleaner for the environment than other energy sources.
- 5 Natural gas improves the value of your residence.
- 6 Natural gas is a safe product to use for heating your residence.
- 7 Natural gas will be a plentiful energy source for years to come.

~

(Q13.) Have you ever considered converting your home to natural gas heating?
 (DO NOT READ LIST) **com: [SINGLE MENTION]**

- 1 YES
- 2 NO

com: [IF Q13=1 CONTINUE, OTHERWISE SKIP TO Q15]

~

(Q14.) In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is "not important at all" and 5 is "extremely important", how important are the following considerations.
com: [SINGLE MENTION FOR EACH CONSIDERATION]

(INTERVIEWER NOTE: IF NEEDED, REREAD "Please give me a number between 1 and 5 where 1 is not important at all and 5 is extremely important,")

Not important at all					Extremely Important	Don't Know
1	2	3	4	5		?

com: [RANDOMIZE]

- 1 Effect on the value of your home
- 2 Environmental friendliness
- 3 Effect on monthly energy bill
- 4 Investment to purchase new gas equipment/appliances
- 5 Level of comfort

~

(Q15.) What are some of the reasons that would prevent you from converting to natural gas?
 (DO NOT READ) **com: [MULTIPLE MENTIONS]**

- 01 COST TO PURCHASE NEW GAS EQUIPMENT/APPLIANCES
- 02 EXPENSE OF SETTING UP NATURAL GAS SERVICE (GETTING GAS TO YOUR RESIDENCE)
- 03 MONTHLY ENERGY EXPENSE
- 04 SATISFIED WITH MY CURRENT HEAT SOURCE
- 05 SAFETY CONCERNS ABOUT NATURAL GAS
- 06 LIMITATIONS OF BUILDING STRUCTURE
- 07 PLAN TO MOVE SOON
- 91 OTHER (PLEASE SPECIFY): _____

~

FUEL SWITCH QUESTIONS`

Assuming that it will cost the average homeowner \$6000 to convert their heating system from electricity to gas and that it will save them approximately **com: [REVISED 06/19]** \$600 annually on their energy bill, we would like to learn about your willingness to convert to **com: [INSERT HEATING TYPE FROM Q7]** even while your current heating system is fully operational.

(Q16.) Given the cost of converting, how likely would you be to convert to **com: [INSERT HEATING TYPE FROM Q7]** for your home in the next

five years? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.

(DO NOT READ LIST) com:[SINGLE MENTION]

- 5 HIGHLY LIKELY
- 4 SOMEWHAT LIKELY
- 3 LIKELY
- 2 SOMEWHAT UNLIKELY
- 1 VERY UNLIKELY

com:[IF Q16=5 SKIP TO Q18, OTHERWISE CONTINUE]

~

com:[REVISED 06/18/08]

(Q17.) If your utility paid com:[RANDOM BID VALUE] of the \$6,000 cost to switch to com:[INSERT HEATING TYPE FROM Q7] for your home, how likely would you be to convert in the next five years? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.

(DO NOT READ LIST) com:[SINGLE MENTION]

- 5 HIGHLY LIKELY
- 4 SOMEWHAT LIKELY
- 3 LIKELY
- 2 SOMEWHAT UNLIKELY
- 1 VERY UNLIKELY

com: [INSERT RANDOM BID VALUES OF \$1500, \$3000, \$4500, \$6000]

~

com:[FOR THESE INSERTS REMOVE "A" FROM HEATING TYPE]

(Q18.) How likely would you be to convert to a gas water heater at the same time as your com:[INSERT HEATING TYPE FROM Q7]? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.

(DO NOT READ LIST) com:[SINGLE MENTION]

- 5 HIGHLY LIKELY
- 4 SOMEWHAT LIKELY
- 3 LIKELY
- 2 SOMEWHAT UNLIKELY
- 1 VERY UNLIKELY
- 0 ALREADY HAVE A GAS WATER HEATER

~

SEGMENTATION QUESTIONS

Finally, we would like to ask you some general questions that will help us in overall policy decisions. All questions need to be answered on a 10-point scale. This data will be used to compare with results we have from other surveys.

(Q19.) Now we'd like to understand how you think about using energy at your home. Using a 10-point scale where '1' means you strongly disagree, and '10' means you strongly agree, please indicate how much you agree or disagree with each of the following statements.

How much do you agree that.....(READ LIST)

(INTERVIEWER: REPEAT THE SCALE AS NECESSARY.)

(INTERVIEWER: IT IS VERY IMPORTANT THAT EACH RESPONDENT PROVIDE A 1-10 RATING FOR EVERY ITEM. IF THE RESPONDENT SAYS "DON'T KNOW", PROMPT AGAIN FOR A 1-10 RATING, REPEATING SCALE AND/OR ITEM AS NECESSARY.)

com: [SINGLE MENTION FOR EACH STATEMENT]

1	2	3	4	5	6	7	8	9	10	?
STRONGLY									STRONGLY	DK
DISAGREE									AGREE	

com: [RANDOMIZE]

- 1 It is very important for you to find ways to control your energy costs.
- 2 You believe it is socially responsible to limit your use of electricity.
- 3 You are very concerned about the environmental effects of electricity generating plants.
- 4 You regularly review your home's energy usage, and constantly look for ways to save on energy costs.
- 5 It is just as important to conserve natural gas as it is to conserve electricity.
- 6 Of all the things you could do to help protect the environment, energy conservation is definitely the most important.
- 7 You pay a lot of attention to energy-related issues because they affect both your home and the country as a whole
- 8 The long-term threat from global warming and climate change is real, and potentially catastrophic

~

(Q20.) Now, I'd like to ask you how important some different factors are when you shop for energy-related products and services for your home.

Please use a scale of 1 to 10, where '1' means that factor is not at all important and '10' means that factor is extremely important when you are selecting which appliance, electronic device, or other energy-related product or service to purchase for your home.

How important.....(READ LIST)

(INTERVIEWER: REPEAT THE SCALE AS NECESSARY)

(INTERVIEWER: IT IS VERY IMPORTANT THAT EACH RESPONDENT PROVIDE A 1-10 RATING FOR EVERY ITEM. IF THE RESPONDENT SAYS "DON'T KNOW", PROMPT AGAIN FOR A 1-10 RATING, REPEATING SCALE AND/OR ITEM AS NECESSARY.)

com: [SINGLE MENTION FOR EACH FACTOR]

1	2	3	4	5	6	7	8	9	10	?
NOT AT ALL									EXTREMELY	DK
IMPORTANT									IMPORTANT	

com: [RANDOMIZE]

- 1 are any cost savings you might get from reduced electricity usage?
- 2 are any positive effects on the environment that might result from reduced energy usage?
- 3 are any purchase discounts that might be offered for purchasing energy efficient devices?

~

(Q21.) I'm going to read a list of different actions that people can take. Using a 10 point scale, where '1' means that action makes no contribution toward protecting the environment at all and '10' means that action makes a major contribution toward protecting the environment please tell me how much impact you think each action has.

How much of a contribution does (INSERT ITEM) make toward protecting the environment?

(INTERVIEWER: REPEAT THE SCALE AS NECESSARY.)

(INTERVIEWER: IT IS VERY IMPORTANT THAT EACH RESPONDENT PROVIDE A 1-10 RATING FOR EVERY ITEM. IF THE RESPONDENT SAYS "DON'T KNOW", PROMPT AGAIN FOR A 1-10 RATING, REPEATING SCALE AND/OR ITEM AS NECESSARY.)

(READ LIST) **com: [SINGLE MENTION FOR EACH ACTION]**

1	2	3	4	5	6	7	8	9	10	?
MAKES NO									MAJOR	DK
CONTRIBUTION									CONTRIBUTION	

com: [RANDOMIZE]

- 1 Using mass transit instead of driving
- 2 Recycling paper, cans, bottles and plastics
- 3 Setting heating or cooling thermostats to use less energy
- 4 Driving an electric or hybrid gas-electric vehicle

- 5 Participating in a Green Power rates program to buy renewable energy
- 6 Replacing major appliances with more energy efficient ones
- 7 Replacing regular light bulbs and fixtures with energy efficient ones
- 8 Installing additional or upgraded insulation or windows

~

Finally, let's turn to the question of what you want from an energy utility company.

(Q22.) Using a 10-point scale, where '1' means not at all important, and '10' means extremely important, please indicate how important it is to you that your energy utility company do the following things, even if that meant that you had to pay a little more in order for the company to pursue these types of initiatives?

(INTERVIEWER: REPEAT THE SCALE AS NECESSARY.)

(INTERVIEWER: IT IS VERY IMPORTANT THAT EACH RESPONDENT PROVIDE A 1-10 RATING FOR EVERY ITEM. IF THE RESPONDENT SAYS "DON'T KNOW", PROMPT AGAIN FOR A 1-10 RATING, REPEATING SCALE AND/OR ITEM AS NECESSARY.)

(READ LIST) **com: [SINGLE MENTION FOR EACH ACTION]**

1	2	3	4	5	6	7	8	9	10	?	
NOT AT ALL									EXTREMELY		DK
IMPORTANT									IMPORTANT		

com: [RANDOMIZE]

- 1 Actively encourage its customers to participate in energy and cost saving programs.
- 2 Do everything possible to supply renewable, clean energy
- 3 Operate its business in a completely environmentally friendly manner.

~

com: [INSERT STANDARD TERMINATION PAGE]

Appendix A.3-3 Summary of Survey Responses

Table 1 - First of all, do you own your home?

Q1	Frequency	Percent
Yes	318	100.00

Table 2 - Which of the following best describes your home?

Q2	Frequency	Percent
Single family detached (on a separate lot) not connected to other living units	311	97.80
Duplex or Triplex with 2 or 3 total living units	7	2.20

Table 3 - Can you verify that you are the person in your household who would be most likely to make decisions concerning appliance purchases for the home

Q3	Frequency	Percent
Yes	318	100.00

Table 4 - Who provides your electricity service?

Q4	Frequency	Percent
Puget Sound Energy	315	99.06
Other	3	0.94

Table 5 - What is your primary source of heating fuel?

Q5	Frequency	Percent
Electric	203	27.47
Propane	10	1.35

Oil	78	10.55
Natural Gas	421	56.97
Other (Please specify)	27	3.65

If already have Natural Gas:

If Q5 = Natural Gas	Frequency	Percent
Puget Sound Energy/Washington Natural Gas	47	11.06
Cascade Natural Gas	355	83.53
Amerigas	0	0.00
Ferrellgas	1	0.24
North West Propane	0	0.00
Permagas	0	0.00
Suburban Propane	0	0.00
Other	5	1.18
Don't Know	17	4.00

Table 6 - What type of heating system does your home have?

Q7	Frequency	Percent
Central forced air heating	138	43.40
Resistance heating, such as baseboard, ceiling, floor, zone, or wall heaters	121	38.05
Portable heaters	3	0.94
Heat pump	42	13.21
Refused	1	0.31
Don't Know	13	4.09

Table 7 - Do any of your close neighbors have gas heating and/or appliances?

Q8	Frequency	Percent
Yes	147	53.26
No/None	69	25.00
Refused	2	0.72
Don't Know	58	21.01

Table 8 - What is the square footage of your home?

Q9	Frequency	Percent
Don't Know	42	13.21
1000 or less	30	9.43
1001-1500	78	24.53
1501-2000	64	20.13
2001-2500	32	10.06
More than 2500	72	22.64

Table 9 – (If previous question “Don't Know) Which of the following categories do you feel best describes the square footage of your home? Your best guess is fine.

Q10	Frequency	Percent
1000 or less	3	10.00
1001-1500	8	26.67
1501-2000	5	16.67
2001-2500	6	20.00
More than 2500	2	6.67
Don't Know	6	20.00

Table 10 - How many bedrooms are there in your home?

Q11	Frequency	Percent
One	6	2.17
Two	33	11.96
Three	156	56.52
Four	61	22.10
Five or More	20	7.25

Table 11 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas is more economical than other energy sources.

Q12_1	Frequency	Percent
One-Strongly Disagree	29	10.51
Two	27	9.78
Three	70	25.36
Four	51	18.48
Five-Strongly Agree	39	14.13
Refused	2	0.72
Don't Know	58	21.01

Table 12 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas heats your residence more comfortably than other heat sources.

Q12_2	Frequency	Percent
One-Strongly Disagree	33	11.96
Two	17	6.16
Three	72	26.09
Four	43	15.58
Five-Strongly Agree	37	13.41
Refused	5	1.81
Don't Know	69	25.00

Table 13 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas has remained more stable in price than other sources of energy over the last 3 years.

Q12_3	Frequency	Percent
One-Strongly Disagree	32	11.59
Two	25	9.06
Three	65	23.55
Four	33	11.96
Five-Strongly Agree	30	10.87
Refused	3	1.09
Don't Know	88	31.88

Table 14 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas is cleaner for the environment than other energy sources.

Q12_4	Frequency	Percent
One-Strongly Disagree	21	7.61
Two	30	10.87
Three	69	25.00
Four	53	19.20
Five-Strongly Agree	52	18.84
Refused	2	0.72
Don't Know	49	17.75

Table 15 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas improves the value of your residence.

Q12_5	Frequency	Percent
One-Strongly Disagree	21	7.61
Two	17	6.16
Three	71	25.72
Four	57	20.65
Five-Strongly Agree	56	20.29
Refused	5	1.81
Don't Know	49	17.75

Table 16 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas is a safe product to use for heating your residence.

Q12_6	Frequency	Percent
One-Strongly Disagree	26	9.42
Two	15	5.43
Three	43	15.58
Four	64	23.19
Five-Strongly Agree	95	34.42
Refused	3	1.09
Don't Know	30	10.87

Table 17 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas will be a plentiful energy source for years to come.

Q12_7	Frequency	Percent
One-Strongly Disagree	26	9.42
Two	31	11.23
Three	71	25.72
Four	39	14.13
Five-Strongly Agree	46	16.67
Refused	3	1.09
Don't Know	60	21.74

Table 18 - Have you ever considered converting your home to natural gas heating?

Q13	Frequency	Percent
Yes	149	53.99
No/None	127	46.01

Table 19 - In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is not important at all and 5 is extremely important , how important are the following considerations. Effect on the value of your home

Q14_1	Frequency	Percent
Not important at all	10	6.71
Somewhat important	10	6.71
Neutral	33	22.15
Very important	42	28.19
Extremely important	46	30.87
Don't Know	8	5.37

Table 20 - In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is not important at all and 5 is extremely important , how important are the following considerations. Environmental friendliness

Q14_2	Frequency	Percent
Not important at all	10	6.71
Somewhat important	9	6.04
Neutral	33	22.15
Very important	49	32.89
Extremely important	43	28.86
Refused	1	0.67
Don't Know	4	2.68

Table 21 - In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is not important at all and 5 is extremely important, how important are the following considerations. Effect on monthly energy bill

Q14_3	Frequency	Percent
Not important at all	5	3.36
Somewhat important	8	5.37
Neutral	25	16.78
Very important	34	22.82
Extremely important	65	43.62
Refused	1	0.67
Don't Know	11	7.38

Table 22 - In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is not important at all and 5 is extremely important, how important are the following considerations. Investment to purchase new gas equipment/appliances

Q14_4	Frequency	Percent
Not important at all	16	10.74
Somewhat important	13	8.72
Neutral	28	18.79
Very important	34	22.82
Extremely important	53	35.57
Don't Know	5	3.36

Table 23 - In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is not important at all and 5 is extremely important , how important are the following considerations. Level of comfort

Q14_5	Frequency	Percent
Not important at all	10	6.71
Somewhat important	5	3.36
Neutral	36	24.16
Very important	45	30.20
Extremely important	45	30.20
Refused	1	0.67
Don't Know	7	4.70

Table 24 - What are some of the reasons that would prevent you from converting to natural gas?

Q15_1	Frequency	Percent
Cost to purchase new gas equipment/appliances	112	40.58
Expense of setting up natural gas service	40	14.49
Monthly energy expense	1	0.36
Satisfied with my current heat source	13	4.71
Safety concerns about natural gas	16	5.80
Limitations of building structure	11	3.99
Plan to move soon	4	1.45
Other	76	27.54
Don't Know	3	1.09

Table 25 - What are some of the reasons that would prevent you from converting to natural gas?

Q15_2	Frequency	Percent
Cost to purchase new gas equipment/appliances	11	18.33
Expense of setting up natural gas service	24	40.00
Monthly energy expense	3	5.00
Satisfied with my current heat source	1	1.67
Safety concerns about natural gas	5	8.33
Limitations of building structure	3	5.00
Other	13	21.67

Table 26 - What are some of the reasons that would prevent you from converting to natural gas?

Q15_3	Frequency	Percent
Monthly energy expense	4	44.44
Safety concerns about natural gas	1	11.11
Limitations of building structure	1	11.11
Plan to move soon	1	11.11
Other	2	22.22

Table 27 - Given the cost of converting, how likely would you be to convert to com:[INSERT HEATING TYPE FROM Q7] for your home in the next five years? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.

Q16	Frequency	Percent
Very unlikely	133	48.19
Somewhat unlikely	47	17.03
Likely	42	15.22
Somewhat likely	25	9.06
Highly likely	26	9.42
Don't Know	3	1.09

Table 28 - If your utility paid com:[RANDOM BID VALUE] of the \$6,000 cost to switch to com:[INSERT HEATING TYPE FROM Q7] for your home, how likely would you be to convert in the next five years? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.

Q17	Bid Value: \$1500	Bid Value: \$3000	Bid Value: \$4500	Bid Value: \$6000	Total
Very unlikely	23	26	13	10	72
Somewhat unlikely	6	12	6	7	31
Likely	11	7	15	4	37
Somewhat likely	12	14	16	11	53
Highly likely	4	8	19	22	53
Don't Know	1	1	2		4

Table 29 - How likely would you be to convert to a gas water heater at the same time as your com:[INSERT HEATING TYPE FROM Q7]? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.

Q18	Frequency	Percent
Already have a gas heater	3	1.09
Very unlikely	70	25.36
Somewhat unlikely	15	5.43
Likely	30	10.87
Somewhat likely	41	14.86
Highly likely	111	40.22
Refused	2	0.72
Don't Know	4	1.45

Table 30 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: It is very important for you to find ways to control your energy costs.

Q19_1	Frequency	Percent
One-strongly disagree	4	1.26
Two	2	0.63
Three	5	1.57
Four	4	1.26
Five	26	8.18
Six	11	3.46
Seven	29	9.12
Eight	58	18.24
Nine	33	10.38
Ten-strongly agree	146	45.91

Table 31 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: You believe it is socially responsible to limit your use of electricity.

Q19_2	Frequency	Percent
One-strongly disagree	20	6.29
Two	7	2.20
Three	5	1.57
Four	10	3.14
Five	29	9.12
Six	13	4.09
Seven	32	10.06
Eight	58	18.24
Nine	29	9.12
Ten-strongly agree	112	35.22
Refused	1	0.31
Don't Know	2	0.63

Table 32 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: You are very concerned about the environmental effects of electricity generating plants.

Q19_3	Frequency	Percent
One-strongly disagree	35	11.01
Two	15	4.72
Three	12	3.77
Four	22	6.92
Five	51	16.04
Six	16	5.03
Seven	32	10.06
Eight	41	12.89
Nine	14	4.40
Ten-strongly agree	69	21.70
Refused	1	0.31
Don't Know	10	3.14

Table 33 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: You regularly review your home s energy usage, and constantly look for ways to save on energy costs.

Q19_4	Frequency	Percent
One-strongly disagree	9	2.83
Two	9	2.83
Three	8	2.52
Four	11	3.46
Five	38	11.95
Six	22	6.92
Seven	27	8.49
Eight	51	16.04
Nine	31	9.75
Ten-strongly agree	110	34.59
Don't Know	2	0.63

Table 34 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: It is just as important to conserve natural gas as it is to conserve electricity.

Q19_5	Frequency	Percent
One-strongly disagree	3	0.94
Two	1	0.31
Three	2	0.63
Four	5	1.57
Five	40	12.58
Six	10	3.14
Seven	28	8.81
Eight	36	11.32
Nine	25	7.86
Ten-strongly agree	158	49.69
Don't Know	10	3.14

Table 35 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: Of all the things you could do to help protect the environment, energy conservation is definitely the most important.

Q19_6	Frequency	Percent
One-strongly disagree	19	5.97
Two	4	1.26
Three	8	2.52
Four	10	3.14
Five	50	15.72
Six	24	7.55
Seven	45	14.15
Eight	60	18.87
Nine	23	7.23
Ten-strongly agree	71	22.33
Refused	1	0.31
Don't Know	3	0.94

Table 36 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: You pay a lot of attention to energy-related issues because they affect both your home and the country as a whole

Q19_7	Frequency	Percent
One-strongly disagree	3	0.94
Two	5	1.57
Three	8	2.52
Four	10	3.14
Five	33	10.38
Six	17	5.35
Seven	32	10.06
Eight	61	19.18
Nine	39	12.26
Ten-strongly agree	107	33.65
Don't Know	3	0.94

Table 37 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: The long-term threat from global warming and climate change is real, and potentially catastrophic

Q19_8	Frequency	Percent
One-strongly disagree	46	14.47
Two	10	3.14
Three	14	4.40
Four	5	1.57
Five	36	11.32
Six	12	3.77
Seven	21	6.60
Eight	34	10.69
Nine	24	7.55
Ten-strongly agree	106	33.33
Refused	1	0.31
Don't Know	9	2.83

Table 38 - Use a scale of 1 to 10, where 1 means that factor is not at all important and 10 means that factor is extremely important when you are selecting which appliance, electronic device, or other energy-related product or service to purchase for your home. are any cost savings you might get from reduced electricity usage?

Q20_1	Frequency	Percent
One-not at all important	3	0.94
Two	4	1.26
Three	6	1.89
Four	5	1.57
Five	29	9.12
Six	13	4.09
Seven	32	10.06
Eight	54	16.98
Nine	36	11.32
Ten-extremely important	131	41.19
Refused	2	0.63
Don't Know	3	0.94

Table 39 - Use a scale of 1 to 10, where 1 means that factor is not at all important and 10 means that factor is extremely important when you are selecting which appliance, electronic device, or other energy-related product or service to purchase for your home. are any positive effects on the environment that might result from reduced energy usage?

Q20_2	Frequency	Percent
One-not at all important	15	4.72
Two	4	1.26
Three	10	3.14
Four	7	2.20
Five	35	11.01
Six	10	3.14
Seven	33	10.38
Eight	59	18.55
Nine	30	9.43
Ten-extremely important	106	33.33
Refused	2	0.63
Don't Know	7	2.20

Table 40 - Use a scale of 1 to 10, where 1 means that factor is not at all important and 10 means that factor is extremely important when you are selecting which appliance, electronic device, or other energy-related product or service to purchase for your home. are any purchase discounts that might be offered for purchasing energy efficient devices?

Q20_3	Frequency	Percent
One-not at all important	10	3.14
Two	4	1.26
Three	11	3.46
Four	4	1.26
Five	34	10.69
Six	16	5.03
Seven	33	10.38
Eight	59	18.55
Nine	25	7.86
Ten-extremely important	116	36.48
Refused	2	0.63
Don't Know	4	1.26

Table 41 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:Using mass transit instead of driving

Q21_1	Frequency	Percent
One-makes no contribution	24	7.55
Two	10	3.14
Three	4	1.26
Four	8	2.52
Five	30	9.43
Six	18	5.66
Seven	29	9.12
Eight	48	15.09
Nine	37	11.64
Ten-major contribution	102	32.08
Refused	6	1.89
Don't Know	2	0.63

Table 42 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has: Recycling paper, cans, bottles and plastics

Q21_2	Frequency	Percent
One-makes no contribution	5	1.57
Two	6	1.89
Three	9	2.83
Four	1	0.31
Five	16	5.03
Six	19	5.97
Seven	25	7.86
Eight	45	14.15
Nine	38	11.95
Ten-major contribution	148	46.54
Refused	5	1.57
Don't Know	1	0.31

Table 43 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:Setting heating or cooling thermostats to use less energy

Q21_3	Frequency	Percent
One-makes no contribution	5	1.57
Two	6	1.89
Three	2	0.63
Four	4	1.26
Five	29	9.12
Six	15	4.72
Seven	31	9.75
Eight	60	18.87
Nine	33	10.38
Ten-major contribution	120	37.74
Refused	5	1.57
Don't Know	8	2.52

Table 44 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has: Driving an electric or hybrid gas-electric vehicle

Q21_4	Frequency	Percent
One-makes no contribution	22	6.92
Two	3	0.94
Three	9	2.83
Four	5	1.57
Five	45	14.15
Six	18	5.66
Seven	41	12.89
Eight	50	15.72
Nine	33	10.38
Ten-major contribution	80	25.16
Refused	6	1.89
Don't Know	6	1.89

*Table 45 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:
Participating in a Green Power rates program to buy renewable energy*

Q21_5	Frequency	Percent
One-makes no contribution	18	5.66
Two	11	3.46
Three	8	2.52
Four	12	3.77
Five	38	11.95
Six	12	3.77
Seven	36	11.32
Eight	53	16.67
Nine	20	6.29
Ten-major contribution	78	24.53
Refused	6	1.89
Don't Know	26	8.18

*Table 46 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:
Replacing major appliances with more energy efficient ones*

Q21_6	Frequency	Percent
One-makes no contribution	5	1.57
Two	4	1.26
Three	10	3.14
Four	13	4.09
Five	40	12.58
Six	21	6.60
Seven	47	14.78
Eight	57	17.92
Nine	27	8.49
Ten-major contribution	85	26.73
Refused	5	1.57
Don't Know	4	1.26

*Table 47 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:
Replacing regular light bulbs and fixtures with energy efficient ones*

Q21_7	Frequency	Percent
One-makes no contribution	18	5.66
Two	6	1.89
Three	8	2.52
Four	8	2.52
Five	29	9.12
Six	24	7.55
Seven	38	11.95
Eight	62	19.50
Nine	23	7.23
Ten-major contribution	94	29.56
Refused	5	1.57
Don't Know	3	0.94

*Table 48 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:
Installing additional or upgraded insulation or windows*

Q21_8	Frequency	Percent
One-makes no contribution	8	2.52
Two	6	1.89
Three	8	2.52
Four	5	1.57
Five	23	7.23
Six	22	6.92
Seven	31	9.75
Eight	56	17.61
Nine	39	12.26
Ten-major contribution	110	34.59
Refused	5	1.57
Don't Know	5	1.57

Table 49 - Where 1 means not at all important, and 10 means extremely important, how important is it to you that your energy utility company do the following things, even if that meant that you had to pay a little more? Actively encourage its customers to participate in energy and cost saving programs.

Q22_1	Frequency	Percent
One-not at all important	17	5.35
Two	2	0.63
Three	6	1.89
Four	10	3.14
Five	29	9.12
Six	13	4.09
Seven	38	11.95
Eight	51	16.04
Nine	34	10.69
Ten-extremely important	110	34.59
Refused	7	2.20
Don't Know	1	0.31

Table 50 - Where 1 means not at all important, and 10 means extremely important, how important is it to you that your energy utility company do the following things, even if that meant that you had to pay a little more? Do everything possible to supply renewable, clean energy

Q22_2	Frequency	Percent
One-not at all important	14	4.40
Two	3	0.94
Three	5	1.57
Four	4	1.26
Five	28	8.81
Six	14	4.40
Seven	25	7.86
Eight	60	18.87
Nine	32	10.06
Ten-extremely important	119	37.42
Refused	7	2.20
Don't Know	7	2.20

Table 51 - Where 1 means not at all important, and 10 means extremely important, how important is it to you that your energy utility company do the following things, even if that meant that you had to pay a little more? Operate its business in a completely environmentally friendly manner.

Q22_3	Frequency	Percent
One-not at all important	15	4.72
Two	8	2.52
Three	6	1.89
Four	6	1.89
Five	39	12.26
Six	16	5.03
Seven	34	10.69
Eight	54	16.98
Nine	34	10.69
Ten-extremely important	92	28.93
Refused	7	2.20
Don't Know	7	2.20

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Appendix B: Data Development

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Appendix B.1: Commercial Measure Descriptions

Electric Non-Equipment Measures

Cooking

Convection Oven. Operates at a lower temperature and cooks more quickly than a standard oven due to fans that circulate heat evenly throughout the oven and move hot air past food. The baseline measure is a standard commercial oven.

Cooking Fryers – Commercial. Under heavy load, operates at 80% or better efficiency and, when idle, uses less than 1,000 Watts. This measure follows the 2006 CEE qualified electric deep fat fryers requirements.

Hot Food Holding Cabinets – Commercial. ENERGY STAR® hot food-holding cabinets use a maximum of 40 Watts/cubic foot less than the baseline measure, a conventional holding cabinet.¹

Steam Cookers – Commercial. Commercial ENERGY STAR electric steam cookers have a cooking efficiency of 50%, with idle energy rates that vary depending upon pan size.²

HVAC Auxiliary

Automated Exhaust VFD Control – Parking Garage CO Sensor. This measure allows the ventilation system to run only when CO₂ levels are above a specified level. The ventilation system would run constantly without this measure.

Cooking Hood Controls. Utilizing sensors and two-speed or variable speed fans, hood controls reduce exhaust (and makeup) airflow when appliances are not at capacity (or have been turned off). The baseline for this measure is no hood controls.

HVAC Motors – Premium Efficiency. Premium efficiency motors are more efficient than standard efficiency motors. According to the Consortium of Energy Efficiency (CEE), premium efficiency motors are typically cost-effective in applications when they operate more than 4,000 hours a year. Payback within two years is estimated. Currently, CEE and the National Electrical Manufacturers Association (NEMA) have premium efficiency standards for manufacturers to adhere to. This measure specifically relates to HVAC motors, ranging from 1 HP to 200 HP, depending on the building size.

Motors – Pump and Fan System – Variable Speed Control. Variable speed controls allow pump and fan motors to operate at a lower speed while still maintaining the set points during partial

¹ http://www.energystar.gov/index.cfm?c=hfhc.pr_hfhc

² http://www.energystar.gov/index.cfm?c=steamcookers.pr_steamcookers

load conditions. Energy is reduced when motor operation can vary with load rather than run at a constant speed.

Motors – Variable Air Volume (VAV) Box High Efficiency. High efficiency fan-powered boxes prevent hot and cold spots by maintaining room air circulation while supply-air temperature is modulated to match load. Energy is saved by re-circulating warm air from zones that have lower heating requirements to zones with greater heating requirements. An electronically commutated motor (ECM) powers the fan in each VAV box. An ECM is a brushless DC motor with all of its speed and torque controls built in electronically, which allows the motor to adjust its speed to ensure the optimal airflow at all times.³

Optimized Variable Volume Lab Hood Design. Allows the volumetric flow rate to vary, which causes a constant speed through the duct, regardless of sash opening. For buildings such as universities, schools, and hospitals that use lab hoods, small savings can be obtained by using a variable, rather than constant, volume lab hood. The baseline measure is a constant volume lab hood.

HVAC & Envelope

Automatic Ventilation VFD Control (occupancy/CO₂ sensors). The ventilation system automatically adjusts air flow when CO₂ levels are above a specified level. When using CO₂ control, a minimum ventilation rate is maintained at all times to control non-occupant contaminants like off-gassing from furniture, equipment, and building components. Without it, as a baseline, the ventilation system would run constantly.

Building Commissioning and Retro-Commissioning. Commissioning ensures that energy-using systems that have been installed are operating in an optimal fashion in order to maximize energy efficiency. The commissioning process can be applied to existing buildings to restore them to optimal performance. Retro-commissioning is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings and brings the buildings up to the design intentions of its current operation.^{4,5} The baseline measure is no commissioning. The cost for this measure is derived by taking the cost of the initial commissioning for the first year and then taking a 40% commissioning cost in each year for the life of the measure (10 years). It is feasible to only perform retro-commissioning every three years. If this step is performed the total cost of the measure would go down, which would make the measure more cost-effective than shown in this study.

Centrifugal Chiller – Variable Speed Drive (VSD) Remodel for Existing. The VSD controls the rotational speed of the chiller compressor to match the output capacity with the part load cooling while maintaining full load efficiency. Baseline for this measure is a constant speed compressor motor with inlet vane control.

³ LEED qualified Justice Center reported by DCJ.com and Minnesota Power Incentive Program

⁴ <http://www.green.ca.gov/CommissioningGuidelines/default.htm>

⁵ <http://cbs.lbl.gov/BPA/cct.html>

Chilled Water Piping Loop with Variable speed drive (VSD) Control. A VSD controller, with two-way valves at the cooling coils, controls the chilled water pump to vary pump speed and chilled water flow to match the varying cooling load, thus reducing pumping energy requirements. The baseline is a constant speed pump with three-way valves.

Chilled Water Reset. Varies the temperature of the chilled water in a loop, allowing for an increase of water temperature as the cooling requirement decreases. The baseline measure is no chilled water reset.

Chiller Water-Side Economizer. Consists of a heat exchanger attached to a condenser water piping loop that operates when outdoor conditions can produce condenser water colder than the mixed air temperature. A water side economizer is used if an outdoor-air economizer is not practical. The baseline measure is no economizer.

Cooling DX Package Air-Side Economizer. An air-side economizer uses already cooled air (return air) mixed with a proportion of outside air to cool indoor spaces. Using the return air results in energy savings, as less air needs to be cooled.

Cooling Tower – Decrease Approach Temperature. An oversized cooling tower allows a reduced approach temperature, which saves energy. The approach temperature is the difference between the tower water leaving and the wet-bulb temperature.

Cooling Tower – Two-Speed Fan Motor. A two-speed fan cycles between off, low, and high speeds to maintain the tower set point. The low-speed setting option uses less energy than a single, high speed fan. The baseline measure is a single-speed fan motor.

Cooling Tower – VSD Fan Control. One step more sophisticated than the two-speed fan motor is the variable speed drive (VSD). A VSD modulates the air flow so the heat rejection exactly matches the load at the desired set point.

Direct Digital Control System – Install. Direct digitally controlled (DDC) systems allow for both HVAC and lighting to be controlled and monitored using an electronic or digital system. For lighting, replacing the manually operated wall switches with a digital interface allows for direct control of lights at a remote location at anytime. For HVAC, the entire system, including pumps, motors, fans, and set points, can be digitally programmed for each unit to further increase tighter control of the system.

Direct Digital Control System – Optimization. Allows for digital monitoring and control of HVAC and lighting systems. The optimization of the control system consists of upgrading a high-efficiency energy management system to a premium efficiency system.

Direct Digital Control System – Wireless Performance Monitoring. These are second-generation building automation systems that allow for wireless optimization and operation of building systems such as HVAC through computerized monitoring and control software and interfaces.

Direct/Indirect Evaporative Cooling, Pre-Cooling. A direct evaporative cooler is a low-energy system that evaporates water into the air stream, thus reducing the temperature of the air, but

increasing the humidity. An indirect evaporative cooler uses a secondary air stream that is cooled by water and goes through a heat exchanger with the primary air stream, cooling the air but not affecting the humidity. A direct/indirect system cools the air stream first through an indirect cooler, and then cools it further through a direct cooler. Including an evaporative cooler before the DX system will reduce the overall cooling load.

Duct Repair and Sealing. The repair and sealing of leaky ducts creates significant energy savings by ensuring conditioned air only goes to occupied spaces, thereby reducing an excessive runtime/load on the HVAC system.

Exhaust Air to Ventilation Air Heat Recovery. Captures air that is exhausted out of a building during the heating season, which is warmer than the air outside. Transferring this heat to the incoming air lowers the overall heating load.

Exhaust Hood Makeup Air. Provides exhaust air at the hood instead of allowing the hood to exhaust the conditioned air in the room. The baseline practice is expulsion of conditioned air through exhaust hoods.

Green Roof. A green roof is a living roof that supports soil and plant growth. A series of carefully engineered layers are applied to the roof deck. These layers are watertight, lightweight, and long lasting. Green roofs can be incorporated into new buildings as long as load requirements are met. They are suited for roofs that have slopes ranging up to 20° and are most successful when sufficient attention has been paid to selecting plants that will thrive in the local climate and conditions. One of the most significant advantages is that a green roof can last up to three times longer than a standard roof. A green roof can also buffer temperature extremes, which improves a building's energy performance by dropping the temperatures on the roof 3° – 7°, resulting in approximately 12% reduction in cooling loads.

Heat Pump – Commissioning. Commissioning ensures that energy-using systems that have been installed are operating in an optimal fashion in order to maximize energy efficiency.⁶ Retro-commissioning is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings and brings the buildings up to the design intentions of its current usage.⁷ The baseline measure is no commissioning. The cost for this measure is derived by taking the cost of the initial commissioning for the first year and then on a yearly basis taking a 40% commissioning cost in each year for the life of the measure (10 years). It is feasible to only perform retro-commissioning every three years and will still only involve 40% of the initial cost for commissioning. If this step is performed, the total cost of the measure would go down making the measure cost effective than it is shown in this study.

Heat Pump – Ground Source. Geothermal or ground source heat pumps (GSHP) utilize the constant temperature of the earth as the exchange medium instead of the outside air temperature that is used by Air Source Heat Pumps (ASHP). This allows higher efficiencies on the coldest

⁶ <http://cbs.lbl.gov/BPA/cct.html>

⁷ <http://www.green.ca.gov/CommissioningGuidelines/default.htm>

nights, compared to air-source heat pumps.⁸ Table B.1 shows the measure and baseline energy efficiency requirements.

Table B.1. Ground Source Heat Pump Efficiency Requirements

Measure Efficiency – GSHP	Baseline Efficiency – ASHP
COP=3.1, EER=13.4 (State Code)	COP=3.2, EER=10.1
COP=4.0, EER=20	

Heat Pump – Water Source. Groundwater source heat pumps use natural wells or man-made lakes to circulate water through a piping system. The water is used as a medium in the pipes to either reject or absorb heat and then is put back into the water source from which it originated.

Hotel Key Card Energy Control System. This is a key card system to control room HVAC and lighting during non-occupied periods. Occupancy is determined by the key card and/or additional sensors. The central system first sets temperature at a minimum level and turns off lighting, then gives control to the guest for temperature and lighting when the guest enters the room.

Infiltration Control (Caulking, Weather Stripping, etc.). Sealing air leaks in windows, doors, roof, crawlspaces, and outside walls decreases overall heating and cooling losses. Baseline and measure values are presented in Table B.2.

Table B.2. Infiltration Reduction Measures

Measure (ACH)	Baseline (ACH)
0.65	1.00

Insulation – Floor (Non-Slab). These measures represent an increase in R-value to current code levels of R-19 for the floor space (non-slab) and better. Baseline and measure values are presented in Table B.3.

Table B.3. Floor Insulation Measures

Measure	Baseline
R-10	R-0
R-19	R-10

Insulation – Ceiling. These measures represent an increase in R-value to current code values of R-21 or better. Baseline and measure values are presented in Table B.4.

⁸ Description source: EERE

Table B.4. Ceiling Insulation Measures

Measure	Baseline
R-21	R-0
R-21	existing ceiling insulation
R-38	R-21
R-49	R-21

Insulation – Duct. Packaged Direct Expansion (DX) and heat-pump equipment are generally coupled with a ducting system inside the building. Insulating the ducts reduces energy loss in the unoccupied plenum space. This measure assumes that R-0 insulation will be replaced with R-4 insulation (or that R-4 insulation will be installed), and that R-4 insulation will be replaced with R-8 (or that R-8 insulation will be installed).

Insulation – Wall. Wall insulation installed with a current code R-value of R-19 or better. Measures are based on 2x6 wall construction. Baseline and measure values are presented in Table B.5.

Table B.5. Wall Insulation Measures

Framing Type	Measure	Baseline
2x6	R-19	R-0
2x6	R-19	Existing wall insulation
2x6 Advanced	R-25	R-19

Leak Proof Duct Fittings. The majority of duct leakage in residential HVAC systems is due to improperly sealed connections between ductwork and fittings. Even when duct connections are initially well-sealed, leakage may increase over time. Although the use of mastics and mechanical fasteners is becoming more widespread, a low-cost, leak-proof system will help to transform the market.

Pipe Insulation. Adding R-4 insulation around the pipes decreases temperature losses, thereby reducing demand on water heaters and chilled water systems.

Sensible and Total Heat Recovery Devices. Sensible heat recovery devices transfer energy (heat) from the return air stream back into the supply air stream, which avoids heat losses in exhausted air. This raises the incoming outdoor air temperature in the winter and cools it in the summer. Energy savings results from reduced needs for mechanical heating or cooling. Total heat devices, also called enthalpy recovery, transfer both sensible and latent heat. Latent heat significantly raises the humidity of the outdoor air in the winter and reduces it in the summer. Dehumidification in the summer can be costly and total recovery devices help reduce this.⁹

Thermostat – Programmable. A programmable thermostat controls the set point temperatures automatically, ensuring the HVAC system is not running during low-occupancy hours.

⁹ http://www.mcquay.com/mcquaybiz/marketing_tools/mt_corporate/EngNews/0701.pdf

Turbocor Compressor. A totally oil-free compressor that incorporates leading edge thermodynamic and electronic technologies with magnetic bearing systems to achieve significantly higher efficiencies than compressors in a similar capacity range.

Windows – High-Efficiency. This measure represents an increase in building performance by reducing the U-value in existing construction and new construction windows, as shown in Table B.6.

Table B.6. High-efficiency Window Measures

Measure U-Value	Baseline U-Value
0.55	0.65
0.35	0.55

The code for either new construction or window replacement states the customer must go to code (U=0.55) at a minimum when installing new windows.

Lighting

Bi-Level Control, Stairwell Lighting. An occupancy sensor that reduces the light load by 50% when a stairwell is unoccupied for a set amount of time. The baseline is continuous operation at full power.

Daylighting Controls – Dimming-Continuous, Fluorescent Fixtures. A dimming switch allows light levels to vary from 0% – 100% brightness. A continuously dimming switch permits variation throughout the range, increasing electricity savings. The baseline measure is operating fluorescent fixtures at full power.

HE Fixtures/Design. This measure is a generic way to indicate improved lighting efficiency. The baseline lighting technology is representative of all available technologies that make up the total Watts per square foot for that particular building type. This includes all overhead lighting such as T12, T8, T5 tubes, canned CFLs, etc. The lighting reduction package measures reduce the lighting power density (W/sqft) by installing higher efficiency technologies such as high performance T8 or T5 tubes, high-efficiency ballasts, reflective lighting fixtures, etc. A low reduction package results in a 15% decrease in power density and high reduction results in a 25% decrease in lighting power density. Lighting reduction packages such as T5HO (High Output) for high bay applications, in warehouse and grocery, can reduce the power density by 35%.

Hotel Key Card Energy Control System. This is a key card system to control room HVAC and lighting during non-occupied periods. Occupancy is determined by the key card and/or additional sensors. The central system first sets temperature and lighting at a minimum level then gives control to the guest for temperature and lighting when the guest enters the room.

Light-Emitting Diodes (LED) Exit Lighting. LED exit signs use a fraction of the Wattage that incandescent and compact fluorescent (CFL) signs use while lasting over 50,000 hours. The baseline measure is incandescent and CFL signs.

LED Refrigeration Case Lights. Light-emitting diodes (LEDs) are highly efficient bulbs that can be used for refrigeration case lights and exit signs, a 70% energy savings over a fluorescent bulb.

LED Solid State White Lighting Package. Light emitting diodes (LEDs) are solid-state devices that convert electricity to light, with very high efficiency and long life. Recently, lighting manufacturers have been able to produce "cool" white LED lighting indirectly, using ultraviolet LEDs to excite phosphors that emit a white-appearing light. Replacement for incandescent lamps.

Occupancy Sensor Control, Fluorescent. If a space is unoccupied for a designated amount of time, an occupancy sensor will turn off the lights. The lights will turn on again once the sensor detects a person has entered the space.

Time Clocks and Timers (Lighting). Includes an integrated time-clock that automatically switches lighting and other loads on and off on a time schedule, or in response to an occupancy sensor or a building automation system.

Lighting – Traffic

LED Pedestrian Light. Replace incandescent pedestrian light with efficient and long-lasting LED array.

LED Traffic Light. LEDs are significantly more efficient at producing light than incandescent bulbs and last for years. LED traffic lights are brighter and use significantly less energy than their incandescent counterparts.

Plug Load

Battery Charging System. Used to recharge a wide variety of cordless products, including power tools, small household appliances, and personal care products like electric shavers. An ENERGY STAR charging system uses 35% less energy than the baseline, non-ENERGY STAR battery charger.¹⁰

Computers. ENERGY STAR computers feature: (1) "on" mode, where the maximum allowed power varies based on the computer monitor's resolution; (2) "sleep" mode, where computer monitor models must consume 2 Watts or less; and, (3) "off" mode, where computer monitor models must consume 1 Watt or less. The baseline measure does not include these features.¹¹

¹⁰ http://www.energystar.gov/index.cfm?c=battery_chargers.pr_battery_chargers

¹¹ http://www.energystar.gov/index.cfm?fuseaction=find_a_product.ShowProductGroup&pgw_code=MO

Copiers. ENERGY STAR copiers deliver the same performance as conventional equipment and are, on average, 25% more efficient. They power down when not in use. The baseline measure is non-ENERGY STAR copiers.¹²

Fax. ENERGY STAR fax machines enter sleep mode after inactivity for at least 5 minutes. This reduces their total power consumption.¹³

Monitors. In “sleep” mode, the monitor consumes less than 2 Watts. The “sleep” mode needs to be enabled in order to de-energize the monitor when not in use.

Office Computer Network Energy Management. On an individual basis, the energy wasted by a computer that remains in the full-power “on” state no matter how long it remains idle is almost insignificant. But for a corporation with hundreds or thousands of workstations operating on a local area network (LAN) or a wide area network (WAN), that wasted energy can be quite significant, easily translating to tens of thousands of dollars in unnecessary electricity expenditures each year. The energy-savings potential of implementing a PC power-management policy across a LAN will vary depending on the equipment attached to the network and how that equipment is being used.

Power Supply 80+ Office Measure. Applies to the 80 PLUS performance specification requirements for power supplies in computers and servers. 80 PLUS specifies 80% or greater efficiency at 20%, 50% and 100% of rated load with a true power factor of 0.9 or greater.¹⁴

Printers. ENERGY STAR printers deploy a maximum time delay to sleep depending upon the size of the equipment. This reduces power consumption during periods of inactivity.¹⁵

Refrigerator eCube. The eCube is placed in a refrigerated area and monitors the temperature of the product and not the temperature of the air. The thermostat is connected to the compressor, which cycles on and off to maintain the set point, based on the product temperature. The cycles of the compressor are reduced because the temperature is now based on the product and not the air.¹⁶

Residential-Size Refrigerator/Freezer. ENERGY STAR residential grade refrigerators use at least 10% less energy than required by current federal standards and 40% less energy than conventional models sold in 2001.

Scanners. ENERGY STAR enabled scanners enter a low power “sleep” mode of less than 12 Watts within 15 minutes of inactivity.¹⁷

¹² http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CP

¹³ http://www.energystar.gov/ia/products/fap/IE_Prog_Req.pdf

¹⁴ www.80PLUS.org

¹⁵ http://www.energystar.gov/ia/products/fap/IE_Prog_Req.pdf

¹⁶ <http://www.senergysolution.com/sEnergySolution/eCube.aspx>

¹⁷ <http://www.energystar.gov.au/products/scanners.html>

Vending Machines – High Efficiency. ENERGY STAR new and rebuilt refrigerated beverage vending machines are up to 40% more energy efficient than the standard model, through more efficient compressors, fan motors, lighting systems, and low-power mode options during non-use periods.¹⁸

Vending Miser. Senses occupancy and cycles off the cooling of the vending machine when no occupancy is detected.

Water Coolers. ENERGY STAR coolers providing only cold water consume less than 0.16 kWh per day; a unit providing both hot and cold water consumes less than 1.20 kWh per day.¹⁹

Refrigeration

Anti-Sweat (Humidistat) Controls. Enables the user to turn refrigeration display case anti-sweat heaters off when ambient relative humidity is low enough that sweating will not occur. Without the control, the heaters generally run continuously.

Commercial Reach-in Refrigerator (Solid Door ENERGY STAR Refrigerators/Freezers). ENERGY STAR labeled commercial solid door refrigerators and freezers are designed with high efficiency components such as ECM evaporator and condenser fan motors, hot gas anti-sweat heaters, or high-efficiency compressors. Compared to standard models, ENERGY STAR labeled commercial solid door refrigerators and freezers save energy.²⁰

Compressor VSD Retrofit. Modulates motor speed in response to changes in load. When low-load conditions exist, the current to the compressor motor is decreased, slowing the compressor motor down. Baseline is a constant-speed compressor.

Custom Refrigeration System. Customized high efficiency walk-in refrigeration system combine energy efficiency measures, including: (1) a premium efficiency (EMS) system; (2) a variable speed drive (VSD) compressor; (3) a VSD condenser; (4) a VSD evaporator fan; and, (5) floating condenser head pressure controls.

Demand Control Defrost – Hot Gas. When frost collects on the evaporator, it reduces coil capacity by acting as a layer of insulation and reducing the airflow between the fins. In hot gas defrost, refrigerant vapor from either the compressor discharge or the high pressure receiver is used to warm the evaporator coil and melt the frost that has collected there.²¹

Display Cases. Refrigerated display cases achieve a higher performance efficiency and reduce overall energy consumption by incorporating hot gas defrost, anti-sweat controls, high

¹⁸ ENERGY STAR

¹⁹ http://www.energystar.gov/index.cfm?c=water_coolers.pr_water_coolers

²⁰ ENERGY STAR

²¹ Parker Refrigeration Specialists

performance evaporative fans, defrost control, improved insulation and liquid suction heat exchangers.²²

Evaporative Condenser – High-Efficiency. In the refrigeration cycle, the condenser consumes all the input electricity to the system in order to produce cooling. A high efficiency condenser can perform the refrigeration cycle using less energy than a standard system.

Floating Head Pressure Controls. Allow more heat to be rejected through the condenser at low outside air temperatures, thereby increasing the compressor efficiency.

High Efficiency Compressors. A component of refrigeration systems, high efficiency compressors operate up to 20% more efficiently than standard-efficiency compressors.

High-Efficiency Evaporator Fans, Walk-in Refrigerators. A component of refrigeration systems, high-efficiency evaporator fan motors release less heat into the refrigerated room than conventional induction motors, reducing the energy draw by the fan motor and the compressor.

Ice Makers. High efficiency commercial ice makers use high efficiency compressors and fan motors, thicker insulation, and other measures to achieve 15% more efficiency than the baseline measure, which is a conventional automatic commercial ice maker.²³

Motors – Case Fans with ECM Motors. The case fan is one of the components of the refrigeration system. ECM are smaller variable speed motors that operate from a single-phase power source with an electronic controller mounted in or on the motor. The baseline measure is a High-Efficiency Case Fan Motor.

Night Covers for Display Cases. Night covers help to eliminate wasted refrigeration cooling by insulating display cases. In addition, they reduce the heating load of buildings through less escaped refrigerated air needing to be reheated.

Reduced Speed or Cycling of Evaporator Fans. Allowing the evaporator fans to run less frequently or at a lower speed permits the evaporator to fit the system need, rather than run continuously at high speed. Only for new construction.

Refrigeration Commissioning or Retro-Commissioning. Commissioning ensures that refrigeration systems that have been installed are operating in an optimal fashion in order to maximize energy efficiency. Retro-commissioning is checking previously commissioned equipment to ensure that it is continuing to run efficiently. The baseline measure is no commissioning.²⁴ The cost for this measure is derived by taking the cost of the initial commissioning for the first year and then on a yearly basis taking a 40% commissioning cost in each year for the life of the measure (10 years). It is feasible to only perform retro-commissioning every three years and will still only involve 40% of the initial cost for

²² OakRidge National Laboratory for the US DOE-1996

²³ Consortium for Energy Efficiency (CEE)

²⁴ <http://cbs.lbl.gov/BPA/cct.html>

commissioning. If this step is performed, the total cost of the measure would go down making the measure cost effective than it is shown in this study.

Refrigerator eCube. The eCube is placed in a refrigerated area and monitors the temperature of the product, not the temperature of the air. The thermostat is connected to the compressor, which cycles on and off to maintain the set point, based on the product temperature. The cycles of the compressor are reduced because the temperature is now based on the product and not the air.²⁵

Special Glass Doors for Refrigerated Reach-In Cases. “Low-E,” double pane thermal glass doors reduce cooling losses in refrigerated reach-in cases.

Strip Curtains for Walk-Ins. Strip curtains on walk-in refrigerators reduce the infiltration of warm air into the refrigerated space by improving the barrier between the cold space and the ambient air.

Total

Dry-Type High Efficiency Transformer. Dry type transformers have coils that are exposed to air rather than oil. Energy Star versions of these transformers offer significant savings over conventional transformers.

Water Heat

Clothes Washer – Ozonating. Disinfects water using a supply of ozone-enriched air, which suppresses subsequent biological activity and controls biological growth within the appliance, thus reducing the need to rely on hot water. The baseline measure is a standard commercial clothes washer.²⁶

Clothes Washer Commercial (w/out dryer). This measure applies to laundromat type facilities where commercial grade clothes washers are used. Energy can be saved by using ENERGY STAR clothes washers.

Demand-Controlled Circulating Systems. A demand-controlled circulating system only circulates hot water when required. The baseline measure is a continuously circulating hot water system, resulting in energy loss through pipes.

Dishwashing – Commercial – Chemical. Sanitizes dishes with chemicals, rather than hot water, allowing for a lower water temperature. The baseline is a standard commercial dishwasher.

Dishwashing – Commercial – High Efficiency. Dishwashers with a minimal idle rate as well as a minimal amount of water consumption per rack of loaded dishes depending upon size and type.

²⁵ <http://www.senergysolution.com/sEnergySolution/eCube.aspx>

²⁶ <http://www.patentstorm.us/patents/6607672-description.html>

Dishwashing – Residential Sized System. Residential sized dishwashing systems are often more appropriate for smaller commercial buildings. The smaller size leads to energy savings.

Drain Water Heat Recovery (Power-Pipe) – Heat Recovery Water Heater. Drain water heat recovery devices recover heat energy from drain water and are used to pre-heat cold water entering the hot water tank. This minimizes the temperature difference between the heating set point and the entering water temperature.²⁷

Faucet Aerators. Faucet aerators, by mixing water and air, reduce the amount of water that flows through the faucet. The faucet aerator creates a fine water spray through an inserted screen in the faucet head. Flow rate requirements for this measure are presented in Table B.7.

Table B.7. Faucet Aerator Flow Rates

Measure Flow Rate (GPM*)	Baseline Flow Rate (GPM)
1.5	2.5
2.5	4.0

* Gallons per minute

Heat Pump Water Heater. The water heating heat pump moves heat from a warm reservoir (such as air) and transfers this heat into the hot water system. The system employs an evaporator, compressor, condenser, expansion valve, hot water circulating pump, and controls to accomplish this function.²⁸

Hot Water Supply Pipe Insulation. R-4 insulation added around hot water pipes decreases heat loss. Only for existing construction. The baseline measure is no insulation.

Low-Flow Showerheads. Low-flow showerheads mix water and air to reduce the amount of water that flows through the showerhead. The showerhead creates a fine water spray through an inserted screen in the showerhead. Flow rate requirements for this measure are presented in Table B.8.

Table B.8. Low-Flow Showerhead Flow Rates

Measure Flow Rate (GPM)	Baseline Flow Rate (GPM)
2.0	2.5
2.5	4.5

Low-Flow Spray Heads. Low-flow spray heads mix water and air to reduce the amount of water that flows through the spray head. The spray head creates a fine water spray through an inserted screen in the spray head, achieving a flow reduction of nearly 50%, from a flow rate of 1.6 GPM to 3.0 GPM.

²⁷ www.toolbase.org/Techinventory/TechDetails.aspx?ContentDetailID=858&BucketID=6&CategoryID=9

²⁸ Description source: U.S. Department of Energy

Ultrasonic Faucet Control. Ultrasonic sensors automatically turn on and off faucet water when motion is detected at the sink. This eliminates the water running continuously while washing hands.

Water Heater Thermostat Setback. This measure generates savings by reducing the set point temperature from 130° to 115°. Often, the set point temperature on a hot water system is set higher than necessary.

Electric Equipment Measures

Direct Expansion Packaged Air Conditioner System. Direct Expansion (DX) system use a refrigerant piping circuit, compressor, and refrigerant coils to transfer heat. All components are in a single package typically installed on the building roof. As a measurement of efficiency, commercial sized units are normally rated as Energy Efficient Ratio (EER). Table B.9 displays the different models compared in this measure.

Table B.9. DX AC Unit EER Comparisons

Measure EER	Baseline EER
11.0	10.3 (state code)
11.5	10.3 (state code)
12.0	10.3 (state code)

Heat Pump – Air Source. Air source heat pumps use a Coefficient of Performance (COP) ratio of the cooling effect produced (expressed in Btu/hr), divided by the energy input (expressed on the same basis and as an EER Ratio).²⁹ These units use the difference between outdoor air temperatures and indoor air temperatures to cool and heat your building. Table B.10 displays the different models compared in this measure.

Table B.10. Heat Pump COP/EER Comparisons

Measure COP & EER	Baseline COP & EER
3.5 (COP) & 11.0 (EER)	3.2 (COP) & 10.1 (EER) (code)
3.8 (COP) & 11.8 (EER) (code)	3.2 (COP) & 10.1 (EER) (code)

Water-Cooled Chiller, Screw Chiller. Screw compressors are positive displacement devices. The refrigerant chamber is actively compressed to a smaller volume by the twisting motion of two interlocking, rotating screws. Refrigerant trapped in the space enclosed between the two rotating screws is compressed as it makes its way from the inlet to the outlet of the compressor. A slide valve is used to adjust the compression effect by varying the amount of compression that occurs before the refrigerant is discharged. Screw chillers are generally used for small- to medium-sized buildings. This unit uses water to cool the refrigerant.

²⁹ <http://tristate.apogee.net/cool/cfmec.asp>

Table B.11. Screw Chiller kW/ton Comparison

Measure kW/ton	Baseline kW/ton
0.461	0.634 (state code replacement)
0.507	0.634 (state code replacement)
0.574	0.634 (state code replacement)

Gas Non-Equipment Measures

Cooking

Broiler. A type of oven unit, ENERGY STAR broilers have a rigorous start-up/shutdown and turndown schedule for additional energy savings over standard units. Improved efficiency broilers have an efficiency of 34%, compared to baseline models at 15%.

Convection Oven. Operates at a lower temperatures and achieves quicker cook times than a standard oven, due to fans that circulate heat evenly throughout the oven by moving hot air past the food. The baseline measure is a standard commercial oven.

Conveyor Oven. A high efficiency conveyor oven has 23% efficiency; in comparison, a standard conveyor oven has 15% efficiency.

Fryers – Commercial Gas Cooking. ENERGY STAR-rated gas fired fryers meet at least a minimal efficiency of 50% and a maximum idle rate of no more than 9,000 Btu/hr. The ENERGY STAR model is being compared to a standard fryer with an efficiency of 35%.

Griddle. ENERGY STAR griddles are at least 40% efficient and on average use less than 0.25 therm/hour. The baseline measure is a standard grill at 32% efficiency.³⁰

Power Burner Oven. Generally, the unit incorporates a larger burner and is often sold on range-oven combination units. This burners mixes a greater percentage of air to the gas to increase the overall combustion efficiency of the burner.

Steam Cooker. ENERGY STAR commercial gas steam cookers must be 38% efficient, while also meeting a maximum idle rate that is based on pan size for each unit. The baseline measure is a steam cooker at 30% efficiency.

HVAC & Envelope

Automatic Ventilation VFD Control (occupancy/CO₂ sensors). The ventilation system automatically adjust air flow when CO₂ levels are above a specified level. When using CO₂ control, a minimum ventilation rate is maintained at all times to control non-occupant

³⁰ www.energystar.org

contaminants like off-gassing from furniture, equipment and building components. Without it, as a baseline, the ventilation system would run constantly.

Boiler – Commissioning. Commissioning ensures that the boiler unit is properly installed, adequately sized, and operated in an optimal fashion in order to maximize energy efficiency. Some measures that are considered include turbulators, heat recovery systems, pipe insulation, out door air re-set controls, and a stack damper.³¹ The baseline measure is no commissioning.

Boiler – Direct Digital Control (DDC) System-Installation. DDC controls replace manual and electromechanical controls to allow for tighter control of the boiler system. These controls include demand control ventilation, which controls air quantities based on demand, resets supply air temperature to reduce reheat energy, and employs optimal start up and setback control points.³²

Boiler – Direct Digital Control System-Optimization. Optimizing a boiler DDC system verifies that control setpoints and general operation of the unit are working properly. This measure can be applied in both new and existing applications.

Boiler – Direct Digital Control System – Wireless Performance Monitoring. Second-generation building automation systems that allow for wireless optimization and operation of building systems such as HVAC through computerized monitoring and control software and interfaces.

Boiler – Retro-Commissioning. The commissioning process is applied to existing buildings to restore them to optimal performance. Retro-commissioning is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings and brings the buildings up to the design intentions of its current usage.³³ The baseline measure is no commissioning on existing equipment. The cost for this measure is derived by taking the cost of the initial commissioning for the first year and then on a yearly basis taking a 40% commissioning cost in each year for the life of the measure (10 years). It is feasible to only perform retro-commissioning every three years and will still only involve 40% of the initial cost for commissioning. If this step is performed, the total cost of the measure would go down making the measure cost effective than it is shown in this study. This change could potentially make the measure pass a cost effectiveness screen and would raise the total estimate for the total economic potential.

Boiler Economizer. Recovers heat energy that would otherwise be lost out the boiler stack. This heat energy is recovered by using a heat exchanger located on the stack to heat boiler feed water.³⁴

Duct Repair and Sealing. The repair and sealing of leaky ducts creates significant energy savings by ensuring that conditioned air only goes to occupied spaces, therefore reducing an

³¹ http://www.pse.com/solutions/businessPDFs/08_3966_GasBoilerTuneup.pdf

³² <http://www.oee.nrcan.gc.ca/publications/infosource/pub/ici/eii/pdf/m92-242-2002-3E.pdf>

³³ <http://www.green.ca.gov/CommissioningGuidelines/default.htm>

³⁴ http://crownsolutions.com/news_september05.html

excessive runtime/load on the HVAC system. Only for existing construction, and applicable to buildings using packaged DX equipment or heat pumps.

Exhaust Air to Ventilation Air Heat Recovery. The air that is exhausted out of a building during the heating season will be warmer than the air outside. Capturing some of this heat and transferring it to the incoming air lowers the overall heating load.

Exhaust Hood Makeup Air. Provides exhaust air at the hood instead of allowing the hood to exhaust the conditioned air in the room. The baseline measure is for conditioned air to be expelled through exhaust hoods.

Existing Windows. This measure replaces an assumed existing window value for the region with a more efficient window.

Furnace – Commissioning & Retro-Commissioning. Commissioning ensures that energy-using systems that have been installed are operating in an optimal fashion in order to maximize energy efficiency. The commissioning process can be applied to existing buildings to restore them to optimal performance. Retro-commissioning is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings and brings the buildings up to the design intentions of its current usage.³⁵ The baseline measure is no commissioning. The cost for this measure is derived by taking the cost of the initial commissioning for the first year and then on a yearly basis taking a 40% commissioning cost in each year for the life of the measure (10 years). It is feasible to only perform retro-commissioning every three years and will still only involve 40% of the initial cost for commissioning. If this step is performed, the total cost of the measure would go down making the measure cost effective than it is shown in this study. This change could potentially make the measure pass a cost effectiveness screen and would raise the total estimate for the total economic potential.

Infiltration Control (Caulking, Weather Stripping, etc.). Sealing air leaks in windows, doors, roof, crawlspaces, and outside walls decreases overall heating and cooling losses. Baseline and measure air changes/hour (ACH) values are presented in Table B.12.

Table B.12. Infiltration Reduction Measures

Measure (ACH)	Baseline (ACH)
0.65	1.00

Insulation – Floor (Non-Slab). These measures represent an increase in R-value to current code levels of R-19 for the floor space (non-slab) and better. Baseline and measure values are presented in Table B.13.

³⁵ <http://www.green.ca.gov/CommissioningGuidelines/default.htm>

Table B.13. Floor Insulation Measures

Measure	Baseline
R-10	R-0
R-19	R-10

Insulation – Ceiling. These measures represent an increase in R-value to current code values of R-21 or better. Baseline and measure values are presented in Table B.14.

Table B.14. Ceiling Insulation Measures

Measure	Baseline
R-21	R-0
R-21	Existing ceiling insulation
R-38	R-21
R-49	R-21

Insulation (Duct) (Unconditioned Spaces). Packaged Direct Expansion (DX) and heat-pump equipment are generally coupled with a ducting system inside the building. Insulating the ducts reduces energy loss in the unoccupied plenum space. This measure assumes that R-0 insulation will be replaced with R-4 insulation (or that R-4 insulation will be installed), and that R-4 insulation will be replaced with R-8 (or that R-8 insulation will be installed).

Insulation – Wall. Wall insulation installed with a current code R-value of R-19 or better. Measures are based on 2x4 or 2x6 wall construction. Baseline and measure values are presented in Table B.15.

Table B.15. Wall Insulation Measures

Framing Type	Measure	Baseline
2x6	R-19	R-0
2x6	R-19	Existing wall insulation
2x6 Advanced	R-25	R-19

Integrated Space Heating/Water Heating. Integrated hot water heating systems provide both space conditioning and hot water heating with one appliance or energy source. Water is heated directly and space heating is accomplished with a hot water heat exchanger coil piped to the forced air heating system. Thus, a combination space/water heating system can provide high efficiency hot water heating and space heating for the cost of one high efficiency appliance.

Leak Proof Duct Fittings. The majority of duct leakage in residential HVAC systems is due to improperly sealed connections between ductwork and fittings. Even when duct connections are initially well-sealed, leakage may increase over time. Although the use of mastics and mechanical fasteners is becoming more widespread, a low-cost, leak-proof system will help to transform the market.

Sensible and Total Heat Recovery Devices. Sensible heat recovery devices transfer energy (heat) from the return air stream back into the supply air stream, avoiding wasting heat in exhausted air. This raises the indoor air temperature in the winter and cools it in the summer. Energy savings results from reduced needs for mechanical heating or cooling. Total heat devices, also called enthalpy recovery, transfer both sensible and latent heat. Latent heat significantly raises the humidity of the incoming outdoor air in the winter and reduces it in the summer. Dehumidification in the summer can be costly and total recovery devices help reduce this.³⁶

Steam Pipe Insulation. Insulation of pipes from R-0 to R-4 prevents pipe losses from transferred heat. The size of the loss depends on the diameter of the pipe and the pressure of steam in PSI.

Steam Trap Maintenance. Prevents the dirt created from chemical treatments and or pipe scaling from plugging the trap. In most cases, plugging prevents the valve from closing, allowing live steam to escape into the condensate return line or atmosphere, wasting energy.³⁷

Thermostat – Programmable. A programmable thermostat controls the set point temperatures automatically. As temperatures can be set separately for low occupancy hours, the HVAC system does not run needlessly.

Windows. Increases building performance by reducing the U-value in existing construction and new construction windows, as shown in Table B.16.

Table B.16. High-Efficiency Window Measures

Measure U-Value (SHGC)	Baseline U-Value (SHGC)
0.55	0.65
0.35	0.55

The code for either new construction or window replacement states the customer must go to code (U=0.55) at a minimum when installing new windows.

Pool Heat

Swimming Pool/Spa Covers. Covers a pool/spa to reduce evaporation, which is the largest source of pool/spa energy loss. It takes 1 Btu (British thermal unit) to raise 1 pound of water 1°, but each pound of 80°F water that evaporates takes 1,048 Btu of heat out of the pool.³⁸ The baseline measure is an uncovered pool or spa.

Water Heat

Chemical Dishwashing System. Sanitizes dishes with chemicals, rather than hot water, allowing for a lower water temperature. The baseline measure is a standard commercial dishwasher.

³⁶ http://www.mcquay.com/mcquaybiz/marketing_tools/mt_corporate/EngNews/0701.pdf

³⁷ <http://www.steamtraptesting.com/>

³⁸ http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=13140

Clothes Washer – Ozonating. Disinfects water using a supply of ozone-enriched air, which suppresses subsequent biological activity as well as controls biological growth within the appliance, thus reducing the need to rely on hot water. The baseline measure is a standard commercial clothes washer.³⁹

Clothes Washer Commercial (without Dryer). This measure applies to laundromat-type facilities where commercial grade clothes washers are used. Energy can be saved by using ENERGY STAR clothes washers.

Demand Controlled Circulating Systems. A demand-controlled circulating system only circulates hot water when required. The baseline measure is a continuously circulating hot water system, resulting in energy loss through pipes.

Dishwashing – Commercial – High Efficiency. Dishwashers with a minimal idle rate as well as a minimal amount of water consumption per rack of loaded dishes depending upon size and type.

Dishwashing – Residential-Sized System. Residential-sized dishwashing systems are often more appropriate for smaller commercial buildings. The smaller size leads to energy savings.

Drain Water Heat Recovery (Power-Pipe) – Heat Recovery Water Heater. Drain water heat recovery devices recover heat energy from drain water and are used to pre-heat cold water entering the hot water tank. This minimizes the temperature difference between the heating set point and the entering water temperature.⁴⁰

Faucet Aerators. Faucet aerators, by mixing water and air, reduce the amount of water that flows through the faucet. The faucet aerator creates a fine water spray with a screen that is inserted in the faucet head. Flow rate requirements for this measure are presented in Table B.17.

Table B.17. Faucet Aerator Flow Rates

Measure Flow Rate (GPM)	Baseline Flow Rate (GPM)
1.5	2.5
2.5	4.0

Hot Water Pipe Insulation. Adding R-4 insulation around the pipes for the storage hot water system will decrease heat loss.

Integrated Space Heating/Water Heating. Integrated hot water heating systems provide both space conditioning and hot water heating with one appliance or energy source. Water is heated directly and space heating is accomplished with a hot water heat exchanger coil piped to the forced air heating system. Thus, a combination space/water heating system can provide high efficiency hot water heating and space heating for the cost of one high efficiency appliance.

³⁹ <http://www.patentstorm.us/patents/6607672-description.html>

⁴⁰ www.toolbase.org/TechInventory/TechDetails.aspx?ContentDetailID=858&BucketID=6&CategoryID=9



Low-Flow Showerheads. Low-flow showerheads, by mixing water and air, reduce the amount of water that flows through the showerhead. The showerhead creates a fine water spray through an inserted screen in the showerhead. Flow rate requirements are presented in Table B.18.

Table B.18. Low-Flow Showerhead Flow Rates

Measure Flow Rate (GPM)	Baseline Flow Rate (GPM)
2.0	2.5
2.5	4.5

Low-Flow Spray Heads. Low-flow spray heads use the same principle as faucet aerators to achieve a flow reduction of nearly 50%, lowering the flow rate to 1.6 GPM from 3.0 GPM.

Refrigeration with Heat Recovery. Commercial walk-in refrigerators are normally equipped with their own compressor/condenser package, which is cooled to remove the heat generated by the vapor compression refrigeration cycle. Typically, this heat is released into the environment. Where the equipment is water-cooled, that heat can be recaptured for useful purposes like domestic water heating.⁴¹

Tankless Water Heater – Commercial. Tankless water heaters provide hot water at a preset temperature when needed without storage, thereby reducing or eliminating standby losses. An energy factor of 0.82 was used for the tankless system and compared to an existing tank with 80% thermal efficiency.

Tankless Water Heater – Residential. Tankless water heaters provide hot water at a preset temperature when needed without storage, thereby reducing or eliminating standby losses. An energy factor of 0.82 was used for the tankless system and compared to an energy factor of 0.59.

Ultrasonic Faucet Control. Ultrasonic sensors automatically turn on and off faucet water when motion is detected at the sink. This eliminates the water running continuously while washing hands.

Water Heater Thermostat Setback. This measure generates savings by reducing the set point temperature from 130° to 115°. Often, the set point temperature on a hot water system is set higher than necessary.

Gas Equipment Measures

Gas Boiler – Greater than 300 kBtuh. Boilers are classified as condensing and non-condensing. Condensing boilers condense the flue gas and water vapor, extracting useful heat and improving the boiler efficiency. Boilers are also rated by their input fuel consumption, or in terms of horsepower, where 1 boiler hp = 33,520 Btuh. This measure compares several boilers with different thermal efficiencies and is applicable to both new and existing construction. The overall efficiency of the boiler is defined as the gross output energy divided by the input energy and is

⁴¹ <http://www.oee.nrcan.gc.ca/publications/infosource/pub/ici/eii/m92-242-2002-6e.cfm?attr=24>

affected by combustion efficiency, standby losses, cycling losses and heat transfer. Table B.19 displays the different thermal efficiencies being compared in this measure.⁴²

Table B.19. Gas Boiler Thermal-Efficiency Comparison

Measure Thermal Efficiency	Baseline Thermal Efficiency
85%	80% (state code)
90%	80% (state code)

Gas Boiler – Less than 300 kBtuh. The National Energy Policy Act of 1992 mandates that all boiler manufacturers must meet the requirements of ASHRAE Standard 90.1. Boilers less than 300 kBtuh are rated using an Annual Fuel Utilization Efficiency (AFUE). AFUE measures the amount of heat actually delivered to the amount of fuel consumed during the heating season; sometimes referred to as the seasonal efficiency. Table B.50 displays the different AFUE values compared in this measure.

Table B.20. AFUE Gas Boiler Comparison

Measure AFUE	Baseline AFUE
AFUE 85%	AFUE 80%
AFUE 90%	

Gas Furnace. Similar to the small gas boiler measure, this furnace measure also compares several different AFUE values amongst different units. Table B.21 displays the different AFUE values compared in this measure.

Table B.21. Gas Furnace AFUE Comparison

Measure AFUE	Baseline AFUE
AFUE 90%	AFUE 80% (state code)
AFUE 94% (condensing)	

Water Heaters. Gas water heaters have a range of thermal efficiencies. Table B.52 displays the different efficiencies compared and their baselines.

Table B.22. Commercial Gas Water Heater Comparison

Measure Energy Factor	Baseline Energy Factor
0.67	0.59 (state code)
0.90 (condensing)	

⁴² <http://www.newbuildings.org/downloads/guidelines/BoilerGuideline.pdf>

Passive Renewable Measures

Smart Siting. For new construction only, this measure analyzes the optimal building orientation to minimize heating and cooling load on the HVAC system.

Solar Pool Heating. A solar pool heater is generally mounted on the roof of a building and is designed to use the sun to directly heat water rather than electricity or gas. Note that this is a passive process, not one that involves photovoltaic cells.

Solar Water Heating. A solar water heater is generally mounted on the roof of a building and is designed to use the sun indirectly to heat water through a heat exchanger, rather than electricity or gas. Note that this is a passive process, not one that involves photovoltaic cells.

Thermal (Trombe) Wall. Thermal walls slow heat movement by slowing convectional currents that occur in walls. This keeps buildings warmer in the winter and cooler in the summer.

Window Overhang. Overhangs shade windows, reducing solar heat gains and the overall cooling load on the home.

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Appendix B.2: Residential Measure Descriptions

Electric Non-Equipment Measures

Cooking

Convection Oven. Operates at lower temperatures and achieves quicker cook times than a standard oven, due to fans that circulate heat evenly throughout the oven by moving hot air past the food. The baseline is a standard commercial oven.

HVAC Aux

ECM Motor. Electronically commutated motors (ECM) consume less power than a standard motor. The cost difference for operating the ECM motor ranges from about 30% lower during high flow rate conditions to about 70% lower during turndown. For existing construction, ECM motors have a technical feasibility of 65% for cooling and varying amounts for HVAC auxiliary (gas or electric heating as the primary fuel). This 65% feasibility for cooling (Central AC) could be underestimating the total potential for this specific application. One reason for the lower feasibility for HVAC auxiliary measures is to account for the percentage of homes that currently use this type of equipment to heat their homes. Typically this is taken into account in equipment fuel shares and saturations, but because of the HVAC auxiliary end use these factors had to be taken into account in the technical feasibility.

VSD Fan. Controls the rotational speed of a piece of motor-driven equipment, through adjusting the frequency of the voltage applied to the motor. Baseline for this measure is a constant speed fan motor.

HVAC & Envelope

Advanced Cold Climate Heat Pump. Cold-climate heat pumps are air-to-air heat pumps that have been optimized for colder climates. The performance of these heat pumps is expected to be approximately the same as ground-source heat pumps (GSHP).

Blinds – Fixed Angle/Automatic. A covering for a window or door, usually attached to the interior side of a window that reduces sunlight, thus blocking unwanted heat from the summer sun and holding in heat in cold weather. Automatic blinds adjust to the appropriate angle at the appropriate time, and make hard to reach blinds accessible for adjustment. The baseline for this measure is no interior blinds.

Canned Lighting Air-Tight Sealing. Proper sealing around recessed lighting fixtures prevents unwanted heat loss through these air spaces due to air pressure differentials in conditioned and unconditioned spaces in homes. The baseline is no sealing.

Ceiling Fan. ENERGY STAR[®]-qualified ceiling fans use improved motors and blade designs, allowing the user to decrease the thermostat a couple of degrees yet still feel at least 5° cooler. The fans do not create cooler temperatures. The kit does not include light fixtures; all savings are associated with the improved fan design.

Check Me! O&M Tune Up. For central air conditioning systems, the Check Me! procedures for certified maintenance will improve overall efficiency. Proper system tune-up/maintenance ensures that both refrigerant charge and airflow through the evaporator coil are properly tested and correctly adjusted – two factors that affect system efficiency. Maintenance includes changing filters and cleaning coils to maintain the overall performance and efficiency of the unit.

Doors – R-5. Composite doors with a foam core increase overall insulation, which slows heat loss. This measure includes adding a thermal door with a resistance value of R-5 to houses with neither thermal nor storm doors.

Doors – R-11. A steel door with a polyurethane foam core offers an insulating value of about R-11. The steel surface holds up well to normal wear and tear, and any dents can be repaired easily with auto-body putty.

Doors – Weatherization. To minimize infiltration door sweep, weather stripping mounts to the bottom of the door. It consists of an extruded aluminum strip that holds a flexible vinyl strip to block the air space between the door frame and the door. The baseline for this measure is no weather stripping.

Duct Location. In many homes, ducts are run through unconditioned areas such as attics, garages, crawlspaces, and basements for convenience and practical reasons. Ducts in unconditioned areas lose energy because of large temperature differences between conditioned air in the ducts and the surrounding space. Locating ducts in conditioned spaces helps to reduce wasted heat loss.⁴³

Duct Repair and Sealing. Duct sealing cost effectively saves energy, improves air and thermal distribution (comfort and ventilation), and reduces cross contamination between different zones in the building (i.e., smoking vs. non-smoking, bio-aerosols, localized indoor air pollutants).

Duct Sealing – Aerosol Based. A significant amount of energy use in residential buildings is associated with duct losses due to leakage. This is an aerosol duct-sealing technology that seals holes in ducts up to ¼” in diameter from the inside by spraying atomized latex aerosol into a pressurized duct system.

Ductless Mini-Split REM. Ductless heat pumps, similar to mini-split systems, are used to provide heating and cooling to multiple zones without duct-work. A ductless heat pump stores the compressor outside and pipes the refrigerant to the individual units located in each zone/room inside where the heating or cooling takes place. Energy is saved by eliminating duct losses.

⁴³ http://www.toolbase.org/pdf/techinv/ductsinconditionedspace_techspec.pdf

Evaporative Space Cooling. A direct evaporative cooler is a low-energy system that evaporates water into the air stream, thus reducing the temperature of the air, but increasing the humidity. An indirect evaporative cooler uses a secondary air stream that is cooled by water and goes through a heat exchanger with the primary air stream, cooling it but not affecting the humidity. A direct/indirect system will cool the air stream first through an indirect cooler, then cool it further through a direct cooler.

Heat Pump – Ground or Water-Source – Open Loop. Ground-source heat pumps use the natural heat storage capacity of the earth or ground water to provide energy efficient heating and cooling. In an open loop application, the system draws well water for use as the heat source or heat sink and, after use, returns the well water to a drainage field or another well. This measure compares an efficient model with a Energy Efficient Ratio (EER) of 16.2 and a Coefficient of Performance (COP) of 3.6 to the baseline model air-source heat pump with a 11.3 EER and 3.2 COP.⁴⁴

Heat Pump – Ground or Water-Source – Closed Loop. In a closed-loop or earth-coupled loop, the system uses a water and antifreeze solution that is circulated in a ground loop of pipes to extract heat from the earth. Ground loops can be installed in a vertical well or a horizontal loop. Vertical wells are usually more expensive and used where space is limited. This measure compares several models to the baseline systems and is summarized in Table B.23.⁴⁵

Table B.23. Closed Loop Heat Pump Comparison

Measure EER/COP	Baseline EER/COP
14.1 EER/3.3 COP	11.3 EER/3.2 COP
16.2 EER/4.1 COP	11.3 EER/3.2 COP

Heat Pump – Proper Sizing. Properly sized heat pumps operate for long periods of time (rather than frequently cycling on and off), resulting in optimum equipment operating efficiency and better control.⁴⁶

ICF Construction. Building a concrete home with insulating concrete forms (ICFs) saves energy and money. The greater insulation, tighter construction, and temperature-moderating mass of the walls conserve heating and cooling energy much better than conventional wood-frame walls.

Infiltration Control (Caulk, Weather Strip, etc.). Filling gaps in windows with synthetic filler prevents drafts and heating/cooling loss.

Insulation (Basement – Wall) 2x4. Adding insulation to the basement or crawlspace walls increases the thermal performance of the concrete foundation. Only for existing homes. Table B.24 summarizes the different resistance values compared in the measure.

⁴⁴ <http://www.toolbase.org/Technology-Inventory/HVAC/geothermal-heat-pumps>

⁴⁵ <http://www.toolbase.org/Technology-Inventory/HVAC/geothermal-heat-pumps>

⁴⁶ <http://www.toolbase.org/Technology-Inventory/HVAC/hvac-sizing-practice>

Table B.24. Wall R-Value Comparison

Measure Insulation	Baseline Insulation
R-13 (state code)	R-0
R-13 (state code)	R-7 existing wall
R-13 + R-5	R-13

Insulation (Ceiling). This measure represents an increase in R-value. Adding insulation in existing buildings increases the thermal performance and brings the resistance value up to and past code, depending on vintage. Table B.25 summarizes the different resistance values compared in the measure.

Table B.25. Ceiling R-Value Comparison

Measure Insulation	Baseline Insulation
R-38	R-9
R-38	R-19
R-49	R-38

Insulation (Duct). Adding insulation around the ducts in the heating system reduces heat loss to unconditioned spaces. Table B.26 summarizes the different resistance values compared in the measure.

Table B.26. Duct R-Value Comparison

Measure Insulation	Baseline Insulation
R-8	R-0
R-8	R-4

Insulation (Floor). Adding insulation to the floor increases the overall resistance value and slow heat transfer from the basement to the upper levels. Table B.27 summarizes the different resistance values compared in the measure.

Table B.27. Floor R-Value Comparison

Measure Insulation	Baseline Insulation
R-30	R-0
R-30	R-20 existing floor
R-38	R-30

Insulation (Rim and Band Joist). An un-insulated band joist can account for a significant portion of a building's heat loss, as the only thing separating inside from outside is 2 inches of wood and the siding material covering it. The heat loss through an un-insulated band joist increases when the basement is kept warmer, or contains heating or water heating equipment. Insulating a band joist is an easy way to improve a building's energy efficiency. The baseline is no insulation.

Insulation (Slab). A substantial amount of heat is lost through an un-insulated slab, resulting in cold, uncomfortable floors. Even if the foundation wall is insulated vertically under the slab, significant heat is still lost from the slab edge that is closest to the cold outside air. Table B.28 compares the different slab insulations for this measure.

Table B.28. Slab Insulation Measures

Measure Insulation	Baseline Insulation
R-10	R-0
R-10	Existing wall insulation R-7
R-15	R-10

Insulation (Wall) 2x4. Wall insulation can help slow the transfer of heat and reduce both the heating and cooling loads in houses. Table B.29 compares the different insulations for 2x4 framing.

Table B.29. 2x4 Wall Insulation Measures

Measure Insulation	Baseline Insulation
R-13	R-0
R-13	Existing wall insulation R-8
R-13 + R-5 Sheathing	R-13

Insulation (Wall) 2x6. Wall insulation can help slow the transfer of heat and reduce both the heating and cooling loads in houses. Table B.30 compares the different insulations for 2x6 framing.

Table B.30. 2x6 Wall Insulation Measures

Measure Insulation	Baseline Insulation
R-21	R-0
R-21	Existing wall insulation R-8
R-21 + R-5 Sheathing	R-21 (State Code)

Leak Proof Duct Fittings. The majority of duct leakage in residential HVAC systems is due to improperly sealed connections between ductwork and fittings. Even when duct connections are initially well-sealed, leakage may increase over time. Although the use of mastics and mechanical fasteners is becoming more widespread, a low-cost, leak-proof system will help to transform the market.

Microchannel Heat Exchangers. A microchannel heat exchanger allows for a longer dwell time for the air passing over it, as compared to a standard fit-tube heat exchanger. This results in an increase in heat exchanger effectiveness.

Motor - ECM Motor for Heat Pump. Applicable to ENERGY STAR appliances and dryers, electronically commutated motors (ECM) provide precisely timed voltages to the coils and use

rotation position sensors for timing. This results in greater efficiency than a standard motor. Applicable to any motor, particularly those used in dryers.

Outlet Gasket. Provide sealing around electrical outlets to reduce drafts and heat loss through small air spaces.

Radiant Electric Ceiling Panels. Radiant heating systems rely on infrared radiation to heat objects, people, and surfaces. The effect is that radiant energy as received by people (directly from the heater and indirectly from other surfaces) allows them to perceive a comfort condition temperature that is 4° to 5° higher than the actual air temperature. This allows a radiant heater to operate at lower air temperatures thus decreasing the use of heating fuel by reducing air stratification within the space, side-wall and ceiling as well as building heat losses.

Radiant Electric Floor Heating. Radiant heating systems rely on infra red radiation to heat objects, people, and surfaces. The effect is that radiant energy as received by people (directly from the heater and indirectly from other surfaces) allows them to perceive a comfort condition temperature that is 4° to 5° higher than the actual air temperature. This allows a radiant heater to operate at lower air temperatures thus decreasing the use of heating fuel by reducing air stratification within the space, side-wall and ceiling as well as building heat losses.

SIP Construction. Structural insulated panels use continuous foam insulation throughout the panel that provides excellent energy efficiency and low levels of air infiltration. Baseline is standard wood framing.

Solid State Refrigeration for Heat Pumps. Using thermoelectric devices to convert electricity for cooling is only starting to become economical due to advances in efficiency levels.

Spray-On Foam Insulation. Unlike traditional insulation materials like fiberglass or cellulose, spray foam insulation seals and fills tiny cracks and seams, which virtually eliminates energy-wasting air infiltration. Because it provides a higher R-value per inch, homeowners using foam insulation can use 2x4 construction on exterior walls instead of the 2x6 studs required with traditional insulation. This measure proposes to increase the resistance value to R-23, compared to the baseline of R-13.⁴⁷

Thermostat – Clock/Programmable. A programmable thermostat controls the set point temperatures automatically, ensuring the HVAC system is not running during low-occupancy hours.

Thermostat – Multi-Zone. A multi-zone programmable thermostat controls the set point temperatures automatically for multiple areas (rooms or zones), ensuring the HVAC system is not running during low-occupancy hours.

VSD Motor for Heat Pump. Controls the rotational speed of a piece of motor-driven equipment, through adjusting the frequency of the voltage applied to the motor. Baseline for this measure is a constant speed fan motor.

⁴⁷ http://www.powerhousetv.com/stellent2/groups/public/documents/pub/phtv_se_in_bu_000575.hcsp

Whole-House Dehumidifier. A high capacity whole-house dehumidifier can be run standalone in a basement or ducted into an existing central air conditioning system. These units remove moisture content from the air and prevent mold, mildew and damp conditions.

Whole-House Fan. Draws cool outdoor air inside through open windows and exhausts hot indoor air through the attic to the outside. A whole house fan is a simple and inexpensive method of cooling a house when outdoor temperatures are lower than indoor temperatures.

Windows. This measure represents an increase in building performance by reducing the U-value in existing construction and new construction windows, as shown in Table B.31. The cost for all increments of windows does not include any labor costs associated with installing the windows. If this value was included, it will only be included in the cost associated with going from Existing windows to a lower more efficiency window. Adding this additional labor for a single family home would increase the cost by approximately \$2000 and would decrease the overall total resource cost effectiveness.

Table B.31. High Efficiency Window Measures

Measure U-Value	Baseline U-Value
0.30	Existing Windows 0.65
0.19	0.30

The code for either new construction or window replacement states the customer must go to code (U=0.40) at a minimum when installing new windows.

Lighting

CFL Lighting – 3-Way. Three-way lights allow for different stages of illumination using different input Wattages. This measure compares a 3-way CFL lamp with 13 Watt, 20 Watt, and 25 Watt increments to a three-way incandescent lamp using 30 Watts, 75 Watts, and 100 Watts.

Compact Fluorescent Lamps & Fixtures. Combining the energy efficiency of fluorescent lighting with the convenience and popularity of incandescent fixtures, CFLs: (1) save up to 75% of the initial lighting energy by replacing incandescent that are roughly 3 – 4 times their Wattage, and (2) create further savings by lasting 6–15 times longer (6,000–15,000 hours). A variety of CFL fixture and lamp replacement measures exist, and this particular measure examines the savings from replacing a 60 watt incandescent bulb with a 15 watt fluorescent lamp.⁴⁸

CFL Torchieres. A compact fluorescent torchiere is a table or floor lamp designed to direct light upward for indirect illumination. Most of the light is thrown against the ceiling and reflected back. This measure compares a standard 180 Watt halogen lamp to a 55 Watt CFL.

Daylighting Controls (Photocell) – Indoor/Outdoors. Photocells are used to adjust lighting levels according to the level of daylight the room is receiving. Baseline is no daylighting controls.

⁴⁸ http://www.eere.energy.gov/consumer/your_home/lighting_daylighting/indexmytopic=12050

LED Christmas Lighting. Typical Christmas tree lighting uses incandescent bulbs that can be costly, as well as a fire hazard. LED lights use a low wattage bulb and can save up to 90% of holiday lighting costs.

LED Lamps. Light emitting diodes (LEDs) are solid-state devices that convert electricity to light, potentially with very high efficiency and long life. Recently, lighting manufacturers have been able to produce “cool” white LED lighting indirectly, using ultraviolet LEDs to excite phosphors that emit a white-appearing light. These lights are viewed as a replacement for incandescent lamps.

Occupancy Sensors. If a space is unoccupied for a designated amount of time, an occupancy sensor will turn off the lights. The lights will turn on again once the sensor detects a person has entered the space.

Time Clocks (Exterior Lighting). Allows the user to program times to automatically turn lights on and off outside the residence. Programmed exterior lighting saves energy by ensuring that lights are not accidentally left on during the daytime.

Plug Load

1-watt Standby Power. Standby power is the electricity used by electrical equipment when it is switched off, or not performing its main function. Minimizing this loss to one watt or less can reduce this standby energy consumption by more than 50%.

Battery Chargers. Battery charging systems recharge a wide variety of cordless products, including power tools, small household appliances, and personal care products like electric shavers. Conventional battery chargers — even when not actively charging a product — draw as much as 5 to 20 times more energy than actually stored in the battery. Advanced energy-saving designs are now available that, on average, use 35% less energy. The baseline is a standard battery charger.⁴⁹

Computers. ENERGY STAR computers feature: (1) “on” mode, where the maximum allowed power varies based on the computer monitor’s resolution; (2) “sleep” mode, where computer monitor models must consume 2 Watts or less; and, (3) “off” mode, where computer monitor models must consume 1 Watt or less. The baseline equipment does not include these features.⁵⁰

Dehumidifiers. ENERGY STAR-qualified models have more efficient refrigeration coils, compressors, and fans than conventional models, which means they use less energy to remove moisture. These qualified models remove the same amount of moisture as a similarly-sized standard unit, but uses 10% – 20% less energy. The baseline for this measure is a standard dehumidifier.⁵¹

⁴⁹ http://www.energystar.gov/index.cfm?c=battery_chargers.pr_battery_chargers

⁵⁰ http://www.energystar.gov/index.cfm?fuseaction=find_a_product.ShowProductGroup&pgw_code=MO

⁵¹ http://www.energystar.gov/index.cfm?c=dehumid.pr_dehumidifiers

Digital Set Top Receiver. ENERGY STAR receivers must consume less than 7 Watts for satellite and 5 Watts for Low Noise Blockers to qualify. The baseline measure is a standard receiver.

DVD System. ENERGY STAR DVD players use as little as one fourth of the energy used by standard models in the “off” mode. Baseline measure is a standard DVD player.⁵²

HDTVs. Short for High-Definition Televisions, ENERGY STAR models are required to consume less than 1 Watt when switched to the off position. The baseline is a standard television, generally consuming more than 3 Watts when off.

Home Audio Systems. According to ENERGY STAR products, a 6% energy savings can be achieved over standard home audio systems.⁵³

Home Office Copiers. ENERGY STAR copy machines enter sleep mode after inactivity for at least 30 minutes. This reduces their total power consumption.⁵⁴

Home Office Monitors. When ENERGY STAR monitors enter sleep mode, the monitor must consume less than 2 Watts. The sleep mode needs to be enabled in order to de-energize the monitor when not in use.

Printers. Printers are required by ENERGY STAR standards to deploy a maximum time delay to sleep depending upon the size of the equipment. This reduces power consumption during periods of inactivity.⁵⁵

TVs. ENERGY STAR certified televisions use approximately 30% less energy than standard models and consume less than 1 Watt when idle.

VCRs. ENERGY STAR certified VCRs use approximately 30% less energy than standard models and consume less than one Watt when idle.

Power Supply Transformer/Converter - External Power Adapters. Energy Star power adapters provide more efficient electricity conversion for a variety of devices.

Powerstrip with Occupancy Sensor. Energy-saving products such as power strips with an occupancy sensor are found in workstations where power strips are commonly used. The sensor will turn on and off the power to all devices such as computers, desk lights, and audio equipment that are plugged into the power strip based on occupancy within the work area.

⁵² http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DP

⁵³ http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=HA

⁵⁴ http://www.energystar.gov/ia/products/fap/IE_Prog_Req.pdf

⁵⁵ http://www.energystar.gov/ia/products/fap/IE_Prog_Req.pdf

Pool Pumps

Pool Pump Timers. Setting a pool pump to run during off-peak times (starting after 8 p.m. and cycling off before 10 a.m.) reduces energy costs. Cycling pumps further reduce monthly costs. Baseline is no continuous running pump.

Pool Pumps – VSD. Enables the pool pump motor to run at variable speeds as opposed to constantly running at full power.

Refrigeration / Freezer

1 kWh per day Refrigerator. Reducing the energy use of a refrigerator to less than 1 kWh/day will result in over 25% reduction in energy use from a baseline refrigerator.

Refrigerator//Freezer – Early Replacement. Replacing equipment before the end of its useful life is advantageous because of the significant inefficiencies in older refrigerator/freezers, resulting in excessive energy consumption. Existing units are replaced with standard (code) models.

Refrigerator eCube. The eCube is placed in a refrigerated area and monitors the temperature of the product and not the temperature of the air. The thermostat is connected to the compressor, which cycles on and off to maintain the set point, based on the product temperature. The cycles of the compressor are reduced because the temperature is now based on the product and not the air.⁵⁶

Removal of Secondary Refrigerator/Freezer. This refers to the environmentally friendly disposal of unneeded appliances such as secondary refrigerators or stand-alone freezers.

Solid State Refrigerator. Using thermoelectric devices to convert electricity for cooling (refrigeration) is only starting to become economical due to advances in efficiency levels.

Stand-Alone Freezer – Removal. Removal of stand-alone freezers is beneficial due to their inefficient use of energy. Proper disposal is required, as they use hazardous materials such as Freon & CFCs.

Water Heat

Clothes Washer. Several Modified Energy Factor (MEF) models were compared in this measure, as shown in Table B.32.

⁵⁶ <http://www.senergysolution.com/sEnergySolution/eCube.aspx>

Table B.32. Clothes Washer Modified Energy Factor Comparisons

Measure MEF	Baseline MEF
1.26 Federal Code	1.10 Existing Unit
1.83 ENERGY STAR	1.26 Federal Code
2.01 ENERGY STAR Tier 2	1.26 Federal Code
2.2 ENERGY STAR Tier 3	1.26 Federal Code

Clothes Washer - Early Replacement. Replacing equipment before the end of its useful life is advantageous because of the significant inefficiencies in older clothes washers, resulting in excessive energy consumption. Existing units are replaced with standard (code) models.

Desuperheater for Central Air Conditioner (Ground-Source Heat Pump) System.

Desuperheaters are heat recovery devices that transfer heat from the air conditioning unit to the domestic water heater, that would normally be transferred to the ground. A desuperheater provides supplemental water heating only when the heat pump operates in the cooling mode.⁵⁷

Dishwasher. ENERGY STAR dishwashers use an estimated 41% less energy than the federal minimum standard for energy consumption. Table B.33 shows the following energy factors compared in this measure.

Table B.33. Dishwasher Energy Factor Comparisons

Measure Energy Factor	Baseline Energy Factor
0.65 Federal Code	0.46 Existing Unit
0.77	0.65 Federal Code

Drain Water Heat Recovery (Power-Pipe). Drain water heat recovery devices recover heat energy from domestic drain water and are used to pre-heat cold water entering the hot water tank. This minimizes the temperature difference between the heating set point and the entering water temperature. This measure is intended only for new construction.

Faucet Aerators. Faucet aerators, by mixing water and air, reduce the amount of water that flows through the faucet. The faucet aerator creates a fine water spray with a screen that is inserted in the faucet head. Flow rate requirements for this measure are presented in Table B.1735.

Table B.34. Faucet Aerator Flow Rates

Measure Flow Rate (GPM*)	Baseline Flow Rate (GPM)
2.2	3.0 (existing)
1.5	2.2
0.5	2.2

* Gallons per minute

⁵⁷ http://www1.eere.energy.gov/femp/procurement/eep_groundsource_heatpumps.html

Heat Pump Water Heater. The water-heating heat pump moves heat from a warm reservoir (such as air) into the hot water system. The system employs an evaporator, compressor, condenser, expansion valve, hot water circulating pump and controls to accomplish this function.⁵⁸

Hot Water Pipe Insulation. Adding R-4 insulation around the pipes will decrease heat loss.

Low-Flow Showerheads. Low-flow showerheads mix water and air to reduce the amount of water that flows through the showerhead. The showerhead creates a fine water spray through an inserted screen in the showerhead. Flow rate requirements for this measure are presented in Table B.836.

Table B.35. Low-Flow Showerhead Flow Rates

Measure Flow Rate (GPM)	Baseline Flow Rate (GPM)
2.5	3.0
1.75	2.5

Tankless Water Heater. Tankless water heaters produce the majority of energy savings by avoiding standby losses that occur when a normal storage tank is not in use. Tankless water heaters provide hot water at a preset temperature when needed without storage, thereby reducing or eliminating standby losses. An energy factor of 0.95 was used for the tankless system and compared to a standard electric water heater with an 0.92 EF.⁵⁹

Water Heater Thermostat Setback. This measure generates savings by reducing the set point temperature from 130° to 120°. Often, the set point temperature on a hot water system is set higher than necessary.

Electric Equipment Measures

Air Conditioner – Central (2.5 ton unit). This unit has a 30,000 BTU/hr cooling capacity. This measure compares several different SEER models, which are summarized in Table B.36

Table B.36. Central AC SEER Comparison

Measure SEER	Baseline SEER
14 SEER	13 SEER (federal code)
16 SEER	
18 SEER	

Air Conditioner – Central (3.0 ton unit). This unit has a 36,000 BTU/hr cooling capacity. This measure compares several different SEER models, as summarized above in Table B.36.

⁵⁸ Description source: U.S. Department of Energy

⁵⁹ <http://www.toolbase.org/Technology-Inventory/Plumbing/tankless-water-heaters>

Air Conditioner – Room (Individual Rooms) (10,000 BTU/HR). ENERGY STAR-qualified room air conditioners use less energy than conventional models through improved energy performance as well as timers for better temperature control. ENERGY STAR qualified room air conditioners have a 10.8 EER value compared to a standard model that has 9.8 EER.

Air Source Heat Pump. Electric air-source heat pumps use the difference between outdoor air temperatures and indoor air temperatures to cool and heat the home. Table B.1039 displays the different models compared in this measure.

Table B.37. Heat Pump SEER/HSPF Comparisons

Measure SEER & HSPF	Baseline SEER & HSPF
14 SEER, 8.5 HSPF	
16 SEER, 8.8 HSPF	13 SEER, 7.7 HSPF
18 SEER, 9.0 HSPF	

Clothes Dryer with Moisture Sensor. High efficiency dryers have a moisture sensor that stops the drying cycle when the humidity in the drum falls below a certain level. Conventional drying equipment uses thermostats or timers that do not determine when clothes are dry, thereby causing excessive energy consumption due to extended run time.

Freezer – Stand-Alone. ENERGY STAR-qualified freezer models use at least 10% less energy than required by current federal standards from the National Appliance Energy Conservation Act (NAECA).

Refrigerator/Freezer. ENERGY STAR residential grade refrigerators use at least 10% less energy than required by current federal standards and 40% less energy than conventional models sold in 2001.

Water Heater (Electric). High efficiency water heaters are more efficient than standard electric water heaters. This measure assumes an energy factor (EF) for the high efficiency water heaters of 0.95, an increase from the code minimum of 0.92.

Gas Non-Equipment Measures

Cooking

Convection Oven. Operates at a lower temperature and achieves quicker cook times than a standard oven, due to fans that circulate heat evenly throughout the oven by moving hot air past the food. The baseline measure is a standard commercial oven.

HVAC & Envelope

Canned Lighting Air-Tight Sealing. Proper sealing around recessed lighting fixtures prevents unwanted heat loss through these air spaces due to air pressure differentials in conditioned and unconditioned spaces in homes. The baseline is no sealing.

Doors – R-5. Composite doors with a foam core increase overall insulation, which slows heat loss. This measure includes adding a thermal door with a resistance value of R-5 to houses with neither thermal nor storm doors.

Doors – R-11. A steel door with a polyurethane foam core offers an insulating value of about R-11. The steel surface holds up well to normal wear and tear, and any dents can be repaired easily with auto-body putty.

Doors – Weatherization. To minimize infiltration door sweep, weather stripping mounts to the bottom of the door. It consists of an extruded aluminum strip that holds a flexible vinyl strip to block the air space between the door frame and the door. The baseline for this measure is no weather stripping.

Duct Location. In many homes, ducts are run through attics, garages, crawlspaces, and basements for convenience and practical reasons. However, ducts in unconditioned areas lose energy because of large temperature differences between air in the ducts and the surrounding space. Locating ducts in conditioned spaces helps to reduce wasted heat loss.⁶⁰

Duct Repair and Sealing. Duct sealing cost effectively saves energy, improves air and thermal distribution (comfort and ventilation), and reduces cross contamination between different zones in the building (i.e., smoking vs. non-smoking, bio-aerosols, localized indoor air pollutants).

Gas Boiler – Proper Sizing. A properly sized gas boiler will operate for long periods of time (rather than frequently cycling on and off), resulting in optimum equipment operating efficiency and better control.⁶¹

Gas Furnace – Maintenance. This involves an overall inspection of the mechanical equipment of the furnace to ensure proper operation prior to the heating season, and also a general cleaning and replacement of the air filter. The measure does not include duct inspection.

Gas Furnace – Maintenance – New Equipment. Includes an overall equipment inspection and tune-up of a recently installed gas unit that may not have been optimized prior to manufacture.

Gas Furnace – Proper Sizing. A properly sized gas furnace will operate for long periods of time (rather than frequently cycling on and off), resulting in optimum equipment operating efficiency and better control.⁶²

ICF Construction. Building a concrete home with insulating concrete forms (ICFs) saves energy and money. The greater insulation, tighter construction and temperature-moderating mass of the walls conserve heating and cooling energy much better than conventional wood-frame walls.

Infiltration Control (Caulk, Weather Strip, etc.). Filling gaps in windows with synthetic filler prevents drafts and heating/cooling loss.

⁶⁰ http://www.toolbase.org/pdf/techinv/ductsinconditionedspace_techspec.pdf

⁶¹ <http://www.toolbase.org/Technology-Inventory/HVAC/hvac-sizing-practice>

⁶² <http://www.toolbase.org/Technology-Inventory/HVAC/hvac-sizing-practice>

Insulation (Basement – Wall) 2x4. Adding insulation to the basement or crawlspace walls increases the thermal performance of the concrete foundation. Only for existing homes. Table B.38 summarizes the different resistance values compared in the measure.

Table B.38. Wall R-Value Comparison

Measure Insulation	Baseline Insulation
R-13	R-0
R-13	R-8 existing wall
R-13 + R-5	R-13

Insulation (Ceiling). This measure represents an increase in R-value. Adding insulation in existing buildings increases the thermal performance and brings the resistance value up to and past code, depending on vintage. Table B.39 summarizes the different resistance values compared in the measure.

Table B.39. Ceiling R-Value Comparison

Measure Insulation	Baseline Insulation
R-38	Existing Value
R-38	R-19
R-49	R-38

Insulation (Duct). Adding insulation around the ducts in the heating system reduces heat loss to unconditioned spaces. Table B.40 summarizes the different thermal resistance values compared in the measure.

Table B.40 Duct R-Value Comparison

Measure Insulation	Baseline Insulation
R-8	R-0
R-8	R-4

Insulation (Floor). Adding insulation to the floor increases the overall resistance value and slow heat transfer from the basement to the upper levels. Table B.41 summarizes the different resistance values compared in the measure.

Table B.41. Floor R-Value Comparison

Measure Insulation	Baseline Insulation
R-30	R-0
R-30	R-5 existing floor
R-38	R-30

Insulation (Rim and band joist). An un-insulated band joist can account for a significant portion of a building’s heat loss, as the only thing separating inside from outside is 2 inches of wood and the siding material covering it. The heat loss through an un-insulated band joist increases when

the basement is kept warmer, or contains heating or water heating equipment. Insulating a band joist is an easy way to improve a building’s energy efficiency. The baseline is no insulation.

Insulation (Slab). A substantial amount of heat is lost through an un-insulated slab, resulting in cold, uncomfortable floors. Even if the foundation wall is insulated vertically under the slab, significant heat is still lost from the slab edge that is closest to the cold outside air. Table B.42 compares the different slab insulations for this measure.

Table B.42. Insulation Slab Measures

Measure Insulation	Baseline Insulation
R-10	R-0
R-10	Existing insulation
R-15	R-10

Insulation (Wall) 2x4. Wall insulation can help slow the transfer of heat and reduce both the heating and cooling loads in houses. Table B.43 compares the different insulations for 2x4 framing.

Table B.43 2x4 Wall Insulation Measures

Measure Insulation	Baseline Insulation
R-13	R-0
R-13	Existing wall insulation R-8
R-13 + R-5 Sheathing	R-13

Insulation (Wall) 2x6. Wall insulation slows the transfer of heat and reduces both the heating and cooling loads in houses. Table B.44 compares the different insulations for 2x6 framing.

Table B.44 2x6 Wall Insulation Measures

Measure Insulation	Baseline Insulation
R-21	R-0
R-21	Existing wall insulation R-8
R-21 + R-5 Sheathing	R-21 (State Code)

Integrated Space Heating/Water Heating. Integrated hot water heating systems provide both space conditioning and hot water heating with one appliance or energy source. Domestic hot water is heated directly and space heating is accomplished with a hot water heat exchanger coil piped to the forced air heating system. Thus, a combination space/water heating system can provide high efficiency hot water heating and space heating for the cost of one high efficiency appliance.

Leak Proof Duct Fittings. The majority of duct leakage in residential HVAC systems is due to improperly sealed connections between ductwork and fittings. Even when duct connections are initially well-sealed, leakage may increase over time. Although the use of mastics and



mechanical fasteners is becoming more widespread, a low-cost, leak-proof system will help to transform the market.

Outlet Gasket. Provide sealing around electrical outlets to reduce drafts and heat loss through small air spaces.

SIP Construction. Structural insulated panels use continuous foam insulation throughout the panel that provides excellent energy efficiency and low levels of air infiltration. Baseline is standard wood framing.

Spray-On Foam Insulation. Unlike traditional insulation materials like fiberglass or cellulose, spray foam insulation seals and fills tiny cracks and seams, which virtually eliminates energy-wasting air infiltration. Because it provides a higher R-value per inch, homeowners using foam insulation can use 2x4 construction on exterior walls instead of the 2x6 studs required with traditional insulation. This measure proposes to increase the resistance value to R-26, compared to the baseline of R-13.⁶³

Thermostat – Clock/Programmable. A programmable thermostat controls the set point temperatures automatically, ensuring the HVAC system is not running during low-occupancy hours.

Thermostat – Multi-Zone. A multi-zone programmable thermostat controls the set point temperatures automatically for multiple areas (rooms or zones), ensuring the HVAC system is not running during low-occupancy hours.

Windows. This measure represents an increase in building thermal performance by reducing the U-value in existing construction and new construction windows, as shown in Table B.45. The cost for all increments of windows does not include any labor costs associated with installing the windows. If this value was include, it will only be included in the cost associated with going from Existing windows to a lower more efficiency window. Adding this additional labor for a single family home would increase the cost by approximately \$2000 and would decrease the overall total resource cost effectiveness.

Table B.45. High-Efficiency Window Measures

Measure U-value	Baseline U-value
0.30	0.65
0.19	0.30

The code for either new construction or window replacement states the customer must go to code (U=0.40) at a minimum when installing new windows.

⁶³ http://www.powerhousetv.com/stellent2/groups/public/documents/pub/phtv_se_in_bu_000575.hcsp

Pool Heat

Pool Heaters. Gas pool heaters use either natural gas or propane. As the pump circulates the pool’s water, the water drawn from the pool passes through a filter and then to the heater. The gas burns in the heater’s combustion chamber, generating heat that transfers to the water that’s returned to the pool. They’re most efficient when heating pools for short periods of time, and they’re ideal for quickly heating pools. The baseline is a standard gas pool heater.⁶⁴

Water Heat

Clothes Washer. Several Modified Energy Factor (MEF) models were compared in this measure, as shown in Table B.46.

Table B.46 Clothes Washer Modified Energy Factor Comparisons

Measure MEF	Baseline MEF
1.26 Federal Code	1.1 Existing Unit
1.72 ENERGY STAR	1.26 Federal Code
2.0 ENERGY STAR Tier 2	1.26 Federal Code
2.2 ENERGY STAR Tier 3	1.26 Federal Code

Desuperheater for Central Air Conditioner (Ground-Source Heat Pump) System.

Desuperheaters are heat recovery devices that transfer heat from the air conditioning unit to the domestic water heater, that would normally be transferred to the ground. A desuperheater provides supplemental water heating only when the heat pump operates in the cooling mode.⁶⁵

Dishwasher. ENERGY STAR dishwashers use an estimated 41% less energy than the federal minimum standard for energy consumption. Table B.3349 shows the following energy factors compared in this measure.

Table B.47. Dishwasher Energy Factor Comparisons

Measure Energy Factor	Baseline Energy Factor
0.65 Federal Code	0.46 Existing Unit
0.77	0.65 Federal Code

Drain Water Heat Recovery (Power-Pipe). Drain water heat recovery devices recover heat energy from drain water and are used to pre-heat cold water entering the hot water tank. This minimizes the temperature difference between the heating set point and the entering water temperature. Only for new construction.

⁶⁴ http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=13160

⁶⁵ http://www1.eere.energy.gov/femp/procurement/eep_groundsource_heatpumps.html

Faucet Aerators. Faucet aerators, by mixing water and air, reduce the amount of water that flows through the faucet. The faucet aerator creates a fine water spray with a screen that is inserted in the faucet head. Flow rate requirements for this measure are presented in Table B.1735.

Table B.48. Faucet Aerator Flow Rates

Measure Flow Rate (GPM*)	Baseline Flow Rate (GPM)
2.2	3.0 (existing)
1.5	2.2
0.5	2.2

* Gallons per minute

Hot Water Supply Pipe Insulation. Adding R-4 insulation around the pipes will decrease heat loss.

Integrated Space Heating/Water Heating. Integrated hot water heating systems provide both space conditioning and hot water heating with one appliance or energy source. Domestic hot water is heated directly and space heating is accomplished with a hot water heat exchanger coil piped to the forced air heating system. Thus, a combination space/water heating system can provide high efficiency hot water heating and space heating for the cost of one high efficiency appliance.

Low-Flow Showerheads. Low-flow showerheads mix water and air to reduce the amount of water that flows through the showerhead. The showerhead creates a fine water spray through an inserted screen in the showerhead. Flow rate requirements for this measure are presented in Table B.836.

Table B.49. Low-Flow Showerhead Flow Rates

Measure Flow Rate (GPM)	Baseline Flow Rate (GPM)
2.5	3.0
1.75	2.5

Tankless Water Heater. The majority of energy savings from tankless water heaters is by avoiding standby losses that occurs for a normal storage tank when it is not being used. Tankless water heaters provide hot water at a preset temperature when needed without storage, thereby reducing or eliminating standby losses. An energy factor of 0.78 was used for the tankless system and compared to the standard code gas water heater with 0.59 EF.⁶⁶

Water Heater Thermostat Setback. This measure generates savings by reducing the set point temperature from 135° to 120°. Often, the set point temperature on a hot water system is set higher than necessary.

⁶⁶ <http://www.toolbase.org/Technology-Inventory/Plumbing/tankless-water-heaters>

Gas Equipment Measures

Clothes Dryer with Moisture Sensor. High efficiency dryers have a moisture sensor that stops the drying cycle when the humidity in the drum falls below a certain level. Conventional drying equipment uses thermostats or timers that do not determine when clothes are dry, thereby causing excessive energy consumption due to extended run time.

Gas Boiler. The National Energy Policy Act of 1992 mandates that all boiler manufacturers must meet the requirements of ASHRAE Standard 90.1. Boilers less than 300 kBtuh are rated using an Annual Fuel Utilization Efficiency (AFUE). AFUE measures the amount of heat actually delivered to the amount of fuel consumed during the heating season; sometimes referred to as the seasonal efficiency. Table B.50 displays the different AFUE values compared in this measure.

Table B.50. AFUE Gas Boiler Comparison

Measure AFUE	Baseline AFUE
AFUE 90%	AFUE 82%
AFUE 94%	

Gas Furnace. This furnace measure also compares several different AFUE values among different units. Table B.51 displays the different AFUE values compared and their baselines.

Table B.51. AFUE Gas Furnace Comparison

Measure AFUE	Baseline AFUE
AFUE 90% (condensing)	AFUE 78% (state code)
AFUE 95% (condensing)	

Water Heater (Gas). Gas water heaters have a range of thermal efficiencies. Table B.52 displays the different efficiencies compared and their baselines.

Table B.52. Residential Gas Water Heater Comparison

Measure Energy Factor	Baseline Energy Factor
0.62	
0.80 (condensing)	0.59 (state code)
0.86 (condensing)	

Passive Renewable Measures

Deciduous Trees. Provide shading and effectively reduce the overall solar heat gain during summer months, which reduces the cooling load on the HVAC system. Baseline for this measure is no trees.

Pellet Stove (Corn or other Biomass Fuel). Biomass energy is organic matter that can be processed into energy for heat, liquid fuels, or power generation. Examples of biomass energy

include: wood grasses, animal wastes, agricultural residues, urban & industrial wastes, and corn. These fuels can be used to heat homes and reduce the use of fossil fuels.

Smart Siting. For new construction only, this measure analyzes the optimal building orientation to minimize the heating and cooling load on the HVAC system.

Solar Attic Fan. Forced attic fan ventilation reduces residential heat gains from the ceiling. The baseline uses passive ventilation without a fan.

Solar Hot Water (SHW). Solar water heating systems include storage tanks and solar collectors. There are two types of solar water heating systems: active, which have circulating pumps and controls, and passive, which don't. Either system actively increases the entering water temperature to the storage tank, reducing the amount of energy required by the hot water heater to achieve the set point temperature.⁶⁷

Thermal (Trombe) Wall. Thermal walls slow heat movement by slowing convectional currents that occur in walls. This keeps buildings warmer in the winter and cooler in the summer.

Window Overhang. Overhangs shade windows, reducing solar heat gains and the overall cooling load on the home.

⁶⁷ http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12850

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Appendix B.3: Industrial Measure Descriptions

Electric Non-Equipment Measures

Process Related

Any measures to improve the industrial process, not specific to the building itself.

Process Cooling Improvements. Improvements that will decrease the energy required for process-related cooling. Examples would include avoid frost formation on evaporators, shutting off cooling water when not required, using economic thickness of insulation for low temperatures.

Process Heating Improvements. Improvements that will decrease the energy required for process-related heating. Examples would include optimizing schedule for drying oven, reducing temperature of process equipment when on standby, and modifying equipment to improve drying process.

Process Heating O&M. Changing operation and maintenance (O&M) procedures of process heating can improve overall energy efficiency of a plant. Some O&M examples include repair faulty insulation, adjust burners for efficient operation, and eliminate leaks in combustible gas lines.

Process Heat Steam Distribution. Any elimination in leaks or improved insulation to the ducting will reduce loss in a distribution system.

Fan System Improvements. Savings from variable-speed drives (VSD) and/or improvements to the design of the fan system, such as better fans, ducting, and flow design.

Pump System Improvements. Similar to fan system improvements, with savings from a VSD and/or improvements to the overall pump system, such as better pumps, more efficient piping and eliminating unnecessary flows. In irrigation, this would include nozzle improvements and scientific irrigation systems.

Other Motor Improvements. Improvements to motors not specific to fans or pumps. This would include using higher efficiency motors, improved rewind practices and correct motor sizing. In the mining industry, this would also include milling technique improvements.

Other Motor O&M. Changing operation and maintenance (O&M) procedures of motors can improve overall energy efficiency of a plant. Some O&M examples include develop and repair/replace policy, avoid emergency rewind of motors, and avoid rewinding motors more than twice.

Air Compressor Improvements. Air compressor energy efficiency, used in the industrial process, can be improved by installing compressor air intakes in coolest locations, or using optimum-sized compressors, amongst others.

Air Compressor O&M. Changing operation and maintenance (O&M) procedures of an air compressor can improve the overall energy efficiency of a plant. Some O&M examples include reducing the pressure of compressed air to the minimum required, cooling compressor air intake with a heat exchanger or eliminating leaks.

Refrigeration Improvements. Refrigeration improvements can include isolating hot equipment from refrigerated area, using highest allowable temperature for refrigerated space or modify refrigeration system to operate at a lower pressure.

Other Process Improvements/O&M. Some generic process improvements/O&M include upgrading obsolete equipment, replace hydraulic/pneumatic equipment with electrical equipment and use optimum size and capacity equipment.

Building Related

Any measures to improve the building itself, not specific to the industrial process.

Boiler Improvements. The boiler is generally used to create steam or hot water for process or non-process applications. Savings can be found by installing a waste heat boiler to provide direct power or using flue gas heat to preheat boiler feedwater.

Lighting Improvements. Any changes to overall illumination levels, use of natural lighting, or technology improvements to use more efficient bulbs or ballasts that will decrease the overall lighting energy consumption.

HVAC Improvements. There are many changes that can be made to reduce the energy consumption in HVAC control of a plant. Many are measures found in the commercial and residential lists. A sample of improvements include: conditioning only space in use, installing timers and/or thermostats, lowering ceiling to reduce conditioned space, and installing or upgrading insulation on distribution systems.

HVAC O&M. Some operation and maintenance (O&M) improvements to the HVAC control system include size air handling grills/ducts/coils to minimize air resistance, adjust vents to minimize energy use and maintain air filters by cleaning or replacement.

Other Building Improvements. Some generic improvements to the building include de-energizing excess transformer capacity, increase electrical conductor size to reduce distribution losses, and optimize plant power factor.

Gas Non-Equipment Measures

Process Related

Any measures to improve the industrial process, not specific to the building itself.

Process Heating Improvements. Improvements that will decrease the energy required for process-related heating. Examples would include optimizing schedule for drying oven, reducing temperature of process equipment when on standby, and modifying equipment to improve drying process.

Process Heating O&M. Changing operation and maintenance (O&M) procedures of process heating can improve overall energy efficiency of a plant. Some O&M examples include repair faulty insulation, adjust burners for efficient operation, and eliminate leaks in combustible gas lines.

Steam Distribution Systems. Any elimination in leaks or improved insulation to the ducting will reduce loss in a distribution system.

Other Process Improvements/O&M. Some generic process improvements/O&M include upgrading obsolete equipment, reducing fluid flow rates, and use optimum size and capacity equipment.

Building Related

Any measures to improve the building itself, not specific to the industrial process.

HVAC Improvements. There are many changes that can be made to reduce the energy consumption in HVAC control of a plant. Many are measures found in the commercial and residential lists. A sample of improvements include: conditioning only space in use, installing timers and/or thermostats, lowering ceiling to reduce conditioned space, and installing or upgrading insulation on distribution systems.

HVAC O&M. Some operation and maintenance (O&M) improvements to the HVAC control system include size air handling grills/ducts/coils to minimize air resistance, adjust vents to minimize energy use and maintain air filters by cleaning or replacement.

Boiler Improvements. The boiler is generally used to create steam or hot water for process or non-process applications. Savings can be found by installing a waste heat boiler to provide direct power or using flue gas heat to preheat boiler feedwater.

Boiler O&M. Such improvements to the boiler would include analyze flue gas for proper air/fuel ration, establishing maintenance schedule or reducing excessive boiler blowdown.

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Appendix B.4: Building Simulations

The consumption – both quantity and timing – of electricity associated with different end uses across building types is a critical component in the assessment of both capacity-based and energy efficiency potentials for the residential and commercial sectors. The primary sources for these data are energy model simulations, which served the following purposes in this study:

- Establish the baseline consumption for various end uses in both existing and new construction vintages
- Estimate the savings associated with equipment upgrades and improvements to both building shell and lighting
- Account for the interactive effects that occur between lighting improvements and HVAC
- Establish the annual hourly timing associated with consumption in different end uses

The two types of energy simulation programs used for this study are eQuest⁶⁸ (for commercial models) and Energy-10⁶⁹ (for residential models). eQuest is a user interface that uses the standard DOE-2 calculation engine with an emphasis on commercial building types. Energy-10 is a program developed by the National Renewable Energy Laboratory (NREL) Center for Building and Energy Storage with an emphasis on simulations for small commercial and residential building types.

Both of these programs provide hourly (8,760) demand and annual energy consumption for a specific end use (e.g., cooling, heating, water heating, etc.). The hourly values were then amalgamated and calibrated with actual hourly usage to determine the load basis for demand response programs. The annual energy consumption was used in the analysis of energy efficiency resources to determine specific building type end-use consumption. A secondary purpose of energy simulations is the ability to determine the energy savings associated with installing higher efficiency equipment (e.g., moving from a SEER 13 Central AC to a SEER 15) and shell improvements (e.g., increasing insulation values and/or using high efficiency windows). Lists of all measures modeled for the residential and commercial sectors are given in Table B.1 and Table B.2, respectively.

Table B.1. Residential Measures Modeled in Energy-10

End Use	Measure Name
Central AC	Central AC - Advanced Technology SEER 18
	Central AC - High Efficiency SEER 16
	Central AC - Premium Efficiency SEER 14
Heat Pump	ASHP - Advanced Efficiency
	ASHP - High Efficiency
	ASHP - Premium Efficiency

⁶⁸ eQuest web page: <http://doe2.com/equest/>

⁶⁹ Energy-10 web page: <http://www.nrel.gov/buildings/energy10.html>

Gas Furnace	Furnace - Advanced Efficiency Furnace - High Efficiency
Gas Boiler	Furnace - Premium Efficiency Boiler - Advanced Efficiency Boiler - High Efficiency Boiler - Premium Efficiency
HVAC	Blinds – Fixed Angle Doors – R-5 and R-11 Insulation-Ceiling Insulation-Floor Insulation-Wall 2x4 Insulation-Wall 2x6 Windows, ENERGY STAR or better

Table B.2. Commercial Measures Modeled in eQuest

End Use	Measure Name
Cooling Chillers	Chiller-High Efficiency
	Chiller-Premium Efficiency
	Cooling Tower-Decrease Approach Temperature
	Cooling Tower-Two-Speed Fan Motor
	Chiller-Water Side Economizer
Cooling DX	DX Package-Air Side Economizer
	High Efficiency DX Package
	Premium Efficiency DX Package
	Advanced Efficiency DX Package
Heat Pump	High Efficiency ASHP
	Premium Efficiency ASHP
Gas Furnace	High Efficiency Furnace
	Premium Efficiency Furnace
Gas Boiler	High Efficiency Boiler
	Premium Efficiency Boiler
Lighting	Lighting Package, High Efficiency
	Lighting Package, Premium Efficiency
HVAC	Infiltration Control
	Insulation - 2*4 Walls
	Insulation - Floor
	Insulation - Roof / Ceiling
	Windows-High Efficiency
Water Heat	Water Heater Temperature Setback

There are three main steps involved in the building simulation process. The first step is the development of building prototypes, which define the typical characteristics associated with the different customer segments (residential dwelling type or commercial business type) for both existing and new construction. These characteristics, which play an important role in driving energy consumption, were developed from a number of sources. For existing buildings, values come from information gathered during the data auditing analysis for the PSE service territory in

addition to energy audits and phone surveys with PSE customers. In cases where data are lacking, engineering judgment is applied. For new construction, the specific state energy code and/or federal code (whichever is the most stringent) is used to determine the building construction and equipment efficiency requirements (International Energy Conservation Code for 2006).

Commercial Building Prototype Parameters

Table B.3. Dry Goods Retail

Dry Goods Retail	Gas for all Heating End Uses		Electric for All Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	2x4 -16" o.c. wood with brick exterior finish medium abs.			
Roof Construction	standard wood frame built up roof			
# of Floors	1	1	1	1
Total Floor Area [sqft]	6,176	6,176	6,176	6,176
Roof Area [sqft]	6,176	6,176	6,176	6,176
Envelope				
Window U-factor	U=0.68	U=0.55	U=0.68	U=0.55
Window to Wall Area	15%	15%	15%	15%
Wall Insulation (R Value)	R-3	R-19	R-3	R-19
Roof Insulation (R Value)	R-7	R-21	R-7	R-21
Floor Insulation (R Value)	R-11	R-19	R-11	R-19
Lighting Density [W/sqft]	1.95	1.5	1.95	1.5
Occupancy Schedule WkDay	9am-7pm			
Occupancy Schedule WkEnd	10am-4pm (Sat)			
HVAC				
Modeling Gas Furnace?	yes	yes	no	no
Heating Efficiency	76% AFUE	78% AFUE	n/a	n/a
Modeling Heat Pump?	no	no	yes	yes
Heating Efficiency	n/a	n/a	2.7 COP	3.2 COP
Percent Of Building Heated	100	100	100	100
Modeling DX Cooling?	yes	yes	yes	yes
Cooling Efficiency	9.2 EER	10.3 EER	9.2 EER	10.3 EER
Modeling Heat Pump Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	9.3 EER	10.1 EER
Modeling Chillers Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	0.793 kW/ton	0.675 kW/ton
Percent Of Building cooled	100	100	100	100
Heating Daytime Set point [°F]	69	69	69	69
Heat. Setback/Setup Set point [°F]	62	62	62	62
Cooling Daytime Set point [°F]	72	72	72	72
Cool. Setback/Setup Set point [°F]	75	75	75	75

Table B.4. Grocery

Grocery	Gas for all Heating End Uses		Electric for All Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	2x4 -16" o.c. wood with brick exterior finish medium abs.			
Roof Construction	standard wood frame built up roof			
# of Floors	1	1	1	1
Total Floor Area [sqft]	12,474	12,474	12,474	12,474
Roof Area [sqft]	12,474	12,474	12,474	12,474
Envelope				
Window U-factor	U=0.65	U=0.55	U=0.65	U=0.55
Window to Wall Area	11%	11%	11%	11%
Wall Insulation (R Value)	R-3	R-19	R-3	R-19
Roof Insulation (R Value)	R-7	R-21	R-7	R-21
Floor Insulation (R Value)	R-11	R-19	R-11	R-19
Lighting Density [W/sqft]	1.7	1.5	1.7	1.5
Occupancy Schedule WkDay	7am-9pm			
Occupancy Schedule WkEnd	8am-9pm (Sat), 9am-8pm (Sun)			
HVAC				
Modeling Gas Furnace?	yes	yes	no	no
Heating Efficiency	76% AFUE	78% AFUE	n/a	n/a
Modeling Heat Pump?	no	no	yes	yes
Heating Efficiency	n/a	n/a	2.7 COP	3.2 COP
Percent Of Building Heated	100	100	100	100
Modeling DX Cooling?	yes	yes	yes	yes
Cooling Efficiency	9.2 EER	10.3 EER	9.2 EER	10.3 EER
Modeling Heat Pump Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	9.3 EER	10.1 EER
Modeling Chillers Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	0.793 kW/ton	0.675 kW/ton
Percent Of Building Cooled	100	100	100	100
Heating Daytime Set point [°F]	68	68	68	68
Heat. Setback/Setup Set point [°F]	62	62	62	62
Cooling Daytime Set point [°F]	72	72	72	72
Cool. Setback/Setup Set point [°F]	75	75	75	75

Table B.5. Hospital

Hospital	Gas for all Heating End Uses		Electric for All Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	2x4 -16" o.c. wood with brick exterior finish medium abs.			
Roof Construction	standard wood frame built up roof			
# of Floors	2	2	2	2
Total Floor Area [sqft]	13,561	13,561	13,561	13,561
Roof Area [sqft]	13,561	13,561	13,561	13,561
Envelope				
Window U-factor	U=0.67	U=0.55	U=0.67	U=0.55
Window to Wall Area	25%	25%	25%	25%
Wall Insulation (R Value)	R-0	R-19	R-0	R-19
Roof Insulation (R Value)	R-11	R-21	R-11	R-19
Floor Insulation (R Value)	R-19	R-19	R-19	R-19
Lighting Density [W/sqft]	1.6	1	1.6	1
Occupancy Schedule WkDay	7am-6pm			
Occupancy Schedule WkEnd	9am-4pm (Sat)			
HVAC				
Modeling Gas Furnace?	yes	yes	no	no
Heating Efficiency	76% AFUE	78% AFUE	n/a	n/a
Modeling Heat Pump?	no	no	yes	yes
Heating Efficiency	n/a	n/a	2.7 COP	3.2 COP
Percent Of Building Heated	100	100	100	100
Modeling DX Cooling?	yes	yes	yes	yes
Cooling Efficiency	9.2 EER	10.3 EER	9.2 EER	10.3 EER
Modeling Heat Pump Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	9.3 EER	10.1 EER
Modeling Chillers Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	0.793 kW/ton	0.675 kW/ton
Percent Of Building Cooled	100	100	100	100
Heating Daytime Set point [°F]	71	71	71	71
Heat. Setback/Setup Set point [°F]	67	67	67	67
Cooling Daytime Set point [°F]	73	73	73	73
Cool. Setback/Setup Set point [°F]	75	75	75	75

Table B.6. Hotel / Motel

Hotel / Motel	Gas for all Heating End Uses		Electric for All Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	2x4 -16" o.c. wood with brick exterior finish medium abs.			
Roof Construction	standard wood frame built up roof			
# of Floors	4	4	4	4
Total Floor Area [sqft]	3,559	3,559	3,559	3,559
Roof Area [sqft]	3,559	3,559	3,559	3,559
Envelope				
Window U-factor	U=0.65	U=0.55	U=0.65	U=0.55
Window to Wall Area	30%	30%	30%	30%
Wall Insulation (R Value)	R-3	0	R-3	R-13
Roof Insulation (R Value)	R-11	0	R-11	0
Floor Insulation (R Value)	R-7	0	R-7	0
Lighting Density [W/sqft]	1.52	1.35	1.52	1.35
Occupancy Schedule WkDay	24 hrs	24 hrs	24 hrs	24 hrs
Occupancy Schedule WkEnd	24 hrs	24 hrs	24 hrs	24 hrs
HVAC				
Modeling Gas Furnace?	yes	yes	no	no
Heating Efficiency	76% AFUE	78% AFUE	n/a	n/a
Modeling Heat Pump?	no	no	yes	yes
Heating Efficiency	n/a	n/a	2.7 COP	3.2 COP
Percent Of Building Heated	100	100	100	100
Modeling DX Cooling?	yes	yes	yes	yes
Cooling Efficiency	9.2 EER	10.3 EER	9.2 EER	10.3 EER
Modeling Heat Pump Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	9.3 EER	9.3 EER
Modeling Chillers Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	0.793 kW/ton	0.793 kW/ton
Percent Of Building Cooled	100	100	100	100
Heating Daytime Set point [°F]	68	68	68	68
Heat. Setback/Setup Set point [°F]	63	63	63	63
Cooling Daytime Set point [°F]	74	74	74	74
Cool. Setback/Setup Set point [°F]	78	78	78	78

Table B.7. Office

Office	Gas for all Heating End Uses		Electric for All Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	2x4 -16" o.c. wood with brick exterior finish medium abs.			
Roof Construction	standard wood frame built up roof			
# of Floors	1	1	1	1
Floor Area [sqft]	4,819	4,819	4,819	4,819
Roof Area [sqft]	4,819	4,819	4,819	4,819
Envelope				
Window U-factor	U=0.60	U=0.55	U=0.60	U=0.55
Window to Wall Area	18%	18%	18%	18%
Wall Insulation (R Value)	R-3	R-19	R-3	R-19
Roof Insulation (R Value)	R-11	R-21	R-11	R-21
Floor Insulation (R Value)	R-11	R-19	R-11	R-19
Lighting Density [W/sqft]	1.6	1	1.6	1
Occupancy Schedule WkDay	8am-5pm			
Occupancy Schedule WkEnd	11am-4pm - Sat			
HVAC				
Modeling Gas Furnace?	yes	yes	no	no
Heating Efficiency	76% AFUE	78% AFUE	n/a	n/a
Modeling Heat Pump?	no	no	yes	yes
Heating Efficiency	n/a	n/a	2.7 COP	3.2 COP
Percent Of Building Heated	100	100	100	100
Modeling DX Cooling?	yes	yes	yes	yes
Cooling Efficiency	9.2 EER	10.3 EER	9.2 EER	10.3 EER
Modeling Heat Pump Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	9.3 EER	10.1 EER
Modeling Chillers Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	0.793 kW/ton	0.675 kW/ton
Heating Daytime Set point [°F]	69	69	69	69
Heat. Setback/Setup Set point [°F]	61	61	61	61
Cooling Daytime Set point [°F]	72	72	72	72
Cool. Setback/Setup Set point [°F]	75	75	75	75

Table B.8. Restaurant

Pacific Power Restaurant	Gas for all Heating End Uses		Electric for All Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	2x4 -16" o.c. wood with brick exterior finish medium abs.			
Roof Construction	standard wood frame built up roof			
# of Floors	1	1	1	1
Total Floor Area [sqft]	2,247	2,247	2,247	2,247
Roof Area [sqft]	2,247	2,247	2,247	2,247
Envelope				
Window U-factor	U=0.65	0	U=0.65	0
Window to Wall Area	15%	15%	15%	15%
Wall Insulation (R Value)	R-3	0	R-3	0
Roof Insulation (R Value)	R-11	0	R-11	0
Floor Insulation (R Value)	R-11	0	R-11	0
Lighting Density [W/sqft]	1.75	1	1.75	1.2
Occupancy Schedule WkDay	9am-9pm (Customer Operating Hours)			
Occupancy Schedule WkEnd	9-9 Sat 11-7 Sun (Customer Operating Hours)			
HVAC				
Modeling Gas Furnace?	yes	yes	no	no
Heating Efficiency	76% AFUE	78% AFUE	n/a	n/a
Modeling Heat Pump?	no	no	yes	yes
Heating Efficiency	n/a	n/a	2.7 COP	3.2 COP
Percent Of Building Heated	100	100	100	100
Modeling DX Cooling?	yes	yes	yes	yes
Cooling Efficiency	9.2 EER	10.3 EER	9.2 EER	10.3 EER
Modeling Heat Pump Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	9.3 EER	10.1 EER
Modeling Chillers Cooling?	no	no	no	no
Cooling Efficiency	n/a	n/a	n/a	n/a
Percent Of Building Cooled	100	100	100	100
Heating Daytime Set point [°F]	67	67	67	67
Heat. Setback/Setup Set point [°F]	64	64	64	64
Cooling Daytime Set point [°F]	71	71	71	71
Cool. Setback/Setup Set point [°F]	74	74	74	74

Table B.9. School

School	Gas for all Heating End Uses		Electric for All Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	2x4 -16" o.c. wood with brick exterior finish medium abs.			
Roof Construction	standard wood frame built up roof			
# of Floors	2	2	2	2
Total Floor Area [sqft]	27,289	27,289	27,289	27,289
Roof Area [sqft]	27,289	27,289	27,289	27,289
Envelope				
Window U-factor	U=0.67	U=0.55	U=0.67	U=0.55
Window to Wall Area	27%	27%	27%	27%
Wall Insulation (R Value)	R-0	R-19	R-0	R-13
Roof Insulation (R Value)	R-7	R-21	R-7	R-19
Floor Insulation (R Value)	R-11	R-19	R-11	R-19
Lighting Density [W/sqft]	1.66	1.35	1.8	1.2
Occupancy Schedule WkDay	School sch.(8am-3pm), Winter-spring Break sch. (9am-2pm) Summer (9am-2pm)			
Occupancy Schedule WkEnd	closed			
HVAC				
Modeling Gas Furnace?	yes	yes	no	no
Heating Efficiency	76% AFUE	78% AFUE	n/a	n/a
Modeling Heat Pump?	no	no	yes	yes
Heating Efficiency	n/a	n/a	2.7 COP	3.2 COP
Percent Of Building Heated	100	100	100	100
Modeling DX Cooling?	yes	yes	yes	yes
Cooling Efficiency	9.2 EER	10.3 EER	9.2 EER	10.3 EER
Modeling Heat Pump Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	9.3 EER	10.1 EER
Modeling Chillers Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	0.793 kW/ton	0.675 kW/ton
Percent Of Building Cooled	100	100	100	100
Heating Daytime Set point [°F]	70	70	70	70
Heat. Setback/Setup Set point [°F]	66	66	66	66
Cooling Daytime Set point [°F]	74	74	74	74
Cool. Setback/Setup Set point [°F]	78	78	78	78

Table B.10. University

University	Gas for all Heating End Uses		Electric for All Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	2x4 -16" o.c. wood with brick exterior finish medium abs.			
Roof Construction	standard wood frame built up roof			
# of Floors	2	2	2	2
Total Floor Area [sqft]	27,289	27,289	27,289	27,289
Roof Area [sqft]	27,289	27,289	27,289	27,289
Envelope				
Window U-factor	U=0.67	U=0.55	U=0.67	U=0.55
Window to Wall Area	27%	27%	27%	27%
Wall Insulation (R Value)	R-0	R-19	R-0	R-13
Roof Insulation (R Value)	R-7	R-21	R-7	R-19
Floor Insulation (R Value)	R-11	R-19	R-11	R-19
Lighting Density [W/sqft]	1.66	1.35	1.8	1.2
Occupancy Schedule WkDay	School sch.(8am-3pm), Winter-spring Break sch. (9am-2pm) Summer (9am-2pm)			
Occupancy Schedule WkEnd	closed			
HVAC				
Modeling Gas Furnace?	yes	yes	no	no
Heating Efficiency	76% AFUE	78% AFUE	n/a	n/a
Modeling Heat Pump?	no	no	yes	yes
Heating Efficiency	n/a	n/a	2.7 COP	3.2 COP
Percent Of Building Heated	100	100	100	100
Modeling DX Cooling?	yes	yes	yes	yes
Cooling Efficiency	9.2 EER	10.3 EER	9.2 EER	10.3 EER
Modeling Heat Pump Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	9.3 EER	10.1 EER
Modeling Chillers Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	0.793 kW/ton	0.675 kW/ton
Percent Of Building Cooled	100	100	100	100
Heating Daytime Set point [°F]	70	70	70	70
Heat. Setback/Setup Set point [°F]	66	66	66	66
Cooling Daytime Set point [°F]	74	74	74	74
Cool. Setback/Setup Set point [°F]	78	78	78	78

Table B.11. Warehouse

Warehouse	Gas for all Heating End Uses		Electric for All Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	2x4 -16" o.c. wood with brick exterior finish medium abs.			
Roof Construction	standard wood frame built up roof			
# of Floors	2	2	2	2
Total Floor Area [sqft]	171,167	171,167	171,167	171,167
Aspect Ratio				
Roof Area [sqft]	171,167	171,167	171,167	171,167
Envelope				
Window U-factor	U=0.65	U=0.55	U=0.65	U=0.55
Window to Wall Area	5%	5%	5%	5%
Wall Insulation (R Value)	R-3	R-19	R-3	R-13
Roof Insulation (R Value)	R-8	R-21	R-8	R-19
Floor Insulation (R Value)	R-8	R-19	R-8	R-19
Lighting Density [W/sqft]	0.75	0.5	1.05	0.7
Occupancy Schedule WkDay	10am-9pmM-F			
Occupancy Schedule WkEnd	10am-6pmSat only.			
HVAC				
Modeling Gas Furnace?	yes	yes	no	no
Heating Efficiency	76% AFUE	78% AFUE	n/a	n/a
Modeling Heat Pump?	no	no	yes	yes
Heating Efficiency	n/a	n/a	2.7 COP	3.2 COP
Percent Of Building Heated	80	80	80	80
Modeling DX Cooling?	yes	yes	yes	yes
Cooling Efficiency	9.2 EER	10.3 EER	9.2 EER	10.3 EER
Modeling Heat Pump Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	9.3 EER	10.1 EER
Modeling Chillers Cooling?	no	no	yes	yes
Cooling Efficiency	n/a	n/a	0.793 kW/ton	0.675 kW/ton
Percent Of Building Cooled	80	80	80	80
Heating Daytime Set point [°F]	68	68	68	68
Heat. Setback/Setup Set point [°F]	60	60	60	60
Cooling Daytime Set point [°F]	75	75	75	75
Cool. Setback/Setup Set point [°F]	79	79	79	79

Residential Building Prototype Parameters

Table B.12. Single Family

General	Gas for all Heating End Uses		Electric for all Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	Brick, wood frame 2*4, insulation, gypsum board	Brick, wood frame 2*6, insulation, gypsum board	Brick, wood frame 2*4, insulation, gypsum board	Brick, wood frame 2*6, insulation, gypsum board
Roof Construction	Pitched roofing 4*12	Pitched roofing 4*12	Pitched roofing 4*12	Pitched roofing 4*12
# of Floors	2	2	2	2
Total Floor Area [sqft]	2035	2190	2035	2380
Roof Area [sqft]	1018	1095	1018	1190
Foundation	Above a Crawl Space	Above a Crawl Space	Above a Crawl Space	Above a Crawl Space
Glass Type	U=0.51,SHGC=0.55	U=0.35,SHGC=0.32	U=0.51,SHGC=0.55	U=0.35,SHGC=0.32
Percent of Double Pane Windows	84%	93%	84%	93%
Window Percentage of Wall Area (ACH)	18%	18%	18%	18%
Wall Insulation (R Value)	11	21	11	21
Floor Insulation (R Value)	15	30	15	30
Roof Insulation (R Value)	10	10	10	10
Rim & Band Joist Insulation (R Value)	0.58	0.58	0.58	0.58
Floor f Factor [Btu/h-F-ft]	30	38	30	38
Air leakage rate (ACH)	0.65	0.35	0.65	0.35
Duct leakage Rate	10%	5%	10%	3%
Lighting Density [W/sqft]	1.2	1.2	1.2	1.2
Peak, typical work day	0.36	0.30	0.36	0.30
Equipment Density [W/sqft]	0.4	0.4	0.4	0.4
Water Heating Fuel Type	Gas	Gas	Electric	Electric
Water Heater Energy Factor	0.57	0.59	0.88	0.92
Water Heater Heat Density [W/sqft]	0.31	0.25	0.31	0.25
Number of Occupants	2.7	3.3	2.7	3.3
Water Heater Temp	123	125	123	125
HVAC				
Distribution Type				
Heating Type	Furnace	Furnace	Furnace	Packaged Heat Pump
Heating Fuel	Gas	Gas	Electric	Electric
Heating Efficiency (AFUE/HSPF)	74%	78%	100%	7.7
Heating System Total Ouput (Btu/h)	40000	40000	40000	40000
Cooling Type	Central AC	Central AC	Central AC	Central AC
Cooling SEER	11	13	11	13

Cooling System Total Output (Btu/h)	36000	36000	36000	36000
Cooling System Sensible Output (Btu/h)	27000	27000	27000	27000
Fan/Air Distribution (cfm)	1200	1200	1200	1200
Heating Daytime Setpoint [°F]	65	67	65	68
Heat. Setback/Setup Setpoint [°F]	58	62	58	62
Cooling Daytime Setpoint [°F]	75	74.5	75	74.5
Cool. Setback/Setup Setpoint [°F]	79	79	79	79

Table B.13. Manufactured

General	Gas for all Heating End Uses		Electric for all Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	Brick, wood frame 2*4, insulation, gypsum board	Brick, wood frame 2*6, insulation, gypsum board	Brick, wood frame 2*4, insulation, gypsum board	Brick, wood frame 2*6, insulation, gypsum board
Roof Construction	Pitched roofing 4*12	Pitched roofing 4*12	Pitched roofing 4*12	Pitched roofing 4*12
# of Floors	1	1	1	1
Total Floor Area [sqft]	1220	1640	1220	1640
Roof Area [sqft]	1220	1640	1220	1640
Foundation	Crawl Space	Crawl Space	Crawl Space	Crawl Space
Glass Type	U=0.51,SHGC=0.78	U=0.35,SHGC=0.32	U=0.51,SHGC=0.5	U=0.35,SHGC=0.32
Percent of Double Pane Windows	64%	64%	64%	64%
Window Percentage of Wall Area (ACH)	18%	18%	18%	18%
Wall Insulation (R Value)	8	21	10.7	21
Floor Insulation (R Value)	15	30	20	30
Roof Insulation (R Value)	19	38	30	38
Air leakage rate (ACH)	0.65	0.45	0.75	0.45
Duct leakage Rate	10%	5%	10%	5%
Lighting Density [W/sqft]	1.2	1.2	1.2	1.2
Equipment Density [W/sqft]	0.4	0.4	0.2	0.4
Water Heating Fuel Type	Gas	Gas	Electric	Electric
Water Heater Energy Factor	0.57	0.59	0.88	0.92
Number of Occupants	2	2.4	2	2.4
Water Heater Temp	128	128	128	128
HVAC				
Distribution Type				
Heating Type	Furnace	Furnace	Furnace	Packaged Heat Pump
Heating Fuel	Gas	Gas	Electric	Electric
Heating Efficiency (AFUE/HSPF)	74%	78%	100%	7.7

Cooling Type	Central AC	Central AC	Central AC	Central AC
Cooling SEER	10	13	11	13
Heating Daytime Setpoint [°F]	67	67	64	64
Heat. Setback/Setup Setpoint [°F]	59	59	59	59
Cooling Daytime Setpoint [°F]	71	71	75	75
Cool. Setback/Setup Setpoint [°F]	75	75	80	80

Table B.14. Multi Family

General	Gas for all Heating End Uses		Electric for all Heating End Uses	
	Existing	New	Existing	New
Exterior Wall Construction	Brick, wood frame 2*4, insulation, gypsum board	Brick, wood frame 2*6, insulation, gypsum board	Brick, wood frame 2*4, insulation, gypsum board	Brick, wood frame 2*6, insulation, gypsum board
Roof Construction	Pitched roofing 4*12	Pitched roofing 4*12	Pitched roofing 4*12	Pitched roofing 4*12
# of Floors	2	2	2	2
Total Floor Area [sqft]	4120	4800	3440	4800
Roof Area [sqft]	2060	2400	1720	2400
Foundation	Slab	Slab	Slab	Slab
Glass Type	U=0.51,SHGC=0.55	U=0.35,SHGC=0.32	U=0.51,SHGC=0.55	U=0.35,SHGC=0.32
Percent of Double Pane Windows	76%	76%	76%	76%
Window Percentage of Wall Area (ACH)	18%	18%	18%	18%
Wall Insulation (R Value)	8	21	8	21
Floor Insulation (R Value)	15	30	15	30
Rim and Band Joist Insulation (R Value)	10	10	10	10
Floor f factor	0.58	0.58	0.58	0.58
Roof Insulation (R Value)	19	38	19	38
Air leakage rate (ACH)	0.75	0.45	0.75	0.45
Duct leakage Rate	10%	5%	10%	5%
Lighting Density [W/sqft]	1.2	1.2	1.2	1.2
Peak, typical work day	0.39	0.28	0.39	0.28
Equipment Density [W/sqft]	0.2	0.29	0.2	0.29
Water Heating Fuel Type	Gas	Gas	Electric	Electric
Water Heater Energy Factor	0.57	0.59	0.88	0.92
Water Heater Heat Density [W/sqft]	0.42	0.29	0.42	0.29
Number of Occupants	6.6	6.6	6.6	6.6
Water Heater Temp	121	121	121	121
HVAC				
Distribution Type				
Heating Type	Furnace	Furnace	Furnace	Packaged Heat Pump

Heating Fuel	Gas	Gas	Electric	Electric
Heating Efficiency (AFUE/HSPF)	74%	78%	100%	7.7
Heating System Total Output (Btu/h)	106,667	106,667	106,667	106,667
Cooling Type	Central AC	Central AC	Central AC	Central AC
Cooling SEER	11	13	11	13
Cooling System Total Output (Btu/h)	96000	96000	96000	96000
Cooling System Sensible Output (Btu/h)	72000	72000	72000	72000
Fan/Air Distribution (cfm)	3200	3200	3200	3200
Heating Daytime Setpoint [°F]	69	67.5	68	67.5
Heat. Setback/Setup Setpoint [°F]	65	61	64	61
Cooling Daytime Setpoint [°F]	71.5	71	72	71
Cool. Setback/Setup Setpoint [°F]	75.5	76	76	76

After the building prototypes are established, the second step is to select the weather station location representing the most typical weather conditions for each state. Although this step is not complicated, it is very important because weather is one of the most important factors underlying annual energy consumption for the HVAC-related measures. Weather is based on a “typical meteorological year,” or TMY. The selection of the TMY file involves two considerations. First, the location should have the closest proximity to the area of the highest energy consumption and population. Second, the TMY should closely match typical weather conditions throughout the respective service territory. The weather file chosen for PSE service territory was Seattle.

Once the building characteristics and weather files are determined, an individual model is prepared for each building type.

Once the models are completed and run, both eQuest and Energy-10 produce output files that contain the estimates of energy consumption and hourly load by end use. For the commercial customer segments, the building-level estimates are converted to represent the kBtu per square foot, also called the end use intensity (EUI). Energy consumption for residential simulations remain at the site level and are referred to as the unit energy consumption, or UEC. The full set of UECs and EUIs are presented in the tables below.

Residential Sector Energy Consumption

Table B.15. Residential Electric UECs (kWh/yr)

	Manufactured		Multi-Family		Single Family	
	Exist.	New	Exist.	New	Exist.	New
Central AC	871	611	709	526	997	849
Central Heat	6635	4688	5354	3361	9000	5561
Cooking Oven	440	440	440	440	440	440
Cooking Range	536	536	536	536	536	536
Dryer	1070	676	960	654	852	805
Freezer	705	541	705	541	705	541
HVAC Aux	670	410	441	344	557	483
Heat Pump	5976	3398	4462	2824	7509	5421
Lighting	1266	1305	1160	1162	2534	2470
Plug Load	1500	1530	1320	1346	2070	2111
Pool Pump	---	---	---	---	1500	1500
Refrigeration	577	446	577	446	577	446
Room AC	461	351	375	302	527	488
Room Heat	5109	3610	4123	2588	6930	4282
Water Heat	3336	2783	1975	1687	3449	2885

Table B.16. Residential Gas UECs

	Manufactured		Multi-Family		Single Family	
	Exist.	New	Exist.	New	Exist.	New
Central Heat Boiler	615	557	444	372	759	591
Central Heat Furnace	468	413	354	310	616	450
Cooking Oven	19	19	19	19	19	19
Cooking Range	24	24	24	24	24	24
Dryer	36	34	36	34	36	34
Pool Heat	---	---	---	---	258	258
Water Heat	158	190	140	169	239	291

Commercial Sector Energy Consumption

For the commercial sector, existing and new EUIs and sources by state are presented in Table B.17 through Table B.19.

Table B.17. Electric EUIs for Commercial Sector by Building Type (kBtu/sq. ft. per Year)

Building Type	Cooking		Cooling Chillers		Cooling DX		HVAC Aux		Heat Pump	
	Exist.	New	Exist.	Exist.	Exist.	Exist.	Exist.	New	Exist.	New
Dry Goods Retail	---	---	1.94	0.98	2.11	1.07	2.71	2.22	3.21	1.57
Grocery	2.66	2.67	1.68	1.36	1.83	1.48	2.13	2.57	4.99	1.77
Hospital	0.54	0.54	1.86	0.47	2.02	0.51	5.37	4.22	3.98	1.66
Hotel / Motel	0.65	.66	1.75	.51	1.91	.55	3.24	2.04	4.26	2.14
Office	---	---	1.62	0.58	1.77	0.63	1.53	1.30	3.43	1.41
Other Comm.	0.39	0.39	1.78	0.78	1.94	0.85	2.12	1.76	3.32	1.49
Restaurant	9.42	9.51	---	---	4.40	1.60	3.57	2.87	5.46	2.26
School	0.22	0.22	0.36	0.16	0.39	0.17	1.32	0.90	3.04	1.23
University	0.42	0.42	0.36	0.16	0.39	0.17	1.32	0.90	3.04	1.23
Warehouse	---	---	0.19	0.22	0.20	0.24	0.58	0.57	0.82	0.57

Table B.18. Electric EUIs for Commercial Sector by Building Type (kBtu/sq. ft. per Year)

Building Type	Lighting		Other		Plug Load		Refrigeration		Space Heat		Water Heat	
	Exist.	New	Exist.	New	Exist.	New	Exist.	New	Exist.	New	Exist.	New
Dry Goods Retail	5.33	4.20	0.78	0.78	2.64	2.71	2.03	2.04	2.02	0.45	0.28	0.28
Grocery	8.06	6.46	0.00	0.00	2.39	2.45	20.28	20.40	2.13	0.19	0.30	0.30
Hospital	4.55	2.87	0.00	0.00	3.75	3.85	0.50	0.50	1.26	0.70	1.38	1.39
Hotel / Motel	2.87	1.91	0.24	0.24	2.16	2.23	0.30	0.30	4.01	2.58	1.73	1.75
Office	3.80	2.37	0.07	0.07	2.20	2.27	---	---	3.21	0.67	0.47	0.37
Other Comm.	2.75	1.96	0.49	0.49	2.45	2.51	0.20	0.20	2.62	0.56	0.38	0.37
Restaurant	5.71	3.26	0.01	0.01	2.12	2.18	5.50	5.55	1.35	0.31	8.79	8.68
School	2.73	1.97	0.03	0.03	1.50	1.54	0.50	0.50	5.67	1.85	1.43	1.44
University	3.79	2.74	0.07	0.08	1.10	1.13	0.50	0.50	5.67	1.85	1.43	1.44
Warehouse	2.50	1.69	0.01	0.01	0.50	0.51	---	---	1.13	0.38	0.20	0.20

Table B.19. Gas EUIs for Commercial Sector by Building Type (kBtu/sq. ft. per Year)

Building Type	Cooking		Pool Heat		Space Heat Boiler		Space Heat Furnace		Water Heat	
	Exist	New	Exist.	New	Exist.	New	Exist.	New	Exist.	New
Dry Goods Retail	---	---	---	---	0.08	0.04	0.11	0.06	0.03	0.02
Grocery	0.19	0.20	---	---	0.26	0.05	0.35	0.08	0.13	0.13
Hospital	0.04	0.04	0.03	0.02	0.36	0.32	0.49	0.47	0.42	0.43
Hotel / Motel	0.08	0.08	0.11	0.06	0.18	0.12	0.25	0.18	0.32	0.32
Office	---	---	---	---	0.24	0.11	0.33	0.17	0.03	0.04
Other Comm.	0.04	0.04	---	---	0.16	0.07	0.22	0.11	0.03	0.03
Restaurant	1.61	1.62	---	---	0.06	0.04	0.06	0.05	0.44	0.45
School	0.02	0.02	0.17	0.03	0.13	0.10	0.17	0.14	0.06	0.06
University	0.05	0.05	0.14	0.04	0.25	0.19	0.34	0.29	0.10	0.10
Warehouse	---	---	---	---	0.09	0.05	0.13	0.07	0.02	0.02

Industrial Sector Energy Consumption

The distribution of energy consumption in the industrial sector is based on data from the Energy Information Administration's Manufacturing Energy Consumption Survey. The allocation of total energy consumption by end use for the various industrial facility types are presented in Table B.20.

Table B.20. Industrial Gas Consumption by Industry Type and End Use

Industry Type	HVAC	Indirect Boiler	Process Heat	Process Other	Other
Chemical Mfg	2%	55%	35%	6%	2%
Computer Electronic Mfg	32%	42%	15%	2%	10%
Electrical Equip. Mfg	29%	12%	53%	0%	6%
Fabricated Metal Products	21%	16%	62%	1%	0%
Food Mfg	7%	51%	38%	5%	0%
Industrial Machinery	37%	18%	37%	3%	5%
Miscellaneous Mfg	33%	30%	27%	0%	10%
Nonmetallic Mineral Products	5%	3%	86%	0%	5%
Paper Mfg	4%	61%	26%	5%	5%
Petroleum Coal Products	1%	33%	60%	2%	4%
Plastics Rubber Products	19%	39%	29%	2%	10%
Primary Metal Mfg	7%	11%	81%	0%	1%
Printing Related Support	35%	21%	42%	2%	0%
Transportation Equipment Mfg	33%	27%	33%	2%	6%
Wastewater	0%	0%	0%	0%	100%
Water	0%	0%	0%	0%	100%
Wood Product Mfg	13%	27%	49%	4%	7%

Table B.21. Industrial Electric Consumption by Industry Type and End Use

Industry Type	HVAC	Process Cool	Process Electro Chem.	Fans	Process Air Comp.	Motors Other	Process Refrigeration
Chemical Mfg	6%	9%	18%	7%	16%	15%	4%
Computer Electronic Mfg	29%	9%	1%	5%	1%	9%	1%
Electrical Equip. Mfg	17%	4%	3%	4%	10%	10%	3%
Fabricated Metal Products	10%	3%	1%	6%	75	17%	3%
Food Mfg	7%	25%	0%	4%	4%	19%	15%
Industrial Machinery	18%	3%	1%	7%	8%	19%	3%
Miscellaneous Mfg	20%	6%	0%	6%	5%	22%	0%
Nonmetallic Mineral Products	6%	3%	0%	8%	9%	23%	4%
Paper Mfg	4%	1%	2%	16%	4%	32%	4%
Petroleum Coal Products	3%	6%	0%	11%	13%	31%	5%
Plastics Rubber Products	10%	8%	0%	7%	9%	21%	4%
Primary Metal Mfg	4%	1%	31%	5%	5%	20%	0%
Printing Related Support	18%	4%	0%	7%	8%	19%	3%
Transportation Equipment Mfg	19%	5%	1%	5%	12%	12%	3%
Wastewater	0%	0%	0%	0%	66%	0%	0%
Water	0%	0%	0%	10%	0%	10%	0%
Wood Product Mfg	7%	1%	0%	10%	11%	28%	5%

Table B.22. Industrial Electric Consumption by Industry Type and End Use

Industry Type	Other	Pumps	Process Heat	Process Other	Lighting	Indirect Boiler
Chemical Mfg	2%	15%	3%	0%	4%	1%
Computer Electronic Mfg	11%	7%	11%	3%	13%	0%
Electrical Equip. Mfg	8%	9%	19%	1%	13%	0%
Fabricated Metal Products	9%	11%	23%	0%	9%	0%
Food Mfg	7%	8%	3%	0%	7%	1%
Industrial Machinery	7%	12%	7%	1%	14%	0%
Miscellaneous Mfg	4%	3%	9%	0%	15%	9%
Nonmetallic Mineral Products	4%	15%	20%	1%	5%	0%
Paper Mfg	2%	25%	2%	0%	4%	3%
Petroleum Coal Products	1%	20%	6%	0%	2%	1%
Plastics Rubber Products	3%	13%	15%	1%	8%	0%
Primary Metal Mfg	1%	3%	28%	0%	3%	0%
Printing Related Support	14%	12%	2%	0%	11%	0%
Transportation Equipment Mfg	4%	11%	10%	1%	15%	0%
Wastewater	14%	18%	0%	0%	2%	0%
Water	14%	64%	0%	0%	2%	0%
Wood Product Mfg	8%	18%	5%	0%	7%	1%

Appendix C: Supplemental Material—Energy Efficiency

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Appendix C.1: Energy Efficiency (Supplemental Material)

Detailed Methodology

Determination of energy-efficiency potential is based on a sequential analysis of various energy-efficiency measures in terms of technical feasibility (technical potential) and economic viability based on standard cost-effectiveness criteria (economic potential). Most of the methodology is identical for electricity and natural gas analyses, but key differences are noted below when applicable. The assessment is carried out in two main steps:

- **Baseline forecasts:** Determine 20-year future energy consumption by segment and end use calibrated to each utility's load forecasts. The baseline forecast reflects efficiency characteristics of current codes and standards, which are assumed to be fixed (frozen efficiency) over the forecast horizon.
- **Estimation of alternative forecasts of technical and technical achievable potentials:** Estimate technical and achievable technical potential based on alternative forecasts reflecting technical impacts of specific energy efficiency measures and market constraints, respectively. The difference between the baseline and each alternative forecast represents the energy-efficiency potential associated with that particular type of potential.

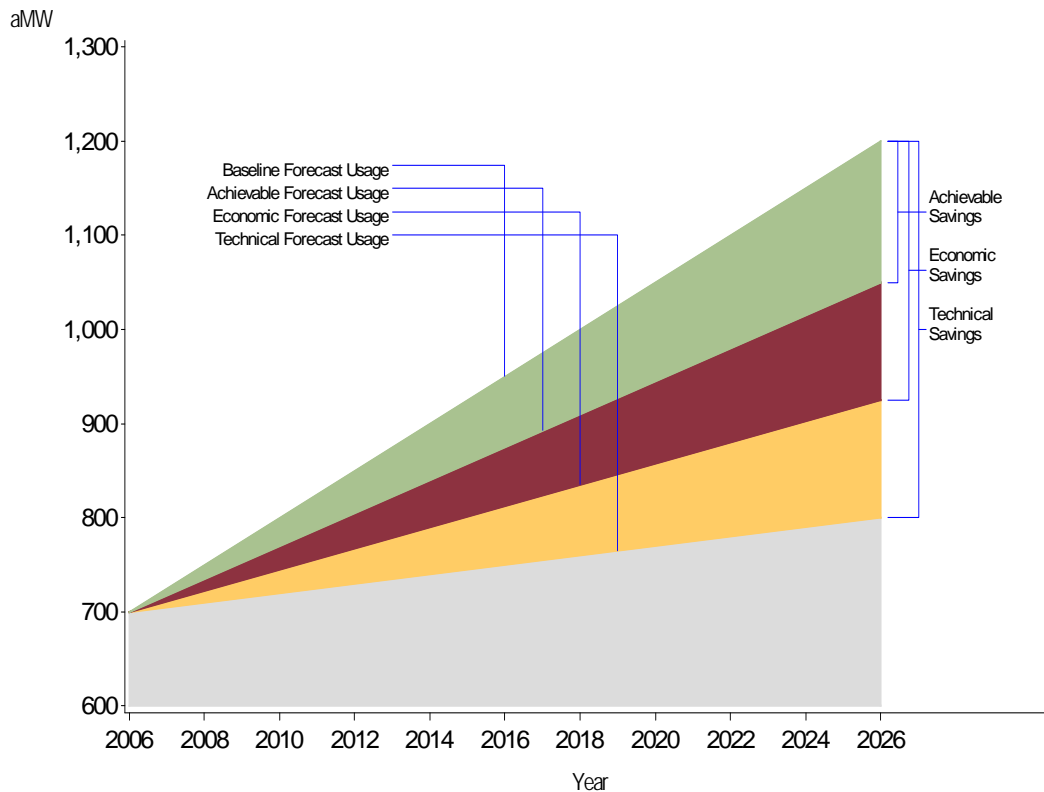
These steps are represented conceptually in Figure C.1, which shows a hypothetical baseline forecast along with the alternative forecasts associated with technical economic, and achievable potential.¹ Although economic and achievable potential were not explicitly estimated for this study, the figure shows the general method of the assessment. These alternative forecasts represent consumption under different sets of assumptions, and the difference between the baseline and each alternative forecasts represents their respective potential savings. For example, the technical potential forecast represents total consumption after incorporation of all measures, consistent with the definition above. The results are intuitive, with total consumption in the technical potential forecast much lower than the baseline, which also indicates the greatest amount of potential.

This approach has two advantages. First, savings estimates are driven by a baseline calibrated to the utility's sales forecasts and is thus consistent with filings. The sales forecast serves as a reality check and helps control for possible errors. Other approaches may simply generate the total potential by summing the estimated impacts of individual measures, which can result in estimates of total savings that represent an unrealistically high percentage of baseline sales. Second, the approach maintains consistency among all the assumptions underlying the baseline and alternative (technical and economic) forecasts. In the alternative forecasts, relevant inputs at

¹ The baseline and alternative forecasts shown in Figure C.1 are purely for example and do not represent the actual data underlying this assessment.

the end-use level are changed to reflect the impact of energy-efficiency measures. Because the estimated savings represent the difference between the baseline and alternative forecasts, they can be directly attributed to specific changes made to analysis inputs. A transparent framework results that allows tracing linkages between various assumptions and calculated measure impacts.

Figure C.1. Representation of Alternative Forecast Approach to Estimation of Energy-Efficiency Potential



Data Sources

The full assessment of energy-efficiency resource potential required the compilation of a large set of measure-specific technical, economic, and market data from secondary sources and through primary research. The main sources of data used in this study included:

- **PSE.** 2006 sales, customers, and forecasts, historical energy-efficiency activities, non-residential customer databases, residential audits. A complete list of data elements provided by PSE is shown in Table C.1.
- **Primary Data Collection.** Surveys of residential and non-residential customers.

Table C.1. Energy Efficiency Utility Data Sources

Data Element	Key Variables	Use in This Study
2006 sales and customer counts	Number of customers and total sales by customer segment.	Base year customers and sales for calibration in end-use model.
2006 load forecasts by rate class	Sales and customer forecasts by customer segment, excluding all DSM activity.	End-use model calibration, new customers as drivers in end-use model development.
Historical program activity/ achievements	Program participation and historical program achievements.	Measure saturations, validation of measure characterization (savings, costs).
Economic assumptions	Discount rate, inflation, line loss, etc.	Measure analysis and estimates of potential at customer meter and generation

- **Building Simulations.** Estimates for normal consumption and load profiles for the majority of end uses in the residential and commercial sectors were developed specifically for this study using the eQuest (commercial) and Energy-10 (residential) building simulation models. Separate models were created for each fuel, customer segment, and construction vintage. Inputs and outputs for these models are presented in detail in Volume II, Appendix B4.
- **Regional Technical Forum.** The RTF measure database was used extensively in this study to ensure consistency both in terms of measures analyzed and expected measure costs and savings.
- **California Energy Commission.** This study used information available through the 2005 Database of Energy Efficiency Resources (DEER) to validate many of the assumptions and data collected on energy-efficiency measure costs and savings.
- **Ancillary Sources.** Other data sources consisted primarily of available information from past energy-efficiency market studies, energy-efficiency potential studies, and evaluations of energy-efficiency programs around the country. The primary information sources on the industrial section were the U.S. Department of Energy, Energy Information Administration Office of Industrial Technologies (including the Industrial Assessment Centers database), and the Northwest Energy Efficiency Alliance’s Industrial Efficiency Alliance initiative.

Baseline Forecasts

PSE’s forecasts of sales form the basis for assessing energy-efficiency potential. Prior to estimating potential, these forecasts are disaggregated by customer sector (residential, commercial, and industrial), customer segment (business, dwelling, and facility types), building vintage (existing structures and new construction), and end uses (all applicable end-uses in each customer sector and segment).

The first step in developing the baseline forecasts is to determine the appropriate customer segments within each sector. These designations were based on categories available in some of

the key data sources used in this study, as well as discussion with PSE and other parties. Table C.2 through Table C.4 show the full set of customer segments and end uses for each sector analyzed in this study.

Table C.2. Residential Sector Dwelling Types and End Uses

Residential Customer Segments	Electric End Uses	Gas End Uses
Manufactured	Central AC	Boiler
Multi-Family	Central Heat	Cooking Oven
Single-Family	Cooking Oven	Cooking Range
	Cooking Range	Dryer
	Dryer	Furnace
	Freezer	Pool Heat
	Heat Pump	Water Heat
	HVAC Auxiliary	
	Lighting	
	Plug Load	
	Pool Pump	
	Refrigerator	
	Room AC	
	Room Heat	
	Water Heat	

Table C.3. Commercial Sector Customer Segments and End Uses

Commercial Customer Segments	Electric End Uses	Gas End Uses
Dry Goods Retail	Cooking	Cooking
Grocery	Cooling - Chillers	Dryer
Hospital	Cooling - DX	Pool Heat
Hotel/Motel	Dryer	Space Heat - Boiler
Office	Heat Pump	Space Heat - Furnace
Other	HVAC Auxiliary	Water Heat
Restaurant	Lighting	
School	Plug Load	
University	Refrigeration	
Warehouse	Space Heat	
	Water Heat	

Table C.4. Industrial Sector and End Uses

Industrial Customer Segments (NAICS)	Electric End Uses	Gas End Uses
Chemical Manufacturing	Fans	HVAC
Computer Electronics Manufacturing	HVAC	Indirect Boiler
Electrical Equipment Manufacturing	Indirect Boiler	Other
Fabricated Metal Products	Lighting	Process - Heating
Food Manufacturing	Motors - Other	Process - Other
Industrial\ Machinery	Other	
Miscellaneous Manufacturing	Process – Air Compressors	
Nonmetallic Mineral Products	Process - Cooling	
Paper Manufacturing	Process – Electro-Chemical	
Petroleum and Coal Products	Process - Heating	
Plastics and Rubber Products	Process - Other	
Primary Metal Manufacturing	Process - Refrigeration	
Printing Related Support	Pumps	
Transportation Equipment Manufacturing		
Wastewater		
Water		
Wood Product Manufacturing		

Once the appropriate customer segments and end uses have been determined for each sector, the integration of current and forecasted customer counts with key market and equipment usage data produced the baseline end-use forecasts. For commercial and residential sectors, the total baseline annual consumption for each end use in each customer segment is calculated as shown below:

$$EUSE_{ij} = \sum_e ACCTS_i * UPA_i * SAT_{ij} * FSH_{ij} * ESH_{ije} * EUI_{ije}$$

where:

$EUSE_{ij}$ = total energy consumption for end use j in customer segment i

$ACCTS_i$ = the number of accounts/customers in customer segment i

UPA_i = the units per account in customer segment i (UPA_i is generally the average square feet per customer in commercial segments and 1.0 in residential dwellings, which are assessed at the whole-home level²)

SAT_{ij} = the share of customers in customer segment i with end use j

FSH_{ij} = the share associated with electricity in end use j in customer segment i

ESH_{ije} = the market share of efficiency level e in the equipment for customer segment ij

² It is important to note the average square footage by home type is an input into the building simulations, so weather and size of homes differences among building segments are reflected in the results.

EUI_{ije} = end-use intensity, energy consumption per unit (per square foot for commercial) for the equipment configuration ije

Total annual consumption in each sector is then determined as the sum of $EUSE_{ij}$ across the end uses and customer segments. The key to ensuring accuracy of the baseline forecasts is the calibration of the end-use model estimates of total consumption to actual sales. This calibration to base year sales includes making appropriate adjustments to data where necessary to conform to known information about customer counts, appliance and equipment saturations, and fuel shares from a variety of sources.

Consistent with other potential studies and commensurate with the industrial end use consumption data that vary widely in quality, the industrial sector's allocation of loads to end uses in various segments (NAICS) was based on data available from the U.S. Department of Energy's Energy Information Administration.³

Derivation of End-Use Consumption Estimates

Estimates of end-use energy consumption (EUI_{ije}) are one of the most important components in the development of the baseline forecast. In the residential sector, these estimates are based on the unit energy consumption (UEC), which represents the annual energy consumption associated with the end use (in some cases, the end use represents the specific type of equipment, such as a central air conditioner or heat pump) at the building level. For the commercial sector, the consumption estimates are treated as end-use intensities (EUIs), which represent the annual energy consumption per square foot of structure. The accuracy of these estimates is critical, so they account for weather and other factors described below that drive differences among the various segments. For the industrial sector, end-use energy consumption represents the total annual facility consumption by end use as allocated by the secondary data described above.

In the residential and commercial sectors, the majority of end-use consumption estimates are derived from building simulation models (eQuest and Energy-10 for commercial and residential segments, respectively)⁴ to account for state code, building size, and shell characteristics. For non-weather-sensitive end uses that cannot be modeled within a building simulations framework (e.g., residential refrigerators), the consumption estimates are taken from the Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS) and the Commercial Building Energy Consumption Survey (CBECS). Most key drivers in developing the simulation models (operating schedules, setback temperatures, and building size) are developed from the primary data collection outlined above.⁵ Summaries of the estimates for end-use consumption for residential (UECs), commercial (EUIs), and industrial (end-use percentages) are provided in Volume II, Appendix F.

³ U.S. DOE, Energy Information Administration, Manufacturing Energy Consumption Survey (2002).

⁴ For details on eQuest and Energy-10, see <http://www.doe2.com> and <http://www.sbicouncil.org/store/e10.php>, respectively.

⁵ Extensive effort was made to validate and cross-check the results of this data collection with data from other sources, including RECS, CBECS, and other available studies.

Estimating Technical Potential

After the development of the baseline forecasts, the next step is estimation of technical potential. Because technical potential is based on creating an alternative forecast⁶ that reflects the installation of all possible measures, the selection of appropriate energy-efficiency resources to include in this study is a central concern. For the residential and commercial sectors, the study began with a broad range of energy-efficiency measures for possible inclusion. These measures are screened to include only measures commonly available, based on well-understood technology, and applicable to Iowa buildings and end uses. Examples of these measures are found in California’s Database of Energy Efficiency Resources (DEER).⁷ The industrial sector measures are based on general categories of building or process improvements.⁸

Table C.5, Table C.7, and

Table C.9 outline the types of energy-efficiency measures assessed in the residential, commercial, and industrial sectors, respectively. Equipment measures are those replacing end-use equipment (e.g., high-efficiency central air conditioners), while non-equipment measures are those reducing end-use consumption without replacing end-use equipment (e.g., insulation). A complete list of all measures, with descriptions, is provided in Volume II, Appendix A.

Table C.5. Residential Electric Energy-Efficiency Measures

End Use	Measure Types
HVAC	Non-Equipment: 2-stage central AC units; HVAC proper sizing; AC ductless split-system; desuperheaters for heat pumps & central AC; appropriate duct location; duct repair/sealing; ECM motors; air-to-air heat exchanger; energy efficient heat pumps; radiant heaters; programmable and multi-zone thermostats; HVAC tune-up/maintenance, VSD Fan Equipment: high-efficiency heat pumps; high-efficiency central AC; high-efficiency room AC units.
Lighting	Non-Equipment: CFL lamps & fixtures; air tight fixture sealing; daylight photocell; fluorescent torchieres; halogen cap lights; LED lighting; occupancy sensors; time clocks;
Water Heating	Non-Equipment: drain water heat recovery; hot water pipe insulation; faucet aerators; low-flow showerheads; temperature setback; ENERGY STAR dishwashers and clothes washers; heat pump water heater; tankless water heating; tank insulation Equipment: high-efficiency water heaters.
Building Envelope	Non-Equipment. Window blinds; doors; fanfolds or dow board; ICF construction; infiltration control; insulation; interior shades or thermal drapes; outlet gaskets; radiant barriers; SIP construction; smart siting; vinyl siding; high efficiency windows;

⁶ The alternative forecast actually consists of four separate forecasts to allow delineation between existing and new construction and equipment and non-equipment measures. These distinctions are explained later in this section.

⁷ Details on DEER are available at <http://eega.cpuc.ca.gov/deer>

⁸ Industrial improvements are derived from a variety of practices and specific measures defined in the Department of Energy’s Industrial Assessment Centers Database, <http://www.iac.rutgers.edu/database/>.

End Use	Measure Types
Appliances	<p><i>Non-Equipment:</i> Attic fan; battery chargers; clothes washer; convection ovens; dehumidifier; ENERGY STAR home audio, copiers, monitors, cordless phones, receivers, computers, printers, HDTV, televisions, VCR's, ceiling fans; induction stove; pool pump timers; VSD pool pumps; range and oven; early replacement of refrigerator/freezer; refrigerator eCube; removal of secondary refrigerator/freezer; whole-house fan;</p> <p><i>Equipment:</i> ENERGY STAR freezers and refrigerators; high-efficiency clothes dryers.</p>

Table C.6. Residential Gas Energy-Efficiency Measures

End Use	Measure Types
HVAC	<p><i>Non-Equipment:</i> HVAC proper sizing; desuperheaters for heat pumps & central AC; appropriate duct location; duct repair/sealing; programmable and multi-zone thermostats; HVAC tune-up/maintenance; integrated space/water heating.</p> <p><i>Equipment:</i> high AFUE gas boilers; high AFUE furnace.</p>
Water Heating	<p><i>Non-Equipment:</i> drain water heat recovery; hot water pipe insulation; faucet aerators; low-flow showerheads; temperature setback; ENERGY STAR dishwashers and clothes washers; tankless water heating; tank insulation; pool heaters.</p> <p><i>Equipment:</i> high-efficiency water heaters.</p>
Building Envelope	<p><i>Non-Equipment:</i> Doors; fanfolds or dow board; ICF construction; infiltration control; insulation; radiant barriers; vinyl siding; high efficiency windows.</p>
Appliances	<p><i>Non-Equipment:</i> Clothes washer; convection ovens; range and oven.</p> <p><i>Equipment:</i> high-efficiency clothes dryers.</p>

Table C.7. Commercial Electric Energy-Efficiency Measures

End Use	Measure Types
HVAC	<p><i>Non-Equipment:</i> ventilation VFD control; chiller VSD control; chilled water piping loop w/ VSD control; chilled water reset; HVAC replacement/retro-commissioning & optimization; chiller economizer; compressed air optimization; VSD compressors; cooling tower approach temperature decrease; cooling tower (two speed and variable speed); evaporative cooling; DDC system (installation and optimization); duct repair & sealing; ductless AC unit; economizers; exhaust air to ventilation air heat recovery; high-efficiency condenser; exhaust hood makeup air; fan control shutoff; floating head pressure control; premium efficiency motors; constant air to VAV conversion; cooling tower improvements; optimized lab hood exhaust; pipe insulation; pump and fan (variable speed controls & optimization); radiant heating; programmable thermostats; sensible/total heat recovery units; spot coolers; VSD exhaust fans.</p> <p><i>Equipment:</i> high-efficiency heat pumps; high-efficiency chillers and DX packages; Room AC units.</p>
Lighting	<p><i>Non-Equipment:</i> bathroom LED light; bi-level controls; CFL lamps & fixtures; fluorescent lamps & fixtures; daylighting controls; delamping; induction lamps; halogen lamps; high-efficiency fixture design; HID lamps & fixtures; LED lamps & fixtures; traffic lights; occupancy sensors; continuous dimming and stepped dimming controls; time clock controls; task lights; twist timers; refrigeration lighting and exit signs; integrated classroom lighting.</p>
Water Heating	<p><i>Non-Equipment:</i> hot water pipe insulation; temperature setback; chemical dishwashing systems; demand controlled circulating systems; drain water heat recovery; low-flow showerheads; low-flow spray heads; low-flow faucet aerators; heat pump water heater; tankless water heaters; ultrasonic faucet controls; water heater insulation.</p> <p><i>Equipment:</i> high-efficiency water heaters.</p>
Building Envelope	<p><i>Non-Equipment:</i> Blinds; infiltration control; insulation; Integrated Building design Tier I & II; interior shades/thermal drapes; natural ventilation; radiant barrier; high-efficiency windows.</p>

End Use	Measure Types
Refrigeration	<i>Non-Equipment:</i> anti-sweat controls; ECM case fans; solid-door refrigerator/freezer; high-efficiency compressors; custom refrigeration system; demand control defrost; demand controlled circulation; high performance display cases; case fans; night cover for display cases; parallel unequal compressors; reduced speed or cycling of evaporator fans; commissioning; heat recovery; refrigerator eCube; low-e glass doors; strip curtains; vending miser; floating condenser heads; anti-sweat controls; high-efficiency ice maker.
Other / Appliances	<i>Non-Equipment:</i> chemical dishwashing system; ozonating & standard clothes washers; ENERGY STAR computers, copiers, fax machines, monitors, printers, scanners, hot food holding cabinets, & water coolers; convection oven; high-efficiency fryer; high-efficiency dishwashers; office computer network management system; PowerSupply 80+; high-efficiency steam cookers; high-efficiency vending machines; power supply transformer/converter; power strip with occupancy sensor; wireless monitoring. <i>Equipment:</i> high efficiency clothes dryer.

Table C.8. Commercial Gas Energy-Efficiency Measures

End Use	Measure Types
HVAC	<i>Non-Equipment:</i> HVAC replacement/retro-commissioning & optimization; boiler economizer; boiler turbulators; direct fired makeup air units; steam trap maintenance; steam pipe insulation; DDC system (installation and optimization); duct repair & sealing; vent damper for atmospheric boiler; exhaust hood makeup air; radiant/infrared heating; programmable thermostats; sensible/total heat recovery units. <i>Equipment:</i> high-efficiency boilers, high-efficiency dryers, high AFUE furnace
Water Heating	<i>Non-Equipment:</i> hot water pipe insulation; temperature setback; chemical dishwashing systems; demand controlled circulating systems; drain water heat recovery; integrated space/water heating; low-flow showerheads; low-flow faucet aerators; tankless water heaters (residential & commercial sized); water heater insulation.
Building Envelope	<i>Non-Equipment:</i> infiltration control; insulation; Integrated Building design Tier I & II; radiant barrier; high-efficiency windows.
Refrigeration	<i>Non-Equipment:</i> refrigeration with heat recovery.
Other / Appliances	<i>Non-Equipment:</i> ENERGY STAR broilers fryers, griddles, steam cookers, chemical dishwashing system; ozonating & standard clothes washers; power burner oven; range and oven; swimming pool/spa covers; convection oven; conveyor oven; wireless monitoring.

Table C.9. Industrial Electric Energy-Efficiency Measures

Electric Measure Types
Air Compressor Improvements
Air Compressor O&M
Building Improvements
Boiler Improvements
Process Cooling Improvements
Process Heating Improvements
HVAC Improvements
HVAC O&M
Lighting Improvements
Motor Improvements
Motor O&M

Electric Measure Types
Other Improvements
Other O&M
Refrigeration Improvements

Table C.10. Industrial Gas Energy-Efficiency Measures

Gas Measure Types
Boiler Improvements
Boiler O&M
Process Heating Improvements
Process Heating O&M
HVAC Improvements
HVAC O&M
Other O&M
Steam Distribution Improvements

Once various measures are properly characterized in terms of savings and costs, technical potential is calculated by subtracting the alternative forecast from the baseline, which yields savings by all dimensions included in the segmentation design (vintage, segment, etc.). The procedure involves three analytic steps, as follows.

Determine Measure Impacts

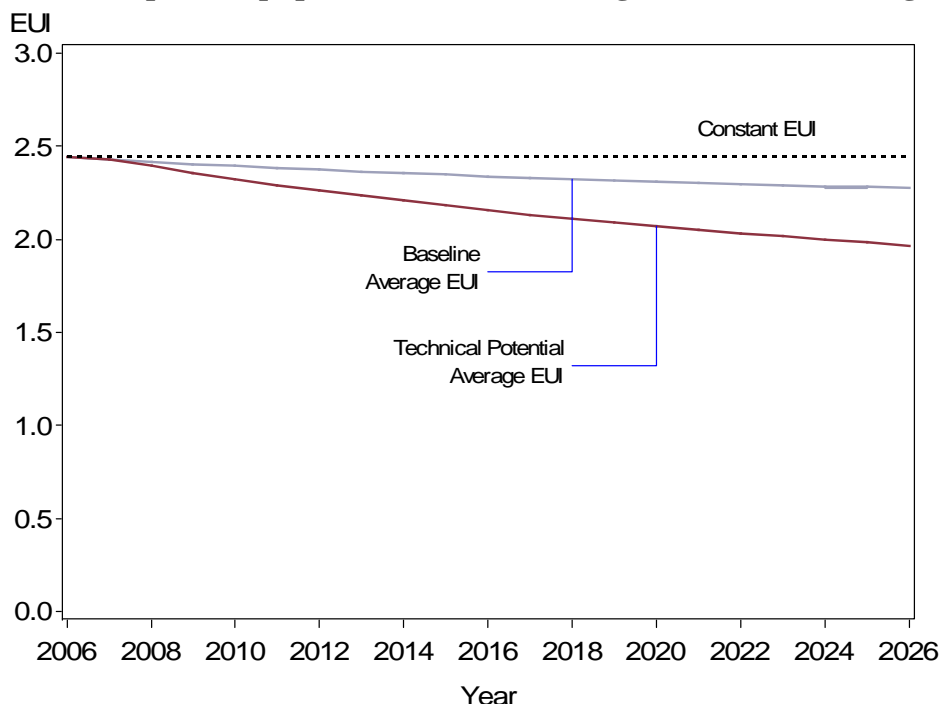
The starting point in assessment of technical potential is the estimation of measure-level impacts. It begins by compiling and analyzing data on the following measure characteristics:

- **Measure savings:** The energy savings associated with a measure as a percentage of the total end-use consumption. Sources include engineering calculations, energy simulation modeling, secondary data sources (case studies), and the California DEER database.
- **Measure costs:** The per-unit cost (either full or incremental, depending on the application) associated with installation of the measure. Sources include the DEER database, RS Means, merchant websites (Home Depot, Trane, etc.), and other secondary sources.
- **Measure life:** The expected lifetime of the measure. Sources include the DEER database, other potential studies, or DSM program evaluations.
- **Measure applicability:** A general term encompassing a number of factors, including the technical feasibility of installation and the current or naturally occurring saturation of the measure as well as factors to allocate savings associated with competing.

In estimating potential savings of equipment measures, it is assumed the baseline efficiency for the measure would shift from its current level to prevailing codes upon burnout. Thus, it is assumed the average baseline efficiencies for this class of measures would improve over time as

existing, sub-code equipment are replaced at the end of their normal, useful lives. An example of this methodology is provided in Figure C.2,⁹ which shows the average EUI (annual kWh per square foot) associated with a piece of end use equipment in the baseline forecast, the technical potential scenario, and a constant EUI scenario, in which the effects of natural decay and current codes and standards are eliminated. The difference between the baseline EUI and the technical potential EUI represents the savings.

Figure C.2. Example of Equipment Potential: Average EUI Over Planning Horizon



The demonstration highlights two important aspects of the approach. First, the figure shows how average baseline usage gradually declines as more equipment decays and is replaced by units that comply with current code. In this case, based on an assumed 15-year life for this measure, its expected baseline efficiency would improve by almost 14% over 20 years. That is, by the end of this forecast period example, all the existing sub-code equipment would be replaced by code.

Second, by contrasting the average usage in the baseline with the constant efficiency scenario, the figure shows how estimates account for the effects of naturally occurring conservation. The technical potential savings are represented by the difference between the technical potential and the baseline, which would not be the case with a constant EUI. This demonstrates how this approach accurately estimates total potential and accurately accounts for naturally occurring potential. It is important to note, however, that the approach does not include any increased efficiency requirements embodied in future changes to codes and standards (that is, the baseline assumes a “frozen efficiency”).

⁹ This is a purely illustrative example and does not contain Iowa-specific data.

The approach for non-equipment (or “retrofit”) measures is more complicated because it requires assessing the collective impacts of a variety of measures with interactive effects. For each segment and end-use combination, the objective of the analysis is to estimate the cumulative effect of the bundle of eligible measures and incorporate those impacts into the end-use model as a percentage adjustment to the baseline end-use consumption. In other words, the objective of the approach is to estimate the percentage reduction in end-use consumption that could be saved in a “typical”¹⁰ structure (multifamily dwelling, small office, etc.) by installing all available measures. The starting point for this approach is characterizing individual measure savings in terms of the percentage of end-use consumption rather than their absolute energy savings. For each individual non-equipment measure, savings are estimated using the following basic relationship:

$$SAVE_{ijm} = EUI_{ije} * PCTSAV_{ijem} * APP_{ijem}$$

where:

$SAVE_{ijm}$ = annual energy savings for measure m for end use j in customer segment i

EUI_{ije} = calibrated annual end-use energy consumption for the equipment e for end use j and customer segment i

$PCTSAV_{ijem}$ = the percentage savings of measure m relative to the base usage for the equipment configuration ije , taking into account interactions among measures such as lighting and HVAC calibrated to annual end-use energy consumption

APP_{ijem} = measure applicability, a fraction that represents a combination of the technical feasibility, existing measure saturation, end-use interaction, and any adjustments to account for competing measures

As described later in this section, it is appropriate to view a measure’s savings in terms of what it saves as a percentage of baseline end-use consumption, given its overall applicability. In the case of wall insulation that saved 10% of space heating consumption, if the overall applicability is only 50%, the final percentage of the end use saved would be 5%. This value represents the percentage of baseline consumption the measure saves in an average home.

However, as stated previously, the study deals almost exclusively with cases where multiple measures affect a single end use. To avoid overestimation of total savings, the assessment of cumulative impact accounts for the interaction among the various measures, a treatment called “measure stacking.” The primary means of accounting for stacking effects is to establish a

¹⁰ This aspect of the approach requires careful determination of what a “typical” structure represents. For example, the average structure might have only a fraction of a measure installed, so it becomes necessary to think of the average single-family home, for instance, as having only 20% of a high-efficiency window already installed. Many of the attributes of structures – size, measures installed, number of stories – have been based on data collected in the surveys. These values were determined using averages from the survey results. When necessary an R-value was converted to a U-value to correctly calculate the average insulation level and then adjusted back to the typical R-value unit. Summaries of attributes associated with the prototypes used in the building simulations are presented in Volume II, Appendix F.

rolling, reduced baseline applied iteratively as measures in the stack are assessed. This is shown in the equations below, where measures 1, 2, and 3 are applied to the same end use:¹¹

$$SAVE_{ij1} = EUI_{ije} * PCTSAV_{ije1} * APP_{ije1}$$

$$SAVE_{ij2} = (EUI_{ije} - SAVE_{ij1}) * PCTSAV_{ije2} * APP_{ije2}$$

$$SAVE_{ij3} = (EUI_{ije} - SAVE_{ij1} - SAVE_{ij2}) * PCTSAV_{ije3} * APP_{ije3}$$

After iterating through all of the measures in a bundle, the final percentage of end-use consumption reduced is the sum of the individual measures' stacked savings divided by the original baseline consumption.

Finally, the nature of this approach requires clarification in that there are actually two different savings types associated with a measure. The first is called as stand-alone savings (the savings the measure would provide when installed entirely on its own). The second is called stacked savings (savings attributable to a measure when assessed in conjunction with other measures and accounting for the various factors that affect applicability). The former represents savings associated with a single, actual installation; the latter is intended to represent the average savings measure would achieve when installed across all homes. A summary of the factors that affect the overall potential associated with a measure are presented in Table C.11.

Estimate Phased-In Technical Potential

Savings from the technical energy-efficiency potential are estimated by incorporating measure impacts (equipment and non-equipment) into the baseline forecast in four steps to develop alternative forecasts. The steps are sequential, with each case building on the previous scenario:

1. Equipment measures in existing construction, in which all equipment is upgraded to the highest level of efficiency after decay.
2. Equipment measures in new construction, in which all new construction is upgraded to the highest level of equipment efficiency.
3. Non-equipment measures in existing construction, in which collective measure energy savings impacts are applied to end-use consumption estimates.
4. Non-equipment in new construction, in which collective measure energy savings are applied to end-use consumption estimates.

The sequence of this approach is necessary to account for the interaction between equipment and non-equipment measures. As equipment is replaced over time with the highest efficiency option, average consumption associated with an end use declines. This results in a reduction in the

¹¹ In some cases, there may not be complete interaction between measures, e.g. wall and ceiling interaction. However, based on building simulation and engineering experience, it is believed that the interaction is substantial. This method provides a somewhat conservative approach to potential estimates in some cases, but to assume no interaction could greatly inflate the actual available potential.

absolute impact associated with non-equipment measures. Accounting for this interaction results in a more accurate estimate of the potential associated with non-equipment measures.

Table C.11. Measure Applicability Factors

Measure Impact	Explanation	Sources
Fuel Saturation	The percentage of customers that use a particular fuel (gas or electric) in low for the specific end use (e.g., water heat, space heat, etc.).	Residential and commercial surveys
End-Use Saturation	The percentage of customers that have the specific end use. (If not all residential customers have a central AC unit, for example, the end-use saturation would be less than 100%.)	Residential and non-residential surveys
Measure Share	Used to distribute the percentage of market shares for competing measures (e.g., CFLs and LEDs each have their own measure share of the market share).	Survey of installation contractors. various secondary sources.
Measure Incomplete Factor	Represents the percentage of buildings that do not have the specific measure currently installed.	<ul style="list-style-type: none"> ▪ ENERGY STAR Sales Records (2003, 2004, 2005 and partial 2006). ▪ Residential and commercial surveys
Technical Feasibility	Accounts for the percentage of buildings that can have the measure physically installed. A couple of factors may affect this percentage, including whether the building already has the baseline measure (e.g., dishwasher) as well as limitations on installation (e.g., size of unit and space available to install the unit).	Survey of installation contractors and trade allies.
Measure Interaction	Only considered for lighting and HVAC.	Energy Simulation Modeling Engineering Judgment.

Technical Achievable Potential

As described in Volume I, Section 2, this study did not rely on the traditional process of estimating technical potential followed by economic and achievable potentials. Instead, a “technical achievable” potential was estimated to represent the potential available after accounting for market barriers other than cost-effectiveness. This was accomplished by applying expected maximum market penetration percentages to the technical potential. These percentages are show in Table C.12.

Table C.12. 20 Year Market Penetration Rates by Fuel and Sector

Sector	Electric		Gas	
	Existing Construction	New Construction	Existing Construction	New Construction
Residential	85%	65%	75%	55%
Commercial	85%	65%	75%	55%
Industrial	85%	65%	75%	55%

This potential was then bundled by cost of conserved energy to create bundles for use in IRP modeling.

Data & Assumptions

Baseline Forecasts

Figure C.3. Residential Electric Sales Forecast

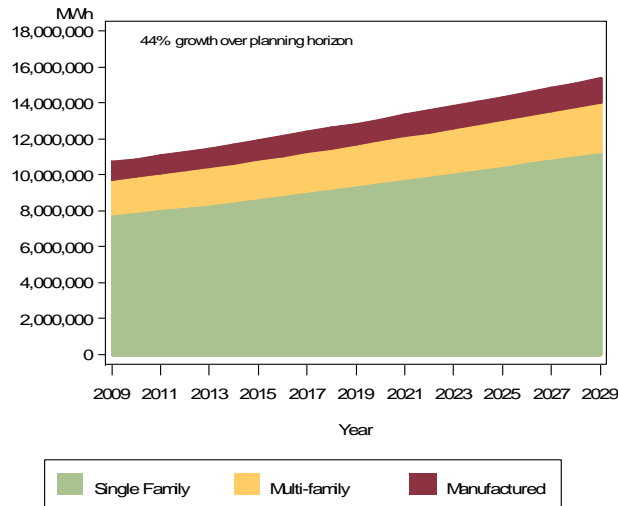


Figure C.4. Commercial Electric Sales Forecast

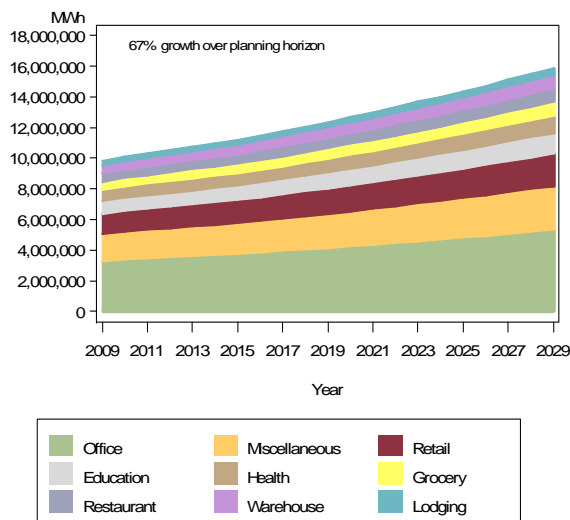


Figure C.5. Industrial Electric Sales Forecast

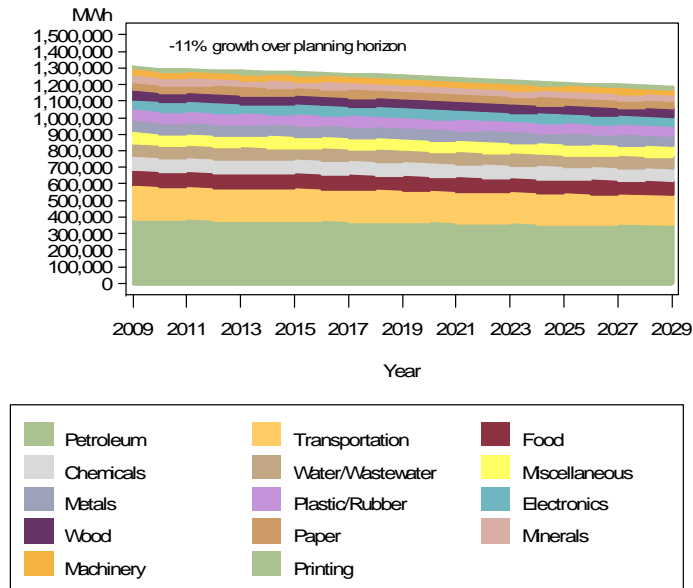


Figure C.6. Residential Gas Sales Forecast

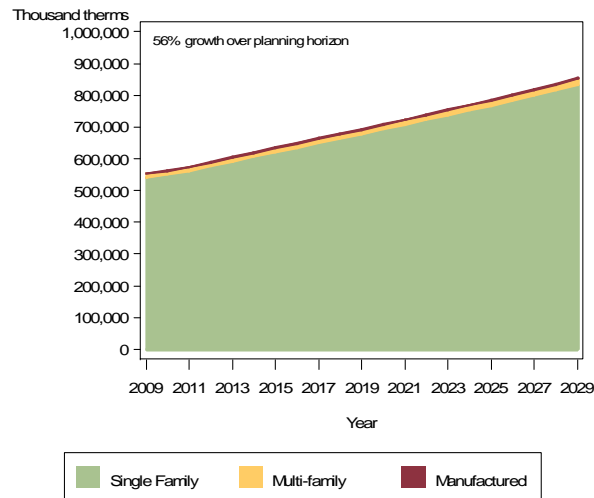


Figure C.7. Commercial Gas Sales Forecast

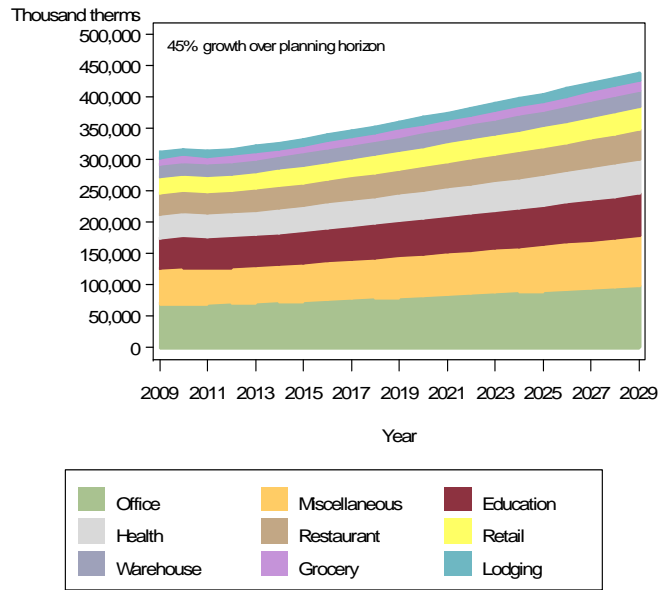
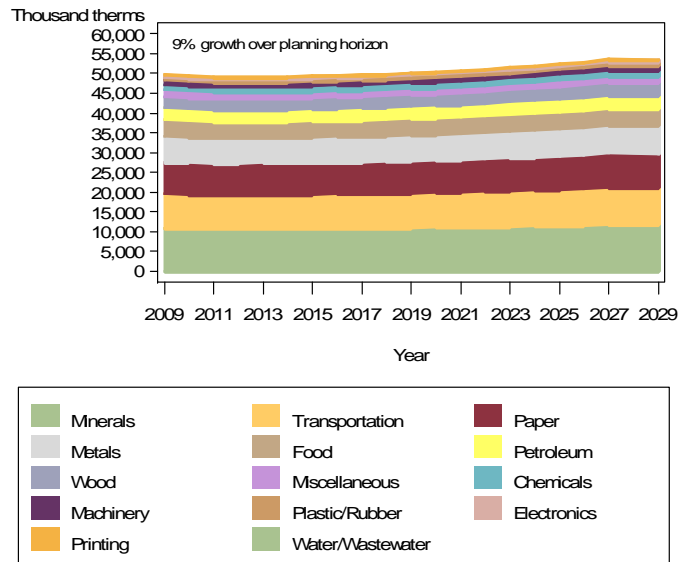


Figure C.8. Industrial Gas Sales Forecast



Baseline Equipment Saturations and Fuel Shares

Table C.13. Residential Electric Equipment Saturations and Fuel Shares

Customer Segment/End Use	Equipment Saturation	Electric Share
Manufactured		
Central AC	18%	100%
Central Heat	69%	58%
Cooking Oven	103%	97%
Cooking Range	103%	93%
Dryer	98%	96%
Freezer	71%	100%
HVAC Aux	100%	100%
Heat Pump	16%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Pool Pump	3%	100%
Refrigerator	109%	100%
Room AC	24%	100%
Room Heat	16%	100%
Water Heat	100%	85%
Multi Family		
Central AC	3%	100%
Central Heat	22%	25%
Cooking Oven	106%	96%
Cooking Range	95%	90%
Dryer	64%	98%
Freezer	5%	100%
HVAC Aux	100%	100%
Heat Pump	0%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Pool Pump	0%	100%
Refrigerator	103%	100%
Room AC	0%	100%
Room Heat	64%	100%
Water Heat	100%	73%
Single Family		
Central AC	14%	100%
Central Heat	73%	10%
Cooking Oven	117%	83%
Cooking Range	97%	68%
Dryer	99%	82%
Freezer	64%	100%
HVAC Aux	100%	100%
Heat Pump	5%	100%
Lighting	100%	100%
Other	100%	100%

Customer Segment/End Use	Equipment Saturation	Electric Share
Plug Load	100%	100%
Pool Pump	3%	100%
Refrigerator	136%	100%
Room AC	6%	100%
Room Heat	15%	94%
Water Heat	100%	42%

Table C.14. Residential Gas Equipment Saturations and Fuel Shares

Customer Segment /End Use	Equipment Saturation	Gas Share
Manufactured		
Central Heat Boiler	3%	100%
Central Heat Furnace	93%	100%
Cooking Oven	100%	20%
Cooking Range	100%	42%
Dryer	100%	21%
Other	100%	100%
Pool Heat	0%	100%
Water Heat	100%	82%
Multi Family		
Central Heat Boiler	5%	100%
Central Heat Furnace	51%	100%
Cooking Oven	105%	31%
Cooking Range	91%	39%
Dryer	74%	7%
Other	100%	100%
Pool Heat	0%	100%
Water Heat	100%	82%
Single Family		
Central Heat Boiler	3%	100%
Central Heat Furnace	93%	96%
Cooking Oven	115%	20%
Cooking Range	98%	42%
Dryer	99%	21%
Other	100%	100%
Pool Heat	3%	77%
Water Heat	100%	85%

Table C.15. Commercial Electric Equipment Saturations and Fuel Shares

Customer Segment /End Use	Equipment Saturation	Electric Share
Dry Goods Retail		
Cooking	0%	28%
Cooling Chillers	2%	100%
Cooling DX	37%	100%
Dryer	100%	25%
Heat Pump	9%	100%
HVAC Aux	74%	100%

Customer Segment /End Use	Equipment Saturation	Electric Share
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Refrigeration	100%	100%
Space Heat	62%	22%
Water Heat	100%	75%
Grocery		
Cooking	100%	72%
Cooling Chillers	2%	100%
Cooling DX	53%	100%
Dryer	100%	25%
Heat Pump	17%	100%
HVAC Aux	84%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Refrigeration	100%	100%
Space Heat	65%	15%
Water Heat	100%	24%
Hospital		
Cooking	100%	22%
Cooling Chillers	4%	100%
Cooling DX	16%	100%
Dryer	100%	25%
Heat Pump	7%	100%
HVAC Aux	76%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Refrigeration	100%	100%
Space Heat	69%	51%
Water Heat	100%	43%
Hotel / Motel		
Cooking	100%	8%
Cooling Chillers	22%	100%
Cooling DX	15%	100%
Dryer	100%	25%
Heat Pump	26%	100%
HVAC Aux	82%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Refrigeration	100%	100%
Space Heat	53%	40%
Water Heat	100%	33%
Office		
Cooking	0%	67%
Cooling Chillers	27%	100%
Cooling DX	31%	100%

Customer Segment /End Use	Equipment Saturation	Electric Share
Dryer	100%	25%
Heat Pump	25%	100%
HVAC Aux	79%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Refrigeration	100%	100%
Space Heat	53%	68%
Water Heat	100%	84%
Other		
Cooking	100%	66%
Cooling Chillers	2%	100%
Cooling DX	11%	100%
Dryer	100%	25%
Heat Pump	11%	100%
HVAC Aux	67%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Refrigeration	100%	100%
Space Heat	56%	36%
Water Heat	100%	58%
Restaurant		
Cooking	100%	16%
Cooling Chillers	0%	100%
Cooling DX	38%	100%
Dryer	100%	25%
Heat Pump	6%	100%
HVAC Aux	82%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Refrigeration	100%	100%
Space Heat	75%	3%
Water Heat	100%	29%
School		
Cooking	100%	62%
Cooling Chillers	2%	100%
Cooling DX	19%	100%
Dryer	100%	25%
Heat Pump	26%	100%
HVAC Aux	82%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Refrigeration	100%	100%
Space Heat	56%	21%
Water Heat	100%	29%
University		

Customer Segment /End Use	Equipment Saturation	Electric Share
Cooking	100%	62%
Cooling Chillers	2%	100%
Cooling DX	19%	100%
Dryer	100%	25%
Heat Pump	26%	100%
HVAC Aux	82%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Refrigeration	100%	100%
Space Heat	56%	21%
Water Heat	100%	29%
Warehouse		
Cooking	0%	100%
Cooling Chillers	5%	100%
Cooling DX	11%	100%
Dryer	100%	25%
Heat Pump	3%	100%
HVAC Aux	50%	100%
Lighting	100%	100%
Other	100%	100%
Plug Load	100%	100%
Refrigeration	100%	100%
Space Heat	44%	26%
Water Heat	100%	89%

Table C.16. Commercial Gas Equipment Saturations and Fuel Shares

Customer Segment /End Use	Equipment Saturation	Gas Share
Dry Goods Retail		
Cooking	0%	72%
Other	100%	100%
Pool Heat	100%	0%
Space Heat Furnace	10%	100%
Space Heat Boiler	60%	87%
Water Heat	100%	30%
Grocery		
Cooking	100%	28%
Other	100%	100%
Pool Heat	100%	0%
Space Heat Furnace	2%	100%
Space Heat Boiler	79%	91%
Water Heat	100%	88%
Hospital		

Customer Segment /End Use	Equipment Saturation	Gas Share
Cooking	100%	74%
Other	100%	100%
Pool Heat	100%	3%
Space Heat Furnace	9%	76%
Space Heat Boiler	43%	81%
Water Heat	100%	74%
Hotel / Motel		
Cooking	100%	99%
Other	100%	100%
Pool Heat	100%	44%
Space Heat Furnace	49%	72%
Space Heat Boiler	29%	57%
Water Heat	100%	94%
Office		
Cooking	0%	36%
Other	100%	100%
Pool Heat	100%	0%
Space Heat Furnace	29%	56%
Space Heat Boiler	49%	30%
Water Heat	100%	31%
Other		
Cooking	100%	34%
Other	100%	100%
Pool Heat	100%	0%
Space Heat Furnace	10%	100%
Space Heat Boiler	60%	66%
Water Heat	100%	63%
Restaurant		
Cooking	100%	84%
Other	100%	100%
Pool Heat	100%	0%
Space Heat Furnace	0%	100%
Space Heat Boiler	79%	97%
Water Heat	100%	75%
School		
Cooking	100%	39%
Other	100%	100%
Pool Heat	100%	13%
Space Heat Furnace	58%	91%
Space Heat Boiler	22%	81%
Water Heat	100%	84%
University		
Cooking	100%	39%
Other	100%	100%
Pool Heat	100%	13%
Space Heat Furnace	58%	91%
Space Heat Boiler	22%	81%
Water Heat	100%	84%
Warehouse		

Customer Segment /End Use	Equipment Saturation	Gas Share
Cooking	0%	0%
Other	100%	100%
Pool Heat	100%	0%
Space Heat Furnace	0%	100%
Space Heat Boiler	58%	89%
Water Heat	100%	14%

Appendix C.2: Technical Measure Inputs

Residential Electric Measures

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 14	SEER 13	765	6.2%	NA	NA	15	\$336
Existing	Manufactured	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 16	SEER 13	765	14.2%	NA	NA	15	\$880
Existing	Manufactured	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 18	SEER 13	765	20.8%	NA	NA	15	\$1,353
Existing	Manufactured	Central AC	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	840	10.0%	0%	95%	15	\$990
Existing	Manufactured	Central AC	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	840	41.3%	65%	30%	10	\$353
Existing	Manufactured	Central AC	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	840	3.3%	60%	55%	30	\$53
Existing	Manufactured	Central AC	Ceiling Fan	Ceiling Fan	No Ceiling Fan	840	0.5%	85%	45%	10	\$104
Existing	Manufactured	Central AC	Check Me! O&M Tune-up	Tune-up/Maintenance	No Tune-up Maintenance	840	10.0%	90%	50%	5	\$236
Existing	Manufactured	Central AC	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	840	20.0%	0%	95%	20	\$34
Existing	Manufactured	Central AC	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	840	0.1%	85%	50%	30	\$116
Existing	Manufactured	Central AC	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	840	0.1%	85%	55%	12	\$42
Existing	Manufactured	Central AC	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	840	2.0%	80%	65%	6	\$36
Existing	Manufactured	Central AC	Duct Sealing	Duct Sealing	No Duct Sealing	840	6.0%	60%	65%	20	\$447
Existing	Manufactured	Central AC	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	840	19.0%	50%	95%	25	\$946
Existing	Manufactured	Central AC	Evaporative Space Cooling	SEER 40	SEER 13	840	70.0%	75%	95%	10	\$1,119
Existing	Manufactured	Central AC	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	840	10.0%	75%	85%	15	\$455
Existing	Manufactured	Central AC	Insulation (Ceiling)	R-49	State Code (R-38)	840	0.3%	87%	85%	25	\$471
Existing	Manufactured	Central AC	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	840	1.0%	95%	40%	25	\$674
Existing	Manufactured	Central AC	Insulation (Ceiling) - below code	State Code (R-38)	R-9	840	0.6%	95%	10%	25	\$674
Existing	Manufactured	Central AC	Insulation (Duct)	R-8	No Duct Insulation	840	3.2%	12%	75%	25	\$201
Existing	Manufactured	Central AC	Insulation (Duct)	R-8	R-4	840	1.6%	12%	95%	25	\$103
Existing	Manufactured	Central AC	Insulation (Floor)	R-38	State Code (R-30)	840	0.1%	75%	90%	25	\$1,061
Existing	Manufactured	Central AC	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	840	0.1%	30%	40%	25	\$532
Existing	Manufactured	Central AC	Insulation (Floor) - below code	State Code (R-30)	R-0	840	0.1%	30%	10%	25	\$1,595
Existing	Manufactured	Central AC	Insulation (Wall) 2'4	R-13 + R5 Sheathing	R-13	840	0.0%	10%	90%	25	\$1,007

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Central AC	Insulation (Wall) 2'4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	840	0.1%	75%	45%	25	\$764
Existing	Manufactured	Central AC	Insulation (Wall) 2'4 - below code	R-13	R-0	840	0.1%	75%	5%	25	\$764
Existing	Manufactured	Central AC	Insulation (wall) 2'6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	840	0.1%	0%	55%	25	\$1,114
Existing	Manufactured	Central AC	Insulation (wall) 2'6 - below code	State Code (R-21)	R-0	840	0.1%	0%	45%	25	\$1,114
Existing	Manufactured	Central AC	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (5 per unit)	13 SEER	840	15.0%	10%	95%	30	\$216
Existing	Manufactured	Central AC	Motor - ECM Motor	ECM motor for Central Air Conditioner	Standard Motor	840	4.5%	65%	95%	15	\$368
Existing	Manufactured	Central AC	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	840	2.0%	95%	60%	5	\$6
Existing	Manufactured	Central AC	Proper Sizing - Central Air Conditioner	Correctly Sized Air Conditioner Unit	Oversized Air Conditioner Unit	840	6.0%	53%	85%	15	\$1
Existing	Manufactured	Central AC	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	840	6.7%	0%	97%	30	\$365
Existing	Manufactured	Central AC	Solar Attic Fan	Solar electric attic ventilation	Standard passive ventilation	840	6.0%	50%	95%	10	\$762
Existing	Manufactured	Central AC	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	840	6.8%	85%	50%	15	\$27
Existing	Manufactured	Central AC	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	840	7.0%	65%	95%	12	\$1,150
Existing	Manufactured	Central AC	VSD Motor - ECM	Variable Speed Motor (ECM) for Central Air Conditioner	Constant Speed Motor	840	13.5%	80%	85%	20	\$341
Existing	Manufactured	Central AC	Whole-House Dehumidifier	Whole-House Dehumidifier	No Dehumidifier	840	6.0%	50%	95%	11	\$1,439
Existing	Manufactured	Central AC	Whole-House Fan	Whole-House Fan	No Whole-House Fan	840	22.0%	50%	96%	15	\$334
Existing	Manufactured	Central AC	Windows	U = 0.19	U=0.30	840	13.0%	65%	95%	25	\$2,378
Existing	Manufactured	Central AC	Windows	U=0.30	Existing Windows (U=0.65)	840	36.0%	65%	60%	25	\$5,656
Existing	Manufactured	Central Heat	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	6,556	10.0%	0%	95%	15	\$990
Existing	Manufactured	Central Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	6,556	3.3%	60%	55%	30	\$53
Existing	Manufactured	Central Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	6,556	3.0%	85%	50%	30	\$116
Existing	Manufactured	Central Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	6,556	2.0%	85%	55%	12	\$42
Existing	Manufactured	Central Heat	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	6,556	2.0%	80%	65%	6	\$36
Existing	Manufactured	Central Heat	Duct Sealing	Duct Sealing	No Duct Sealing	6,556	6.0%	60%	65%	20	\$447
Existing	Manufactured	Central Heat	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	6,556	19.0%	50%	95%	25	\$946
Existing	Manufactured	Central Heat	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	6,556	10.0%	75%	85%	15	\$455
Existing	Manufactured	Central Heat	Insulation (Ceiling)	R-49	State Code (R-38)	6,556	1.0%	87%	85%	25	\$471

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Central Heat	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	6,556	2.0%	95%	40%	25	\$674
Existing	Manufactured	Central Heat	Insulation (Ceiling) - below code	State Code (R-38)	R-9	6,556	10.2%	95%	10%	25	\$674
Existing	Manufactured	Central Heat	Insulation (Duct)	R-8	No Duct Insulation	6,556	4.3%	12%	75%	25	\$201
Existing	Manufactured	Central Heat	Insulation (Duct)	R-8	R-4	6,556	2.1%	12%	95%	25	\$103
Existing	Manufactured	Central Heat	Insulation (Floor)	R-38	State Code (R-30)	6,556	1.0%	75%	90%	25	\$1,061
Existing	Manufactured	Central Heat	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	6,556	2.0%	30%	40%	25	\$532
Existing	Manufactured	Central Heat	Insulation (Floor) - below code	State Code (R-30)	R-0	6,556	10.0%	30%	10%	25	\$1,595
Existing	Manufactured	Central Heat	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	6,556	2.2%	10%	90%	25	\$1,007
Existing	Manufactured	Central Heat	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	6,556	5.0%	75%	45%	25	\$764
Existing	Manufactured	Central Heat	Insulation (Wall) 2*4 - below code	R-13	R-0	6,556	44.0%	75%	5%	25	\$764
Existing	Manufactured	Central Heat	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	6,556	12.0%	0%	55%	25	\$1,114
Existing	Manufactured	Central Heat	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	6,556	49.0%	0%	45%	25	\$1,114
Existing	Manufactured	Central Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (5 per unit)	13 SEER	6,556	15.0%	10%	95%	30	\$216
Existing	Manufactured	Central Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	6,556	2.0%	95%	60%	5	\$6
Existing	Manufactured	Central Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	6,556	2.0%	0%	97%	30	\$365
Existing	Manufactured	Central Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	6,556	12.0%	0%	95%	25	\$3,675
Existing	Manufactured	Central Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	6,556	6.8%	85%	50%	15	\$27
Existing	Manufactured	Central Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	6,556	7.0%	65%	95%	12	\$1,150
Existing	Manufactured	Central Heat	Windows	U = 0.19	U=0.30	6,556	6.0%	65%	95%	25	\$2,378
Existing	Manufactured	Central Heat	Windows	U=0.30	Existing Windows (U=0.65)	6,556	15.0%	65%	60%	25	\$5,656
Existing	Manufactured	Cooking Oven	Convection Oven	Convection Oven (wall oven)	Standard Oven (wall oven)	435	23.0%	85%	85%	15	\$432
Existing	Manufactured	Dryer	Clothes Dryer With Moisture Sensor	High-Efficiency Clothes Dryer With Moisture Sensor	Standard Dryer Without Moisture Sensor	720	13.0%	NA	NA	18	\$58
Existing	Manufactured	Freezer	Freezer - Stand-Alone	Energy Star 14.8 cu ft Chest Freezer	Standard 14.8 cu ft Freezer	553	10.0%	NA	NA	12	\$26
Existing	Manufactured	Freezer	Stand-Alone Freezer - Early Replacement	Energy Star Freezer	Existing Non-Efficient Freezer	665	9.4%	35%	80%	12	\$489
Existing	Manufactured	Freezer	Stand-Alone Freezer - Removal	Proper Disposal of Freezer	Existing Non-Efficient Freezer	665	248.7%	35%	80%	6	\$103

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Electric Furnace	Standard Motor	662	25.0%	65%	95%	15	\$368
Existing	Manufactured	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Gas Furnace	Standard Motor	662	25.0%	65%	95%	15	\$368
Existing	Manufactured	HVAC Aux	VSD Fan	Variable Speed Fan - Electric Furnace	Constant Speed Fan	662	75.0%	40%	85%	20	\$447
Existing	Manufactured	HVAC Aux	VSD Fan	Variable Speed Fan - Gas Furnace	Constant Speed Fan	662	75.0%	29%	85%	20	\$447
Existing	Manufactured	Heat Pump	Air Source Heat_Pump	2.5 ton, 14 SEER, 8.5 HSPF	2.5 ton, 13 SEER, 7.7 HSPF	5,256	4.9%	NA	NA	15	\$420
Existing	Manufactured	Heat Pump	Air Source Heat_Pump	2.5 ton, 16 SEER, 8.8 HSPF	2.5 ton, 13 SEER, 7.7 HSPF	5,256	7.4%	NA	NA	15	\$543
Existing	Manufactured	Heat Pump	Air Source Heat_Pump	2.5 ton, 18 SEER, 9.0 HSPF	2.5 ton, 13 SEER, 7.7 HSPF	5,256	9.2%	NA	NA	15	\$1,210
Existing	Manufactured	Heat Pump	Advanced Cold-Climate Heat Pump	16 SEER, 9.6 HSPF	13 SEER, 7.7 HSPF, 2.5 ton	5,478	14.0%	20%	99%	20	\$3,677
Existing	Manufactured	Heat Pump	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	5,478	10.0%	0%	95%	15	\$990
Existing	Manufactured	Heat Pump	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	5,478	5.8%	65%	30%	10	\$353
Existing	Manufactured	Heat Pump	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	5,478	3.3%	60%	55%	30	\$53
Existing	Manufactured	Heat Pump	Ceiling Fan	Ceiling Fan	No Ceiling Fan	5,478	0.1%	85%	45%	10	\$104
Existing	Manufactured	Heat Pump	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	5,478	2.8%	0%	95%	20	\$34
Existing	Manufactured	Heat Pump	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	5,478	2.0%	85%	50%	30	\$116
Existing	Manufactured	Heat Pump	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	5,478	2.0%	85%	55%	12	\$42
Existing	Manufactured	Heat Pump	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	5,478	2.0%	80%	65%	6	\$31
Existing	Manufactured	Heat Pump	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	5,478	10.0%	75%	85%	15	\$455
Existing	Manufactured	Heat Pump	Insulation (Ceiling)	R-49	State Code (R-38)	5,478	1.0%	87%	85%	25	\$471
Existing	Manufactured	Heat Pump	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	5,478	2.0%	95%	40%	25	\$674
Existing	Manufactured	Heat Pump	Insulation (Ceiling) - below code	State Code (R-38)	R-9	5,478	8.0%	95%	10%	25	\$674
Existing	Manufactured	Heat Pump	Insulation (Duct)	R-8	No Duct Insulation	5,478	4.1%	12%	75%	25	\$201
Existing	Manufactured	Heat Pump	Insulation (Duct)	R-8	R-4	5,478	2.0%	12%	95%	25	\$103
Existing	Manufactured	Heat Pump	Insulation (Floor)	R-38	State Code (R-30)	5,478	0.3%	75%	90%	25	\$1,061
Existing	Manufactured	Heat Pump	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	5,478	1.0%	30%	40%	25	\$532
Existing	Manufactured	Heat Pump	Insulation (Floor) - below code	State Code (R-30)	R-0	5,478	5.0%	30%	10%	25	\$1,595
Existing	Manufactured	Heat Pump	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	5,478	1.3%	10%	90%	25	\$1,007
Existing	Manufactured	Heat Pump	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	5,478	3.0%	75%	45%	25	\$764
Existing	Manufactured	Heat Pump	Insulation (Wall) 2*4 - below code	R-13	R-0	5,478	28.0%	75%	5%	25	\$764

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Heat Pump	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	5,478	8.0%	0%	55%	25	\$1,114
Existing	Manufactured	Heat Pump	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	5,478	37.0%	0%	45%	25	\$1,114
Existing	Manufactured	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (5 per unit)	13 SEER	5,478	15.0%	10%	95%	30	\$216
Existing	Manufactured	Heat Pump	Micro Channel Heat Exchangers (Evaporator)	Micro Channel Heat Exchangers (5 ton unit)	13 SEER, 7.7 HSPF, 2.5 ton	5,478	5.0%	15%	99%	18	\$3,890
Existing	Manufactured	Heat Pump	Motor - ECM Motor	ECM motor for Heat Pump	Standard Motor	5,478	1.3%	65%	95%	15	\$368
Existing	Manufactured	Heat Pump	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	5,478	2.0%	95%	60%	5	\$6
Existing	Manufactured	Heat Pump	PTCS Aerosol-Based Duct Sealing	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	5,478	19.0%	80%	65%	25	\$946
Existing	Manufactured	Heat Pump	PTCS Duct Sealing	PTCS Duct Sealing	No Duct Sealing	5,478	15.0%	80%	65%	20	\$447
Existing	Manufactured	Heat Pump	Proper Sizing - Heat Pump	Correctly Sized Heat_Pump (Cooling And Heating Unit)	Oversized Heat_Pump	5,478	8.6%	53%	85%	15	\$1
Existing	Manufactured	Heat Pump	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	5,478	2.7%	0%	97%	30	\$365
Existing	Manufactured	Heat Pump	Small Scale Absorption Cooling	Small Scale Absorption Cooling (5 ton)	13 SEER, 7.7 HSPF, 2.5 ton	5,478	9.0%	0%	99%	20	\$946
Existing	Manufactured	Heat Pump	Solar Attic Fan	Solar electric attic ventilation	Standard passive ventilation	5,478	0.8%	50%	95%	10	\$762
Existing	Manufactured	Heat Pump	Solid state refrigeration (cool chips™) for heat pumps	Solid State Thermoelectric cooling system	13 SEER, 7.7 HSPF, 2.5 ton	5,478	18.0%	29%	99%	18	\$2,101
Existing	Manufactured	Heat Pump	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	5,478	10.0%	0%	95%	25	\$3,675
Existing	Manufactured	Heat Pump	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	5,478	6.8%	85%	25%	15	\$27
Existing	Manufactured	Heat Pump	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	5,478	7.0%	65%	95%	12	\$1,150
Existing	Manufactured	Heat Pump	VSD Motor - ECM	Variable Speed Motor (ECM) for Heat Pump	Constant Speed Motor	5,478	3.8%	80%	85%	20	\$341
Existing	Manufactured	Heat Pump	Whole-House Fan	Whole-House Fan	No Whole-House Fan	5,478	3.3%	50%	96%	15	\$334
Existing	Manufactured	Heat Pump	Windows	U = 0.19	U=0.30	5,478	8.0%	65%	95%	25	\$2,378
Existing	Manufactured	Heat Pump	Windows	U=0.30	Existing Windows (U=0.65)	5,478	11.0%	65%	60%	25	\$5,656
Existing	Manufactured	Lighting	CFL Fixtures, High Use	2-15 W CFLs, 4.0 hr/day (37%)	2-60 W Incandescent	1,251	4.7%	98%	62%	20	\$35
Existing	Manufactured	Lighting	CFL Fixtures, Low Use	2-15 W CFLs, 1.0 hr/day (32%)	2-60 W Incandescent	1,251	4.0%	98%	62%	20	\$30
Existing	Manufactured	Lighting	CFL Fixtures, Medium Use	2-15 W CFLs, 2.5 hr/day (33%)	2-60 W Incandescent	1,251	4.2%	98%	62%	20	\$33
Existing	Manufactured	Lighting	CFL Lamps, High Use	1-15W, 4.0 hr/day (37%)	Incandescent 60W	1,251	34.0%	86%	62%	7	\$2
Existing	Manufactured	Lighting	CFL Lamps, Low Use	1-15W, 1.0 hr/day (32%)	Incandescent 60W	1,251	9.7%	86%	62%	27	\$2
Existing	Manufactured	Lighting	CFL Lamps, Medium Use	1-15W, 2.5 hr/day (33%)	Incandescent 60W	1,251	14.0%	86%	62%	11	\$2
Existing	Manufactured	Lighting	CFL Lighting - 3-Way	13 W, 20W And 25W	30W, 75W, 100W	1,251	1.8%	75%	62%	7	\$13

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Lighting	CFL Torchieries, High Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	1,251	0.4%	70%	65%	7	\$7
Existing	Manufactured	Lighting	CFL Torchieries, Low Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	1,251	0.4%	70%	65%	27	\$7
Existing	Manufactured	Lighting	CFL Torchieries, Medium Use	55 W CFL, (60%)	Incandescent Torchieries, 180W Halogen	1,251	1.3%	70%	65%	11	\$7
Existing	Manufactured	Lighting	Daylighting Controls (Photocell) - Indoor/Outdoors	Install Photocell	No Daylighting Controls	1,251	4.5%	0%	95%	10	\$151
Existing	Manufactured	Lighting	LED Christmas Lighting	LED Christmas Lighting	Incandescent Christmas Lighting	1,251	0.4%	40%	85%	13	\$11
Existing	Manufactured	Lighting	LED Interior Lighting (White), High Use	LED 4W	Incandescent 60W	1,251	42.3%	85%	98%	13	\$31
Existing	Manufactured	Lighting	LED Interior Lighting (White), Low Use	LED 4W	Incandescent 60W	1,251	12.1%	85%	98%	13	\$31
Existing	Manufactured	Lighting	LED Interior Lighting (White), Medium Use	LED 4W	Incandescent 60W	1,251	17.4%	85%	98%	13	\$31
Existing	Manufactured	Lighting	Occupancy Sensors	Wall-Switch Occupancy Sensors	No Occupancy Sensor	1,251	14.0%	75%	85%	10	\$64
Existing	Manufactured	Lighting	Time Clocks (Exterior Lighting)	Exterior Lighting on a Time Clock	Exterior Lighting (Manual Control)	1,251	1.9%	75%	90%	10	\$93
Existing	Manufactured	Plug Load	1-Watt Standby Power	1W or less standby power use for small appliances	Standard plug load appliance.	1,542	4.2%	15%	85%	7	\$32
Existing	Manufactured	Plug Load	Energy Star Battery Chargers	Energy Star Battery Chargers	Standard Battery Chargers	1,542	0.2%	55%	40%	7	\$4
Existing	Manufactured	Plug Load	Energy Star DVD System	Energy Star DVD System	Standard DVD System	1,542	1.9%	100%	24%	7	\$12
Existing	Manufactured	Plug Load	Energy Star Dehumidifiers	Energy Star Dehumidifiers	Standard Dehumidifiers	1,542	0.5%	15%	5%	10	\$13
Existing	Manufactured	Plug Load	Energy Star Digital Set Top Receiver	Energy Star Digital Set Top Receiver	Standard Digital Set Top Receiver	1,542	1.9%	94%	62%	6	\$37
Existing	Manufactured	Plug Load	Energy Star HDTV	Energy Star HDTV	Standard HDTV	1,542	2.5%	24%	70%	9	\$105
Existing	Manufactured	Plug Load	Energy Star Home Audio System	Energy Star Home Audio System	Standard Home Audio system	1,542	2.6%	92%	90%	7	\$21
Existing	Manufactured	Plug Load	Energy Star Office Computer	Energy Star Office Computer	Standard Office Computer	1,542	10.4%	73%	15%	4	\$84
Existing	Manufactured	Plug Load	Energy Star Office Copiers	Energy Star Office Copiers	Standard Office Copiers	1,542	1.5%	17%	55%	6	\$53
Existing	Manufactured	Plug Load	Energy Star Office Monitor	Energy Star Office Monitor	Standard Office Monitor	1,542	3.3%	100%	15%	4	\$16
Existing	Manufactured	Plug Load	Energy Star Office Printer	Energy Star Office Printer	Standard Office Printer	1,542	0.3%	62%	40%	5	\$11
Existing	Manufactured	Plug Load	Energy Star TV	Energy Star TV	Standard TV	1,542	3.5%	100%	38%	9	\$32
Existing	Manufactured	Plug Load	Energy Star VCR	Energy Star VCR/DVD Combo	Standard Home VCR	1,542	0.7%	100%	45%	4	\$38
Existing	Manufactured	Plug Load	Power supply transformer/converter - External power adapters	Power supply transformer/converter - High efficiency External power adapters	Standard Efficiency	1,542	0.7%	85%	40%	7	\$8
Existing	Manufactured	Plug Load	Powerstrip with Occupancy Sensor	Powerstrip with Occupancy Sensor	Powerstrip w/o Occupany Sensor	1,542	1.0%	75%	90%	10	\$88
Existing	Manufactured	Refrigerator	Refrigerator/Freezer - Energy Star	Energy Star Refrigerator	Standard Refrigerator	490	20.0%	NA	NA	18	\$32
Existing	Manufactured	Refrigerator	1 kWh/day Refrigerator	20 cf top-freezer using no more than 1 kWh/day	Standard Refrigerator, 20cf, top-freezer	538	30.0%	90%	97%	19	\$74
Existing	Manufactured	Refrigerator	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	538	6.3%	85%	95%	5	\$236

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Refrigerator	Refrigerator/Freezer - Early Replacement	Standard Refrigerator	Existing Refrigerator	538	100.0%	19%	85%	9	\$452
Existing	Manufactured	Refrigerator	Refrigerator/Freezer - Energy Star	Energy Star Refrigerator	Existing Refrigerator	538	20.0%	0%	40%	18	\$651
Existing	Manufactured	Refrigerator	Refrigerator/Freezer - Removal of Secondary	Proper Disposal of Refrigerator/Freezer	Existing Non-Efficient Refrigerator/Freezer	538	282.8%	19%	95%	9	\$103
Existing	Manufactured	Refrigerator	Solid state refrigeration (cool chips™) for refrigerators	Thermoelectric refrigerator, 1.7 cubic ft.	Compact refrigerator, 1.7 cubic ft.	538	4.0%	75%	95%	19	\$56
Existing	Manufactured	Room AC	Air Conditioner - Room (Individual Rooms) (10,000 BTU/HR)	EER = 10.8	EER = 9.8	440	8.3%	NA	NA	10	\$42
Existing	Manufactured	Room AC	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	449	41.3%	65%	30%	10	\$353
Existing	Manufactured	Room AC	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	449	3.3%	60%	55%	30	\$53
Existing	Manufactured	Room AC	Ceiling Fan	Ceiling Fan	No Ceiling Fan	449	0.5%	85%	45%	10	\$104
Existing	Manufactured	Room AC	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	449	20.0%	0%	95%	20	\$34
Existing	Manufactured	Room AC	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	449	0.1%	85%	50%	30	\$116
Existing	Manufactured	Room AC	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	449	0.1%	85%	55%	12	\$42
Existing	Manufactured	Room AC	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	449	2.0%	80%	65%	6	\$31
Existing	Manufactured	Room AC	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	449	10.0%	75%	85%	15	\$455
Existing	Manufactured	Room AC	Insulation (Ceiling)	R-49	State Code (R-38)	449	0.3%	87%	85%	25	\$471
Existing	Manufactured	Room AC	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	449	1.0%	95%	40%	25	\$674
Existing	Manufactured	Room AC	Insulation (Ceiling) - below code	State Code (R-38)	R-9	449	0.6%	95%	10%	25	\$674
Existing	Manufactured	Room AC	Insulation (Duct)	R-8	No Duct Insulation	449	3.2%	12%	75%	25	\$201
Existing	Manufactured	Room AC	Insulation (Duct)	R-8	R-4	449	1.6%	12%	95%	25	\$103
Existing	Manufactured	Room AC	Insulation (Floor)	R-38	State Code (R-30)	449	0.1%	75%	90%	25	\$1,061
Existing	Manufactured	Room AC	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	449	0.1%	30%	40%	25	\$532
Existing	Manufactured	Room AC	Insulation (Floor) - below code	State Code (R-30)	R-0	449	0.1%	30%	10%	25	\$1,595
Existing	Manufactured	Room AC	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	449	0.0%	10%	90%	25	\$1,007
Existing	Manufactured	Room AC	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	449	0.1%	75%	45%	25	\$764
Existing	Manufactured	Room AC	Insulation (Wall) 2*4 - below code	R-13	R-0	449	0.1%	75%	5%	25	\$764
Existing	Manufactured	Room AC	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	449	0.1%	0%	55%	25	\$1,114
Existing	Manufactured	Room AC	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	449	0.1%	0%	45%	25	\$1,114

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Room AC	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	449	2.0%	95%	60%	5	\$6
Existing	Manufactured	Room AC	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	449	6.7%	0%	97%	30	\$365
Existing	Manufactured	Room AC	Windows	U = 0.19	U=0.30	449	13.0%	65%	95%	25	\$2,378
Existing	Manufactured	Room AC	Windows	U=0.30	Existing Windows (U=0.65)	449	36.0%	65%	60%	25	\$5,656
Existing	Manufactured	Room Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	5,048	3.3%	60%	55%	30	\$53
Existing	Manufactured	Room Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	5,048	3.0%	85%	50%	30	\$116
Existing	Manufactured	Room Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	5,048	2.0%	85%	55%	12	\$42
Existing	Manufactured	Room Heat	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	5,048	2.0%	80%	65%	6	\$31
Existing	Manufactured	Room Heat	Ductless Mini-Split REM	2.5 ton, SEER 15, HSPF 9.0	Electric Baseboard Heating HSPF=1	5,048	62.1%	25%	95%	15	\$5,311
Existing	Manufactured	Room Heat	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	5,048	10.0%	75%	85%	15	\$455
Existing	Manufactured	Room Heat	Insulation (Ceiling)	R-49	State Code (R-38)	5,048	1.0%	87%	85%	25	\$471
Existing	Manufactured	Room Heat	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	5,048	2.0%	95%	40%	25	\$674
Existing	Manufactured	Room Heat	Insulation (Ceiling) - below code	State Code (R-38)	R-9	5,048	10.2%	95%	10%	25	\$674
Existing	Manufactured	Room Heat	Insulation (Duct)	R-8	No Duct Insulation	5,048	4.3%	12%	75%	25	\$201
Existing	Manufactured	Room Heat	Insulation (Duct)	R-8	R-4	5,048	2.1%	12%	95%	25	\$103
Existing	Manufactured	Room Heat	Insulation (Floor)	R-38	State Code (R-30)	5,048	1.0%	75%	90%	25	\$1,061
Existing	Manufactured	Room Heat	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	5,048	2.0%	30%	40%	25	\$532
Existing	Manufactured	Room Heat	Insulation (Floor) - below code	State Code (R-30)	R-0	5,048	10.0%	30%	10%	25	\$1,595
Existing	Manufactured	Room Heat	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	5,048	2.2%	10%	90%	25	\$1,007
Existing	Manufactured	Room Heat	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	5,048	5.0%	75%	45%	25	\$764
Existing	Manufactured	Room Heat	Insulation (Wall) 2*4 - below code	R-13	R-0	5,048	44.0%	75%	5%	25	\$764
Existing	Manufactured	Room Heat	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	5,048	12.0%	0%	55%	25	\$1,114
Existing	Manufactured	Room Heat	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	5,048	49.0%	0%	45%	25	\$1,114
Existing	Manufactured	Room Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	5,048	2.0%	95%	60%	5	\$6
Existing	Manufactured	Room Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	5,048	2.0%	0%	97%	30	\$365
Existing	Manufactured	Room Heat	Radiant Electric Ceiling Panels	Radiant Electric Heating with Ceiling Panels	Electric Baseboard Heating	5,048	52.0%	45%	98%	20	\$3,313
Existing	Manufactured	Room Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	5,048	12.0%	0%	95%	25	\$3,675

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Room Heat	Windows	U = 0.19	U=0.30	5,048	6.0%	65%	95%	25	\$2,378
Existing	Manufactured	Room Heat	Windows	U=0.30	Existing Windows (U=0.65)	5,048	15.0%	65%	60%	25	\$5,656
Existing	Manufactured	Water Heat	Water_Heater (40 Gallon Electric)	EF = 0.95	EF = 0.92	3,199	3.2%	NA	NA	15	\$129
Existing	Manufactured	Water Heat	Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)	3,277	9.3%	30%	68%	14	\$252
Existing	Manufactured	Water Heat	Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)	3,277	11.2%	30%	91%	14	\$312
Existing	Manufactured	Water Heat	Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)	3,277	12.8%	30%	91%	14	\$417
Existing	Manufactured	Water Heat	Clothes Washer - Early Replacement	Standard Clothes Washer (1.26)	Existing Clothes Washer (MEF = 1.1)	3,277	3.8%	30%	25%	14	\$378
Existing	Manufactured	Water Heat	Desuperheater (Ground-Source system)	Heat_Pump) Desuperheater with Standard Water_Heater	Standard Water_Heater - EF = 0.92	3,277	55.2%	5%	90%	10	\$251
Existing	Manufactured	Water Heat	Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)	3,277	1.2%	23%	35%	13	\$514
Existing	Manufactured	Water Heat	Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher	3,277	2.2%	23%	15%	13	\$11
Existing	Manufactured	Water Heat	Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery	3,277	18.5%	0%	95%	30	\$630
Existing	Manufactured	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM	3,277	4.9%	95%	95%	9	\$3
Existing	Manufactured	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM	3,277	2.0%	95%	55%	9	\$2
Existing	Manufactured	Water Heat	Faucet Aerators	2.2 GPM	Existing Faucet Aerator (3.0 GPM)	3,277	2.3%	95%	10%	9	\$2
Existing	Manufactured	Water Heat	Heat Pump Water Heater	EF=2.9	No Heat Pump Water Heater	3,277	54.6%	30%	95%	15	\$2,322
Existing	Manufactured	Water Heat	Hot Water Pipe Insulation	R-4 Wrap	No insulation	3,277	1.2%	65%	25%	5	\$8
Existing	Manufactured	Water Heat	Low-Flow Showerheads	1.75 GPM	2.5 GPM	3,277	8.4%	95%	85%	10	\$5
Existing	Manufactured	Water Heat	Low-Flow Showerheads	2.5 GPM	3.0 GPM	3,277	5.6%	95%	33%	10	\$12
Existing	Manufactured	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater	3,277	44.4%	20%	95%	20	\$8,930
Existing	Manufactured	Water Heat	Tankless Water_Heater	EF = 0.95, 4.0 gpm	EF = 0.92	3,277	3.2%	85%	96%	20	\$1,429
Existing	Manufactured	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	3,277	6.5%	0%	55%	10	\$19
Existing	Manufactured	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees	3,277	6.0%	95%	43%	4	\$0
New	Manufactured	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 14	SEER 13	621	6.4%	NA	NA	15	\$336
New	Manufactured	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 16	SEER 13	621	16.1%	NA	NA	15	\$880
New	Manufactured	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 18	SEER 13	621	23.6%	NA	NA	15	\$1,353
New	Manufactured	Central AC	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	538	10.0%	0%	95%	15	\$990
New	Manufactured	Central AC	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	538	31.5%	65%	30%	10	\$353
New	Manufactured	Central AC	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	538	3.3%	75%	25%	30	\$3
New	Manufactured	Central AC	Ceiling Fan	Ceiling Fan	No Ceiling Fan	538	0.5%	85%	45%	10	\$104

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Manufactured	Central AC	Check Mel O&M Tune-up	Tune-up/Maintenance	No Tune-up Maintenance	538	10.0%	90%	50%	5	\$236
New	Manufactured	Central AC	Construction - ICF	Concrete Framing	Standard Wood Framing	538	32.0%	1%	95%	30	\$6,442
New	Manufactured	Central AC	Construction - SIP	Specialty Framing	Standard Wood Framing	538	14.0%	1%	95%	30	\$5,680
New	Manufactured	Central AC	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	538	20.0%	0%	95%	20	\$34
New	Manufactured	Central AC	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	538	0.1%	85%	50%	30	\$116
New	Manufactured	Central AC	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	538	0.1%	85%	55%	12	\$42
New	Manufactured	Central AC	Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	538	8.0%	85%	75%	30	\$126
New	Manufactured	Central AC	Duct Sealing	Duct Sealing	No Duct Sealing	538	6.0%	0%	65%	20	\$447
New	Manufactured	Central AC	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	New homes with AFUE HVAC, SEER 13	538	19.0%	0%	95%	25	\$525
New	Manufactured	Central AC	Ductless Mini-Split REM	2.5 ton, SEER 15, HSPF 9.0	SEER 13 Central AC	538	10.8%	80%	95%	15	\$1,713
New	Manufactured	Central AC	Evaporative Space Cooling	SEER 40	SEER 13	538	70.0%	75%	95%	10	\$1,119
New	Manufactured	Central AC	Green Roof	ecorooft	Standard Roof	538	6.5%	0%	98%	40	\$12669
New	Manufactured	Central AC	Insulation (Ceiling)	R-49	State Code (R-38)	538	0.1%	87%	85%	25	\$582
New	Manufactured	Central AC	Insulation (Floor)	R-38	State Code (R-30)	538	0.1%	75%	90%	25	\$1,061
New	Manufactured	Central AC	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	538	0.0%	95%	50%	25	\$372
New	Manufactured	Central AC	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (5 per unit)	13 SEER	538	15.0%	0%	95%	30	\$96
New	Manufactured	Central AC	Motor - ECM Motor	ECM motor for Central Air Conditioner	Standard Motor	538	4.5%	65%	95%	15	\$368
New	Manufactured	Central AC	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	538	2.0%	95%	40%	5	\$6
New	Manufactured	Central AC	Proper Sizing - Central Air Conditioner	Correctly Sized Air Conditioner Unit	Oversized Air Conditioner Unit	538	6.0%	53%	85%	15	\$1
New	Manufactured	Central AC	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	538	6.7%	0%	97%	30	\$365
New	Manufactured	Central AC	Solar Attic Fan	Solar electric attic ventilation	Standard passive ventilation	538	6.0%	70%	95%	10	\$762
New	Manufactured	Central AC	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	538	6.8%	85%	50%	15	\$27
New	Manufactured	Central AC	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	538	7.0%	65%	95%	12	\$1,150
New	Manufactured	Central AC	VSD Motor - ECM	Variable Speed Motor (ECM) for Central Air Conditioner	Constant Speed Motor	538	13.5%	90%	85%	20	\$341
New	Manufactured	Central AC	Whole-House Dehumidifier	Whole-House Dehumidifier	No Dehumidifier	538	6.0%	50%	95%	11	\$1,439
New	Manufactured	Central AC	Whole-House Fan	Whole-House Fan	No Whole-House Fan	538	22.0%	50%	96%	15	\$334
New	Manufactured	Central AC	Window Overhang	Overhangs over windows for shading	No window overhangs	538	14.0%	50%	80%	30	\$724

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Manufactured	Central AC	Windows	U = 0.19	U=0.30	538	5.0%	85%	95%	25	\$2,757
New	Manufactured	Central Heat	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	4,632	10.0%	0%	95%	15	\$990
New	Manufactured	Central Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	4,632	3.3%	75%	25%	30	\$3
New	Manufactured	Central Heat	Construction - ICF	Concrete Framing	Standard Wood Framing	4,632	44.0%	1%	95%	30	\$6,442
New	Manufactured	Central Heat	Construction - SIP	Specialty Framing	Standard Wood Framing	4,632	14.0%	1%	95%	30	\$5,680
New	Manufactured	Central Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	4,632	5.0%	85%	50%	30	\$116
New	Manufactured	Central Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	4,632	3.0%	85%	55%	12	\$42
New	Manufactured	Central Heat	Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	4,632	8.0%	85%	75%	30	\$126
New	Manufactured	Central Heat	Duct Sealing	Duct Sealing	No Duct Sealing	4,632	6.0%	0%	65%	20	\$447
New	Manufactured	Central Heat	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	New homes with AFUE HVAC, SEER 13	4,632	19.0%	0%	95%	25	\$525
New	Manufactured	Central Heat	Green Roof	ecorooft	Standard Roof	4,632	6.5%	0%	98%	40	\$12669
New	Manufactured	Central Heat	Insulation (Ceiling)	R-49	State Code (R-38)	4,632	3.0%	87%	85%	25	\$582
New	Manufactured	Central Heat	Insulation (Floor)	R-38	State Code (R-30)	4,632	2.0%	75%	90%	25	\$1,061
New	Manufactured	Central Heat	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	4,632	3.2%	95%	50%	25	\$372
New	Manufactured	Central Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (5 per unit)	13 SEER	4,632	15.0%	0%	95%	30	\$96
New	Manufactured	Central Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	4,632	2.0%	95%	40%	5	\$6
New	Manufactured	Central Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	4,632	2.0%	0%	97%	30	\$365
New	Manufactured	Central Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	4,632	3.0%	90%	90%	25	\$4,071
New	Manufactured	Central Heat	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	4,632	10.0%	90%	90%	25	\$5,843
New	Manufactured	Central Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	4,632	6.8%	85%	50%	15	\$27
New	Manufactured	Central Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	4,632	7.0%	65%	95%	12	\$1,150
New	Manufactured	Central Heat	Windows	U = 0.19	U=0.30	4,632	16.0%	85%	95%	25	\$2,757
New	Manufactured	Cooking Oven	Convection Oven	Convection Oven (wall oven)	Standard Oven (wall oven)	435	23.0%	85%	85%	15	\$432
New	Manufactured	Dryer	Clothes Dryer With Moisture Sensor	High-Efficiency Clothes Dryer With Moisture Sensor	Standard Dryer Without Moisture Sensor	720	13.0%	NA	NA	18	\$58
New	Manufactured	Freezer	Freezer - Stand-Alone	Energy Star 14.8 cu ft Chest Freezer	Standard 14.8 cu ft Freezer	553	10.0%	NA	NA	12	\$26
New	Manufactured	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Electric Furnace	Standard Motor	405	25.0%	6%	95%	15	\$368
New	Manufactured	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Gas Furnace	Standard Motor	405	25.0%	72%	95%	15	\$368

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Manufactured	HVAC Aux	VSD Fan	Variable Speed Fan - Electric Furnace	Constant Speed Fan	405	75.0%	40%	85%	20	\$447
New	Manufactured	HVAC Aux	VSD Fan	Variable Speed Fan - Gas Furnace	Constant Speed Fan	405	75.0%	29%	85%	20	\$447
New	Manufactured	Heat Pump	Air Source Heat_Pump	2.5 ton, 14 SEER, 8.5 HSPF	2.5 ton, 13 SEER, 7.7 HSPF	3,441	4.9%	NA	NA	15	\$420
New	Manufactured	Heat Pump	Air Source Heat_Pump	2.5 ton, 16 SEER, 8.8 HSPF	2.5 ton, 13 SEER, 7.7 HSPF	3,441	7.4%	NA	NA	15	\$543
New	Manufactured	Heat Pump	Air Source Heat_Pump	2.5 ton, 18 SEER, 9.0 HSPF	2.5 ton, 13 SEER, 7.7 HSPF	3,441	9.2%	NA	NA	15	\$1,210
New	Manufactured	Heat Pump	Advanced Cold-Climate Heat Pump	16 SEER, 9.6 HSPF	13 SEER, 7.7 HSPF, 2.5 ton	3,249	14.0%	20%	99%	20	\$3,677
New	Manufactured	Heat Pump	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	3,249	10.0%	0%	95%	15	\$990
New	Manufactured	Heat Pump	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	3,249	4.4%	65%	30%	10	\$353
New	Manufactured	Heat Pump	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	3,249	3.3%	75%	25%	30	\$3
New	Manufactured	Heat Pump	Ceiling Fan	Ceiling Fan	No Ceiling Fan	3,249	0.1%	85%	45%	10	\$104
New	Manufactured	Heat Pump	Construction - ICF	Concrete Framing	Standard Wood Framing	3,249	43.3%	1%	95%	30	\$6,442
New	Manufactured	Heat Pump	Construction - SIP	Specialty Framing	Standard Wood Framing	3,249	14.0%	1%	95%	30	\$5,680
New	Manufactured	Heat Pump	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	3,249	2.8%	0%	95%	20	\$34
New	Manufactured	Heat Pump	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	3,249	3.0%	85%	50%	30	\$116
New	Manufactured	Heat Pump	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	3,249	2.0%	85%	55%	12	\$42
New	Manufactured	Heat Pump	Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	3,249	8.0%	85%	75%	30	\$126
New	Manufactured	Heat Pump	Green Roof	ecorroof	Standard Roof	3,249	6.5%	0%	98%	40	\$12669
New	Manufactured	Heat Pump	Heat_Pump - Ground or Water-Source - Open Loop (Desuperheater)	EER = 16.2, COP = 3.6	Air Source Heat_Pump - 13 SEER, 7.7 HSPF (Federal Code) (11.3 EER, 3.2 COP)	3,249	16.8%	15%	99%	18	\$13492
New	Manufactured	Heat Pump	Heat_Pump - Ground or Water-Source - Closed Loop (Desuperheater)	EER = 14.1, COP = 3.3	Air Source Heat_Pump - 13 SEER, 7.7 HSPF (Federal Code) (11.3 EER, 3.2 COP)	3,249	6.2%	30%	99%	18	\$13492
New	Manufactured	Heat Pump	Insulation (Ceiling)	R-49	State Code (R-38)	3,249	2.0%	87%	85%	25	\$582
New	Manufactured	Heat Pump	Insulation (Floor)	R-38	State Code (R-30)	3,249	1.0%	75%	90%	25	\$1,061
New	Manufactured	Heat Pump	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	3,249	2.1%	95%	50%	25	\$372
New	Manufactured	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (5 per unit)	13 SEER	3,249	15.0%	0%	95%	30	\$96
New	Manufactured	Heat Pump	Micro Channel Heat Exchangers (Evaporator)	Micro Channel Heat Exchangers (5 ton unit)	13 SEER, 7.7 HSPF, 2.5 ton	3,249	5.0%	15%	99%	18	\$3,890
New	Manufactured	Heat Pump	Motor - ECM Motor	ECM motor for Heat Pump	Standard Motor	3,249	1.3%	65%	95%	15	\$368
New	Manufactured	Heat Pump	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	3,249	2.0%	95%	40%	5	\$6
New	Manufactured	Heat Pump	PTCS Aerosol-Based Duct Sealing	Spray-in ductwork sealant to minimize duct leaks	No Duct Sealing	3,249	19.0%	60%	65%	25	\$525

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Manufactured	Heat Pump	PTCS Duct Sealing	PTCS Duct Sealing	No Duct Sealing	3,249	15.0%	60%	65%	20	\$447
New	Manufactured	Heat Pump	Proper Sizing - Heat Pump	Correctly Sized Heat_Pump (Cooling And Heating Unit)	Oversized Heat_Pump	3,249	8.6%	53%	85%	15	\$1
New	Manufactured	Heat Pump	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	3,249	2.7%	0%	97%	30	\$365
New	Manufactured	Heat Pump	Small Scale Absorption Cooling	Small Scale Absorption Cooling (5 ton)	13 SEER, 7.7 HSPF, 2.5 ton	3,249	9.0%	0%	99%	20	\$946
New	Manufactured	Heat Pump	Solar Attic Fan	Solar electric attic ventilation	Standard passive ventilation	3,249	0.8%	70%	95%	10	\$762
New	Manufactured	Heat Pump	Solid state refrigeration (cool chips™) for heat pumps	Solid State Thermoelectric cooling system	13 SEER, 7.7 HSPF, 2.5 ton	3,249	18.0%	29%	99%	18	\$2,101
New	Manufactured	Heat Pump	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	3,249	3.0%	90%	90%	25	\$4,071
New	Manufactured	Heat Pump	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	3,249	8.0%	90%	90%	25	\$5,843
New	Manufactured	Heat Pump	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	3,249	6.8%	0%	25%	15	\$27
New	Manufactured	Heat Pump	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	3,249	7.0%	65%	95%	12	\$1,150
New	Manufactured	Heat Pump	VSD Motor - ECM	Variable Speed Motor (ECM) for Heat Pump	Constant Speed Motor	3,249	3.8%	90%	85%	20	\$341
New	Manufactured	Heat Pump	Whole-House Fan	Whole-House Fan	No Whole-House Fan	3,249	3.3%	50%	96%	15	\$334
New	Manufactured	Heat Pump	Windows	U = 0.19	U=0.30	3,249	11.0%	85%	95%	25	\$2,757
New	Manufactured	Lighting	CFL Fixtures, High Use	2-15 W CFLs, 4.0 hr/day (37%)	2-60 W Incandescent	1,289	4.7%	98%	62%	20	\$35
New	Manufactured	Lighting	CFL Fixtures, Low Use	2-15 W CFLs, 1.0 hr/day (32%)	2-60 W Incandescent	1,289	4.0%	98%	62%	20	\$30
New	Manufactured	Lighting	CFL Fixtures, Medium Use	2-15 W CFLs, 2.5 hr/day (33%)	2-60 W Incandescent	1,289	4.2%	98%	62%	20	\$33
New	Manufactured	Lighting	CFL Lamps, High Use	1-15W, 4.0 hr/day (37%)	Incandescent 60W	1,289	34.0%	86%	62%	7	\$2
New	Manufactured	Lighting	CFL Lamps, Low Use	1-15W, 1.0 hr/day (32%)	Incandescent 60W	1,289	9.7%	86%	62%	27	\$2
New	Manufactured	Lighting	CFL Lamps, Medium Use	1-15W, 2.5 hr/day (33%)	Incandescent 60W	1,289	14.0%	86%	62%	11	\$2
New	Manufactured	Lighting	CFL Lighting - 3-Way	13 W, 20W And 25W	30W, 75W, 100W	1,289	1.8%	75%	62%	7	\$13
New	Manufactured	Lighting	CFL Torchieries, High Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	1,289	0.4%	70%	35%	7	\$7
New	Manufactured	Lighting	CFL Torchieries, Low Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	1,289	0.4%	70%	35%	27	\$7
New	Manufactured	Lighting	CFL Torchieries, Medium Use	55 W CFL, (60%)	Incandescent Torchieries, 180W Halogen	1,289	1.3%	70%	35%	11	\$7
New	Manufactured	Lighting	Daylighting Controls (Photocell) - Indoor/Outdoors	Install Photocell	No Daylighting Controls	1,289	4.5%	0%	95%	10	\$110
New	Manufactured	Lighting	LED Christmas Lighting	LED Christmas Lighting	Incandescent Christmas Lighting	1,289	0.4%	40%	85%	13	\$11
New	Manufactured	Lighting	LED Interior Lighting (White), High Use	LED 4W	Incandescent 60W	1,289	42.3%	85%	98%	13	\$31
New	Manufactured	Lighting	LED Interior Lighting (White), Low Use	LED 4W	Incandescent 60W	1,289	12.1%	85%	98%	13	\$31
New	Manufactured	Lighting	LED Interior Lighting (White), Medium Use	LED 4W	Incandescent 60W	1,289	17.4%	85%	98%	13	\$31

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Manufactured	Lighting	Occupancy Sensors	Wall-Switch Occupancy Sensors	No Occupancy Sensor	1,289	14.0%	75%	85%	10	\$64
New	Manufactured	Lighting	Time Clocks (Exterior Lighting)	Exterior Lighting on a Time Clock	Exterior Lighting (Manual Control)	1,289	1.9%	75%	90%	10	\$93
New	Manufactured	Plug Load	1-Watt Standby Power	1W or less standby power use for small appliances	Standard plug load appliance.	1,542	4.2%	15%	85%	7	\$32
New	Manufactured	Plug Load	Energy Star Battery Chargers	Energy Star Battery Chargers	Standard Battery Chargers	1,542	0.2%	55%	40%	7	\$4
New	Manufactured	Plug Load	Energy Star DVD System	Energy Star DVD System	Standard DVD System	1,542	1.9%	100%	24%	7	\$12
New	Manufactured	Plug Load	Energy Star Dehumidifiers	Energy Star Dehumidifiers	Standard Dehumidifiers	1,542	0.5%	15%	5%	10	\$13
New	Manufactured	Plug Load	Energy Star Digital Set Top Receiver	Energy Star Digital Set Top Receiver	Standard Digital Set Top Receiver	1,542	1.9%	94%	62%	6	\$37
New	Manufactured	Plug Load	Energy Star HDTV	Energy Star HDTV	Standard HDTV	1,542	2.5%	24%	70%	9	\$105
New	Manufactured	Plug Load	Energy Star Home Audio System	Energy Star Home Audio System	Standard Home Audio system	1,542	2.6%	92%	90%	7	\$21
New	Manufactured	Plug Load	Energy Star Office Computer	Energy Star Office Computer	Standard Office Computer	1,542	10.4%	73%	15%	4	\$84
New	Manufactured	Plug Load	Energy Star Office Copiers	Energy Star Office Copiers	Standard Office Copiers	1,542	1.5%	17%	55%	6	\$53
New	Manufactured	Plug Load	Energy Star Office Monitor	Energy Star Office Monitor	Standard Office Monitor	1,542	3.3%	100%	15%	4	\$16
New	Manufactured	Plug Load	Energy Star Office Printer	Energy Star Office Printer	Standard Office Printer	1,542	0.3%	62%	40%	5	\$11
New	Manufactured	Plug Load	Energy Star TV	Energy Star TV	Standard TV	1,542	3.5%	100%	38%	9	\$32
New	Manufactured	Plug Load	Energy Star VCR	Energy Star VCR/DVD Combo	Standard Home VCR	1,542	0.7%	100%	45%	4	\$38
New	Manufactured	Plug Load	Power supply transformer/converter - External power adapters	Power supply transformer/converter - High efficiency External power adapters	Standard Efficiency	1,542	0.7%	85%	40%	7	\$8
New	Manufactured	Plug Load	Powerstrip with Occupancy Sensor	Powerstrip with Occupancy Sensor	Powerstrip w/o Occupancy Sensor	1,542	1.0%	75%	90%	10	\$88
New	Manufactured	Refrigerator	Refrigerator/Freezer - Energy Star	Energy Star Refrigerator	Standard Refrigerator	490	20.0%	NA	NA	18	\$32
New	Manufactured	Refrigerator	1 kWh/day Refrigerator	20 cf top-freezer using no more than 1 kWh/day	Standard Refrigerator, 20cf, top-freezer	416	30.0%	90%	97%	19	\$74
New	Manufactured	Refrigerator	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	416	6.3%	85%	95%	5	\$236
New	Manufactured	Refrigerator	Solid state refrigeration (cool chips™) for refrigerators	Thermoelectric refrigerator, 1.7 cubic ft.	Compact refrigerator, 1.7 cubic ft.	416	4.0%	75%	95%	19	\$56
New	Manufactured	Room AC	Air Conditioner - Room (Individual Rooms) (10,000 BTU/HR)	EER = 10.8	EER = 9.8	357	8.6%	NA	NA	10	\$42
New	Manufactured	Room AC	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	336	31.5%	65%	30%	10	\$353
New	Manufactured	Room AC	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	336	3.3%	75%	25%	30	\$3
New	Manufactured	Room AC	Ceiling Fan	Ceiling Fan	No Ceiling Fan	336	0.5%	85%	45%	10	\$104
New	Manufactured	Room AC	Construction - ICF	Concrete Framing	Standard Wood Framing	336	32.0%	1%	95%	30	\$6,442
New	Manufactured	Room AC	Construction - SIP	Specialty Framing	Standard Wood Framing	336	14.0%	1%	95%	30	\$5,680

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Manufactured	Room AC	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	336	20.0%	0%	95%	20	\$34
New	Manufactured	Room AC	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	336	0.1%	85%	50%	30	\$116
New	Manufactured	Room AC	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	336	0.1%	85%	55%	12	\$42
New	Manufactured	Room AC	Green Roof	ecorof	Standard Roof	336	6.5%	0%	98%	40	\$12669
New	Manufactured	Room AC	Insulation (Ceiling)	R-49	State Code (R-38)	336	0.1%	87%	85%	25	\$582
New	Manufactured	Room AC	Insulation (Floor)	R-38	State Code (R-30)	336	0.1%	75%	90%	25	\$1,061
New	Manufactured	Room AC	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	336	0.0%	95%	50%	25	\$372
New	Manufactured	Room AC	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	336	2.0%	95%	40%	5	\$6
New	Manufactured	Room AC	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	336	6.7%	0%	97%	30	\$365
New	Manufactured	Room AC	Window Overhang	Overhangs over windows for shading	No window overhangs	336	14.0%	50%	80%	30	\$724
New	Manufactured	Room AC	Windows	U = 0.19	U=0.30	336	5.0%	85%	95%	25	\$2,757
New	Manufactured	Room Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	3,567	3.3%	75%	25%	30	\$3
New	Manufactured	Room Heat	Construction - ICF	Concrete Framing	Standard Wood Framing	3,567	44.0%	1%	95%	30	\$6,442
New	Manufactured	Room Heat	Construction - SIP	Specialty Framing	Standard Wood Framing	3,567	14.0%	1%	95%	30	\$5,680
New	Manufactured	Room Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	3,567	5.0%	85%	50%	30	\$116
New	Manufactured	Room Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	3,567	3.0%	85%	55%	12	\$42
New	Manufactured	Room Heat	Ductless Mini-Split REM	2.5 ton, SEER 15, HSPF 9.0	Electric Baseboard Heating HSPF=1	3,567	62.1%	80%	95%	15	\$5,311
New	Manufactured	Room Heat	Green Roof	ecorof	Standard Roof	3,567	6.5%	0%	98%	40	\$12669
New	Manufactured	Room Heat	Insulation (Ceiling)	R-49	State Code (R-38)	3,567	3.0%	87%	85%	25	\$582
New	Manufactured	Room Heat	Insulation (Floor)	R-38	State Code (R-30)	3,567	2.0%	75%	90%	25	\$1,061
New	Manufactured	Room Heat	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	3,567	3.2%	95%	50%	25	\$372
New	Manufactured	Room Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	3,567	2.0%	95%	40%	5	\$6
New	Manufactured	Room Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	3,567	2.0%	0%	97%	30	\$365
New	Manufactured	Room Heat	Radiant Electric Ceiling Panels	Radiant Electric Heating with Ceiling Panels	Electric Baseboard Heating	3,567	52.0%	75%	98%	20	\$3,187
New	Manufactured	Room Heat	Radiant Electric Floor Heating	Radiant Heating with Electric Cables in Flooring	Electric Baseboard Heating	3,567	20.0%	75%	95%	25	\$17460
New	Manufactured	Room Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	3,567	3.0%	90%	90%	25	\$4,071
New	Manufactured	Room Heat	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	3,567	10.0%	90%	90%	25	\$5,843
New	Manufactured	Room Heat	Windows	U = 0.19	U=0.30	3,567	16.0%	85%	95%	25	\$2,757
New	Manufactured	Water Heat	Water_Heater (40 Gallon Electric)	EF = 0.95	EF = 0.92	2,765	3.2%	NA	NA	15	\$129

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Manufactured	Water Heat	Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)	2,713	9.3%	30%	68%	14	\$252
New	Manufactured	Water Heat	Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)	2,713	11.2%	30%	91%	14	\$312
New	Manufactured	Water Heat	Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)	2,713	12.8%	30%	91%	14	\$417
New	Manufactured	Water Heat	Desuperheater (Ground-Source system)	Heat_Pump) Desuperheater with Standard Water_Heater	Standard Water_Heater - EF = 0.92	2,713	55.2%	5%	90%	10	\$251
New	Manufactured	Water Heat	Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)	2,713	1.2%	23%	35%	13	\$514
New	Manufactured	Water Heat	Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher	2,713	2.2%	23%	15%	13	\$11
New	Manufactured	Water Heat	Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery	2,713	18.5%	50%	95%	30	\$630
New	Manufactured	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM	2,713	5.9%	95%	95%	9	\$3
New	Manufactured	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM	2,713	2.4%	95%	55%	9	\$2
New	Manufactured	Water Heat	Heat Pump Water Heater	EF=2.9	No Heat Pump Water Heater	2,713	54.6%	30%	95%	15	\$2,322
New	Manufactured	Water Heat	Hot Water Pipe Insulation	R-4 Wrap	No insulation	2,713	1.2%	85%	25%	5	\$8
New	Manufactured	Water Heat	Low-Flow Showerheads	1.75 GPM	2.5 GPM	2,713	10.0%	95%	85%	10	\$5
New	Manufactured	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater	2,713	47.2%	20%	95%	20	\$8,930
New	Manufactured	Water Heat	Tankless Water_Heater	EF = 0.95, 4.0 gpm	EF = 0.92	2,713	3.2%	85%	96%	20	\$1,302
New	Manufactured	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	2,713	6.5%	0%	55%	10	\$19
New	Manufactured	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees	2,713	6.0%	95%	43%	4	\$0
Existing	Multi Family	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 14	SEER 13	619	5.9%	NA	NA	15	\$336
Existing	Multi Family	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 16	SEER 13	619	15.0%	NA	NA	15	\$880
Existing	Multi Family	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 18	SEER 13	619	22.2%	NA	NA	15	\$1,353
Existing	Multi Family	Central AC	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	683	10.0%	0%	95%	15	\$990
Existing	Multi Family	Central AC	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	683	41.3%	65%	30%	10	\$172
Existing	Multi Family	Central AC	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	683	3.3%	60%	55%	30	\$53
Existing	Multi Family	Central AC	Ceiling Fan	Ceiling Fan	No Ceiling Fan	683	0.4%	85%	45%	10	\$104
Existing	Multi Family	Central AC	Check Mel O&M Tune-up	Tune-up/Maintenance	No Tune-up Maintenance	683	10.0%	90%	50%	5	\$236
Existing	Multi Family	Central AC	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	683	20.0%	0%	95%	20	\$24
Existing	Multi Family	Central AC	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	683	0.1%	85%	50%	30	\$58
Existing	Multi Family	Central AC	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	683	0.1%	85%	55%	12	\$21
Existing	Multi Family	Central AC	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	683	2.0%	80%	55%	6	\$36
Existing	Multi Family	Central AC	Duct Sealing	Duct Sealing	No Duct Sealing	683	6.0%	60%	65%	20	\$447

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Multi Family	Central AC	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	683	19.0%	50%	95%	25	\$946
Existing	Multi Family	Central AC	Evaporative Space Cooling	SEER 40	SEER 13	683	70.0%	0%	95%	10	\$1,119
Existing	Multi Family	Central AC	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	683	10.0%	75%	75%	15	\$228
Existing	Multi Family	Central AC	Insulation (Ceiling)	R-49	State Code (R-38)	683	0.3%	87%	85%	25	\$246
Existing	Multi Family	Central AC	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	683	1.0%	95%	40%	25	\$475
Existing	Multi Family	Central AC	Insulation (Ceiling) - below code	State Code (R-38)	R-9	683	0.6%	95%	10%	25	\$475
Existing	Multi Family	Central AC	Insulation (Duct)	R-8	No Duct Insulation	683	3.2%	12%	75%	25	\$141
Existing	Multi Family	Central AC	Insulation (Duct)	R-8	R-4	683	1.6%	12%	95%	25	\$73
Existing	Multi Family	Central AC	Insulation (Floor)	R-38	State Code (R-30)	683	0.1%	75%	90%	25	\$747
Existing	Multi Family	Central AC	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	683	0.1%	80%	40%	25	\$375
Existing	Multi Family	Central AC	Insulation (Floor) - below code	State Code (R-30)	R-0	683	0.1%	80%	10%	25	\$1,125
Existing	Multi Family	Central AC	Insulation (Slab)	R-15	State Code (R-10)	683	1.4%	0%	87%	25	\$221
Existing	Multi Family	Central AC	Insulation (Slab) - average existing value	State Code (R-10)	Average Existing Insulation Value and/or Code Value (R-7)	683	1.3%	0%	65%	25	\$994
Existing	Multi Family	Central AC	Insulation (Slab) - below code	State Code (R-10)	R-0	683	4.3%	0%	60%	25	\$994
Existing	Multi Family	Central AC	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	683	0.0%	10%	90%	25	\$452
Existing	Multi Family	Central AC	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	683	0.1%	75%	45%	25	\$314
Existing	Multi Family	Central AC	Insulation (Wall) 2*4 - below code	R-13	R-0	683	0.1%	75%	5%	25	\$314
Existing	Multi Family	Central AC	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	683	0.1%	0%	40%	25	\$513
Existing	Multi Family	Central AC	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	683	0.1%	0%	35%	25	\$513
Existing	Multi Family	Central AC	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (4 per unit)	13 SEER	683	15.0%	10%	95%	30	\$216
Existing	Multi Family	Central AC	Motor - ECM Motor	ECM motor for Central Air Conditioner	Standard Motor	683	4.5%	65%	95%	15	\$368
Existing	Multi Family	Central AC	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	683	2.0%	95%	60%	5	\$4
Existing	Multi Family	Central AC	Proper Sizing - Central Air Conditioner	Correctly Sized Air Conditioner Unit	Oversized Air Conditioner Unit	683	6.0%	53%	85%	15	\$1
Existing	Multi Family	Central AC	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	683	6.7%	0%	97%	30	\$258
Existing	Multi Family	Central AC	Solar Attic Fan	Solar electric attic ventilation	Standard passive ventilation	683	6.0%	50%	95%	10	\$762
Existing	Multi Family	Central AC	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	683	6.8%	85%	25%	15	\$27

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Multi Family	Central AC	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	683	7.0%	65%	95%	12	\$1,150
Existing	Multi Family	Central AC	VSD Motor - ECM	Variable Speed Motor (ECM) for Central Air Conditioner	Constant Speed Motor	683	13.5%	80%	85%	20	\$341
Existing	Multi Family	Central AC	Whole-House Dehumidifier	Whole-House Dehumidifier	No Dehumidifier	683	6.0%	0%	95%	11	\$1,439
Existing	Multi Family	Central AC	Whole-House Fan	Whole-House Fan	No Whole-House Fan	683	22.0%	0%	96%	15	\$334
Existing	Multi Family	Central AC	Windows	U = 0.19	U=0.30	683	13.0%	75%	95%	25	\$815
Existing	Multi Family	Central AC	Windows	U=0.30	Existing Windows (U=0.65)	683	36.0%	75%	60%	25	\$1,939
Existing	Multi Family	Central Heat	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	5,290	10.0%	0%	95%	15	\$990
Existing	Multi Family	Central Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	5,290	3.3%	60%	55%	30	\$53
Existing	Multi Family	Central Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	5,290	3.0%	85%	50%	30	\$58
Existing	Multi Family	Central Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	5,290	2.0%	85%	55%	12	\$21
Existing	Multi Family	Central Heat	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	5,290	2.0%	80%	55%	6	\$36
Existing	Multi Family	Central Heat	Duct Sealing	Duct Sealing	No Duct Sealing	5,290	6.0%	60%	65%	20	\$447
Existing	Multi Family	Central Heat	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	5,290	19.0%	50%	95%	25	\$946
Existing	Multi Family	Central Heat	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	5,290	10.0%	75%	75%	15	\$228
Existing	Multi Family	Central Heat	Insulation (Ceiling)	R-49	State Code (R-38)	5,290	1.0%	87%	85%	25	\$246
Existing	Multi Family	Central Heat	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	5,290	2.0%	95%	40%	25	\$475
Existing	Multi Family	Central Heat	Insulation (Ceiling) - below code	State Code (R-38)	R-9	5,290	10.2%	95%	10%	25	\$475
Existing	Multi Family	Central Heat	Insulation (Duct)	R-8	No Duct Insulation	5,290	4.3%	12%	75%	25	\$141
Existing	Multi Family	Central Heat	Insulation (Duct)	R-8	R-4	5,290	2.1%	12%	95%	25	\$73
Existing	Multi Family	Central Heat	Insulation (Floor)	R-38	State Code (R-30)	5,290	1.0%	75%	90%	25	\$747
Existing	Multi Family	Central Heat	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	5,290	2.0%	80%	40%	25	\$375
Existing	Multi Family	Central Heat	Insulation (Floor) - below code	State Code (R-30)	R-0	5,290	10.0%	80%	10%	25	\$1,125
Existing	Multi Family	Central Heat	Insulation (Slab)	R-15	State Code (R-10)	5,290	1.4%	0%	87%	25	\$221
Existing	Multi Family	Central Heat	Insulation (Slab) - average existing value	State Code (R-10)	Average Existing Insulation Value and/or Code Value (R-7)	5,290	1.3%	0%	65%	25	\$994
Existing	Multi Family	Central Heat	Insulation (Slab) - below code	State Code (R-10)	R-0	5,290	4.3%	0%	60%	25	\$994
Existing	Multi Family	Central Heat	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	5,290	2.2%	10%	90%	25	\$452

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Multi Family	Central Heat	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	5,290	5.0%	75%	45%	25	\$314
Existing	Multi Family	Central Heat	Insulation (Wall) 2*4 - below code	R-13	R-0	5,290	44.0%	75%	5%	25	\$314
Existing	Multi Family	Central Heat	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	5,290	12.0%	0%	40%	25	\$513
Existing	Multi Family	Central Heat	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	5,290	49.0%	0%	35%	25	\$513
Existing	Multi Family	Central Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (4 per unit)	13 SEER	5,290	15.0%	10%	95%	30	\$216
Existing	Multi Family	Central Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	5,290	2.0%	95%	60%	5	\$4
Existing	Multi Family	Central Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	5,290	2.0%	0%	97%	30	\$258
Existing	Multi Family	Central Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	5,290	12.0%	0%	95%	25	\$1,511
Existing	Multi Family	Central Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	5,290	6.8%	85%	75%	15	\$27
Existing	Multi Family	Central Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	5,290	7.0%	65%	95%	12	\$1,150
Existing	Multi Family	Central Heat	Windows	U = 0.19	U=0.30	5,290	6.0%	75%	95%	25	\$815
Existing	Multi Family	Central Heat	Windows	U=0.30	Existing Windows (U=0.65)	5,290	15.0%	75%	60%	25	\$1,939
Existing	Multi Family	Cooking Oven	Convection Oven	Convection Oven (wall oven)	Standard Oven (wall oven)	435	23.0%	85%	85%	15	\$432
Existing	Multi Family	Dryer	Clothes Dryer With Moisture Sensor	High-Efficiency Clothes Dryer With Moisture Sensor	Standard Dryer Without Moisture Sensor	646	13.0%	NA	NA	18	\$58
Existing	Multi Family	Freezer	Freezer - Stand-Alone	Energy Star 14.8 cu ft Chest Freezer	Standard 14.8 cu ft Freezer	553	10.0%	NA	NA	12	\$26
Existing	Multi Family	Freezer	Stand-Alone Freezer - Early Replacement	Energy Star Freezer	Existing Non-Efficient Freezer	665	9.4%	35%	80%	12	\$489
Existing	Multi Family	Freezer	Stand-Alone Freezer - Removal	Proper Disposal of Freezer	Existing Non-Efficient Freezer	665	248.7%	35%	80%	6	\$103
Existing	Multi Family	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Electric Furnace	Standard Motor	436	25.0%	65%	95%	15	\$368
Existing	Multi Family	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Gas Furnace	Standard Motor	436	25.0%	65%	95%	15	\$368
Existing	Multi Family	HVAC Aux	VSD Fan	Variable Speed Fan - Electric Furnace	Constant Speed Fan	436	75.0%	5%	85%	20	\$447
Existing	Multi Family	HVAC Aux	VSD Fan	Variable Speed Fan - Gas Furnace	Constant Speed Fan	436	75.0%	16%	85%	20	\$447
Existing	Multi Family	Lighting	CFL Fixtures, High Use	2-15 W CFLs, 4.0 hr/day (37%)	2-60 W Incandescent	1,146	4.7%	98%	79%	20	\$35
Existing	Multi Family	Lighting	CFL Fixtures, Low Use	2-15 W CFLs, 1.0 hr/day (32%)	2-60 W Incandescent	1,146	4.0%	98%	79%	20	\$30
Existing	Multi Family	Lighting	CFL Fixtures, Medium Use	2-15 W CFLs, 2.5 hr/day (33%)	2-60 W Incandescent	1,146	4.2%	98%	79%	20	\$33
Existing	Multi Family	Lighting	CFL Lamps, High Use	1-15W, 4.0 hr/day (37%)	Incandescent 60W	1,146	34.0%	86%	79%	7	\$2
Existing	Multi Family	Lighting	CFL Lamps, Low Use	1-15W, 1.0 hr/day (32%)	Incandescent 60W	1,146	9.7%	86%	79%	27	\$2

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Multi Family	Lighting	CFL Lamps, Medium Use	1-15W, 2.5 hr/day (33%)	Incandescent 60W	1,146	14.0%	86%	79%	11	\$2
Existing	Multi Family	Lighting	CFL Lighting - 3-Way	13 W, 20W And 25W	30W, 75W, 100W	1,146	1.8%	75%	79%	7	\$13
Existing	Multi Family	Lighting	CFL Torchieries, High Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	1,146	0.4%	70%	65%	7	\$7
Existing	Multi Family	Lighting	CFL Torchieries, Low Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	1,146	0.4%	70%	65%	27	\$7
Existing	Multi Family	Lighting	CFL Torchieries, Medium Use	55 W CFL, (60%)	Incandescent Torchieries, 180W Halogen	1,146	1.3%	70%	65%	11	\$7
Existing	Multi Family	Lighting	Daylighting Controls (Photocell) - Indoor/Outdoors	Install Photocell	No Daylighting Controls	1,146	4.5%	0%	95%	10	\$151
Existing	Multi Family	Lighting	LED Christmas Lighting	LED Christmas Lighting	Incandescent Christmas Lighting	1,146	0.4%	40%	85%	13	\$11
Existing	Multi Family	Lighting	LED Interior Lighting (White), High Use	LED 4W	Incandescent 60W	1,146	42.3%	85%	98%	13	\$31
Existing	Multi Family	Lighting	LED Interior Lighting (White), Low Use	LED 4W	Incandescent 60W	1,146	12.1%	85%	98%	13	\$31
Existing	Multi Family	Lighting	LED Interior Lighting (White), Medium Use	LED 4W	Incandescent 60W	1,146	17.4%	85%	98%	13	\$31
Existing	Multi Family	Lighting	Occupancy Sensors	Wall-Switch Occupancy Sensors	No Occupancy Sensor	1,146	14.0%	75%	85%	10	\$64
Existing	Multi Family	Lighting	Time Clocks (Exterior Lighting)	Exterior Lighting on a Time Clock	Exterior Lighting (Manual Control)	1,146	1.9%	75%	90%	10	\$93
Existing	Multi Family	Plug Load	1-Watt Standby Power	1W or less standby power use for small appliances	Standard plug load appliance.	1,357	4.2%	15%	85%	7	\$32
Existing	Multi Family	Plug Load	Energy Star Battery Chargers	Energy Star Battery Chargers	Standard Battery Chargers	1,357	0.2%	55%	40%	7	\$4
Existing	Multi Family	Plug Load	Energy Star DVD System	Energy Star DVD System	Standard DVD System	1,357	2.7%	74%	24%	7	\$12
Existing	Multi Family	Plug Load	Energy Star Dehumidifiers	Energy Star Dehumidifiers	Standard Dehumidifiers	1,357	0.6%	15%	5%	10	\$13
Existing	Multi Family	Plug Load	Energy Star Digital Set Top Receiver	Energy Star Digital Set Top Receiver	Standard Digital Set Top Receiver	1,357	1.9%	68%	62%	6	\$37
Existing	Multi Family	Plug Load	Energy Star HDTV	Energy Star HDTV	Standard HDTV	1,357	1.6%	22%	70%	9	\$105
Existing	Multi Family	Plug Load	Energy Star Home Audio System	Energy Star Home Audio System	Standard Home Audio system	1,357	2.4%	66%	90%	7	\$21
Existing	Multi Family	Plug Load	Energy Star Office Computer	Energy Star Office Computer	Standard Office Computer	1,357	12.8%	64%	15%	4	\$84
Existing	Multi Family	Plug Load	Energy Star Office Copiers	Energy Star Office Copiers	Standard Office Copiers	1,357	1.5%	14%	55%	6	\$53
Existing	Multi Family	Plug Load	Energy Star Office Monitor	Energy Star Office Monitor	Standard Office Monitor	1,357	3.0%	82%	15%	4	\$16
Existing	Multi Family	Plug Load	Energy Star Office Printer	Energy Star Office Printer	Standard Office Printer	1,357	0.2%	56%	40%	5	\$11
Existing	Multi Family	Plug Load	Energy Star TV	Energy Star TV	Standard TV	1,357	3.9%	100%	38%	9	\$32
Existing	Multi Family	Plug Load	Energy Star VCR	Energy Star VCR/DVD Combo	Standard Home VCR	1,357	0.9%	85%	45%	4	\$38
Existing	Multi Family	Plug Load	Power supply transformer/converter - External power adapters	Power supply transformer/converter - High efficiency External power adapters	Standard Efficiency	1,357	0.7%	85%	40%	7	\$8
Existing	Multi Family	Plug Load	Powerstrip with Occupancy Sensor	Powerstrip with Occupancy Sensor	Powerstrip w/o Occupancy Sensor	1,357	1.2%	65%	90%	10	\$88
Existing	Multi Family	Refrigerator	Refrigerator/Freezer - Energy Star	Energy Star Refrigerator	Standard Refrigerator	490	20.0%	NA	NA	18	\$32

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Multi Family	Refrigerator	1 kWh/day Refrigerator	20 cf top-freezer using no more than 1 kWh/day	Standard Refrigerator, 20cf, top-freezer	538	30.0%	90%	97%	19	\$74
Existing	Multi Family	Refrigerator	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	538	6.3%	85%	95%	5	\$236
Existing	Multi Family	Refrigerator	Refrigerator/Freezer - Early Replacement	Standard Refrigerator	Existing Refrigerator	538	100.0%	7%	85%	9	\$452
Existing	Multi Family	Refrigerator	Refrigerator/Freezer - Energy Star	Energy Star Refrigerator	Existing Refrigerator	538	20.0%	0%	40%	18	\$651
Existing	Multi Family	Refrigerator	Refrigerator/Freezer - Removal of Secondary	Proper Disposal of Refrigerator/Freezer	Existing Non-Efficient Refrigerator/Freezer	538	282.8%	7%	99%	9	\$103
Existing	Multi Family	Refrigerator	Solid state refrigeration (cool chips™) for refrigerators	Thermoelectric refrigerator, 1.7 cubic ft.	Compact refrigerator, 1.7 cubic ft.	538	4.0%	75%	95%	19	\$56
Existing	Multi Family	Room Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	4,074	3.3%	60%	55%	30	\$53
Existing	Multi Family	Room Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	4,074	3.0%	85%	50%	30	\$58
Existing	Multi Family	Room Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	4,074	2.0%	85%	55%	12	\$21
Existing	Multi Family	Room Heat	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	4,074	2.0%	80%	55%	6	\$31
Existing	Multi Family	Room Heat	Ductless Mini-Split REM	2.5 ton, SEER 15, HSPF 9.0	Electric Baseboard Heating HSPF=1	4,074	62.1%	25%	95%	15	\$5,311
Existing	Multi Family	Room Heat	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	4,074	10.0%	75%	75%	15	\$228
Existing	Multi Family	Room Heat	Insulation (Ceiling)	R-49	State Code (R-38)	4,074	1.0%	87%	85%	25	\$246
Existing	Multi Family	Room Heat	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	4,074	2.0%	95%	40%	25	\$475
Existing	Multi Family	Room Heat	Insulation (Ceiling) - below code	State Code (R-38)	R-9	4,074	10.2%	95%	10%	25	\$475
Existing	Multi Family	Room Heat	Insulation (Duct)	R-8	No Duct Insulation	4,074	4.3%	12%	75%	25	\$141
Existing	Multi Family	Room Heat	Insulation (Duct)	R-8	R-4	4,074	2.1%	12%	95%	25	\$73
Existing	Multi Family	Room Heat	Insulation (Floor)	R-38	State Code (R-30)	4,074	1.0%	75%	90%	25	\$747
Existing	Multi Family	Room Heat	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	4,074	2.0%	80%	40%	25	\$375
Existing	Multi Family	Room Heat	Insulation (Floor) - below code	State Code (R-30)	R-0	4,074	10.0%	80%	10%	25	\$1,125
Existing	Multi Family	Room Heat	Insulation (Slab)	R-15	State Code (R-10)	4,074	1.4%	0%	87%	25	\$221
Existing	Multi Family	Room Heat	Insulation (Slab) - average existing value	State Code (R-10)	Average Existing Insulation Value and/or Code Value (R-7)	4,074	1.3%	0%	65%	25	\$994
Existing	Multi Family	Room Heat	Insulation (Slab) - below code	State Code (R-10)	R-0	4,074	4.3%	0%	60%	25	\$994
Existing	Multi Family	Room Heat	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	4,074	2.2%	10%	90%	25	\$452
Existing	Multi Family	Room Heat	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	4,074	5.0%	75%	45%	25	\$314
Existing	Multi Family	Room Heat	Insulation (Wall) 2*4 - below code	R-13	R-0	4,074	44.0%	75%	5%	25	\$314

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Multi Family	Room Heat	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	4,074	12.0%	0%	40%	25	\$513
Existing	Multi Family	Room Heat	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	4,074	49.0%	0%	35%	25	\$513
Existing	Multi Family	Room Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	4,074	2.0%	95%	60%	5	\$4
Existing	Multi Family	Room Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	4,074	2.0%	0%	97%	30	\$258
Existing	Multi Family	Room Heat	Radiant Electric Ceiling Panels	Radiant Electric Heating with Ceiling Panels	Electric Baseboard Heating	4,074	52.0%	45%	98%	20	\$3,313
Existing	Multi Family	Room Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	4,074	12.0%	0%	95%	25	\$1,511
Existing	Multi Family	Room Heat	Windows	U = 0.19	U=0.30	4,074	6.0%	75%	95%	25	\$815
Existing	Multi Family	Room Heat	Windows	U=0.30	Existing Windows (U=0.65)	4,074	15.0%	75%	60%	25	\$1,939
Existing	Multi Family	Water Heat	Water_Heater (40 Gallon Electric)	EF = 0.95	EF = 0.92	1,893	3.1%	NA	NA	15	\$129
Existing	Multi Family	Water Heat	Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)	1,940	9.3%	25%	68%	14	\$252
Existing	Multi Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)	1,940	11.2%	25%	85%	14	\$312
Existing	Multi Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)	1,940	12.8%	25%	85%	14	\$417
Existing	Multi Family	Water Heat	Clothes Washer - Early Replacement	Standard Clothes Washer (1.26)	Existing Clothes Washer (MEF = 1.1)	1,940	3.8%	25%	25%	14	\$378
Existing	Multi Family	Water Heat	Desuperheater (Ground-Source Heat_Pump) system	Desuperheater with Standard Water_Heater	Standard Water_Heater - EF = 0.92	1,940	55.2%	5%	90%	10	\$251
Existing	Multi Family	Water Heat	Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)	1,940	1.6%	27%	35%	13	\$514
Existing	Multi Family	Water Heat	Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher	1,940	3.0%	27%	15%	13	\$11
Existing	Multi Family	Water Heat	Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery	1,940	18.5%	0%	95%	30	\$630
Existing	Multi Family	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM	1,940	8.3%	95%	95%	9	\$3
Existing	Multi Family	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM	1,940	3.4%	95%	55%	9	\$2
Existing	Multi Family	Water Heat	Faucet Aerators	2.2 GPM	Existing Faucet Aerator (3.0 GPM)	1,940	3.9%	95%	10%	9	\$2
Existing	Multi Family	Water Heat	Heat Pump Water Heater	EF=2.9	No Heat Pump Water Heater	1,940	54.6%	30%	95%	15	\$2,322
Existing	Multi Family	Water Heat	Hot Water Pipe Insulation	R-4 Wrap	No insulation	1,940	1.2%	65%	62%	5	\$8
Existing	Multi Family	Water Heat	Low-Flow Showerheads	1.75 GPM	2.5 GPM	1,940	14.1%	95%	85%	10	\$5
Existing	Multi Family	Water Heat	Low-Flow Showerheads	2.5 GPM	3.0 GPM	1,940	9.4%	95%	33%	10	\$12
Existing	Multi Family	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater	1,940	37.5%	20%	95%	20	\$4,465
Existing	Multi Family	Water Heat	Tankless Water_Heater	EF = 0.95, 4.0 gpm	EF = 0.92	1,940	3.2%	85%	98%	20	\$1,429
Existing	Multi Family	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	1,940	6.5%	0%	73%	10	\$19
Existing	Multi Family	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees	1,940	6.0%	95%	64%	4	\$0

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings		Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
							as Percent of End Use	End				
New	Multi Family	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 14	SEER 13	534	6.1%	NA	NA	15	\$336	
New	Multi Family	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 16	SEER 13	534	15.4%	NA	NA	15	\$880	
New	Multi Family	Central AC	Air Conditioner - Central (2.5 ton unit)	SEER 18	SEER 13	534	22.8%	NA	NA	15	\$1,353	
New	Multi Family	Central AC	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	465	10.0%	0%	95%	15	\$990	
New	Multi Family	Central AC	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	465	31.5%	65%	30%	10	\$172	
New	Multi Family	Central AC	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	465	3.3%	75%	25%	30	\$3	
New	Multi Family	Central AC	Ceiling Fan	Ceiling Fan	No Ceiling Fan	465	0.4%	85%	45%	10	\$104	
New	Multi Family	Central AC	Check Mel O&M Tune-up	Tune-up/Maintenance	No Tune-up Maintenance	465	10.0%	90%	50%	5	\$236	
New	Multi Family	Central AC	Construction - ICF	Concrete Framing	Standard Wood Framing	465	32.0%	45%	95%	30	\$2,650	
New	Multi Family	Central AC	Construction - SIP	Specialty Framing	Standard Wood Framing	465	14.0%	20%	95%	30	\$2,380	
New	Multi Family	Central AC	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	465	20.0%	0%	95%	20	\$24	
New	Multi Family	Central AC	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	465	0.1%	85%	50%	30	\$58	
New	Multi Family	Central AC	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	465	0.1%	85%	55%	12	\$21	
New	Multi Family	Central AC	Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	465	8.0%	85%	10%	30	\$106	
New	Multi Family	Central AC	Duct Sealing	Duct Sealing	No Duct Sealing	465	6.0%	0%	65%	20	\$447	
New	Multi Family	Central AC	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	New homes with AFUE HVAC, SEER 13	465	19.0%	0%	95%	25	\$525	
New	Multi Family	Central AC	Ductless Mini-Split REM	2.5 ton, SEER 15, HSPF 9.0	SEER 13 Central AC	465	11.3%	80%	95%	15	\$2,114	
New	Multi Family	Central AC	Evaporative Space Cooling	SEER 40	SEER 13	465	70.0%	0%	95%	10	\$1,119	
New	Multi Family	Central AC	Green Roof	ecorooF	Standard Roof	465	6.5%	0%	98%	40	\$6,206	
New	Multi Family	Central AC	Insulation (Ceiling)	R-49	State Code (R-38)	465	0.1%	87%	85%	25	\$336	
New	Multi Family	Central AC	Insulation (Floor)	R-38	State Code (R-30)	465	0.1%	75%	90%	25	\$747	
New	Multi Family	Central AC	Insulation (Slab)	R-15	State Code (R-10)	465	1.4%	65%	64%	25	\$221	
New	Multi Family	Central AC	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	465	0.0%	95%	90%	25	\$372	
New	Multi Family	Central AC	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (4 per unit)	13 SEER	465	15.0%	0%	95%	30	\$96	
New	Multi Family	Central AC	Motor - ECM Motor	ECM motor for Central Air Conditioner	Standard Motor	465	4.5%	65%	95%	15	\$368	
New	Multi Family	Central AC	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	465	2.0%	95%	40%	5	\$4	
New	Multi Family	Central AC	Proper Sizing - Central Air Conditioner	Correctly Sized Air Conditioner Unit	Oversized Air Conditioner Unit	465	6.0%	53%	85%	15	\$1	
New	Multi Family	Central AC	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	465	6.7%	0%	97%	30	\$258	

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Multi Family	Central AC	Solar Attic Fan	Solar electric attic ventilation	Standard passive ventilation	465	6.0%	70%	95%	10	\$762
New	Multi Family	Central AC	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	465	6.8%	85%	25%	15	\$27
New	Multi Family	Central AC	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	465	7.0%	65%	95%	12	\$1,150
New	Multi Family	Central AC	VSD Motor - ECM	Variable Speed Motor (ECM) for Central Air Conditioner	Constant Speed Motor	465	13.5%	90%	85%	20	\$341
New	Multi Family	Central AC	Whole-House Dehumidifier	Whole-House Dehumidifier	No Dehumidifier	465	6.0%	0%	95%	11	\$1,439
New	Multi Family	Central AC	Whole-House Fan	Whole-House Fan	No Whole-House Fan	465	22.0%	0%	96%	15	\$334
New	Multi Family	Central AC	Window Overhang	Overhangs over windows for shading	No window overhangs	465	14.0%	50%	80%	30	\$724
New	Multi Family	Central AC	Windows	U = 0.19	U=0.30	465	5.0%	85%	95%	25	\$1,155
New	Multi Family	Central Heat	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	3,321	10.0%	0%	95%	15	\$990
New	Multi Family	Central Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	3,321	3.3%	75%	25%	30	\$3
New	Multi Family	Central Heat	Construction - ICF	Concrete Framing	Standard Wood Framing	3,321	44.0%	45%	95%	30	\$2,650
New	Multi Family	Central Heat	Construction - SIP	Specialty Framing	Standard Wood Framing	3,321	14.0%	20%	95%	30	\$2,380
New	Multi Family	Central Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	3,321	5.0%	85%	50%	30	\$58
New	Multi Family	Central Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	3,321	3.0%	85%	55%	12	\$21
New	Multi Family	Central Heat	Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	3,321	8.0%	85%	10%	30	\$106
New	Multi Family	Central Heat	Duct Sealing	Duct Sealing	No Duct Sealing	3,321	6.0%	0%	65%	20	\$447
New	Multi Family	Central Heat	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	New homes with AFUE HVAC, SEER 13	3,321	19.0%	0%	95%	25	\$525
New	Multi Family	Central Heat	Green Roof	ecorroof	Standard Roof	3,321	6.5%	0%	98%	40	\$6,206
New	Multi Family	Central Heat	Insulation (Ceiling)	R-49	State Code (R-38)	3,321	3.0%	87%	85%	25	\$336
New	Multi Family	Central Heat	Insulation (Floor)	R-38	State Code (R-30)	3,321	2.0%	75%	90%	25	\$747
New	Multi Family	Central Heat	Insulation (Slab)	R-15	State Code (R-10)	3,321	1.4%	65%	64%	25	\$221
New	Multi Family	Central Heat	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	3,321	3.2%	95%	90%	25	\$372
New	Multi Family	Central Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (4 per unit)	13 SEER	3,321	15.0%	0%	95%	30	\$96
New	Multi Family	Central Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	3,321	2.0%	95%	40%	5	\$4
New	Multi Family	Central Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	3,321	2.0%	0%	97%	30	\$258
New	Multi Family	Central Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	3,321	3.0%	90%	90%	25	\$1,706
New	Multi Family	Central Heat	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	3,321	10.0%	90%	90%	25	\$2,448

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Multi Family	Central Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	3,321	6.8%	85%	75%	15	\$27
New	Multi Family	Central Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	3,321	7.0%	65%	95%	12	\$1,150
New	Multi Family	Central Heat	Windows	U = 0.19	U=0.30	3,321	16.0%	85%	95%	25	\$1,155
New	Multi Family	Cooking Oven	Convection Oven	Convection Oven (wall oven)	Standard Oven (wall oven)	435	23.0%	85%	85%	15	\$432
New	Multi Family	Dryer	Clothes Dryer With Moisture Sensor	High-Efficiency Clothes Dryer With Moisture Sensor	Standard Dryer Without Moisture Sensor	646	13.0%	NA	NA	18	\$58
New	Multi Family	Freezer	Freezer - Stand-Alone	Energy Star 14.8 cu ft Chest Freezer	Standard 14.8 cu ft Freezer	553	10.0%	NA	NA	12	\$26
New	Multi Family	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Electric Furnace	Standard Motor	340	25.0%	10%	95%	15	\$368
New	Multi Family	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Gas Furnace	Standard Motor	340	25.0%	72%	95%	15	\$368
New	Multi Family	HVAC Aux	VSD Fan	Variable Speed Fan - Electric Furnace	Constant Speed Fan	340	75.0%	5%	85%	20	\$447
New	Multi Family	HVAC Aux	VSD Fan	Variable Speed Fan - Gas Furnace	Constant Speed Fan	340	75.0%	16%	85%	20	\$447
New	Multi Family	Lighting	CFL Fixtures, High Use	2-15 W CFLs, 4.0 hr/day (37%)	2-60 W Incandescent	1,148	4.7%	98%	79%	20	\$35
New	Multi Family	Lighting	CFL Fixtures, Low Use	2-15 W CFLs, 1.0 hr/day (32%)	2-60 W Incandescent	1,148	4.0%	98%	79%	20	\$30
New	Multi Family	Lighting	CFL Fixtures, Medium Use	2-15 W CFLs, 2.5 hr/day (33%)	2-60 W Incandescent	1,148	4.2%	98%	79%	20	\$33
New	Multi Family	Lighting	CFL Lamps, High Use	1-15W, 4.0 hr/day (37%)	Incandescent 60W	1,148	34.0%	86%	79%	7	\$2
New	Multi Family	Lighting	CFL Lamps, Low Use	1-15W, 1.0 hr/day (32%)	Incandescent 60W	1,148	9.7%	86%	79%	27	\$2
New	Multi Family	Lighting	CFL Lamps, Medium Use	1-15W, 2.5 hr/day (33%)	Incandescent 60W	1,148	14.0%	86%	79%	11	\$2
New	Multi Family	Lighting	CFL Lighting - 3-Way	13 W, 20W And 25W	30W, 75W, 100W	1,148	1.8%	75%	79%	7	\$13
New	Multi Family	Lighting	CFL Torchieries, High Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	1,148	0.4%	70%	35%	7	\$7
New	Multi Family	Lighting	CFL Torchieries, Low Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	1,148	0.4%	70%	35%	27	\$7
New	Multi Family	Lighting	CFL Torchieries, Medium Use	55 W CFL, (60%)	Incandescent Torchieries, 180W Halogen	1,148	1.3%	70%	35%	11	\$7
New	Multi Family	Lighting	Daylighting Controls (Photocell) - Indoor/Outdoors	Install Photocell	No Daylighting Controls	1,148	4.5%	0%	95%	10	\$110
New	Multi Family	Lighting	LED Christmas Lighting	LED Christmas Lighting	Incandescent Christmas Lighting	1,148	0.4%	40%	85%	13	\$11
New	Multi Family	Lighting	LED Interior Lighting (White), High Use	LED 4W	Incandescent 60W	1,148	42.3%	85%	98%	13	\$31
New	Multi Family	Lighting	LED Interior Lighting (White), Low Use	LED 4W	Incandescent 60W	1,148	12.1%	85%	98%	13	\$31
New	Multi Family	Lighting	LED Interior Lighting (White), Medium Use	LED 4W	Incandescent 60W	1,148	17.4%	85%	98%	13	\$31
New	Multi Family	Lighting	Occupancy Sensors	Wall-Switch Occupancy Sensors	No Occupancy Sensor	1,148	14.0%	75%	85%	10	\$64
New	Multi Family	Lighting	Time Clocks (Exterior Lighting)	Exterior Lighting on a Time Clock	Exterior Lighting (Manual Control)	1,148	1.9%	75%	90%	10	\$93

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Multi Family	Plug Load	1-Watt Standby Power	1W or less standby power use for small appliances	Standard plug load appliance.	1,357	4.2%	15%	85%	7	\$32
New	Multi Family	Plug Load	Energy Star Battery Chargers	Energy Star Battery Chargers	Standard Battery Chargers	1,357	0.2%	55%	40%	7	\$4
New	Multi Family	Plug Load	Energy Star DVD System	Energy Star DVD System	Standard DVD System	1,357	2.7%	74%	24%	7	\$12
New	Multi Family	Plug Load	Energy Star Dehumidifiers	Energy Star Dehumidifiers	Standard Dehumidifiers	1,357	0.6%	15%	5%	10	\$13
New	Multi Family	Plug Load	Energy Star Digital Set Top Receiver	Energy Star Digital Set Top Receiver	Standard Digital Set Top Receiver	1,357	1.9%	68%	62%	6	\$37
New	Multi Family	Plug Load	Energy Star HDTV	Energy Star HDTV	Standard HDTV	1,357	1.6%	22%	70%	9	\$105
New	Multi Family	Plug Load	Energy Star Home Audio System	Energy Star Home Audio System	Standard Home Audio system	1,357	2.4%	66%	90%	7	\$21
New	Multi Family	Plug Load	Energy Star Office Computer	Energy Star Office Computer	Standard Office Computer	1,357	12.8%	64%	15%	4	\$84
New	Multi Family	Plug Load	Energy Star Office Copiers	Energy Star Office Copiers	Standard Office Copiers	1,357	1.5%	14%	55%	6	\$53
New	Multi Family	Plug Load	Energy Star Office Monitor	Energy Star Office Monitor	Standard Office Monitor	1,357	3.0%	82%	15%	4	\$16
New	Multi Family	Plug Load	Energy Star Office Printer	Energy Star Office Printer	Standard Office Printer	1,357	0.2%	56%	40%	5	\$11
New	Multi Family	Plug Load	Energy Star TV	Energy Star TV	Standard TV	1,357	3.9%	100%	38%	9	\$32
New	Multi Family	Plug Load	Energy Star VCR	Energy Star VCR/DVD Combo	Standard Home VCR	1,357	0.9%	85%	45%	4	\$38
New	Multi Family	Plug Load	Power supply transformer/converter - External power adapters	Power supply transformer/converter - High efficiency External power adapters	Standard Efficiency	1,357	0.7%	85%	40%	7	\$8
New	Multi Family	Plug Load	Powerstrip with Occupancy Sensor	Powerstrip with Occupancy Sensor	Powerstrip w/o Occupancy Sensor	1,357	1.2%	65%	90%	10	\$88
New	Multi Family	Refrigerator	Refrigerator/Freezer - Energy Star	Energy Star Refrigerator	Standard Refrigerator	490	20.0%	NA	NA	18	\$32
New	Multi Family	Refrigerator	1 kWh/day Refrigerator	20 cf top-freezer using no more than 1 kWh/day	Standard Refrigerator, 20cf, top-freezer	416	30.0%	90%	97%	19	\$74
New	Multi Family	Refrigerator	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	416	6.3%	85%	95%	5	\$236
New	Multi Family	Refrigerator	Solid state refrigeration (cool chips™) for refrigerators	Thermoelectric refrigerator, 1.7 cubic ft. refrigerators	Compact refrigerator, 1.7 cubic ft.	416	4.0%	75%	95%	19	\$56
New	Multi Family	Room Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	2,557	3.3%	75%	25%	30	\$3
New	Multi Family	Room Heat	Construction - ICF	Concrete Framing	Standard Wood Framing	2,557	44.0%	45%	95%	30	\$2,650
New	Multi Family	Room Heat	Construction - SIP	Specialty Framing	Standard Wood Framing	2,557	14.0%	20%	95%	30	\$2,380
New	Multi Family	Room Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	2,557	5.0%	85%	50%	30	\$58
New	Multi Family	Room Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	2,557	3.0%	85%	55%	12	\$21
New	Multi Family	Room Heat	Ductless Mini-Split REM	2.5 ton, SEER 15, HSPF 9.0	Electric Baseboard Heating HSPF=1	2,557	62.1%	80%	95%	15	\$5,311
New	Multi Family	Room Heat	Green Roof	ecorroof	Standard Roof	2,557	6.5%	0%	98%	40	\$6,206
New	Multi Family	Room Heat	Insulation (Ceiling)	R-49	State Code (R-38)	2,557	3.0%	87%	85%	25	\$336
New	Multi Family	Room Heat	Insulation (Floor)	R-38	State Code (R-30)	2,557	2.0%	75%	90%	25	\$747

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Multi Family	Room Heat	Insulation (Slab)	R-15	State Code (R-10)	2,557	1.4%	65%	64%	25	\$221
New	Multi Family	Room Heat	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	2,557	3.2%	95%	90%	25	\$372
New	Multi Family	Room Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	2,557	2.0%	95%	40%	5	\$4
New	Multi Family	Room Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	2,557	2.0%	0%	97%	30	\$258
New	Multi Family	Room Heat	Radiant Electric Ceiling Panels	Radiant Electric Heating with Ceiling Panels	Electric Baseboard Heating	2,557	52.0%	75%	98%	20	\$3,187
New	Multi Family	Room Heat	Radiant Electric Floor Heating	Radiant Heating with Electric Cables in Flooring	Electric Baseboard Heating	2,557	20.0%	75%	95%	25	\$12838
New	Multi Family	Room Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	2,557	3.0%	90%	90%	25	\$1,706
New	Multi Family	Room Heat	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	2,557	10.0%	90%	90%	25	\$2,448
New	Multi Family	Room Heat	Windows	U = 0.19	U=0.30	2,557	16.0%	85%	95%	25	\$1,155
New	Multi Family	Water Heat	Water_Heater (40 Gallon Electric)	EF = 0.95	EF = 0.92	1,676	3.1%	NA	NA	15	\$129
New	Multi Family	Water Heat	Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)	1,645	9.3%	25%	68%	14	\$252
New	Multi Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)	1,645	11.2%	25%	85%	14	\$312
New	Multi Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)	1,645	12.8%	25%	85%	14	\$417
New	Multi Family	Water Heat	Desuperheater (Ground-Source system)	Heat_Pump) Desuperheater with Standard Water_Heater	Standard Water_Heater - EF = 0.92	1,645	55.2%	5%	90%	10	\$251
New	Multi Family	Water Heat	Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)	1,645	1.6%	27%	35%	13	\$514
New	Multi Family	Water Heat	Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher	1,645	3.0%	27%	15%	13	\$11
New	Multi Family	Water Heat	Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery	1,645	18.5%	50%	95%	30	\$630
New	Multi Family	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM	1,645	9.7%	95%	95%	9	\$3
New	Multi Family	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM	1,645	4.0%	95%	55%	9	\$2
New	Multi Family	Water Heat	Heat Pump Water Heater	EF=2.9	No Heat Pump Water Heater	1,645	54.6%	30%	95%	15	\$2,322
New	Multi Family	Water Heat	Hot Water Pipe Insulation	R-4 Wrap	No insulation	1,645	1.2%	85%	62%	5	\$8
New	Multi Family	Water Heat	Low-Flow Showerheads	1.75 GPM	2.5 GPM	1,645	16.5%	95%	85%	10	\$5
New	Multi Family	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater	1,645	38.9%	20%	95%	20	\$4,465
New	Multi Family	Water Heat	Tankless Water_Heater	EF = 0.95, 4.0 gpm	EF = 0.92	1,645	3.2%	85%	98%	20	\$1,302
New	Multi Family	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	1,645	6.5%	0%	73%	10	\$19
New	Multi Family	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees	1,645	6.0%	95%	64%	4	\$0
Existing	Single Family	Central AC	Air Conditioner - Central (3.0 ton unit)	SEER 14	SEER 13	864	5.7%	NA	NA	15	\$368
Existing	Single Family	Central AC	Air Conditioner - Central (3.0 ton unit)	SEER 16	SEER 13	864	15.1%	NA	NA	15	\$1,061
Existing	Single Family	Central AC	Air Conditioner - Central (3.0 ton unit)	SEER 18	SEER 13	864	26.9%	NA	NA	15	\$1,789

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Central AC	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	958	10.0%	0%	95%	15	\$990
Existing	Single Family	Central AC	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	958	41.3%	65%	30%	10	\$603
Existing	Single Family	Central AC	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	958	3.3%	60%	55%	30	\$53
Existing	Single Family	Central AC	Ceiling Fan	Ceiling Fan	No Ceiling Fan	958	0.3%	85%	20%	10	\$104
Existing	Single Family	Central AC	Check Mel O&M Tune-up	Tune-up/Maintenance	No Tune-up Maintenance	958	10.0%	90%	50%	5	\$236
Existing	Single Family	Central AC	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	958	20.0%	0%	95%	20	\$57
Existing	Single Family	Central AC	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	958	0.1%	85%	50%	30	\$116
Existing	Single Family	Central AC	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	958	0.1%	85%	55%	12	\$42
Existing	Single Family	Central AC	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	958	2.0%	80%	45%	6	\$36
Existing	Single Family	Central AC	Duct Sealing	Duct Sealing	No Duct Sealing	958	6.0%	60%	65%	20	\$447
Existing	Single Family	Central AC	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	958	19.0%	50%	95%	25	\$946
Existing	Single Family	Central AC	Evaporative Space Cooling	SEER 40	SEER 13	958	70.0%	75%	95%	10	\$1,119
Existing	Single Family	Central AC	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	958	10.0%	75%	75%	15	\$455
Existing	Single Family	Central AC	Insulation (Basement - Wall) 2'4	R-13 + R-5 sheathing	R-13	958	6.1%	13%	95%	25	\$708
Existing	Single Family	Central AC	Insulation (Basement - Wall) 2'4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-7)	958	6.9%	13%	70%	25	\$906
Existing	Single Family	Central AC	Insulation (Basement - Wall) 2'4 - below code	R-13	R-0	958	14.9%	13%	70%	25	\$906
Existing	Single Family	Central AC	Insulation (Ceiling)	R-49	State Code (R-38)	958	0.3%	87%	85%	25	\$344
Existing	Single Family	Central AC	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	958	1.0%	95%	40%	25	\$562
Existing	Single Family	Central AC	Insulation (Ceiling) - below code	State Code (R-38)	R-9	958	0.6%	95%	10%	25	\$562
Existing	Single Family	Central AC	Insulation (Duct)	R-8	No Duct Insulation	958	3.2%	12%	75%	25	\$335
Existing	Single Family	Central AC	Insulation (Duct)	R-8	R-4	958	1.6%	12%	95%	25	\$172
Existing	Single Family	Central AC	Insulation (Floor)	R-38	State Code (R-30)	958	0.1%	75%	90%	25	\$884
Existing	Single Family	Central AC	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	958	0.1%	55%	40%	25	\$443
Existing	Single Family	Central AC	Insulation (Floor) - below code	State Code (R-30)	R-0	958	0.1%	55%	10%	25	\$1,331
Existing	Single Family	Central AC	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	958	3.0%	60%	45%	25	\$130
Existing	Single Family	Central AC	Insulation (Rim And Band Joist)	R-19	R-10	958	4.0%	60%	75%	25	\$84
Existing	Single Family	Central AC	Insulation (Slab)	R-15	State Code (R-10)	958	1.4%	0%	87%	25	\$223

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Central AC	Insulation (Slab) - average existing value	State Code (R-10)	Average Existing Insulation Value and/or Code Value (R-7)	958	1.3%	0%	65%	25	\$1,049
Existing	Single Family	Central AC	Insulation (Slab) - below code	State Code (R-10)	R-0	958	4.3%	0%	60%	25	\$1,049
Existing	Single Family	Central AC	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	958	0.0%	10%	90%	25	\$1,786
Existing	Single Family	Central AC	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	958	0.1%	75%	45%	25	\$1,396
Existing	Single Family	Central AC	Insulation (Wall) 2*4 - below code	R-13	R-0	958	0.1%	75%	5%	25	\$1,396
Existing	Single Family	Central AC	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	958	0.1%	0%	60%	25	\$2,276
Existing	Single Family	Central AC	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	958	0.1%	0%	50%	25	\$2,276
Existing	Single Family	Central AC	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (6 per unit)	13 SEER	958	15.0%	10%	95%	30	\$288
Existing	Single Family	Central AC	Motor - ECM Motor	ECM motor for Central Air Conditioner	Standard Motor	958	4.5%	65%	95%	15	\$368
Existing	Single Family	Central AC	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	958	2.0%	95%	60%	5	\$7
Existing	Single Family	Central AC	Proper Sizing - Central Air Conditioner	Correctly Sized Air Conditioner Unit	Oversized Air Conditioner Unit	958	6.0%	53%	85%	15	\$1
Existing	Single Family	Central AC	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	958	6.7%	0%	97%	30	\$305
Existing	Single Family	Central AC	Solar Attic Fan	Solar electric attic ventilation	Standard passive ventilation	958	6.0%	50%	95%	10	\$762
Existing	Single Family	Central AC	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	958	6.8%	85%	24%	15	\$27
Existing	Single Family	Central AC	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	958	7.0%	65%	95%	12	\$1,422
Existing	Single Family	Central AC	VSD Motor - ECM	Variable Speed Motor (ECM) for Central Air Conditioner	Constant Speed Motor	958	13.5%	80%	85%	20	\$341
Existing	Single Family	Central AC	Whole-House Dehumidifier	Whole-House Dehumidifier	No Dehumidifier	958	6.0%	50%	95%	11	\$1,439
Existing	Single Family	Central AC	Whole-House Fan	Whole-House Fan	No Whole-House Fan	958	22.0%	50%	96%	15	\$334
Existing	Single Family	Central AC	Windows	U = 0.19	U=0.30	958	13.0%	75%	95%	25	\$4,343
Existing	Single Family	Central AC	Windows	U=0.30	Existing Windows (U=0.65)	958	36.0%	75%	60%	25	\$10331
Existing	Single Family	Central Heat	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	8,893	10.0%	0%	95%	15	\$990
Existing	Single Family	Central Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	8,893	3.3%	60%	55%	30	\$53
Existing	Single Family	Central Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	8,893	3.0%	85%	50%	30	\$116
Existing	Single Family	Central Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	8,893	2.0%	85%	55%	12	\$42
Existing	Single Family	Central Heat	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	8,893	2.0%	80%	45%	6	\$36
Existing	Single Family	Central Heat	Duct Sealing	Duct Sealing	No Duct Sealing	8,893	6.0%	60%	65%	20	\$447

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Central Heat	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	8,893	19.0%	50%	95%	25	\$946
Existing	Single Family	Central Heat	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	8,893	10.0%	75%	75%	15	\$455
Existing	Single Family	Central Heat	Insulation (Basement - Wall) 2*4	R-13 + R-5 sheathing	R-13	8,893	6.1%	13%	95%	25	\$708
Existing	Single Family	Central Heat	Insulation (Basement - Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-7)	8,893	6.9%	13%	70%	25	\$906
Existing	Single Family	Central Heat	Insulation (Basement - Wall) 2*4 - below code	R-13	R-0	8,893	14.9%	13%	70%	25	\$906
Existing	Single Family	Central Heat	Insulation (Ceiling)	R-49	State Code (R-38)	8,893	1.0%	87%	85%	25	\$344
Existing	Single Family	Central Heat	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	8,893	2.0%	95%	40%	25	\$562
Existing	Single Family	Central Heat	Insulation (Ceiling) - below code	State Code (R-38)	R-9	8,893	10.2%	95%	10%	25	\$562
Existing	Single Family	Central Heat	Insulation (Duct)	R-8	No Duct Insulation	8,893	4.3%	12%	75%	25	\$335
Existing	Single Family	Central Heat	Insulation (Duct)	R-8	R-4	8,893	2.1%	12%	95%	25	\$172
Existing	Single Family	Central Heat	Insulation (Floor)	R-38	State Code (R-30)	8,893	1.0%	75%	90%	25	\$884
Existing	Single Family	Central Heat	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	8,893	2.0%	55%	40%	25	\$443
Existing	Single Family	Central Heat	Insulation (Floor) - below code	State Code (R-30)	R-0	8,893	10.0%	55%	10%	25	\$1,331
Existing	Single Family	Central Heat	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	8,893	3.0%	60%	45%	25	\$130
Existing	Single Family	Central Heat	Insulation (Rim And Band Joist)	R-19	R-10	8,893	4.0%	60%	75%	25	\$84
Existing	Single Family	Central Heat	Insulation (Slab)	R-15	State Code (R-10)	8,893	1.4%	0%	87%	25	\$223
Existing	Single Family	Central Heat	Insulation (Slab) - average existing value	State Code (R-10)	Average Existing Insulation Value and/or Code Value (R-7)	8,893	1.3%	0%	65%	25	\$1,049
Existing	Single Family	Central Heat	Insulation (Slab) - below code	State Code (R-10)	R-0	8,893	4.3%	0%	60%	25	\$1,049
Existing	Single Family	Central Heat	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	8,893	2.2%	10%	90%	25	\$1,786
Existing	Single Family	Central Heat	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	8,893	5.0%	75%	45%	25	\$1,396
Existing	Single Family	Central Heat	Insulation (Wall) 2*4 - below code	R-13	R-0	8,893	44.0%	75%	5%	25	\$1,396
Existing	Single Family	Central Heat	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	8,893	12.0%	0%	60%	25	\$2,276
Existing	Single Family	Central Heat	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	8,893	49.0%	0%	50%	25	\$2,276
Existing	Single Family	Central Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (6 per unit)	13 SEER	8,893	15.0%	10%	95%	30	\$288
Existing	Single Family	Central Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	8,893	2.0%	95%	60%	5	\$7

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Central Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	8,893	2.0%	0%	97%	30	\$305
Existing	Single Family	Central Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	8,893	12.0%	0%	95%	25	\$6,711
Existing	Single Family	Central Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	8,893	6.8%	85%	33%	15	\$27
Existing	Single Family	Central Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	8,893	7.0%	65%	95%	12	\$1,422
Existing	Single Family	Central Heat	Windows	U = 0.19	U=0.30	8,893	6.0%	75%	95%	25	\$4,343
Existing	Single Family	Central Heat	Windows	U=0.30	Existing Windows (U=0.65)	8,893	15.0%	75%	60%	25	\$10331
Existing	Single Family	Cooking Oven	Convection Oven	Convection Oven (wall oven)	Standard Oven (wall oven)	435	23.0%	85%	85%	15	\$432
Existing	Single Family	Dryer	Clothes Dryer With Moisture Sensor	High-Efficiency Clothes Dryer With Moisture Sensor	Standard Dryer Without Moisture Sensor	858	13.0%	NA	NA	18	\$58
Existing	Single Family	Freezer	Freezer - Stand-Alone	Energy Star 14.8 cu ft Chest Freezer	Standard 14.8 cu ft Freezer	553	10.0%	NA	NA	12	\$26
Existing	Single Family	Freezer	Stand-Alone Freezer - Early Replacement	Energy Star Freezer	Existing Non-Efficient Freezer	665	9.4%	35%	80%	12	\$489
Existing	Single Family	Freezer	Stand-Alone Freezer - Removal	Proper Disposal of Freezer	Existing Non-Efficient Freezer	665	248.7%	35%	80%	6	\$103
Existing	Single Family	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Electric Furnace	Standard Motor	550	25.0%	65%	95%	15	\$368
Existing	Single Family	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Gas Furnace	Standard Motor	550	25.0%	65%	95%	15	\$368
Existing	Single Family	HVAC Aux	VSD Fan	Variable Speed Fan - Electric Furnace	Constant Speed Fan	550	75.0%	7%	85%	20	\$447
Existing	Single Family	HVAC Aux	VSD Fan	Variable Speed Fan - Gas Furnace	Constant Speed Fan	550	75.0%	66%	85%	20	\$447
Existing	Single Family	Heat Pump	Air Source Heat_Pump	3 ton, 14 SEER, 8.5 HSPF	3 ton, 13 SEER, 7.7 HSPF	6,748	4.9%	NA	NA	15	\$517
Existing	Single Family	Heat Pump	Air Source Heat_Pump	3 ton, 16 SEER, 8.8 HSPF	3 ton, 13 SEER, 7.7 HSPF	6,748	7.4%	NA	NA	15	\$660
Existing	Single Family	Heat Pump	Air Source Heat_Pump	3 ton, 18 SEER, 9.0 HSPF	3 ton, 13 SEER, 7.7 HSPF	6,748	9.2%	NA	NA	15	\$1,435
Existing	Single Family	Heat Pump	Advanced Cold-Climate Heat Pump	16 SEER, 9.6 HSPF	13 SEER, 7.7 HSPF, 3 ton	7,033	14.0%	20%	99%	20	\$3,677
Existing	Single Family	Heat Pump	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	7,033	10.0%	0%	95%	15	\$990
Existing	Single Family	Heat Pump	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	7,033	5.8%	65%	30%	10	\$603
Existing	Single Family	Heat Pump	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	7,033	3.3%	60%	55%	30	\$53
Existing	Single Family	Heat Pump	Ceiling Fan	Ceiling Fan	No Ceiling Fan	7,033	0.0%	85%	20%	10	\$104
Existing	Single Family	Heat Pump	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	7,033	2.8%	0%	95%	20	\$57
Existing	Single Family	Heat Pump	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	7,033	2.0%	85%	50%	30	\$116
Existing	Single Family	Heat Pump	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	7,033	2.0%	85%	55%	12	\$42
Existing	Single Family	Heat Pump	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	7,033	2.0%	80%	45%	6	\$31

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Heat Pump	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	7,033	10.0%	75%	75%	15	\$455
Existing	Single Family	Heat Pump	Insulation (Basement - Wall) 2*4	R-13 + R-5 sheathing	R-13	7,033	6.1%	13%	95%	25	\$708
Existing	Single Family	Heat Pump	Insulation (Basement - Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-7)	7,033	6.9%	13%	70%	25	\$906
Existing	Single Family	Heat Pump	Insulation (Basement - Wall) 2*4 - below code	R-13	R-0	7,033	14.9%	13%	70%	25	\$906
Existing	Single Family	Heat Pump	Insulation (Ceiling)	R-49	State Code (R-38)	7,033	1.0%	87%	85%	25	\$344
Existing	Single Family	Heat Pump	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	7,033	2.0%	95%	40%	25	\$562
Existing	Single Family	Heat Pump	Insulation (Ceiling) - below code	State Code (R-38)	R-9	7,033	8.0%	95%	10%	25	\$562
Existing	Single Family	Heat Pump	Insulation (Duct)	R-8	No Duct Insulation	7,033	4.1%	12%	75%	25	\$335
Existing	Single Family	Heat Pump	Insulation (Duct)	R-8	R-4	7,033	2.0%	12%	95%	25	\$172
Existing	Single Family	Heat Pump	Insulation (Floor)	R-38	State Code (R-30)	7,033	0.3%	75%	90%	25	\$884
Existing	Single Family	Heat Pump	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	7,033	1.0%	55%	40%	25	\$443
Existing	Single Family	Heat Pump	Insulation (Floor) - below code	State Code (R-30)	R-0	7,033	5.0%	55%	10%	25	\$1,331
Existing	Single Family	Heat Pump	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	7,033	3.0%	60%	45%	25	\$130
Existing	Single Family	Heat Pump	Insulation (Rim And Band Joist)	R-19	R-10	7,033	4.0%	60%	75%	25	\$84
Existing	Single Family	Heat Pump	Insulation (Slab)	R-15	State Code (R-10)	7,033	1.4%	0%	87%	25	\$223
Existing	Single Family	Heat Pump	Insulation (Slab) - average existing value	State Code (R-10)	Average Existing Insulation Value and/or Code Value (R-7)	7,033	1.3%	0%	65%	25	\$1,049
Existing	Single Family	Heat Pump	Insulation (Slab) - below code	State Code (R-10)	R-0	7,033	4.3%	0%	60%	25	\$1,049
Existing	Single Family	Heat Pump	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	7,033	1.3%	10%	90%	25	\$1,786
Existing	Single Family	Heat Pump	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	7,033	3.0%	75%	45%	25	\$1,396
Existing	Single Family	Heat Pump	Insulation (Wall) 2*4 - below code	R-13	R-0	7,033	28.0%	75%	5%	25	\$1,396
Existing	Single Family	Heat Pump	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	7,033	8.0%	0%	60%	25	\$2,276
Existing	Single Family	Heat Pump	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	7,033	37.0%	0%	50%	25	\$2,276
Existing	Single Family	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (6 per unit)	13 SEER	7,033	15.0%	10%	95%	30	\$288
Existing	Single Family	Heat Pump	Micro Channel Heat Exchangers (Evaporator)	Micro Channel Heat Exchangers (5 ton unit)	13 SEER, 7.7 HSPF, 3 ton	7,033	5.0%	15%	99%	18	\$3,732
Existing	Single Family	Heat Pump	Motor - ECM Motor	ECM motor for Heat Pump	Standard Motor	7,033	1.3%	65%	95%	15	\$368

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Heat Pump	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	7,033	2.0%	95%	60%	5	\$7
Existing	Single Family	Heat Pump	PTCS Aerosol-Based Duct Sealing	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	7,033	19.0%	80%	65%	25	\$946
Existing	Single Family	Heat Pump	PTCS Duct Sealing	PTCS Duct Sealing	No Duct Sealing	7,033	15.0%	80%	65%	20	\$447
Existing	Single Family	Heat Pump	Proper Sizing - Heat Pump	Correctly Sized Heat_Pump (Cooling And Heating Unit)	Oversized Heat_Pump	7,033	8.6%	53%	85%	15	\$1
Existing	Single Family	Heat Pump	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	7,033	2.7%	0%	97%	30	\$305
Existing	Single Family	Heat Pump	Small Scale Absorption Cooling	Small Scale Absorption Cooling (5 ton)	13 SEER, 7.7 HSPF, 3 ton	7,033	9.0%	0%	99%	20	\$946
Existing	Single Family	Heat Pump	Solar Attic Fan	Solar electric attic ventilation	Standard passive ventilation	7,033	0.8%	50%	95%	10	\$762
Existing	Single Family	Heat Pump	Solid state refrigeration (cool chips™) for heat pumps	Solid State Thermoelectric cooling system	13 SEER, 7.7 HSPF, 3 ton	7,033	18.0%	29%	99%	18	\$2,101
Existing	Single Family	Heat Pump	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	7,033	10.0%	0%	95%	25	\$6,711
Existing	Single Family	Heat Pump	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	7,033	6.8%	85%	27%	15	\$27
Existing	Single Family	Heat Pump	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	7,033	7.0%	65%	95%	12	\$1,422
Existing	Single Family	Heat Pump	VSD Motor - ECM	Variable Speed Motor (ECM) for Heat Pump	Constant Speed Motor	7,033	3.8%	80%	85%	20	\$341
Existing	Single Family	Heat Pump	Whole-House Fan	Whole-House Fan	No Whole-House Fan	7,033	3.3%	50%	96%	15	\$334
Existing	Single Family	Heat Pump	Windows	U = 0.19	U=0.30	7,033	8.0%	75%	95%	25	\$4,343
Existing	Single Family	Heat Pump	Windows	U=0.30	Existing Windows (U=0.65)	7,033	11.0%	75%	60%	25	\$10331
Existing	Single Family	Lighting	CFL Fixtures, High Use	2-15 W CFLs, 4.0 hr/day (37%)	2-60 W Incandescent	2,504	4.7%	98%	73%	20	\$35
Existing	Single Family	Lighting	CFL Fixtures, Low Use	2-15 W CFLs, 1.0 hr/day (32%)	2-60 W Incandescent	2,504	4.0%	98%	73%	20	\$30
Existing	Single Family	Lighting	CFL Fixtures, Medium Use	2-15 W CFLs, 2.5 hr/day (33%)	2-60 W Incandescent	2,504	4.2%	98%	73%	20	\$33
Existing	Single Family	Lighting	CFL Lamps, High Use	1-15W, 4.0 hr/day (37%)	Incandescent 60W	2,504	34.0%	86%	73%	7	\$2
Existing	Single Family	Lighting	CFL Lamps, Low Use	1-15W, 1.0 hr/day (32%)	Incandescent 60W	2,504	9.7%	86%	73%	27	\$2
Existing	Single Family	Lighting	CFL Lamps, Medium Use	1-15W, 2.5 hr/day (33%)	Incandescent 60W	2,504	14.0%	86%	73%	11	\$2
Existing	Single Family	Lighting	CFL Lighting - 3-Way	13 W, 20W And 25W	30W, 75W, 100W	2,504	1.8%	75%	73%	7	\$13
Existing	Single Family	Lighting	CFL Torchieries, High Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	2,504	0.4%	70%	65%	7	\$7
Existing	Single Family	Lighting	CFL Torchieries, Low Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	2,504	0.4%	70%	65%	27	\$7
Existing	Single Family	Lighting	CFL Torchieries, Medium Use	55 W CFL, (60%)	Incandescent Torchieries, 180W Halogen	2,504	1.3%	70%	65%	11	\$7
Existing	Single Family	Lighting	Daylighting Controls (Photocell) - Indoor/Outdoors	Install Photocell	No Daylighting Controls	2,504	4.5%	0%	95%	10	\$151
Existing	Single Family	Lighting	LED Christmas Lighting	LED Christmas Lighting	Incandescent Christmas Lighting	2,504	0.4%	40%	85%	13	\$11
Existing	Single Family	Lighting	LED Interior Lighting (White), High Use	LED 4W	Incandescent 60W	2,504	42.3%	85%	98%	13	\$31

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Lighting	LED Interior Lighting (White), Low Use	LED 4W	Incandescent 60W	2,504	12.1%	85%	98%	13	\$31
Existing	Single Family	Lighting	LED Interior Lighting (White), Medium Use	LED 4W	Incandescent 60W	2,504	17.4%	85%	98%	13	\$31
Existing	Single Family	Lighting	Occupancy Sensors	Wall-Switch Occupancy Sensors	No Occupancy Sensor	2,504	14.0%	75%	85%	10	\$64
Existing	Single Family	Lighting	Time Clocks (Exterior Lighting)	Exterior Lighting on a Time Clock	Exterior Lighting (Manual Control)	2,504	1.9%	75%	90%	10	\$93
Existing	Single Family	Plug Load	1-Watt Standby Power	1W or less standby power use for small appliances	Standard plug load appliance.	2,128	4.2%	15%	85%	7	\$32
Existing	Single Family	Plug Load	Energy Star Battery Chargers	Energy Star Battery Chargers	Standard Battery Chargers	2,128	0.2%	55%	40%	7	\$4
Existing	Single Family	Plug Load	Energy Star DVD System	Energy Star DVD System	Standard DVD System	2,128	1.9%	100%	24%	7	\$12
Existing	Single Family	Plug Load	Energy Star Dehumidifiers	Energy Star Dehumidifiers	Standard Dehumidifiers	2,128	0.4%	15%	5%	10	\$13
Existing	Single Family	Plug Load	Energy Star Digital Set Top Receiver	Energy Star Digital Set Top Receiver	Standard Digital Set Top Receiver	2,128	1.7%	81%	62%	6	\$37
Existing	Single Family	Plug Load	Energy Star HDTV	Energy Star HDTV	Standard HDTV	2,128	3.2%	38%	70%	9	\$105
Existing	Single Family	Plug Load	Energy Star Home Audio System	Energy Star Home Audio System	Standard Home Audio system	2,128	2.5%	91%	90%	7	\$21
Existing	Single Family	Plug Load	Energy Star Office Computer	Energy Star Office Computer	Standard Office Computer	2,128	13.7%	100%	15%	4	\$84
Existing	Single Family	Plug Load	Energy Star Office Copiers	Energy Star Office Copiers	Standard Office Copiers	2,128	1.9%	25%	55%	6	\$53
Existing	Single Family	Plug Load	Energy Star Office Monitor	Energy Star Office Monitor	Standard Office Monitor	2,128	4.1%	100%	15%	4	\$16
Existing	Single Family	Plug Load	Energy Star Office Printer	Energy Star Office Printer	Standard Office Printer	2,128	0.0%	75%	40%	5	\$11
Existing	Single Family	Plug Load	Energy Star TV	Energy Star TV	Standard TV	2,128	3.3%	100%	38%	9	\$32
Existing	Single Family	Plug Load	Energy Star VCR	Energy Star VCR/DVD Combo	Standard Home VCR	2,128	0.6%	100%	45%	4	\$38
Existing	Single Family	Plug Load	Power supply transformer/converter - External power adapters	Power supply transformer/converter - High efficiency External power adapters	Standard Efficiency	2,128	0.3%	85%	40%	7	\$8
Existing	Single Family	Plug Load	Powerstrip with Occupancy Sensor	Powerstrip with Occupancy Sensor	Powerstrip w/o Occupancy Sensor	2,128	0.6%	85%	90%	10	\$88
Existing	Single Family	Pool Pump	Pool Pump Timers	Pool Pump Timers	Pool Pump No Timers	1,482	50.0%	3%	83%	10	\$52
Existing	Single Family	Pool Pump	Pool Pumps - VSD	Pool Pumps (VSD)	Pool Pumps constant speed	1,482	85.0%	3%	92%	10	\$714
Existing	Single Family	Refrigerator	Refrigerator/Freezer - Energy Star	Energy Star Refrigerator	Standard Refrigerator	490	20.0%	NA	NA	18	\$32
Existing	Single Family	Refrigerator	1 kWh/day Refrigerator	20 cf top-freezer using no more than 1 kWh/day	Standard Refrigerator, 20.5 cf, top-freezer	538	30.0%	90%	97%	19	\$74
Existing	Single Family	Refrigerator	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	538	6.3%	85%	95%	5	\$236
Existing	Single Family	Refrigerator	Refrigerator/Freezer - Early Replacement	Standard Refrigerator	Existing Refrigerator	538	100.0%	11%	85%	9	\$452
Existing	Single Family	Refrigerator	Refrigerator/Freezer - Energy Star	Energy Star Refrigerator	Existing Refrigerator	538	20.0%	0%	40%	18	\$651
Existing	Single Family	Refrigerator	Refrigerator/Freezer - Removal of Secondary	Proper Disposal of Refrigerator/Freezer	Existing Non-Efficient Refrigerator/Freezer	538	282.8%	11%	82%	9	\$103
Existing	Single Family	Refrigerator	Solid state refrigeration (cool chips™) for refrigerators	Thermoelectric refrigerator, 1.7 cubic ft.	Compact refrigerator, 1.7 cubic ft.	538	4.0%	75%	95%	19	\$56

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Room AC	Air Conditioner - Room (Individual Rooms) (10,000 BTU/HR)	EER = 10.8	EER = 9.8	497	8.0%	NA	NA	10	\$42
Existing	Single Family	Room AC	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	513	41.3%	65%	30%	10	\$603
Existing	Single Family	Room AC	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	513	3.3%	60%	55%	30	\$53
Existing	Single Family	Room AC	Ceiling Fan	Ceiling Fan	No Ceiling Fan	513	0.3%	85%	20%	10	\$104
Existing	Single Family	Room AC	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	513	20.0%	0%	95%	20	\$57
Existing	Single Family	Room AC	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	513	0.1%	85%	50%	30	\$116
Existing	Single Family	Room AC	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	513	0.1%	85%	55%	12	\$42
Existing	Single Family	Room AC	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	513	2.0%	80%	45%	6	\$31
Existing	Single Family	Room AC	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	513	10.0%	75%	75%	15	\$455
Existing	Single Family	Room AC	Insulation (Basement - Wall) 2'4	R-13 + R-5 sheathing	R-13	513	6.1%	13%	95%	25	\$708
Existing	Single Family	Room AC	Insulation (Basement - Wall) 2'4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-7)	513	6.9%	13%	70%	25	\$906
Existing	Single Family	Room AC	Insulation (Basement - Wall) 2'4 - below code	R-13	R-0	513	14.9%	13%	70%	25	\$906
Existing	Single Family	Room AC	Insulation (Ceiling)	R-49	State Code (R-38)	513	0.3%	87%	85%	25	\$344
Existing	Single Family	Room AC	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	513	1.0%	95%	40%	25	\$562
Existing	Single Family	Room AC	Insulation (Ceiling) - below code	State Code (R-38)	R-9	513	0.6%	95%	10%	25	\$562
Existing	Single Family	Room AC	Insulation (Duct)	R-8	No Duct Insulation	513	3.2%	12%	75%	25	\$335
Existing	Single Family	Room AC	Insulation (Duct)	R-8	R-4	513	1.6%	12%	95%	25	\$172
Existing	Single Family	Room AC	Insulation (Floor)	R-38	State Code (R-30)	513	0.1%	75%	90%	25	\$884
Existing	Single Family	Room AC	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	513	0.1%	55%	40%	25	\$443
Existing	Single Family	Room AC	Insulation (Floor) - below code	State Code (R-30)	R-0	513	0.1%	55%	10%	25	\$1,331
Existing	Single Family	Room AC	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	513	3.0%	60%	45%	25	\$130
Existing	Single Family	Room AC	Insulation (Rim And Band Joist)	R-19	R-10	513	4.0%	60%	75%	25	\$84
Existing	Single Family	Room AC	Insulation (Slab)	R-15	State Code (R-10)	513	1.4%	0%	87%	25	\$223
Existing	Single Family	Room AC	Insulation (Slab) - average existing value	State Code (R-10)	Average Existing Insulation Value and/or Code Value (R-7)	513	1.3%	0%	65%	25	\$1,049
Existing	Single Family	Room AC	Insulation (Slab) - below code	State Code (R-10)	R-0	513	4.3%	0%	60%	25	\$1,049
Existing	Single Family	Room AC	Insulation (Wall) 2'4	R-13 + R5 Sheathing	R-13	513	0.0%	10%	90%	25	\$1,786

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Room AC	Insulation (Wall) 2'4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	513	0.1%	75%	45%	25	\$1,396
Existing	Single Family	Room AC	Insulation (Wall) 2'4 - below code	R-13	R-0	513	0.1%	75%	5%	25	\$1,396
Existing	Single Family	Room AC	Insulation (wall) 2'6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	513	0.1%	0%	60%	25	\$2,276
Existing	Single Family	Room AC	Insulation (wall) 2'6 - below code	State Code (R-21)	R-0	513	0.1%	0%	50%	25	\$2,276
Existing	Single Family	Room AC	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	513	2.0%	95%	60%	5	\$7
Existing	Single Family	Room AC	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	513	6.7%	0%	97%	30	\$305
Existing	Single Family	Room AC	Windows	U = 0.19	U=0.30	513	13.0%	75%	95%	25	\$4,343
Existing	Single Family	Room AC	Windows	U=0.30	Existing Windows (U=0.65)	513	36.0%	75%	60%	25	\$10331
Existing	Single Family	Room Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	6,847	3.3%	60%	55%	30	\$53
Existing	Single Family	Room Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	6,847	3.0%	85%	50%	30	\$116
Existing	Single Family	Room Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	6,847	2.0%	85%	55%	12	\$42
Existing	Single Family	Room Heat	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	6,847	2.0%	80%	45%	6	\$31
Existing	Single Family	Room Heat	Ductless Mini-Split REM	3 ton, SEER 15, HSPF 9.0	Electric Baseboard Heating HSPF=1	6,847	62.1%	25%	95%	15	\$5,700
Existing	Single Family	Room Heat	Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	6,847	10.0%	75%	75%	15	\$455
Existing	Single Family	Room Heat	Insulation (Basement - Wall) 2'4	R-13 + R-5 sheathing	R-13	6,847	6.1%	13%	95%	25	\$708
Existing	Single Family	Room Heat	Insulation (Basement - Wall) 2'4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-7)	6,847	6.9%	13%	70%	25	\$906
Existing	Single Family	Room Heat	Insulation (Basement - Wall) 2'4 - below code	R-13	R-0	6,847	14.9%	13%	70%	25	\$906
Existing	Single Family	Room Heat	Insulation (Ceiling)	R-49	State Code (R-38)	6,847	1.0%	87%	85%	25	\$344
Existing	Single Family	Room Heat	Insulation (Ceiling) - average existing value	State Code (R-38)	Average Existing Insulation Value (R-19)	6,847	2.0%	95%	40%	25	\$562
Existing	Single Family	Room Heat	Insulation (Ceiling) - below code	State Code (R-38)	R-9	6,847	10.2%	95%	10%	25	\$562
Existing	Single Family	Room Heat	Insulation (Duct)	R-8	No Duct Insulation	6,847	4.3%	12%	75%	25	\$335
Existing	Single Family	Room Heat	Insulation (Duct)	R-8	R-4	6,847	2.1%	12%	95%	25	\$172
Existing	Single Family	Room Heat	Insulation (Floor)	R-38	State Code (R-30)	6,847	1.0%	75%	90%	25	\$884
Existing	Single Family	Room Heat	Insulation (Floor) - average existing value	State Code (R-30)	Average Existing Insulation Value and/or Code Value (R-20)	6,847	2.0%	55%	40%	25	\$443
Existing	Single Family	Room Heat	Insulation (Floor) - below code	State Code (R-30)	R-0	6,847	10.0%	55%	10%	25	\$1,331
Existing	Single Family	Room Heat	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	6,847	3.0%	60%	45%	25	\$130
Existing	Single Family	Room Heat	Insulation (Rim And Band Joist)	R-19	R-10	6,847	4.0%	60%	75%	25	\$84

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Room Heat	Insulation (Slab)	R-15	State Code (R-10)	6,847	1.4%	0%	87%	25	\$223
Existing	Single Family	Room Heat	Insulation (Slab) - average existing value	State Code (R-10)	Average Existing Insulation Value and/or Code Value (R-7)	6,847	1.3%	0%	65%	25	\$1,049
Existing	Single Family	Room Heat	Insulation (Slab) - below code	State Code (R-10)	R-0	6,847	4.3%	0%	60%	25	\$1,049
Existing	Single Family	Room Heat	Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	6,847	2.2%	10%	90%	25	\$1,786
Existing	Single Family	Room Heat	Insulation (Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-8)	6,847	5.0%	75%	45%	25	\$1,396
Existing	Single Family	Room Heat	Insulation (Wall) 2*4 - below code	R-13	R-0	6,847	44.0%	75%	5%	25	\$1,396
Existing	Single Family	Room Heat	Insulation (wall) 2*6 - average existing value	State Code (R-21)	Average Existing Insulation Value and/or Code Value (R-8)	6,847	12.0%	0%	60%	25	\$2,276
Existing	Single Family	Room Heat	Insulation (wall) 2*6 - below code	State Code (R-21)	R-0	6,847	49.0%	0%	50%	25	\$2,276
Existing	Single Family	Room Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	6,847	2.0%	95%	60%	5	\$7
Existing	Single Family	Room Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	6,847	2.0%	0%	97%	30	\$305
Existing	Single Family	Room Heat	Radiant Electric Ceiling Panels	Radiant Electric Heating with Ceiling Panels	Electric Baseboard Heating	6,847	52.0%	45%	98%	20	\$4,364
Existing	Single Family	Room Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	6,847	12.0%	0%	95%	25	\$6,711
Existing	Single Family	Room Heat	Windows	U = 0.19	U=0.30	6,847	6.0%	75%	95%	25	\$4,343
Existing	Single Family	Room Heat	Windows	U=0.30	Existing Windows (U=0.65)	6,847	15.0%	75%	60%	25	\$10331
Existing	Single Family	Water Heat	Water_Heater (40 Gallon Electric)	EF = 0.95	EF = 0.92	3,308	3.2%	NA	NA	15	\$129
Existing	Single Family	Water Heat	Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)	3,392	9.3%	35%	68%	14	\$252
Existing	Single Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)	3,392	11.2%	35%	77%	14	\$312
Existing	Single Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)	3,392	12.8%	35%	77%	14	\$417
Existing	Single Family	Water Heat	Clothes Washer - Early Replacement	Standard Clothes Washer (1.26)	Existing Clothes Washer (MEF = 1.1)	3,392	3.8%	35%	25%	14	\$378
Existing	Single Family	Water Heat	Desuperheater (Ground-Source Heat_Pump) system	Desuperheater with Standard Water_Heater system	Standard Water_Heater - EF = 0.92	3,392	55.2%	5%	90%	10	\$251
Existing	Single Family	Water Heat	Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)	3,392	1.1%	30%	35%	13	\$514
Existing	Single Family	Water Heat	Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher	3,392	2.1%	30%	15%	13	\$11
Existing	Single Family	Water Heat	Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery	3,392	18.5%	0%	95%	30	\$630
Existing	Single Family	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM	3,392	7.1%	95%	95%	9	\$4
Existing	Single Family	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM	3,392	2.9%	95%	55%	9	\$3
Existing	Single Family	Water Heat	Faucet Aerators	2.2 GPM	Existing Faucet Aerator (3.0 GPM)	3,392	3.3%	95%	10%	9	\$2
Existing	Single Family	Water Heat	Heat Pump Water Heater	EF=2.9	No Heat Pump Water Heater	3,392	54.6%	30%	95%	15	\$2,322

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Water Heat	Hot Water Pipe Insulation	R-4 Wrap	No insulation	3,392	1.2%	65%	38%	5	\$8
Existing	Single Family	Water Heat	Low-Flow Showerheads	1.75 GPM	2.5 GPM	3,392	16.2%	95%	85%	10	\$11
Existing	Single Family	Water Heat	Low-Flow Showerheads	2.5 GPM	3.0 GPM	3,392	10.8%	95%	33%	10	\$25
Existing	Single Family	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater	3,392	42.9%	20%	95%	20	\$8,930
Existing	Single Family	Water Heat	Tankless Water_Heater	EF = 0.95, 4.0 gpm	EF = 0.92	3,392	3.2%	85%	97%	20	\$1,429
Existing	Single Family	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	3,392	6.5%	0%	65%	10	\$19
Existing	Single Family	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees	3,392	6.0%	95%	43%	4	\$0
New	Single Family	Central AC	Air Conditioner - Central (3.0 ton unit)	SEER 14	SEER 13	863	6.3%	NA	NA	15	\$368
New	Single Family	Central AC	Air Conditioner - Central (3.0 ton unit)	SEER 16	SEER 13	863	15.9%	NA	NA	15	\$1,061
New	Single Family	Central AC	Air Conditioner - Central (3.0 ton unit)	SEER 18	SEER 13	863	23.4%	NA	NA	15	\$1,789
New	Single Family	Central AC	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	749	10.0%	0%	95%	15	\$990
New	Single Family	Central AC	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	749	31.5%	65%	30%	10	\$603
New	Single Family	Central AC	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	749	3.3%	75%	25%	30	\$3
New	Single Family	Central AC	Ceiling Fan	Ceiling Fan	No Ceiling Fan	749	0.3%	85%	20%	10	\$104
New	Single Family	Central AC	Check Me! O&M Tune-up	Tune-up/Maintenance	No Tune-up Maintenance	749	10.0%	90%	50%	5	\$236
New	Single Family	Central AC	Construction - ICF	Concrete Framing	Standard Wood Framing	749	32.0%	45%	95%	30	\$11629
New	Single Family	Central AC	Construction - SIP	Specialty Framing	Standard Wood Framing	749	14.0%	45%	95%	30	\$4,839
New	Single Family	Central AC	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	749	20.0%	0%	95%	20	\$57
New	Single Family	Central AC	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	749	0.1%	85%	50%	30	\$116
New	Single Family	Central AC	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	749	0.1%	85%	55%	12	\$42
New	Single Family	Central AC	Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	749	8.0%	85%	15%	30	\$210
New	Single Family	Central AC	Duct Sealing	Duct Sealing	No Duct Sealing	749	6.0%	0%	65%	20	\$447
New	Single Family	Central AC	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	New homes with AFUE HVAC, SEER 13	749	19.0%	0%	95%	25	\$525
New	Single Family	Central AC	Ductless Mini-Split REM	3 ton, SEER 15, HSPF 9.0	SEER 13 Central AC	749	11.1%	80%	95%	15	\$1,480
New	Single Family	Central AC	Evaporative Space Cooling	SEER 40	SEER 13	749	70.0%	75%	95%	10	\$1,119
New	Single Family	Central AC	Green Roof	ecorroof	Standard Roof	749	6.5%	0%	98%	40	\$21956
New	Single Family	Central AC	Insulation (Basement - Wall) 2*4	R-13 + R-5 sheathing	R-13	749	6.1%	20%	95%	25	\$474
New	Single Family	Central AC	Insulation (Basement - Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-7)	749	6.9%	20%	70%	25	\$671

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Single Family	Central AC	Insulation (Ceiling)	R-49	State Code (R-38)	749	0.1%	87%	85%	25	\$390
New	Single Family	Central AC	Insulation (Floor)	R-38	State Code (R-30)	749	0.1%	75%	90%	25	\$884
New	Single Family	Central AC	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	749	3.0%	80%	45%	25	\$130
New	Single Family	Central AC	Insulation (Rim And Band Joist)	R-19	R-10	749	4.0%	80%	75%	25	\$84
New	Single Family	Central AC	Insulation (Slab)	R-15	State Code (R-10)	749	1.4%	32%	64%	25	\$223
New	Single Family	Central AC	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	749	0.0%	95%	85%	25	\$2,363
New	Single Family	Central AC	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (6 per unit)	13 SEER	749	15.0%	0%	95%	30	\$127
New	Single Family	Central AC	Motor - ECM Motor	ECM motor for Central Air Conditioner	Standard Motor	749	4.5%	65%	95%	15	\$368
New	Single Family	Central AC	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	749	2.0%	95%	40%	5	\$7
New	Single Family	Central AC	Proper Sizing - Central Air Conditioner	Correctly Sized Air Conditioner Unit	Oversized Air Conditioner Unit	749	6.0%	53%	85%	15	\$1
New	Single Family	Central AC	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	749	6.7%	0%	97%	30	\$305
New	Single Family	Central AC	Solar Attic Fan	Solar electric attic ventilation	Standard passive ventilation	749	6.0%	70%	95%	10	\$762
New	Single Family	Central AC	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	749	6.8%	85%	24%	15	\$27
New	Single Family	Central AC	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	749	7.0%	65%	95%	12	\$1,422
New	Single Family	Central AC	VSD Motor - ECM	Variable Speed Motor (ECM) for Central Air Conditioner	Constant Speed Motor	749	13.5%	90%	85%	20	\$341
New	Single Family	Central AC	Whole-House Dehumidifier	Whole-House Dehumidifier	No Dehumidifier	749	6.0%	50%	95%	11	\$1,439
New	Single Family	Central AC	Whole-House Fan	Whole-House Fan	No Whole-House Fan	749	22.0%	50%	96%	15	\$334
New	Single Family	Central AC	Window Overhang	Overhangs over windows for shading	No window overhangs	749	14.0%	50%	80%	30	\$905
New	Single Family	Central AC	Windows	U = 0.19	U=0.30	749	5.0%	85%	95%	25	\$4,696
New	Single Family	Central Heat	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	5,495	10.0%	0%	95%	15	\$990
New	Single Family	Central Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	5,495	3.3%	75%	25%	30	\$3
New	Single Family	Central Heat	Construction - ICF	Concrete Framing	Standard Wood Framing	5,495	44.0%	45%	95%	30	\$11629
New	Single Family	Central Heat	Construction - SIP	Specialty Framing	Standard Wood Framing	5,495	14.0%	45%	95%	30	\$4,839
New	Single Family	Central Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	5,495	5.0%	85%	50%	30	\$116
New	Single Family	Central Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	5,495	3.0%	85%	55%	12	\$42
New	Single Family	Central Heat	Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	5,495	8.0%	85%	15%	30	\$210
New	Single Family	Central Heat	Duct Sealing	Duct Sealing	No Duct Sealing	5,495	6.0%	0%	65%	20	\$447

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Single Family	Central Heat	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	New homes with AFUE HVAC, SEER 13	5,495	19.0%	0%	95%	25	\$525
New	Single Family	Central Heat	Green Roof	ecorooft	Standard Roof	5,495	6.5%	0%	98%	40	\$21956
New	Single Family	Central Heat	Insulation (Basement - Wall) 2*4	R-13 + R-5 sheathing	R-13	5,495	6.1%	20%	95%	25	\$474
New	Single Family	Central Heat	Insulation (Basement - Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-7)	5,495	6.9%	20%	70%	25	\$671
New	Single Family	Central Heat	Insulation (Ceiling)	R-49	State Code (R-38)	5,495	3.0%	87%	85%	25	\$390
New	Single Family	Central Heat	Insulation (Floor)	R-38	State Code (R-30)	5,495	2.0%	75%	90%	25	\$884
New	Single Family	Central Heat	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	5,495	3.0%	80%	45%	25	\$130
New	Single Family	Central Heat	Insulation (Rim And Band Joist)	R-19	R-10	5,495	4.0%	80%	75%	25	\$84
New	Single Family	Central Heat	Insulation (Slab)	R-15	State Code (R-10)	5,495	1.4%	32%	64%	25	\$223
New	Single Family	Central Heat	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	5,495	3.2%	95%	85%	25	\$2,363
New	Single Family	Central Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (6 per unit)	13 SEER	5,495	15.0%	0%	95%	30	\$127
New	Single Family	Central Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	5,495	2.0%	95%	40%	5	\$7
New	Single Family	Central Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	5,495	2.0%	0%	97%	30	\$305
New	Single Family	Central Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	5,495	3.0%	90%	90%	25	\$6,935
New	Single Family	Central Heat	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	5,495	10.0%	90%	90%	25	\$9,954
New	Single Family	Central Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	5,495	6.8%	85%	33%	15	\$27
New	Single Family	Central Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	5,495	7.0%	65%	95%	12	\$1,422
New	Single Family	Central Heat	Windows	U = 0.19	U=0.30	5,495	16.0%	85%	95%	25	\$4,696
New	Single Family	Cooking Oven	Convection Oven	Convection Oven (wall oven)	Standard Oven (wall oven)	435	23.0%	85%	85%	15	\$432
New	Single Family	Dryer	Clothes Dryer With Moisture Sensor	High-Efficiency Clothes Dryer With Moisture Sensor	Standard Dryer Without Moisture Sensor	858	13.0%	NA	NA	18	\$58
New	Single Family	Freezer	Freezer - Stand-Alone	Energy Star 14.8 cu ft Chest Freezer	Standard 14.8 cu ft Freezer	553	10.0%	NA	NA	12	\$26
New	Single Family	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Electric Furnace	Standard Motor	477	25.0%	0%	95%	15	\$368
New	Single Family	HVAC Aux	Motor - ECM Motor	ECM Motor for Forced Air Gas Furnace	Standard Motor	477	25.0%	71%	95%	15	\$368
New	Single Family	HVAC Aux	VSD Fan	Variable Speed Fan - Electric Furnace	Constant Speed Fan	477	75.0%	7%	85%	20	\$447
New	Single Family	HVAC Aux	VSD Fan	Variable Speed Fan - Gas Furnace	Constant Speed Fan	477	75.0%	66%	85%	20	\$447
New	Single Family	Heat Pump	Air Source Heat_Pump	3 ton, 14 SEER, 8.5 HSPF	3 ton, 13 SEER, 7.7 HSPF	5,438	4.9%	NA	NA	15	\$517
New	Single Family	Heat Pump	Air Source Heat_Pump	3 ton, 16 SEER, 8.8 HSPF	3 ton, 13 SEER, 7.7 HSPF	5,438	7.4%	NA	NA	15	\$660

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Single Family	Heat Pump	Air Source Heat_Pump	3 ton, 18 SEER, 9.0 HSPF	3 ton, 13 SEER, 7.7 HSPF	5,438	9.2%	NA	NA	15	\$1,435
New	Single Family	Heat Pump	Advanced Cold-Climate Heat Pump	16 SEER, 9.6 HSPF	13 SEER, 7.7 HSPF, 3 ton	5,134	14.0%	20%	99%	20	\$3,677
New	Single Family	Heat Pump	Air-to-Air Heat Exchangers	Air-to-Air Heat Exchangers	No Air to Air Heat Exchangers	5,134	10.0%	0%	95%	15	\$990
New	Single Family	Heat Pump	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	5,134	4.4%	65%	30%	10	\$603
New	Single Family	Heat Pump	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	5,134	3.3%	75%	25%	30	\$3
New	Single Family	Heat Pump	Ceiling Fan	Ceiling Fan	No Ceiling Fan	5,134	0.0%	85%	20%	10	\$104
New	Single Family	Heat Pump	Construction - ICF	Concrete Framing	Standard Wood Framing	5,134	43.3%	45%	95%	30	\$11629
New	Single Family	Heat Pump	Construction - SIP	Specialty Framing	Standard Wood Framing	5,134	14.0%	45%	95%	30	\$4,839
New	Single Family	Heat Pump	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	5,134	2.8%	0%	95%	20	\$57
New	Single Family	Heat Pump	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	5,134	3.0%	85%	50%	30	\$116
New	Single Family	Heat Pump	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	5,134	2.0%	85%	55%	12	\$42
New	Single Family	Heat Pump	Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	5,134	8.0%	85%	15%	30	\$210
New	Single Family	Heat Pump	Green Roof	ecorooft	Standard Roof	5,134	6.5%	0%	98%	40	\$21956
New	Single Family	Heat Pump	Heat_Pump - Ground or Water-Source - Open Loop (Desuperheater)	EER = 16.2, COP = 3.6	Air Source Heat_Pump - 13 SEER, 7.7 HSPF (Federal Code) (11.3 EER, 3.2 COP)	5,134	16.8%	15%	95%	18	\$14703
New	Single Family	Heat Pump	Heat_Pump - Ground or Water-Source - Closed Loop (Desuperheater)	EER = 14.1, COP = 3.3	Air Source Heat_Pump - 13 SEER, 7.7 HSPF (Federal Code) (11.3 EER, 3.2 COP)	5,134	6.2%	30%	95%	18	\$14703
New	Single Family	Heat Pump	Insulation (Basement - Wall) 2*4	R-13 + R-5 sheathing	R-13	5,134	6.1%	20%	95%	25	\$474
New	Single Family	Heat Pump	Insulation (Basement - Wall) 2*4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-7)	5,134	6.9%	20%	70%	25	\$671
New	Single Family	Heat Pump	Insulation (Ceiling)	R-49	State Code (R-38)	5,134	2.0%	87%	85%	25	\$390
New	Single Family	Heat Pump	Insulation (Floor)	R-38	State Code (R-30)	5,134	1.0%	75%	90%	25	\$884
New	Single Family	Heat Pump	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	5,134	3.0%	80%	45%	25	\$130
New	Single Family	Heat Pump	Insulation (Rim And Band Joist)	R-19	R-10	5,134	4.0%	80%	75%	25	\$84
New	Single Family	Heat Pump	Insulation (Slab)	R-15	State Code (R-10)	5,134	1.4%	32%	64%	25	\$223
New	Single Family	Heat Pump	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	5,134	2.1%	95%	85%	25	\$1,430
New	Single Family	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands (6 per unit)	13 SEER	5,134	15.0%	0%	95%	30	\$127
New	Single Family	Heat Pump	Micro Channel Heat Exchangers (Evaporator)	Micro Channel Heat Exchangers (5 ton unit)	13 SEER, 7.7 HSPF, 3 ton	5,134	5.0%	15%	99%	18	\$3,732
New	Single Family	Heat Pump	Motor - ECM Motor	ECM motor for Heat Pump	Standard Motor	5,134	1.3%	65%	95%	15	\$368
New	Single Family	Heat Pump	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	5,134	2.0%	95%	40%	5	\$7

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Single Family	Heat Pump	PTCS Aerosol-Based Duct Sealing	Spray-in ductwork sealant to minimize duct leaks	No Duct Sealing	5,134	19.0%	60%	65%	25	\$525
New	Single Family	Heat Pump	PTCS Duct Sealing	PTCS Duct Sealing	No Duct Sealing	5,134	15.0%	60%	65%	20	\$447
New	Single Family	Heat Pump	Proper Sizing - Heat Pump	Correctly Sized Heat_Pump (Cooling And Heating Unit)	Oversized Heat_Pump	5,134	8.6%	53%	85%	15	\$1
New	Single Family	Heat Pump	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	5,134	2.7%	0%	97%	30	\$305
New	Single Family	Heat Pump	Small Scale Absorption Cooling	Small Scale Absorption Cooling (5 ton)	13 SEER, 7.7 HSPF, 3 ton	5,134	9.0%	0%	99%	20	\$946
New	Single Family	Heat Pump	Solar Attic Fan	Solar electric attic ventilation	Standard passive ventilation	5,134	0.8%	70%	95%	10	\$762
New	Single Family	Heat Pump	Solid state refrigeration (cool chips™) for heat pumps	Solid State Thermoelectric cooling system	13 SEER, 7.7 HSPF, 3 ton	5,134	18.0%	29%	99%	18	\$2,101
New	Single Family	Heat Pump	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	5,134	3.0%	90%	90%	25	\$6,935
New	Single Family	Heat Pump	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	5,134	8.0%	90%	90%	25	\$9,954
New	Single Family	Heat Pump	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	5,134	6.8%	0%	27%	15	\$27
New	Single Family	Heat Pump	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	5,134	7.0%	65%	95%	12	\$1,422
New	Single Family	Heat Pump	VSD Motor - ECM	Variable Speed Motor (ECM) for Heat Pump	Constant Speed Motor	5,134	3.8%	90%	85%	20	\$341
New	Single Family	Heat Pump	Whole-House Fan	Whole-House Fan	No Whole-House Fan	5,134	3.3%	50%	96%	15	\$334
New	Single Family	Heat Pump	Windows	U = 0.19	U=0.30	5,134	11.0%	85%	95%	25	\$4,696
New	Single Family	Lighting	CFL Fixtures, High Use	2-15 W CFLs, 4.0 hr/day (37%)	2-60 W Incandescent	2,441	4.7%	98%	73%	20	\$35
New	Single Family	Lighting	CFL Fixtures, Low Use	2-15 W CFLs, 1.0 hr/day (32%)	2-60 W Incandescent	2,441	4.0%	98%	73%	20	\$30
New	Single Family	Lighting	CFL Fixtures, Medium Use	2-15 W CFLs, 2.5 hr/day (33%)	2-60 W Incandescent	2,441	4.2%	98%	73%	20	\$33
New	Single Family	Lighting	CFL Lamps, High Use	1-15W, 4.0 hr/day (37%)	Incandescent 60W	2,441	34.0%	86%	73%	7	\$2
New	Single Family	Lighting	CFL Lamps, Low Use	1-15W, 1.0 hr/day (32%)	Incandescent 60W	2,441	9.7%	86%	73%	27	\$2
New	Single Family	Lighting	CFL Lamps, Medium Use	1-15W, 2.5 hr/day (33%)	Incandescent 60W	2,441	14.0%	86%	73%	11	\$2
New	Single Family	Lighting	CFL Lighting - 3-Way	13 W, 20W And 25W	30W, 75W, 100W	2,441	1.8%	75%	73%	7	\$13
New	Single Family	Lighting	CFL Torchieries, High Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	2,441	0.4%	70%	35%	7	\$7
New	Single Family	Lighting	CFL Torchieries, Low Use	55 W CFL, (20%)	Incandescent Torchieries, 180W Halogen	2,441	0.4%	70%	35%	27	\$7
New	Single Family	Lighting	CFL Torchieries, Medium Use	55 W CFL, (60%)	Incandescent Torchieries, 180W Halogen	2,441	1.3%	70%	35%	11	\$7
New	Single Family	Lighting	Daylighting Controls (Photocell) - Indoor/Outdoors	Install Photocell	No Daylighting Controls	2,441	4.5%	0%	95%	10	\$110
New	Single Family	Lighting	LED Christmas Lighting	LED Christmas Lighting	Incandescent Christmas Lighting	2,441	0.4%	40%	85%	13	\$11
New	Single Family	Lighting	LED Interior Lighting (White), High Use	LED 4W	Incandescent 60W	2,441	42.3%	85%	98%	13	\$31
New	Single Family	Lighting	LED Interior Lighting (White), Low Use	LED 4W	Incandescent 60W	2,441	12.1%	85%	98%	13	\$31

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Single Family	Lighting	LED Interior Lighting (White), Medium Use	LED 4W	Incandescent 60W	2,441	17.4%	85%	98%	13	\$31
New	Single Family	Lighting	Occupancy Sensors	Wall-Switch Occupancy Sensors	No Occupancy Sensor	2,441	14.0%	75%	85%	10	\$64
New	Single Family	Lighting	Time Clocks (Exterior Lighting)	Exterior Lighting on a Time Clock	Exterior Lighting (Manual Control)	2,441	1.9%	75%	90%	10	\$93
New	Single Family	Plug Load	1-Watt Standby Power	1W or less standby power use for small appliances	Standard plug load appliance.	2,128	4.2%	15%	85%	7	\$32
New	Single Family	Plug Load	Energy Star Battery Chargers	Energy Star Battery Chargers	Standard Battery Chargers	2,128	0.2%	55%	40%	7	\$4
New	Single Family	Plug Load	Energy Star DVD System	Energy Star DVD System	Standard DVD System	2,128	1.9%	100%	24%	7	\$12
New	Single Family	Plug Load	Energy Star Dehumidifiers	Energy Star Dehumidifiers	Standard Dehumidifiers	2,128	0.4%	15%	5%	10	\$13
New	Single Family	Plug Load	Energy Star Digital Set Top Receiver	Energy Star Digital Set Top Receiver	Standard Digital Set Top Receiver	2,128	1.7%	81%	62%	6	\$37
New	Single Family	Plug Load	Energy Star HDTV	Energy Star HDTV	Standard HDTV	2,128	3.2%	38%	70%	9	\$105
New	Single Family	Plug Load	Energy Star Home Audio System	Energy Star Home Audio System	Standard Home Audio system	2,128	2.5%	91%	90%	7	\$21
New	Single Family	Plug Load	Energy Star Office Computer	Energy Star Office Computer	Standard Office Computer	2,128	13.7%	100%	15%	4	\$84
New	Single Family	Plug Load	Energy Star Office Copiers	Energy Star Office Copiers	Standard Office Copiers	2,128	1.9%	25%	55%	6	\$53
New	Single Family	Plug Load	Energy Star Office Monitor	Energy Star Office Monitor	Standard Office Monitor	2,128	4.1%	100%	15%	4	\$16
New	Single Family	Plug Load	Energy Star Office Printer	Energy Star Office Printer	Standard Office Printer	2,128	0.0%	75%	40%	5	\$11
New	Single Family	Plug Load	Energy Star TV	Energy Star TV	Standard TV	2,128	3.3%	100%	38%	9	\$32
New	Single Family	Plug Load	Energy Star VCR	Energy Star VCR/DVD Combo	Standard Home VCR	2,128	0.6%	100%	45%	4	\$38
New	Single Family	Plug Load	Power supply transformer/converter - External power adapters	Power supply transformer/converter - High efficiency External power adapters	Standard Efficiency	2,128	0.3%	85%	40%	7	\$8
New	Single Family	Plug Load	Powerstrip with Occupancy Sensor	Powerstrip with Occupancy Sensor	Powerstrip w/o Occupancy Sensor	2,128	0.6%	85%	90%	10	\$88
New	Single Family	Pool Pump	Pool Pump Timers	Pool Pump Timers	Pool Pump No Timers	1,482	50.0%	3%	83%	10	\$52
New	Single Family	Pool Pump	Pool Pumps - VSD	Pool Pumps (VSD)	Pool Pumps constant speed	1,482	85.0%	3%	92%	10	\$714
New	Single Family	Refrigerator	Refrigerator/Freezer - Energy Star	Energy Star Refrigerator	Standard Refrigerator	490	20.0%	NA	NA	18	\$32
New	Single Family	Refrigerator	1 kWh/day Refrigerator	20 cf top-freezer using no more than 1 kWh/day	Standard Refrigerator, 20cf, top-freezer	416	30.0%	90%	97%	19	\$74
New	Single Family	Refrigerator	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	416	6.3%	85%	95%	5	\$236
New	Single Family	Refrigerator	Solid state refrigeration (cool chips™) for refrigerators	Thermoelectric refrigerator, 1.7 cubic ft.	Compact refrigerator, 1.7 cubic ft.	416	4.0%	75%	95%	19	\$56
New	Single Family	Room AC	Air Conditioner - Room (Individual Rooms) (10,000 BTU/HR)	EER = 10.8	EER = 9.8	496	8.4%	NA	NA	10	\$42
New	Single Family	Room AC	Blinds - Fixed Angle/Automatic	Install Blinds (Reduce Window SHGC by 50%)	No Interior Shading Device	468	31.5%	65%	30%	10	\$603
New	Single Family	Room AC	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	468	3.3%	75%	25%	30	\$3

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Single Family	Room AC	Ceiling Fan	Ceiling Fan	No Ceiling Fan	468	0.3%	85%	20%	10	\$104
New	Single Family	Room AC	Construction - ICF	Concrete Framing	Standard Wood Framing	468	32.0%	45%	95%	30	\$11629
New	Single Family	Room AC	Construction - SIP	Specialty Framing	Standard Wood Framing	468	14.0%	45%	95%	30	\$4,839
New	Single Family	Room AC	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	468	20.0%	0%	95%	20	\$57
New	Single Family	Room AC	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	468	0.1%	85%	50%	30	\$116
New	Single Family	Room AC	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	468	0.1%	85%	55%	12	\$42
New	Single Family	Room AC	Green Roof	ecorof	Standard Roof	468	6.5%	0%	98%	40	\$21956
New	Single Family	Room AC	Insulation (Basement - Wall) 2'4	R-13 + R-5 sheathing	R-13	468	6.1%	20%	95%	25	\$474
New	Single Family	Room AC	Insulation (Basement - Wall) 2'4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-7)	468	6.9%	20%	70%	25	\$671
New	Single Family	Room AC	Insulation (Ceiling)	R-49	State Code (R-38)	468	0.1%	87%	85%	25	\$390
New	Single Family	Room AC	Insulation (Floor)	R-38	State Code (R-30)	468	0.1%	75%	90%	25	\$884
New	Single Family	Room AC	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	468	3.0%	80%	45%	25	\$130
New	Single Family	Room AC	Insulation (Rim And Band Joist)	R-19	R-10	468	4.0%	80%	75%	25	\$84
New	Single Family	Room AC	Insulation (Slab)	R-15	State Code (R-10)	468	1.4%	32%	64%	25	\$223
New	Single Family	Room AC	Insulation (wall) 2'6	R-21 + R5 Sheathing	State Code (R-21)	468	0.0%	95%	85%	25	\$2,363
New	Single Family	Room AC	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	468	2.0%	95%	40%	5	\$7
New	Single Family	Room AC	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	468	6.7%	0%	97%	30	\$305
New	Single Family	Room AC	Window Overhang	Overhangs over windows for shading	No window overhangs	468	14.0%	50%	80%	30	\$905
New	Single Family	Room AC	Windows	U = 0.19	U=0.30	468	5.0%	85%	95%	25	\$4,696
New	Single Family	Room Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	4,231	3.3%	75%	25%	30	\$3
New	Single Family	Room Heat	Construction - ICF	Concrete Framing	Standard Wood Framing	4,231	44.0%	45%	95%	30	\$11629
New	Single Family	Room Heat	Construction - SIP	Specialty Framing	Standard Wood Framing	4,231	14.0%	45%	95%	30	\$4,839
New	Single Family	Room Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	4,231	5.0%	85%	50%	30	\$116
New	Single Family	Room Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	4,231	3.0%	85%	55%	12	\$42
New	Single Family	Room Heat	Ductless Mini-Split REM	3 ton, SEER 15, HSPF 9.0	Electric Baseboard Heating HSPF=1	4,231	62.1%	80%	95%	15	\$5,700
New	Single Family	Room Heat	Green Roof	ecorof	Standard Roof	4,231	6.5%	0%	98%	40	\$21956
New	Single Family	Room Heat	Insulation (Basement - Wall) 2'4	R-13 + R-5 sheathing	R-13	4,231	6.1%	20%	95%	25	\$474
New	Single Family	Room Heat	Insulation (Basement - Wall) 2'4 - average existing value	R-13	Average Existing Insulation Value and/or Code Value (R-7)	4,231	6.9%	20%	70%	25	\$671

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Single Family	Room Heat	Insulation (Ceiling)	R-49	State Code (R-38)	4,231	3.0%	87%	85%	25	\$390
New	Single Family	Room Heat	Insulation (Floor)	R-38	State Code (R-30)	4,231	2.0%	75%	90%	25	\$884
New	Single Family	Room Heat	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	4,231	3.0%	80%	45%	25	\$130
New	Single Family	Room Heat	Insulation (Rim And Band Joist)	R-19	R-10	4,231	4.0%	80%	75%	25	\$84
New	Single Family	Room Heat	Insulation (Slab)	R-15	State Code (R-10)	4,231	1.4%	32%	64%	25	\$223
New	Single Family	Room Heat	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	4,231	3.2%	95%	85%	25	\$2,363
New	Single Family	Room Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	4,231	2.0%	95%	40%	5	\$7
New	Single Family	Room Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	4,231	2.0%	0%	97%	30	\$305
New	Single Family	Room Heat	Radiant Electric Ceiling Panels	Radiant Electric Heating with Ceiling Panels	Electric Baseboard Heating	4,231	52.0%	75%	98%	20	\$4,238
New	Single Family	Room Heat	Radiant Electric Floor Heating	Radiant Heating with Electric Cables in Flooring	Electric Baseboard Heating	4,231	20.0%	75%	95%	25	\$25183
New	Single Family	Room Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	4,231	3.0%	90%	90%	25	\$6,935
New	Single Family	Room Heat	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	4,231	10.0%	90%	90%	25	\$9,954
New	Single Family	Room Heat	Windows	U = 0.19	U=0.30	4,231	16.0%	85%	95%	25	\$4,696
New	Single Family	Water Heat	Water_Heater (40 Gallon Electric)	EF = 0.95	EF = 0.92	2,865	3.2%	NA	NA	15	\$129
New	Single Family	Water Heat	Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)	2,812	9.3%	35%	68%	14	\$252
New	Single Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)	2,812	11.2%	35%	77%	14	\$312
New	Single Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)	2,812	12.8%	35%	77%	14	\$417
New	Single Family	Water Heat	Desuperheater (Ground-Source system)	Heat_Pump) Desuperheater with Standard Water_Heater	Standard Water_Heater - EF = 0.92	2,812	55.2%	5%	90%	10	\$251
New	Single Family	Water Heat	Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)	2,812	1.1%	30%	35%	13	\$514
New	Single Family	Water Heat	Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher	2,812	2.1%	30%	15%	13	\$11
New	Single Family	Water Heat	Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery	2,812	18.5%	50%	95%	30	\$630
New	Single Family	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM	2,812	8.5%	95%	95%	9	\$4
New	Single Family	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM	2,812	3.5%	95%	55%	9	\$3
New	Single Family	Water Heat	Heat Pump Water Heater	EF=2.9	No Heat Pump Water Heater	2,812	54.6%	30%	95%	15	\$2,322
New	Single Family	Water Heat	Hot Water Pipe Insulation	R-4 Wrap	No insulation	2,812	1.2%	85%	38%	5	\$8
New	Single Family	Water Heat	Low-Flow Showerheads	1.75 GPM	2.5 GPM	2,812	19.3%	95%	85%	10	\$11
New	Single Family	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater	2,812	45.5%	20%	95%	20	\$8,930
New	Single Family	Water Heat	Tankless Water_Heater	EF = 0.95, 4.0 gpm	EF = 0.92	2,812	3.2%	85%	97%	20	\$1,302

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Single Family	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	2,812	6.5%	0%	65%	10	\$19
New	Single Family	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees	2,812	6.0%	95%	43%	4	\$0

Residential Gas Measures

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Central Boiler	Heat Gas Boiler	AFUE=90%	AFUE=82%	626	9.0%	NA	NA	18	\$2,399
Existing	Manufactured	Central Boiler	Heat Gas Boiler	AFUE=94%	AFUE=82%	626	12.7%	NA	NA	18	\$3,344
Existing	Manufactured	Central Boiler	Heat Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	601	3.3%	60%	55%	30	\$53
Existing	Manufactured	Central Boiler	Heat Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	601	3.0%	85%	50%	30	\$116
Existing	Manufactured	Central Boiler	Heat Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	601	2.0%	85%	55%	12	\$42
Existing	Manufactured	Central Boiler	Heat Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	601	1.3%	80%	65%	3	\$36
Existing	Manufactured	Central Boiler	Heat Gas Boiler - Proper Sizing	Proper Sizing of Gas Boiler	Oversized Gas Boiler	601	5.0%	53%	85%	30	\$1
Existing	Manufactured	Central Boiler	Heat Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	601	10.0%	85%	85%	15	\$435
Existing	Manufactured	Central Boiler	Heat Insulation (Ceiling)	R-49	State Code (R-38)	601	1.0%	87%	85%	25	\$471
Existing	Manufactured	Central Boiler	Heat Insulation (Ceiling)	State Code (R-38)	Average Existing Insulation Value (R-19)	601	2.0%	95%	40%	25	\$674
Existing	Manufactured	Central Boiler	Heat Insulation (Ceiling)	State Code (R-38)	R-9	601	10.5%	95%	10%	25	\$674
Existing	Manufactured	Central Boiler	Heat Insulation (Duct)	R-8	R-4	601	1.6%	12%	95%	25	\$103
Existing	Manufactured	Central Boiler	Heat Insulation (Floor)	R-38	State Code (R-30)	601	1.0%	75%	90%	25	\$1,061
Existing	Manufactured	Central Boiler	Heat Insulation (Floor)	State Code (R-30)	Average Existing Insulation Value and/or Code Value	601	2.0%	30%	40%	25	\$532
Existing	Manufactured	Central Boiler	Heat Insulation (Floor)	State Code (R-30)	R-0	601	8.0%	30%	10%	25	\$532
Existing	Manufactured	Central Boiler	Heat Insulation (Wall) 2*4	R-13	Average Existing Insulation Value and/or Code Value	601	4.0%	75%	40%	25	\$764
Existing	Manufactured	Central Boiler	Heat Insulation (Wall) 2*4	R-13	R-0	601	40.0%	75%	10%	25	\$764

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Central Boiler	Heat Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	601	1.8%	10%	90%	25	\$1,007
Existing	Manufactured	Central Boiler	Heat Insulation (wall) 2*6	State Code (R-21)	Average Existing Insulation Value and/or Code Value	601	11.0%	0%	55%	25	\$1,246
Existing	Manufactured	Central Boiler	Heat Insulation (wall) 2*6	State Code (R-21)	R-0	601	45.0%	0%	45%	25	\$1,246
Existing	Manufactured	Central Boiler	Heat Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	601	2.0%	95%	60%	5	\$6
Existing	Manufactured	Central Boiler	Heat Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	601	2.0%	0%	97%	30	\$365
Existing	Manufactured	Central Boiler	Heat Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	601	14.0%	0%	95%	25	\$3,000
Existing	Manufactured	Central Boiler	Heat Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	601	6.8%	85%	50%	15	\$27
Existing	Manufactured	Central Boiler	Heat Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	601	7.0%	65%	95%	12	\$1,150
Existing	Manufactured	Central Boiler	Heat Windows	U = 0.19	U = 0.30	601	8.0%	65%	95%	25	\$2,378
Existing	Manufactured	Central Boiler	Heat Windows	U = 0.30	Existing Windows (U=0.65)	601	8.0%	65%	15%	25	\$5,656
Existing	Manufactured	Central Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE = 80%	481	11.0%	NA	NA	18	\$788
Existing	Manufactured	Central Furnace	Heat Gas Furnace	AFUE = 95% (Condensing Furnace)	AFUE = 80%	481	16.0%	NA	NA	18	\$1,103
Existing	Manufactured	Central Furnace	Heat Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	457	3.3%	60%	55%	30	\$53
Existing	Manufactured	Central Furnace	Heat Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	457	3.0%	85%	50%	30	\$116
Existing	Manufactured	Central Furnace	Heat Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	457	2.0%	85%	55%	12	\$42
Existing	Manufactured	Central Furnace	Heat Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	457	1.3%	80%	65%	3	\$36
Existing	Manufactured	Central Furnace	Heat Duct Sealing	Duct Sealing	No Duct Sealing	457	6.0%	60%	65%	20	\$447
Existing	Manufactured	Central Furnace	Heat Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	457	19.0%	50%	95%	25	\$946
Existing	Manufactured	Central Furnace	Heat Gas Furnace - Maintenance	Maintenance	No Maintenance	457	5.0%	95%	75%	2	\$105

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Manufactured	Central Furnace	Heat Gas Furnace - Maintenance - New Equipment	Maintenance	No Maintenance	457	5.0%	6%	75%	1	\$105
Existing	Manufactured	Central Furnace	Heat Gas Furnace - Proper Sizing	Proper Sizing of Gas Furnace	Oversized Gas Furnace	457	5.0%	53%	85%	18	\$1
Existing	Manufactured	Central Furnace	Heat Insulation (Ceiling)	R-49	State Code (R-38)	457	1.0%	87%	85%	25	\$471
Existing	Manufactured	Central Furnace	Heat Insulation (Ceiling)	State Code (R-38)	Average Existing Insulation Value (R-19)	457	2.0%	95%	40%	25	\$674
Existing	Manufactured	Central Furnace	Heat Insulation (Ceiling)	State Code (R-38)	R-9	457	10.5%	95%	10%	25	\$674
Existing	Manufactured	Central Furnace	Heat Insulation (Duct)	R-8	No Duct Insulation	457	4.3%	12%	75%	25	\$201
Existing	Manufactured	Central Furnace	Heat Insulation (Floor)	R-38	State Code (R-30)	457	1.0%	75%	90%	25	\$1,061
Existing	Manufactured	Central Furnace	Heat Insulation (Floor)	State Code (R-30)	Average Existing Insulation Value and/or Code Value	457	2.0%	30%	40%	25	\$532
Existing	Manufactured	Central Furnace	Heat Insulation (Floor)	State Code (R-30)	R-0	457	9.0%	30%	10%	25	\$532
Existing	Manufactured	Central Furnace	Heat Insulation (Wall) 2*4	R-13	Average Existing Insulation Value and/or Code Value	457	5.0%	75%	40%	25	\$764
Existing	Manufactured	Central Furnace	Heat Insulation (Wall) 2*4	R-13	R-0	457	43.0%	75%	10%	25	\$764
Existing	Manufactured	Central Furnace	Heat Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	457	2.2%	10%	90%	25	\$1,007
Existing	Manufactured	Central Furnace	Heat Insulation (wall) 2*6	State Code (R-21)	Average Existing Insulation Value and/or Code Value	457	10.0%	0%	55%	25	\$1,246
Existing	Manufactured	Central Furnace	Heat Insulation (wall) 2*6	State Code (R-21)	R-0	457	48.0%	0%	45%	25	\$1,246
Existing	Manufactured	Central Furnace	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	3-ton AC/furnace, 13 SEER	457	15.0%	10%	95%	30	\$216
Existing	Manufactured	Central Furnace	Heat Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	457	2.0%	95%	60%	5	\$6
Existing	Manufactured	Central Furnace	Heat Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	457	2.0%	0%	97%	30	\$365
Existing	Manufactured	Central Furnace	Heat Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	457	14.0%	0%	95%	25	\$3,000
Existing	Manufactured	Central Furnace	Heat Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	457	6.8%	85%	60%	15	\$27

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Manufactured	Central Furnace	Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	457	7.0%	65%	95%	12	\$1,150
Existing	Manufactured	Central Furnace	Heat	Windows	U = 0.19	U = 0.30	457	9.0%	65%	95%	25	\$2,378
Existing	Manufactured	Central Furnace	Heat	Windows	U = 0.30	Existing Windows (U=0.65)	457	10.0%	65%	15%	25	\$5,656
Existing	Manufactured	Cooking Oven		Convection Oven	Convection Oven	Standard Oven	19	23.0%	85%	85%	15	\$305
Existing	Manufactured	Dryer		Clothes Dryer w Moisture Sensor	High-Efficiency Clothes Dryer w Moisture Sensor	Standard Dryer without Moisture Sensor	36	13.0%	NA	NA	18	\$53
Existing	Manufactured	Water Heat		Water Heater (40 Gallon Gas)	EF=0.62	EF = 0.59	156	4.4%	NA	NA	13	\$81
Existing	Manufactured	Water Heat		Water Heater (Gas)	EF=0.80 Condensing Water Heater	EF = 0.59	156	26.4%	NA	NA	13	\$1,212
Existing	Manufactured	Water Heat		Water Heater (Gas)	EF=0.86 Condensing Water Heater	EF = 0.59	156	31.4%	NA	NA	13	\$1,289
Existing	Manufactured	Water Heat		Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)	152	9.3%	85%	68%	14	\$252
Existing	Manufactured	Water Heat		Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)	152	11.2%	85%	91%	14	\$312
Existing	Manufactured	Water Heat		Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)	152	12.8%	85%	91%	14	\$417
Existing	Manufactured	Water Heat		Clothes Washer - Early Replacement	Standard Clothes Washer (1.26)	Existing Clothes Washer (MEF = 1.1)	152	12.7%	30%	25%	14	\$378
Existing	Manufactured	Water Heat		Desuperheater (Ground-Source Heat Pump) system	Desuperheater	Standard Water_Heater - EF = 0.59 (40 Gallon Tank)	152	30.0%	5%	90%	10	\$251
Existing	Manufactured	Water Heat		Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)	152	2.2%	23%	35%	13	\$514
Existing	Manufactured	Water Heat		Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher	152	4.1%	23%	15%	13	\$11
Existing	Manufactured	Water Heat		Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery	152	3.5%	0%	95%	30	\$630
Existing	Manufactured	Water Heat		Faucet Aerators	0.5 GPM	2.2 GPM	152	5.6%	95%	95%	9	\$3
Existing	Manufactured	Water Heat		Faucet Aerators	1.5 GPM	2.2 GPM	152	2.3%	95%	55%	9	\$2
Existing	Manufactured	Water Heat		Faucet Aerators	2.2 GPM	Existing Faucet Aerator (3.0 GPM)	152	2.6%	95%	10%	9	\$2
Existing	Manufactured	Water Heat		Hot Water Pipe Insulation	Install Insulation (R-4)	No insulation	152	1.2%	65%	25%	15	\$8
Existing	Manufactured	Water Heat		Low-Flow Showerheads	1.75 GPM	2.5 GPM	152	9.5%	95%	85%	10	\$5
Existing	Manufactured	Water Heat		Low-Flow Showerheads	2.5 GPM	3.0 GPM	152	6.4%	95%	33%	10	\$12
Existing	Manufactured	Water Heat		Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater	152	33.6%	20%	95%	20	\$8,930
Existing	Manufactured	Water Heat		Tankless Water_Heater	EF = 0.78, 4.3 gpm	EF = 0.59	152	24.4%	75%	99%	20	\$1,525
Existing	Manufactured	Water Heat		Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	152	6.5%	0%	75%	10	\$19
Existing	Manufactured	Water Heat		Water_Heater Thermostat Setback	120 degrees	135 degrees	152	6.0%	95%	43%	5	\$0
New	Manufactured	Central Boiler	Heat	Gas Boiler	AFUE=90%	AFUE=82%	585	8.9%	NA	NA	18	\$2,399

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Manufactured	Central Boiler	Heat Gas Boiler	AFUE=94%	AFUE=82%	585	12.8%	NA	NA	18	\$3,344
New	Manufactured	Central Boiler	Heat Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	529	3.3%	75%	25%	30	\$3
New	Manufactured	Central Boiler	Heat Construction - ICF	Concrete Framing	Standard Wood Framing	529	44.0%	1%	95%	30	\$6,442
New	Manufactured	Central Boiler	Heat Construction - SIP	Specialty Framing	Standard Wood Framing	529	14.0%	1%	95%	30	\$5,680
New	Manufactured	Central Boiler	Heat Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	529	4.0%	85%	50%	30	\$116
New	Manufactured	Central Boiler	Heat Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	529	3.0%	85%	55%	12	\$42
New	Manufactured	Central Boiler	Heat Gas Boiler - Proper Sizing	Proper Sizing of Gas Boiler	Oversized Gas Boiler	529	5.0%	53%	85%	30	\$1
New	Manufactured	Central Boiler	Heat Green Roof	ecorroof	Standard Roof	529	6.5%	0%	98%	40	\$26327
New	Manufactured	Central Boiler	Heat Insulation (Ceiling)	R-49	State Code (R-38)	529	2.0%	87%	85%	25	\$582
New	Manufactured	Central Boiler	Heat Insulation (Floor)	R-38	State Code (R-30)	529	1.0%	75%	90%	25	\$1,061
New	Manufactured	Central Boiler	Heat Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	529	2.8%	95%	50%	25	\$812
New	Manufactured	Central Boiler	Heat Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	529	2.0%	95%	40%	5	\$6
New	Manufactured	Central Boiler	Heat Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	529	2.0%	0%	97%	30	\$365
New	Manufactured	Central Boiler	Heat Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	529	3.0%	95%	95%	25	\$3,289
New	Manufactured	Central Boiler	Heat Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	529	11.0%	95%	95%	25	\$5,061
New	Manufactured	Central Boiler	Heat Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	529	6.8%	85%	50%	15	\$27
New	Manufactured	Central Boiler	Heat Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	529	7.0%	65%	95%	12	\$1,150
New	Manufactured	Central Boiler	Heat Windows	U = 0.19	U = 0.30	529	14.0%	85%	95%	25	\$2,757
New	Manufactured	Central Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE = 80%	441	10.9%	NA	NA	18	\$788

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Manufactured	Central Furnace	Heat Gas Furnace	AFUE = 95% (Condensing Furnace)	AFUE = 80%	441	15.6%	NA	NA	18	\$1,103
New	Manufactured	Central Furnace	Heat Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	389	3.3%	75%	25%	30	\$3
New	Manufactured	Central Furnace	Heat Construction - ICF	Concrete Framing	Standard Wood Framing	389	44.0%	1%	95%	30	\$6,442
New	Manufactured	Central Furnace	Heat Construction - SIP	Specialty Framing	Standard Wood Framing	389	14.0%	1%	95%	30	\$5,680
New	Manufactured	Central Furnace	Heat Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	389	5.0%	85%	50%	30	\$116
New	Manufactured	Central Furnace	Heat Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	389	3.0%	85%	55%	12	\$42
New	Manufactured	Central Furnace	Heat Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	389	8.0%	85%	75%	30	\$126
New	Manufactured	Central Furnace	Heat Duct Sealing	Duct Sealing	No Duct Sealing	389	6.0%	0%	65%	20	\$447
New	Manufactured	Central Furnace	Heat Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	New homes with AFUE HVAC, SEER 13	389	19.0%	0%	95%	25	\$525
New	Manufactured	Central Furnace	Heat Gas Furnace - Maintenance - New Equipment	Maintenance	No Maintenance	389	4.0%	95%	75%	1	\$105
New	Manufactured	Central Furnace	Heat Gas Furnace - Proper Sizing	Proper Sizing of Gas Furnace	Oversized Gas Furnace	389	5.0%	53%	85%	18	\$1
New	Manufactured	Central Furnace	Heat Green Roof	ecorroof	Standard Roof	389	6.5%	0%	98%	40	\$26327
New	Manufactured	Central Furnace	Heat Insulation (Ceiling)	R-49	State Code (R-38)	389	2.0%	87%	85%	25	\$582
New	Manufactured	Central Furnace	Heat Insulation (Floor)	R-38	State Code (R-30)	389	2.0%	75%	90%	25	\$1,061
New	Manufactured	Central Furnace	Heat Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	389	2.8%	95%	50%	25	\$812
New	Manufactured	Central Furnace	Heat Integrated Space and Water Heating	Premium Efficiency AFUE = 90 - Condensing Furnace	Standard Efficiency AFUE = 78- Condensing Furnace	389	13.3%	15%	95%	15	\$184
New	Manufactured	Central Furnace	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	3-ton AC/furnace, 13 SEER	389	15.0%	0%	95%	30	\$96
New	Manufactured	Central Furnace	Heat Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	389	2.0%	95%	40%	5	\$6
New	Manufactured	Central Furnace	Heat Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	389	2.0%	0%	97%	30	\$365

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	Manufactured	Central Furnace	Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	389	3.0%	95%	95%	25	\$3,289
New	Manufactured	Central Furnace	Heat	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	389	11.0%	95%	95%	25	\$5,061
New	Manufactured	Central Furnace	Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	389	6.8%	85%	60%	15	\$27
New	Manufactured	Central Furnace	Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	389	7.0%	65%	95%	12	\$1,150
New	Manufactured	Central Furnace	Heat	Windows	U = 0.19	U = 0.30	389	16.0%	85%	95%	25	\$2,757
New	Manufactured	Cooking Oven	Convection Oven	Convection Oven	Standard Oven		19	23.0%	85%	85%	15	\$305
New	Manufactured	Dryer	Clothes Dryer w Moisture Sensor	High-Efficiency Clothes Dryer w Moisture Sensor	Standard Dryer without Moisture Sensor		36	13.0%	NA	NA	18	\$53
New	Manufactured	Water Heat	Water Heater (40 Gallon Gas)	EF=0.62	EF = 0.59		193	4.6%	NA	NA	13	\$81
New	Manufactured	Water Heat	Water Heater (Gas)	EF=0.80 Condensing Water Heater	EF = 0.59		193	26.0%	NA	NA	13	\$1,212
New	Manufactured	Water Heat	Water Heater (Gas)	EF=0.86 Condensing Water Heater	EF = 0.59		193	31.1%	NA	NA	13	\$1,289
New	Manufactured	Water Heat	Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)		159	9.3%	85%	68%	14	\$252
New	Manufactured	Water Heat	Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)		159	11.2%	85%	91%	14	\$312
New	Manufactured	Water Heat	Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)		159	12.8%	85%	91%	14	\$417
New	Manufactured	Water Heat	Desuperheater (Ground-Source Heat Pump) system	Desuperheater	Standard Water_Heater - EF = 0.59 (40 Gallon Tank)		159	30.0%	5%	90%	10	\$251
New	Manufactured	Water Heat	Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)		159	2.2%	23%	35%	13	\$514
New	Manufactured	Water Heat	Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher		159	4.1%	23%	15%	13	\$11
New	Manufactured	Water Heat	Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery		159	3.5%	50%	95%	30	\$630
New	Manufactured	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM		159	4.6%	95%	95%	9	\$3
New	Manufactured	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM		159	1.9%	95%	55%	9	\$2
New	Manufactured	Water Heat	Hot Water Pipe Insulation	Install Insulation (R-4)	No insulation		159	1.2%	0%	75%	15	\$8
New	Manufactured	Water Heat	Integrated Space and Water Heating	High Efficiency Water Heater EF =0.62	Standard efficiency Water Heater EF = 0.59		159	4.8%	15%	95%	15	\$71
New	Manufactured	Water Heat	Low-Flow Showerheads	1.75 GPM	2.5 GPM		159	7.9%	95%	65%	10	\$5
New	Manufactured	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater		159	33.7%	20%	95%	20	\$8,930
New	Manufactured	Water Heat	Tankless Water_Heater	EF = 0.78, 4.3 gpm	EF = 0.59		159	24.4%	75%	99%	20	\$1,398
New	Manufactured	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation		159	6.5%	0%	75%	10	\$19
New	Manufactured	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees		159	6.0%	95%	43%	5	\$0

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Multi Family	Central Boiler	Heat Gas Boiler	AFUE=90%	AFUE=82%	453	9.1%	NA	NA	18	\$2,399
Existing	Multi Family	Central Boiler	Heat Gas Boiler	AFUE=94%	AFUE=82%	453	12.8%	NA	NA	18	\$3,344
Existing	Multi Family	Central Boiler	Heat Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	435	3.3%	60%	55%	30	\$53
Existing	Multi Family	Central Boiler	Heat Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	435	3.0%	85%	50%	30	\$58
Existing	Multi Family	Central Boiler	Heat Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	435	2.0%	85%	55%	12	\$21
Existing	Multi Family	Central Boiler	Heat Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	435	1.3%	80%	55%	3	\$36
Existing	Multi Family	Central Boiler	Heat Gas Boiler - Proper Sizing	Proper Sizing of Gas Boiler	Oversized Gas Boiler	435	5.0%	53%	85%	30	\$1
Existing	Multi Family	Central Boiler	Heat Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	435	10.0%	85%	75%	15	\$218
Existing	Multi Family	Central Boiler	Heat Insulation (Ceiling)	R-49	State Code (R-38)	435	1.0%	87%	85%	25	\$291
Existing	Multi Family	Central Boiler	Heat Insulation (Ceiling)	State Code (R-38)	Average Existing Insulation Value (R-19)	435	2.0%	95%	40%	25	\$520
Existing	Multi Family	Central Boiler	Heat Insulation (Ceiling)	State Code (R-38)	R-9	435	10.5%	95%	10%	25	\$520
Existing	Multi Family	Central Boiler	Heat Insulation (Duct)	R-8	R-4	435	1.6%	12%	95%	25	\$73
Existing	Multi Family	Central Boiler	Heat Insulation (Floor)	R-38	State Code (R-30)	435	1.0%	75%	90%	25	\$747
Existing	Multi Family	Central Boiler	Heat Insulation (Floor)	State Code (R-30)	Average Existing Insulation Value and/or Code Value	435	2.0%	80%	40%	25	\$375
Existing	Multi Family	Central Boiler	Heat Insulation (Floor)	State Code (R-30)	R-0	435	8.0%	80%	10%	25	\$375
Existing	Multi Family	Central Boiler	Heat Insulation (Slab)	R-10	Average Existing Insulation Value and/or Code Value	435	1.3%	47%	65%	25	\$994
Existing	Multi Family	Central Boiler	Heat Insulation (Slab)	R-10	R-0	435	4.3%	47%	60%	25	\$994
Existing	Multi Family	Central Boiler	Heat Insulation (Slab)	R-15	R-10	435	1.4%	47%	87%	25	\$221
Existing	Multi Family	Central Boiler	Heat Insulation (Wall) 2*4	R-13	Average Existing Insulation Value and/or Code Value	435	4.0%	75%	40%	25	\$314

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Multi Family	Central Boiler	Heat Insulation (Wall) 2*4	R-13	R-0	435	40.0%	75%	10%	25	\$314
Existing	Multi Family	Central Boiler	Heat Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	435	1.8%	10%	90%	25	\$452
Existing	Multi Family	Central Boiler	Heat Insulation (wall) 2*6	State Code (R-21)	Average Existing Insulation Value and/or Code Value	435	11.0%	0%	40%	25	\$513
Existing	Multi Family	Central Boiler	Heat Insulation (wall) 2*6	State Code (R-21)	R-0	435	45.0%	0%	35%	25	\$513
Existing	Multi Family	Central Boiler	Heat Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	435	2.0%	95%	60%	5	\$4
Existing	Multi Family	Central Boiler	Heat Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	435	2.0%	0%	97%	30	\$258
Existing	Multi Family	Central Boiler	Heat Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	435	14.0%	0%	95%	25	\$1,125
Existing	Multi Family	Central Boiler	Heat Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	435	6.8%	85%	75%	15	\$27
Existing	Multi Family	Central Boiler	Heat Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	435	7.0%	65%	95%	12	\$1,150
Existing	Multi Family	Central Boiler	Heat Windows	U = 0.19	U = 0.30	435	8.0%	75%	95%	25	\$815
Existing	Multi Family	Central Boiler	Heat Windows	U = 0.30	Existing Windows (U=0.65)	435	8.0%	75%	15%	25	\$1,939
Existing	Multi Family	Central Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE = 80%	364	11.1%	NA	NA	18	\$788
Existing	Multi Family	Central Furnace	Heat Gas Furnace	AFUE = 95% (Condensing Furnace)	AFUE = 80%	364	15.9%	NA	NA	18	\$1,103
Existing	Multi Family	Central Furnace	Heat Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	345	3.3%	60%	55%	30	\$53
Existing	Multi Family	Central Furnace	Heat Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	345	3.0%	85%	50%	30	\$58
Existing	Multi Family	Central Furnace	Heat Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	345	2.0%	85%	55%	12	\$21
Existing	Multi Family	Central Furnace	Heat Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	345	1.3%	80%	55%	3	\$36
Existing	Multi Family	Central Furnace	Heat Duct Sealing	Duct Sealing	No Duct Sealing	345	6.0%	60%	65%	20	\$447
Existing	Multi Family	Central Furnace	Heat Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	345	19.0%	50%	95%	25	\$946

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Multi Family	Central Furnace	Heat Gas Furnace - Maintenance	Maintenance	No Maintenance	345	5.0%	95%	75%	2	\$105
Existing	Multi Family	Central Furnace	Heat Gas Furnace - Maintenance - New Equipment	Maintenance	No Maintenance	345	5.0%	6%	75%	1	\$105
Existing	Multi Family	Central Furnace	Heat Gas Furnace - Proper Sizing	Proper Sizing of Gas Furnace	Oversized Gas Furnace	345	5.0%	53%	85%	18	\$1
Existing	Multi Family	Central Furnace	Heat Insulation (Ceiling)	R-49	State Code (R-38)	345	1.0%	87%	85%	25	\$291
Existing	Multi Family	Central Furnace	Heat Insulation (Ceiling)	State Code (R-38)	Average Existing Insulation Value (R-19)	345	2.0%	95%	40%	25	\$520
Existing	Multi Family	Central Furnace	Heat Insulation (Ceiling)	State Code (R-38)	R-9	345	10.5%	95%	10%	25	\$520
Existing	Multi Family	Central Furnace	Heat Insulation (Duct)	R-8	No Duct Insulation	345	4.3%	12%	75%	25	\$141
Existing	Multi Family	Central Furnace	Heat Insulation (Floor)	R-38	State Code (R-30)	345	1.0%	75%	90%	25	\$747
Existing	Multi Family	Central Furnace	Heat Insulation (Floor)	State Code (R-30)	Average Existing Insulation Value and/or Code Value	345	2.0%	80%	40%	25	\$375
Existing	Multi Family	Central Furnace	Heat Insulation (Floor)	State Code (R-30)	R-0	345	9.0%	80%	10%	25	\$375
Existing	Multi Family	Central Furnace	Heat Insulation (Slab)	R-10	Average Existing Insulation Value and/or Code Value	345	1.3%	47%	65%	25	\$994
Existing	Multi Family	Central Furnace	Heat Insulation (Slab)	R-10	R-0	345	4.3%	47%	60%	25	\$994
Existing	Multi Family	Central Furnace	Heat Insulation (Slab)	R-15	R-10	345	1.4%	47%	87%	25	\$221
Existing	Multi Family	Central Furnace	Heat Insulation (Wall) 2*4	R-13	Average Existing Insulation Value and/or Code Value	345	5.0%	75%	40%	25	\$314
Existing	Multi Family	Central Furnace	Heat Insulation (Wall) 2*4	R-13	R-0	345	43.0%	75%	10%	25	\$314
Existing	Multi Family	Central Furnace	Heat Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	345	2.2%	10%	90%	25	\$452
Existing	Multi Family	Central Furnace	Heat Insulation (wall) 2*6	State Code (R-21)	Average Existing Insulation Value and/or Code Value	345	10.0%	0%	40%	25	\$513
Existing	Multi Family	Central Furnace	Heat Insulation (wall) 2*6	State Code (R-21)	R-0	345	48.0%	0%	35%	25	\$513
Existing	Multi Family	Central Furnace	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	3-ton AC/furnace, 13 SEER	345	15.0%	10%	95%	30	\$216

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Multi Family	Central Furnace	Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	345	2.0%	95%	60%	5	\$4
Existing	Multi Family	Central Furnace	Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	345	2.0%	0%	97%	30	\$258
Existing	Multi Family	Central Furnace	Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	345	14.0%	0%	95%	25	\$1,125
Existing	Multi Family	Central Furnace	Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	345	6.8%	85%	55%	15	\$27
Existing	Multi Family	Central Furnace	Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	345	7.0%	65%	95%	12	\$1,150
Existing	Multi Family	Central Furnace	Heat	Windows	U = 0.19	U = 0.30	345	9.0%	75%	95%	25	\$815
Existing	Multi Family	Central Furnace	Heat	Windows	U = 0.30	Existing Windows (U=0.65)	345	10.0%	75%	15%	25	\$1,939
Existing	Multi Family	Cooking Oven		Convection Oven	Convection Oven	Standard Oven	19	23.0%	85%	85%	15	\$305
Existing	Multi Family	Dryer		Clothes Dryer w Moisture Sensor	High-Efficiency Clothes Dryer w Moisture Sensor	Standard Dryer without Moisture Sensor	36	13.0%	NA	NA	18	\$53
Existing	Multi Family	Water Heat		Water Heater (40 Gallon Gas)	EF=0.62	EF = 0.59	139	5.0%	NA	NA	13	\$81
Existing	Multi Family	Water Heat		Water Heater (Gas)	EF=0.80 Condensing Water Heater	EF = 0.59	139	26.2%	NA	NA	13	\$1,212
Existing	Multi Family	Water Heat		Water Heater (Gas)	EF=0.86 Condensing Water Heater	EF = 0.59	139	31.2%	NA	NA	13	\$1,289
Existing	Multi Family	Water Heat		Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)	135	9.3%	67%	68%	14	\$252
Existing	Multi Family	Water Heat		Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)	135	11.2%	67%	85%	14	\$312
Existing	Multi Family	Water Heat		Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)	135	12.8%	67%	85%	14	\$417
Existing	Multi Family	Water Heat		Clothes Washer - Early Replacement	Standard Clothes Washer (1.26)	Existing Clothes Washer (MEF = 1.1)	135	12.7%	25%	25%	14	\$378
Existing	Multi Family	Water Heat		Desuperheater (Ground-Source Heat Pump) system	Desuperheater	Standard Water_Heater - EF = 0.59 (40 Gallon Tank)	135	30.0%	5%	90%	10	\$251
Existing	Multi Family	Water Heat		Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)	135	2.2%	27%	35%	13	\$514
Existing	Multi Family	Water Heat		Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher	135	4.1%	27%	15%	13	\$11
Existing	Multi Family	Water Heat		Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery	135	3.5%	0%	95%	30	\$630
Existing	Multi Family	Water Heat		Faucet Aerators	0.5 GPM	2.2 GPM	135	6.3%	95%	95%	9	\$3
Existing	Multi Family	Water Heat		Faucet Aerators	1.5 GPM	2.2 GPM	135	2.6%	95%	55%	9	\$2
Existing	Multi Family	Water Heat		Faucet Aerators	2.2 GPM	Existing Faucet Aerator (3.0 GPM)	135	3.0%	95%	10%	9	\$2
Existing	Multi Family	Water Heat		Hot Water Pipe Insulation	Install Insulation (R-4)	No insulation	135	1.2%	65%	62%	15	\$8
Existing	Multi Family	Water Heat		Low-Flow Showerheads	1.75 GPM	2.5 GPM	135	10.8%	95%	85%	10	\$5

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Multi Family	Water Heat	Low-Flow Showerheads	2.5 GPM	3.0 GPM	135	7.2%	95%	33%	10	\$12
Existing	Multi Family	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater	135	19.0%	20%	95%	20	\$4,465
Existing	Multi Family	Water Heat	Tankless Water_Heater	EF = 0.78, 4.3 gpm	EF = 0.59	135	24.4%	75%	99%	20	\$1,525
Existing	Multi Family	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	135	6.5%	0%	78%	10	\$19
Existing	Multi Family	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees	135	6.0%	95%	64%	5	\$0
New	Multi Family	Central Boiler	Heat Gas Boiler	AFUE=90%	AFUE=82%	391	8.8%	NA	NA	18	\$2,399
New	Multi Family	Central Boiler	Heat Gas Boiler	AFUE=94%	AFUE=82%	391	12.8%	NA	NA	18	\$3,344
New	Multi Family	Central Boiler	Heat Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	353	3.3%	75%	25%	30	\$3
New	Multi Family	Central Boiler	Heat Construction - ICF	Concrete Framing	Standard Wood Framing	353	44.0%	45%	95%	30	\$2,650
New	Multi Family	Central Boiler	Heat Construction - SIP	Specialty Framing	Standard Wood Framing	353	14.0%	20%	95%	30	\$1,984
New	Multi Family	Central Boiler	Heat Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	353	4.0%	85%	50%	30	\$58
New	Multi Family	Central Boiler	Heat Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	353	3.0%	85%	55%	12	\$68
New	Multi Family	Central Boiler	Heat Gas Boiler - Proper Sizing	Proper Sizing of Gas Boiler	Oversized Gas Boiler	353	5.0%	53%	85%	30	\$1
New	Multi Family	Central Boiler	Heat Green Roof	ecorooft	Standard Roof	353	6.5%	0%	98%	40	\$11078
New	Multi Family	Central Boiler	Heat Insulation (Ceiling)	R-49	State Code (R-38)	353	2.0%	87%	85%	25	\$336
New	Multi Family	Central Boiler	Heat Insulation (Floor)	R-38	State Code (R-30)	353	1.0%	75%	90%	25	\$747
New	Multi Family	Central Boiler	Heat Insulation (Slab)	R-15	R-10	353	1.4%	47%	64%	25	\$221
New	Multi Family	Central Boiler	Heat Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	353	2.8%	95%	90%	25	\$372
New	Multi Family	Central Boiler	Heat Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	353	2.0%	95%	40%	5	\$4
New	Multi Family	Central Boiler	Heat Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	353	2.0%	0%	97%	30	\$258

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	Multi Family	Central Boiler	Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	353	3.0%	95%	95%	25	\$1,149
New	Multi Family	Central Boiler	Heat	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	353	11.0%	95%	95%	25	\$1,767
New	Multi Family	Central Boiler	Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	353	6.8%	85%	75%	15	\$27
New	Multi Family	Central Boiler	Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	353	7.0%	65%	95%	12	\$1,150
New	Multi Family	Central Boiler	Heat	Windows	U = 0.19	U = 0.30	353	14.0%	85%	95%	25	\$1,155
New	Multi Family	Central Furnace	Heat	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE = 80%	331	11.0%	NA	NA	18	\$788
New	Multi Family	Central Furnace	Heat	Gas Furnace	AFUE = 95% (Condensing Furnace)	AFUE = 80%	331	15.8%	NA	NA	18	\$1,103
New	Multi Family	Central Furnace	Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	291	3.3%	75%	25%	30	\$3
New	Multi Family	Central Furnace	Heat	Construction - ICF	Concrete Framing	Standard Wood Framing	291	44.0%	45%	95%	30	\$2,650
New	Multi Family	Central Furnace	Heat	Construction - SIP	Specialty Framing	Standard Wood Framing	291	14.0%	20%	95%	30	\$1,984
New	Multi Family	Central Furnace	Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	291	5.0%	85%	50%	30	\$58
New	Multi Family	Central Furnace	Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	291	3.0%	85%	55%	12	\$21
New	Multi Family	Central Furnace	Heat	Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	291	8.0%	85%	10%	30	\$106
New	Multi Family	Central Furnace	Heat	Duct Sealing	Duct Sealing	No Duct Sealing	291	6.0%	0%	65%	20	\$447
New	Multi Family	Central Furnace	Heat	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	New homes with AFUE HVAC, SEER 13	291	19.0%	0%	95%	25	\$525
New	Multi Family	Central Furnace	Heat	Gas Furnace - Maintenance - New Equipment	Maintenance	No Maintenance	291	4.0%	95%	75%	1	\$105
New	Multi Family	Central Furnace	Heat	Gas Furnace - Proper Sizing	Proper Sizing of Gas Furnace	Oversized Gas Furnace	291	5.0%	53%	85%	18	\$1
New	Multi Family	Central Furnace	Heat	Green Roof	ecorroof	Standard Roof	291	6.5%	0%	98%	40	\$11078
New	Multi Family	Central Furnace	Heat	Insulation (Ceiling)	R-49	State Code (R-38)	291	2.0%	87%	85%	25	\$336

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Multi Family	Central Furnace	Heat Insulation (Floor)	R-38	State Code (R-30)	291	2.0%	75%	90%	25	\$747
New	Multi Family	Central Furnace	Heat Insulation (Slab)	R-15	R-10	291	1.4%	47%	64%	25	\$221
New	Multi Family	Central Furnace	Heat Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	291	2.8%	95%	90%	25	\$372
New	Multi Family	Central Furnace	Heat Integrated Space and Water Heating	Premium Efficiency AFUE = 90 - Condensing Furnace	Standard Efficiency AFUE = 78- Condensing Furnace	291	13.3%	25%	95%	15	\$184
New	Multi Family	Central Furnace	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	3-ton AC/furnace, 13 SEER	291	15.0%	0%	95%	30	\$96
New	Multi Family	Central Furnace	Heat Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	291	2.0%	95%	40%	5	\$4
New	Multi Family	Central Furnace	Heat Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	291	2.0%	0%	97%	30	\$258
New	Multi Family	Central Furnace	Heat Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	291	3.0%	95%	95%	25	\$1,149
New	Multi Family	Central Furnace	Heat Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	291	11.0%	95%	95%	25	\$1,767
New	Multi Family	Central Furnace	Heat Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	291	6.8%	85%	55%	15	\$27
New	Multi Family	Central Furnace	Heat Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	291	7.0%	65%	95%	12	\$1,150
New	Multi Family	Central Furnace	Heat Windows	U = 0.19	U = 0.30	291	16.0%	85%	95%	25	\$1,155
New	Multi Family	Cooking Oven	Convection Oven	Convection Oven	Standard Oven	19	23.0%	85%	85%	15	\$305
New	Multi Family	Dryer	Clothes Dryer w Moisture Sensor	High-Efficiency Clothes Dryer w Moisture Sensor	Standard Dryer without Moisture Sensor	36	13.0%	NA	NA	18	\$53
New	Multi Family	Water Heat	Water Heater (40 Gallon Gas)	EF=0.62	EF = 0.59	171	5.2%	NA	NA	13	\$81
New	Multi Family	Water Heat	Water Heater (Gas)	EF=0.80 Condensing Water Heater	EF = 0.59	171	26.4%	NA	NA	13	\$1,212
New	Multi Family	Water Heat	Water Heater (Gas)	EF=0.86 Condensing Water Heater	EF = 0.59	171	31.6%	NA	NA	13	\$1,289
New	Multi Family	Water Heat	Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)	141	9.3%	67%	68%	14	\$252
New	Multi Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)	141	11.2%	67%	85%	14	\$312
New	Multi Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)	141	12.8%	67%	85%	14	\$417
New	Multi Family	Water Heat	Desuperheater (Ground-Source Heat Pump) system	Desuperheater	Standard Water_Heater - EF = 0.59 (40 Gallon Tank)	141	30.0%	5%	90%	10	\$251
New	Multi Family	Water Heat	Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)	141	2.2%	27%	35%	13	\$514

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Multi Family	Water Heat	Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher	141	4.1%	27%	15%	13	\$11
New	Multi Family	Water Heat	Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery	141	3.5%	50%	95%	30	\$630
New	Multi Family	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM	141	5.2%	95%	95%	9	\$3
New	Multi Family	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM	141	2.1%	95%	55%	9	\$2
New	Multi Family	Water Heat	Hot Water Pipe Insulation	Install Insulation (R-4)	No insulation	141	1.2%	0%	67%	15	\$8
New	Multi Family	Water Heat	Integrated Space and Water Heating	High Efficiency Water Heater EF =0.62	Standard efficiency Water Heater EF = 0.59	141	4.8%	25%	95%	15	\$71
New	Multi Family	Water Heat	Low-Flow Showerheads	1.75 GPM	2.5 GPM	141	8.9%	95%	65%	10	\$5
New	Multi Family	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater	141	19.1%	20%	95%	20	\$4,465
New	Multi Family	Water Heat	Tankless Water_Heater	EF = 0.78, 4.3 gpm	EF = 0.59	141	24.4%	75%	99%	20	\$1,398
New	Multi Family	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	141	6.5%	0%	78%	10	\$19
New	Multi Family	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees	141	6.0%	95%	64%	5	\$0
Existing	Single Family	Central Boiler	Heat Gas Boiler	AFUE=90%	AFUE=82%	772	8.9%	NA	NA	18	\$2,399
Existing	Single Family	Central Boiler	Heat Gas Boiler	AFUE=94%	AFUE=82%	772	12.9%	NA	NA	18	\$3,344
Existing	Single Family	Central Boiler	Heat Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	742	3.3%	60%	55%	30	\$53
Existing	Single Family	Central Boiler	Heat Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	742	3.0%	85%	50%	30	\$116
Existing	Single Family	Central Boiler	Heat Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	742	2.0%	85%	55%	12	\$42
Existing	Single Family	Central Boiler	Heat Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	742	1.3%	80%	45%	3	\$36
Existing	Single Family	Central Boiler	Heat Gas Boiler - Proper Sizing	Proper Sizing of Gas Boiler	Oversized Gas Boiler	742	5.0%	53%	85%	30	\$1
Existing	Single Family	Central Boiler	Heat Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test	Install Caulking And Weatherstripping	Existing Infiltration Conditions	742	10.0%	85%	75%	15	\$435
Existing	Single Family	Central Boiler	Heat Insulation (Basement - Wall) 2*4	R-13	Average Existing Insulation Value and/or Code Value	742	6.9%	14%	70%	25	\$906
Existing	Single Family	Central Boiler	Heat Insulation (Basement - Wall) 2*4	R-13	R-0	742	14.9%	14%	70%	25	\$906
Existing	Single Family	Central Boiler	Heat Insulation (Basement - Wall) 2*4	R-13 + R-5 sheathing	R-13	742	6.1%	14%	95%	25	\$708
Existing	Single Family	Central Boiler	Heat Insulation (Ceiling)	R-49	State Code (R-38)	742	1.0%	87%	85%	25	\$344

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Central Boiler	Heat Insulation (Ceiling)	State Code (R-38)	Average Existing Insulation Value (R-19)	742	2.0%	95%	40%	25	\$562
Existing	Single Family	Central Boiler	Heat Insulation (Ceiling)	State Code (R-38)	R-9	742	10.5%	95%	10%	25	\$562
Existing	Single Family	Central Boiler	Heat Insulation (Duct)	R-8	R-4	742	1.6%	12%	95%	25	\$172
Existing	Single Family	Central Boiler	Heat Insulation (Floor)	R-38	State Code (R-30)	742	1.0%	75%	90%	25	\$884
Existing	Single Family	Central Boiler	Heat Insulation (Floor)	State Code (R-30)	Average Existing Insulation Value and/or Code Value	742	2.0%	55%	40%	25	\$443
Existing	Single Family	Central Boiler	Heat Insulation (Floor)	State Code (R-30)	R-0	742	8.0%	55%	10%	25	\$443
Existing	Single Family	Central Boiler	Heat Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	742	3.0%	60%	45%	25	\$130
Existing	Single Family	Central Boiler	Heat Insulation (Rim And Band Joist)	R-19	R-10	742	4.0%	60%	75%	25	\$84
Existing	Single Family	Central Boiler	Heat Insulation (Slab)	R-10	Average Existing Insulation Value and/or Code Value	742	1.3%	28%	65%	25	\$1,049
Existing	Single Family	Central Boiler	Heat Insulation (Slab)	R-10	R-0	742	4.3%	28%	60%	25	\$1,049
Existing	Single Family	Central Boiler	Heat Insulation (Slab)	R-15	R-10	742	1.4%	28%	87%	25	\$223
Existing	Single Family	Central Boiler	Heat Insulation (Wall) 2*4	R-13	Average Existing Insulation Value and/or Code Value	742	4.0%	75%	40%	25	\$1,396
Existing	Single Family	Central Boiler	Heat Insulation (Wall) 2*4	R-13	R-0	742	40.0%	75%	10%	25	\$1,396
Existing	Single Family	Central Boiler	Heat Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	742	1.8%	10%	90%	25	\$1,786
Existing	Single Family	Central Boiler	Heat Insulation (wall) 2*6	State Code (R-21)	Average Existing Insulation Value and/or Code Value	742	11.0%	0%	60%	25	\$2,276
Existing	Single Family	Central Boiler	Heat Insulation (wall) 2*6	State Code (R-21)	R-0	742	45.0%	0%	50%	25	\$2,276
Existing	Single Family	Central Boiler	Heat Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	742	2.0%	95%	60%	5	\$7
Existing	Single Family	Central Boiler	Heat Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	742	2.0%	0%	97%	30	\$305
Existing	Single Family	Central Boiler	Heat Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	742	14.0%	0%	95%	25	\$7,750

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Single Family	Central Boiler	Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	742	6.8%	85%	37%	15	\$27
Existing	Single Family	Central Boiler	Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	742	7.0%	65%	95%	12	\$1,422
Existing	Single Family	Central Boiler	Heat	Windows	U = 0.19	U = 0.30	742	8.0%	75%	95%	25	\$4,343
Existing	Single Family	Central Boiler	Heat	Windows	U = 0.30	Existing Windows (U=0.65)	742	8.0%	75%	15%	25	\$10331
Existing	Single Family	Central Furnace	Heat	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE = 80%	634	11.0%	NA	NA	18	\$788
Existing	Single Family	Central Furnace	Heat	Gas Furnace	AFUE = 95% (Condensing Furnace)	AFUE = 80%	634	15.8%	NA	NA	18	\$1,103
Existing	Single Family	Central Furnace	Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	602	3.3%	60%	55%	30	\$53
Existing	Single Family	Central Furnace	Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	602	3.0%	85%	50%	30	\$116
Existing	Single Family	Central Furnace	Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	602	2.0%	85%	55%	12	\$42
Existing	Single Family	Central Furnace	Heat	Doors - Weatherization	Weatherstripping And Adding Door Sweeps	Existing Non-Efficient door	602	1.3%	80%	45%	3	\$36
Existing	Single Family	Central Furnace	Heat	Duct Sealing	Duct Sealing	No Duct Sealing	602	6.0%	60%	65%	20	\$447
Existing	Single Family	Central Furnace	Heat	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	Older homes with AFUE HVAC, SEER 9	602	19.0%	50%	95%	25	\$946
Existing	Single Family	Central Furnace	Heat	Gas Furnace - Maintenance	Maintenance	No Maintenance	602	5.0%	95%	75%	2	\$105
Existing	Single Family	Central Furnace	Heat	Gas Furnace - Maintenance - New Equipment	Maintenance	No Maintenance	602	5.0%	6%	75%	1	\$105
Existing	Single Family	Central Furnace	Heat	Gas Furnace - Proper Sizing	Proper Sizing of Gas Furnace	Oversized Gas Furnace	602	5.0%	53%	85%	18	\$1
Existing	Single Family	Central Furnace	Heat	Insulation (Basement - Wall) 2*4	R-13	Average Existing Insulation Value and/or Code Value	602	6.9%	14%	70%	25	\$906
Existing	Single Family	Central Furnace	Heat	Insulation (Basement - Wall) 2*4	R-13	R-0	602	14.9%	14%	70%	25	\$906
Existing	Single Family	Central Furnace	Heat	Insulation (Basement - Wall) 2*4	R-13 + R-5 sheathing	R-13	602	6.1%	14%	95%	25	\$708
Existing	Single Family	Central Furnace	Heat	Insulation (Ceiling)	R-49	State Code (R-38)	602	1.0%	87%	85%	25	\$344

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Central Furnace	Heat Insulation (Ceiling)	State Code (R-38)	Average Existing Insulation Value (R-19)	602	2.0%	95%	40%	25	\$562
Existing	Single Family	Central Furnace	Heat Insulation (Ceiling)	State Code (R-38)	R-9	602	10.5%	95%	10%	25	\$562
Existing	Single Family	Central Furnace	Heat Insulation (Duct)	R-8	No Duct Insulation	602	4.3%	12%	75%	25	\$335
Existing	Single Family	Central Furnace	Heat Insulation (Floor)	R-38	State Code (R-30)	602	1.0%	75%	90%	25	\$884
Existing	Single Family	Central Furnace	Heat Insulation (Floor)	State Code (R-30)	Average Existing Insulation Value and/or Code Value	602	2.0%	55%	40%	25	\$443
Existing	Single Family	Central Furnace	Heat Insulation (Floor)	State Code (R-30)	R-0	602	9.0%	55%	10%	25	\$443
Existing	Single Family	Central Furnace	Heat Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	602	3.0%	60%	45%	25	\$130
Existing	Single Family	Central Furnace	Heat Insulation (Rim And Band Joist)	R-19	R-10	602	4.0%	60%	75%	25	\$84
Existing	Single Family	Central Furnace	Heat Insulation (Slab)	R-10	Average Existing Insulation Value and/or Code Value	602	1.3%	28%	65%	25	\$1,049
Existing	Single Family	Central Furnace	Heat Insulation (Slab)	R-10	R-0	602	4.3%	28%	60%	25	\$1,049
Existing	Single Family	Central Furnace	Heat Insulation (Slab)	R-15	R-10	602	1.4%	28%	87%	25	\$223
Existing	Single Family	Central Furnace	Heat Insulation (Wall) 2*4	R-13	Average Existing Insulation Value and/or Code Value	602	5.0%	75%	40%	25	\$1,396
Existing	Single Family	Central Furnace	Heat Insulation (Wall) 2*4	R-13	R-0	602	43.0%	75%	10%	25	\$1,396
Existing	Single Family	Central Furnace	Heat Insulation (Wall) 2*4	R-13 + R5 Sheathing	R-13	602	2.2%	10%	90%	25	\$1,786
Existing	Single Family	Central Furnace	Heat Insulation (wall) 2*6	State Code (R-21)	Average Existing Insulation Value and/or Code Value	602	10.0%	0%	60%	25	\$2,276
Existing	Single Family	Central Furnace	Heat Insulation (wall) 2*6	State Code (R-21)	R-0	602	48.0%	0%	50%	25	\$2,276
Existing	Single Family	Central Furnace	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	3-ton AC/furnace, 13 SEER	602	15.0%	10%	95%	30	\$288
Existing	Single Family	Central Furnace	Heat Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	602	2.0%	95%	60%	5	\$7
Existing	Single Family	Central Furnace	Heat Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	602	2.0%	0%	97%	30	\$305

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Single Family	Central Furnace	Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*4Wall R-13	602	14.0%	0%	95%	25	\$7,750
Existing	Single Family	Central Furnace	Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	602	6.8%	85%	32%	15	\$27
Existing	Single Family	Central Furnace	Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	602	7.0%	65%	95%	12	\$1,422
Existing	Single Family	Central Furnace	Heat	Windows	U = 0.19	U = 0.30	602	9.0%	75%	95%	25	\$4,343
Existing	Single Family	Central Furnace	Heat	Windows	U = 0.30	Existing Windows (U=0.65)	602	10.0%	75%	15%	25	\$10331
Existing	Single Family	Cooking Oven	Convection Oven	Convection Oven	Standard Oven		19	23.0%	85%	85%	15	\$305
Existing	Single Family	Dryer	Clothes Dryer w Moisture Sensor	High-Efficiency Clothes Dryer w Moisture Sensor	Standard Dryer without Moisture Sensor		36	13.0%	NA	NA	18	\$53
Existing	Single Family	Pool Heat	Pool Heaters	Energy Efficient Heaters - 88% efficiency	Standard Heaters - 83% efficiency		253	5.7%	85%	65%	8	\$483
Existing	Single Family	Water Heat	Water Heater (40 Gallon Gas)	EF=0.62	EF = 0.59		238	5.0%	NA	NA	13	\$81
Existing	Single Family	Water Heat	Water Heater (Gas)	EF=0.80 Condensing Water Heater	EF = 0.59		238	26.4%	NA	NA	13	\$1,212
Existing	Single Family	Water Heat	Water Heater (Gas)	EF=0.86 Condensing Water Heater	EF = 0.59		238	31.4%	NA	NA	13	\$1,289
Existing	Single Family	Water Heat	Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)		231	9.3%	99%	68%	14	\$252
Existing	Single Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)		231	11.2%	99%	77%	14	\$312
Existing	Single Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)		231	12.8%	99%	77%	14	\$417
Existing	Single Family	Water Heat	Clothes Washer - Early Replacement	Standard Clothes Washer (1.26)	Existing Clothes Washer (MEF = 1.1)		231	12.7%	35%	25%	14	\$378
Existing	Single Family	Water Heat	Desuperheater (Ground-Source Heat Pump) system	Desuperheater	Standard Water_Heater - EF = 0.59 (40 Gallon Tank)		231	30.0%	5%	90%	10	\$251
Existing	Single Family	Water Heat	Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)		231	2.2%	30%	35%	13	\$514
Existing	Single Family	Water Heat	Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher		231	4.1%	30%	15%	13	\$11
Existing	Single Family	Water Heat	Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery		231	3.5%	0%	95%	30	\$630
Existing	Single Family	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM		231	5.5%	95%	95%	9	\$4
Existing	Single Family	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM		231	2.3%	95%	55%	9	\$3
Existing	Single Family	Water Heat	Faucet Aerators	2.2 GPM	Existing Faucet Aerator (3.0 GPM)		231	2.6%	95%	10%	9	\$2
Existing	Single Family	Water Heat	Hot Water Pipe Insulation	Install Insulation (R-4)	No insulation		231	1.2%	65%	38%	15	\$8
Existing	Single Family	Water Heat	Low-Flow Showerheads	1.75 GPM	2.5 GPM		231	12.5%	95%	85%	10	\$11
Existing	Single Family	Water Heat	Low-Flow Showerheads	2.5 GPM	3.0 GPM		231	8.4%	95%	33%	10	\$25
Existing	Single Family	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater		231	22.2%	20%	95%	20	\$8,930

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Single Family	Water Heat	Tankless Water_Heater	EF = 0.78, 4.3 gpm	EF = 0.59	231	24.4%	75%	97%	20	\$1,525
Existing	Single Family	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	231	6.5%	0%	63%	10	\$19
Existing	Single Family	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees	231	6.0%	95%	43%	5	\$0
New	Single Family	Central Boiler	Heat Gas Boiler	AFUE=90%	AFUE=82%	621	9.0%	NA	NA	18	\$2,399
New	Single Family	Central Boiler	Heat Gas Boiler	AFUE=94%	AFUE=82%	621	12.7%	NA	NA	18	\$3,344
New	Single Family	Central Boiler	Heat Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	561	3.3%	75%	25%	30	\$3
New	Single Family	Central Boiler	Heat Construction - ICF	Concrete Framing	Standard Wood Framing	561	44.0%	45%	95%	30	\$11629
New	Single Family	Central Boiler	Heat Construction - SIP	Specialty Framing	Standard Wood Framing	561	14.0%	45%	95%	30	\$6,564
New	Single Family	Central Boiler	Heat Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	561	4.0%	85%	50%	30	\$116
New	Single Family	Central Boiler	Heat Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	561	3.0%	85%	55%	12	\$42
New	Single Family	Central Boiler	Heat Gas Boiler - Proper Sizing	Proper Sizing of Gas Boiler	Oversized Gas Boiler	561	5.0%	53%	85%	30	\$1
New	Single Family	Central Boiler	Heat Green Roof	ecorroof	Standard Roof	561	6.5%	0%	98%	40	\$21956
New	Single Family	Central Boiler	Heat Insulation (Basement - Wall) 2*4	R-13	Average Existing Insulation Value and/or Code Value	561	6.9%	14%	70%	25	\$671
New	Single Family	Central Boiler	Heat Insulation (Basement - Wall) 2*4	R-13 + R-5 sheathing	R-13	561	6.1%	14%	95%	25	\$474
New	Single Family	Central Boiler	Heat Insulation (Ceiling)	R-49	State Code (R-38)	561	2.0%	87%	85%	25	\$365
New	Single Family	Central Boiler	Heat Insulation (Floor)	R-38	State Code (R-30)	561	1.0%	75%	90%	25	\$884
New	Single Family	Central Boiler	Heat Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	561	3.0%	80%	45%	25	\$130
New	Single Family	Central Boiler	Heat Insulation (Rim And Band Joist)	R-19	R-10	561	4.0%	80%	75%	25	\$84
New	Single Family	Central Boiler	Heat Insulation (Slab)	R-15	R-10	561	1.4%	28%	64%	25	\$223
New	Single Family	Central Boiler	Heat Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	561	2.8%	95%	85%	25	\$2,363

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	Single Family	Central Boiler	Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	561	2.0%	95%	40%	5	\$7
New	Single Family	Central Boiler	Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	561	2.0%	0%	97%	30	\$305
New	Single Family	Central Boiler	Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	561	3.0%	95%	95%	25	\$7,602
New	Single Family	Central Boiler	Heat	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	561	11.0%	95%	95%	25	\$11697
New	Single Family	Central Boiler	Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	561	6.8%	85%	37%	15	\$27
New	Single Family	Central Boiler	Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	561	7.0%	65%	95%	12	\$1,422
New	Single Family	Central Boiler	Heat	Windows	U = 0.19	U = 0.30	561	14.0%	85%	95%	25	\$4,696
New	Single Family	Central Furnace	Heat	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE = 80%	480	11.1%	NA	NA	18	\$788
New	Single Family	Central Furnace	Heat	Gas Furnace	AFUE = 95% (Condensing Furnace)	AFUE = 80%	480	15.8%	NA	NA	18	\$1,103
New	Single Family	Central Furnace	Heat	Canned Lighting Air Tight Sealing	Canned Lighting Air Tight Sealing	No Air tight Sealing	423	3.3%	75%	25%	30	\$3
New	Single Family	Central Furnace	Heat	Construction - ICF	Concrete Framing	Standard Wood Framing	423	44.0%	45%	95%	30	\$11629
New	Single Family	Central Furnace	Heat	Construction - SIP	Specialty Framing	Standard Wood Framing	423	14.0%	45%	95%	30	\$6,564
New	Single Family	Central Furnace	Heat	Doors	R-11 (Steel Doors with foam core)	Standard non-thermal wood door (R-2)	423	5.0%	85%	50%	30	\$116
New	Single Family	Central Furnace	Heat	Doors	R-5 (Composite Doors with foam core)	Standard non-thermal wood door (R-2)	423	3.0%	85%	55%	12	\$42
New	Single Family	Central Furnace	Heat	Duct Location	Conditioned Space Design - Duct Loss Is Not A Concern	Ducts in Unconditioned Space (Duct loss)	423	8.0%	85%	15%	30	\$210
New	Single Family	Central Furnace	Heat	Duct Sealing	Duct Sealing	No Duct Sealing	423	6.0%	0%	65%	20	\$447
New	Single Family	Central Furnace	Heat	Duct Sealing - Aerosol-Based	Spray-in ductwork sealant to minimize duct leaks	New homes with AFUE HVAC, SEER 13	423	19.0%	0%	95%	25	\$525
New	Single Family	Central Furnace	Heat	Gas Furnace - Maintenance - New Equipment	Maintenance	No Maintenance	423	4.0%	95%	75%	1	\$105
New	Single Family	Central Furnace	Heat	Gas Furnace - Proper Sizing	Proper Sizing of Gas Furnace	Oversized Gas Furnace	423	5.0%	53%	85%	18	\$1

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	Single Family	Central Furnace	Heat	Green Roof	ecorooft	Standard Roof	423	6.5%	0%	98%	40	\$21956
New	Single Family	Central Furnace	Heat	Insulation (Basement - Wall) 2*4	R-13	Average Existing Insulation Value and/or Code Value	423	6.9%	14%	70%	25	\$671
New	Single Family	Central Furnace	Heat	Insulation (Basement - Wall) 2*4	R-13 + R-5 sheathing	R-13	423	6.1%	14%	95%	25	\$474
New	Single Family	Central Furnace	Heat	Insulation (Ceiling)	R-49	State Code (R-38)	423	2.0%	87%	85%	25	\$365
New	Single Family	Central Furnace	Heat	Insulation (Floor)	R-38	State Code (R-30)	423	2.0%	75%	90%	25	\$884
New	Single Family	Central Furnace	Heat	Insulation (Rim And Band Joist)	R-10	No Rim And Band Joist Insulation	423	3.0%	80%	45%	25	\$130
New	Single Family	Central Furnace	Heat	Insulation (Rim And Band Joist)	R-19	R-10	423	4.0%	80%	75%	25	\$84
New	Single Family	Central Furnace	Heat	Insulation (Slab)	R-15	R-10	423	1.4%	28%	64%	25	\$223
New	Single Family	Central Furnace	Heat	Insulation (wall) 2*6	R-21 + R5 Sheathing	State Code (R-21)	423	2.8%	95%	85%	25	\$2,363
New	Single Family	Central Furnace	Heat	Integrated Space and Water Heating	Premium Efficiency AFUE = 90 - Condensing Furnace	Standard Efficiency AFUE = 78- Condensing Furnace	423	13.3%	60%	95%	15	\$184
New	Single Family	Central Furnace	Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	3-ton AC/furnace, 13 SEER	423	15.0%	0%	95%	30	\$127
New	Single Family	Central Furnace	Heat	Outlet Gasket	Install Outlet Gasket (Reduce Air Leakage)	No Outlet Gasket	423	2.0%	95%	40%	5	\$7
New	Single Family	Central Furnace	Heat	Radiant Barrier (Ceiling)	Install Radiant Barrier	No Radiant Barrier	423	2.0%	0%	97%	30	\$305
New	Single Family	Central Furnace	Heat	Spray in insulation 2*4 Wall	2*4Wall - closed cell foam insulation R-23	2*6Wall R-21	423	3.0%	95%	95%	25	\$7,602
New	Single Family	Central Furnace	Heat	Spray in insulation 2*6 Wall	2*6Wall - closed cell foam insulation R-37	2*6Wall R-21	423	11.0%	95%	95%	25	\$11697
New	Single Family	Central Furnace	Heat	Thermostat - Clock/Programmable	Programmable Thermostat	Manual Thermostat	423	6.8%	85%	32%	15	\$27
New	Single Family	Central Furnace	Heat	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	423	7.0%	65%	95%	12	\$1,422
New	Single Family	Central Furnace	Heat	Windows	U = 0.19	U = 0.30	423	16.0%	85%	95%	25	\$4,696
New	Single Family	Cooking Oven	Convection Oven	Convection Oven	Standard Oven		19	23.0%	85%	85%	15	\$305

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Single Family	Dryer	Clothes Dryer w Moisture Sensor	High-Efficiency Clothes Dryer w Moisture Sensor	Standard Dryer without Moisture Sensor	36	13.0%	NA	NA	18	\$53
New	Single Family	Pool Heat	Pool Heaters	Energy Efficient Heaters - 88% efficiency	Standard Heaters - 83% efficiency	253	5.7%	85%	65%	8	\$483
New	Single Family	Water Heat	Water Heater (40 Gallon Gas)	EF=0.62	EF = 0.59	295	5.0%	NA	NA	13	\$81
New	Single Family	Water Heat	Water Heater (Gas)	EF=0.80 Condensing Water Heater	EF = 0.59	295	26.3%	NA	NA	13	\$1,212
New	Single Family	Water Heat	Water Heater (Gas)	EF=0.86 Condensing Water Heater	EF = 0.59	295	31.3%	NA	NA	13	\$1,289
New	Single Family	Water Heat	Clothes Washer	Energy Star MEF = 1.83 (top Load)	Standard Clothes Washer (1.26)	243	9.3%	99%	68%	14	\$252
New	Single Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.01 (front load)	Standard Clothes Washer (1.26)	243	11.2%	99%	77%	14	\$312
New	Single Family	Water Heat	Clothes Washer	Tier 2. MEF = 2.2 (front load)	Standard Clothes Washer (1.26)	243	12.8%	99%	77%	14	\$417
New	Single Family	Water Heat	Desuperheater (Ground-Source Heat Pump) system	Desuperheater	Standard Water_Heater - EF = 0.59 (40 Gallon Tank)	243	30.0%	5%	90%	10	\$251
New	Single Family	Water Heat	Dishwasher	EF = 0.77	EF = 0.65 (ENERGY STAR)	243	2.2%	30%	35%	13	\$514
New	Single Family	Water Heat	Dishwasher - Existing	EF = 0.65 (ENERGY STAR)	EF = 0.46 Existing Dishwasher	243	4.1%	30%	15%	13	\$11
New	Single Family	Water Heat	Drain Water Heat Recovery	Drain Water Heat Recovery (GFX or Power-Pipe)	No Drain Water Heat Recovery	243	3.5%	50%	95%	30	\$630
New	Single Family	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM	243	4.5%	95%	95%	9	\$4
New	Single Family	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM	243	1.9%	95%	55%	9	\$3
New	Single Family	Water Heat	Hot Water Pipe Insulation	Install Insulation (R-4)	No insulation	243	1.2%	0%	37%	15	\$8
New	Single Family	Water Heat	Integrated Space and Water Heating	High Efficiency Water Heater EF =0.62	Standard efficiency Water Heater EF = 0.59	243	4.8%	60%	95%	15	\$71
New	Single Family	Water Heat	Low-Flow Showerheads	1.75 GPM	2.5 GPM	243	10.3%	95%	65%	10	\$11
New	Single Family	Water Heat	Solar Hot Water (SHW)	Solar thermal collector	Non-solar hot water heater	243	22.1%	20%	95%	20	\$8,930
New	Single Family	Water Heat	Tankless Water_Heater	EF = 0.78, 4.3 gpm	EF = 0.59	243	24.4%	75%	97%	20	\$1,398
New	Single Family	Water Heat	Water_Heater Tank Blanket/Insulation	Install Insulation (R-5)	No Tank Insulation	243	6.5%	0%	63%	10	\$19
New	Single Family	Water Heat	Water_Heater Thermostat Setback	120 degrees	135 degrees	243	6.0%	95%	43%	5	\$0

Commercial Electric Measures

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Dry Retail	Goods	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	1.82	20.0%	NA	NA	20	\$3,334
Existing	Dry Retail	Goods	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	1.82	27.3%	NA	NA	20	\$4,156
Existing	Dry Retail	Goods	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	1.82	9.5%	NA	NA	20	\$1,196
Existing	Dry Retail	Goods	Cooling Chillers	Centrifugal Chiller - VSD Remodel for Existing	VSD motor	Constant Speed Motor	1.87	40.0%	43%	45%	10	\$6,220
Existing	Dry Retail	Goods	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	1.87	7.6%	25%	70%	10	\$7,543
Existing	Dry Retail	Goods	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	1.87	5.0%	95%	95%	10	\$7,158
Existing	Dry Retail	Goods	Cooling Chillers	Chiller-Water Side Economizer	Install Economizer	No Economizer	1.87	5.0%	45%	90%	10	\$17517
Existing	Dry Retail	Goods	Cooling Chillers	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.87	12.5%	90%	40%	3	\$2,071
Existing	Dry Retail	Goods	Cooling Chillers	Cooling Tower-Decrease Temperature	Approach 6 Deg F	10 Deg F	1.87	8.0%	50%	94%	15	\$746
Existing	Dry Retail	Goods	Cooling Chillers	Cooling Tower-Two-Speed Fan Motor	Two-Speed Tower Fans replace Single-Speed	Cooling Tower-One-Speed Fan Motor	1.87	14.0%	95%	35%	10	\$83
Existing	Dry Retail	Goods	Cooling Chillers	Cooling Tower-VSD Fan Control	Variable-Speed Tower Fans replace Two-Speed	Cooling Tower-Two-Speed Fan Motor	1.87	4.0%	95%	75%	10	\$675
Existing	Dry Retail	Goods	Cooling Chillers	Direct Digital Control System-Installation	DDC Retrofit	Pnuematic	1.87	15.0%	75%	59%	5	\$10103
Existing	Dry Retail	Goods	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.87	10.0%	75%	80%	5	\$5,658
Existing	Dry Retail	Goods	Cooling Chillers	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pnuematic	1.87	15.0%	50%	80%	5	\$4,083
Existing	Dry Retail	Goods	Cooling Chillers	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.87	2.5%	45%	45%	18	\$4,203
Existing	Dry Retail	Goods	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	1.87	10.0%	15%	98%	30	106431
Existing	Dry Retail	Goods	Cooling Chillers	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	1.87	5.0%	40%	10%	10	\$2,460

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Dry Retail	Goods	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	1.87	2.0%	75%	95%	25	\$5,463
Existing	Dry Retail	Goods	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	1.87	3.0%	75%	98%	25	\$7,249
Existing	Dry Retail	Goods	Cooling Chillers	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.87	2.4%	75%	85%	25	\$6,409
Existing	Dry Retail	Goods	Cooling Chillers	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.87	6.0%	75%	0%	25	\$6,409
Existing	Dry Retail	Goods	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.87	4.4%	10%	15%	25	\$1,175
Existing	Dry Retail	Goods	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.87	2.4%	10%	15%	25	\$1,224
Existing	Dry Retail	Goods	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.87	3.0%	10%	95%	25	\$2,479
Existing	Dry Retail	Goods	Cooling Chillers	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.87	10.0%	10%	0%	25	\$2,685
Existing	Dry Retail	Goods	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.87	1.0%	35%	90%	25	\$946
Existing	Dry Retail	Goods	Cooling Chillers	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.87	3.0%	35%	90%	25	\$5,463
Existing	Dry Retail	Goods	Cooling Chillers	Pipe Insulation	R-4	R-0	1.87	1.0%	65%	45%	15	\$215
Existing	Dry Retail	Goods	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.87	25.0%	25%	98%	10	\$22168
Existing	Dry Retail	Goods	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	1.87	44.8%	60%	99%	20	\$20427
Existing	Dry Retail	Goods	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	1.87	0.9%	80%	80%	25	\$9,436
Existing	Dry Retail	Goods	Cooling Chillers	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.87	0.5%	10%	80%	25	\$26640
Existing	Dry Retail	Goods	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	1.98	14.2%	NA	NA	15	\$7,460
Existing	Dry Retail	Goods	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	1.98	6.4%	NA	NA	15	\$3,971
Existing	Dry Retail	Goods	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	1.98	10.4%	NA	NA	15	\$6,156

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Dry Retail	Goods	Cooling DX	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	2.03	12.5%	90%	40%	3	\$2,071
Existing	Dry Retail	Goods	Cooling DX	Cooling DX Package-Air Side Economizer	Air-Side Economizer	No Economizer	2.03	15.0%	10%	80%	15	\$6,043
Existing	Dry Retail	Goods	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	2.03	25.0%	50%	85%	15	\$21889
Existing	Dry Retail	Goods	Cooling DX	Direct Digital Control System-Installation	DDC Retrofit	Pnuematic	2.03	15.0%	75%	59%	5	\$10103
Existing	Dry Retail	Goods	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	2.03	10.0%	75%	80%	5	\$5,658
Existing	Dry Retail	Goods	Cooling DX	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pnuematic	2.03	15.0%	50%	80%	5	\$4,083
Existing	Dry Retail	Goods	Cooling DX	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	2.03	2.5%	45%	45%	18	\$4,203
Existing	Dry Retail	Goods	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	2.03	10.0%	15%	98%	30	106431
Existing	Dry Retail	Goods	Cooling DX	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	2.03	5.0%	40%	10%	10	\$2,460
Existing	Dry Retail	Goods	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	2.03	2.0%	75%	95%	25	\$5,463
Existing	Dry Retail	Goods	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	2.03	3.0%	75%	98%	25	\$7,249
Existing	Dry Retail	Goods	Cooling DX	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	2.03	2.4%	75%	85%	25	\$6,409
Existing	Dry Retail	Goods	Cooling DX	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	2.03	6.0%	75%	0%	25	\$6,409
Existing	Dry Retail	Goods	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	2.03	4.4%	10%	15%	25	\$1,175
Existing	Dry Retail	Goods	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	2.03	2.4%	10%	15%	25	\$1,224
Existing	Dry Retail	Goods	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	2.03	3.0%	10%	95%	25	\$2,479
Existing	Dry Retail	Goods	Cooling DX	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	2.03	8.4%	10%	35%	25	\$2,716
Existing	Dry Retail	Goods	Cooling DX	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	2.03	10.0%	10%	0%	25	\$2,685
Existing	Dry Retail	Goods	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	2.03	1.0%	35%	90%	25	\$946

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Dry Retail	Goods	Cooling DX	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	2.03	3.0%	35%	90%	25	\$5,463
Existing	Dry Retail	Goods	Cooling DX	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	2.03	3.0%	95%	54%	15	\$145
Existing	Dry Retail	Goods	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	2.03	0.9%	80%	80%	25	\$9,436
Existing	Dry Retail	Goods	Cooling DX	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	2.03	0.5%	10%	80%	25	\$26640
Existing	Dry Retail	Goods	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	2.74	20.0%	1%	85%	10	\$2,147
Existing	Dry Retail	Goods	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	2.74	7.5%	25%	65%	10	\$13133
Existing	Dry Retail	Goods	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	2.74	3.8%	85%	81%	10	\$274
Existing	Dry Retail	Goods	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	2.74	33.8%	85%	75%	20	\$2,132
Existing	Dry Retail	Goods	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	2.74	8.8%	10%	77%	10	\$3,837
Existing	Dry Retail	Goods	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	2.74	1.6%	5%	94%	10	\$1,791
Existing	Dry Retail	Goods	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	2.90	16.8%	NA	NA	15	\$5,288
Existing	Dry Retail	Goods	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	2.90	30.2%	NA	NA	15	\$11323
Existing	Dry Retail	Goods	Heat Pump	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	3.02	12.5%	90%	40%	3	\$2,071
Existing	Dry Retail	Goods	Heat Pump	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	3.02	15.0%	75%	59%	5	\$10103
Existing	Dry Retail	Goods	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	3.02	10.0%	75%	80%	5	\$5,658
Existing	Dry Retail	Goods	Heat Pump	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	3.02	15.0%	50%	80%	5	\$4,083
Existing	Dry Retail	Goods	Heat Pump	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	3.02	2.5%	45%	45%	18	\$4,203
Existing	Dry Retail	Goods	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	3.02	4.8%	5%	94%	10	\$9,529

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Dry Retail	Goods	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	3.02	2.0%	15%	98%	30	106431
Existing	Dry Retail	Goods	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Stnd. Air Source HP 'EER=10.1, COP=3.2	3.02	17.8%	5%	92%	20	\$61334
Existing	Dry Retail	Goods	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Stnd. Air Source HP 'EER=10.1, COP=3.2	3.02	40.9%	5%	92%	20	115230
Existing	Dry Retail	Goods	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Stnd. Air Source Heat Pump'EER=10.1, COP=3.2	3.02	19.1%	5%	90%	20	\$12337
Existing	Dry Retail	Goods	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Stnd. Air Source Heat Pump'EER=10.1, COP=3.2	3.02	32.0%	5%	90%	20	\$16294
Existing	Dry Retail	Goods	Heat Pump	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	3.02	8.3%	40%	10%	10	\$2,460
Existing	Dry Retail	Goods	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	3.02	5.9%	75%	95%	25	\$5,463
Existing	Dry Retail	Goods	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	3.02	8.9%	75%	98%	25	\$7,249
Existing	Dry Retail	Goods	Heat Pump	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	3.02	5.5%	75%	85%	25	\$6,409
Existing	Dry Retail	Goods	Heat Pump	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	3.02	13.8%	75%	0%	25	\$6,409
Existing	Dry Retail	Goods	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	3.02	4.4%	10%	15%	25	\$1,175
Existing	Dry Retail	Goods	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	3.02	2.4%	10%	15%	25	\$1,224
Existing	Dry Retail	Goods	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	3.02	5.0%	10%	95%	25	\$2,479
Existing	Dry Retail	Goods	Heat Pump	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	3.02	16.6%	10%	35%	25	\$2,716
Existing	Dry Retail	Goods	Heat Pump	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	3.02	19.8%	10%	0%	25	\$2,685
Existing	Dry Retail	Goods	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	3.02	3.7%	35%	90%	25	\$946
Existing	Dry Retail	Goods	Heat Pump	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	3.02	11.1%	35%	90%	25	\$5,463
Existing	Dry Retail	Goods	Heat Pump	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	3.02	3.0%	95%	54%	15	\$145
Existing	Dry Retail	Goods	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	3.02	6.4%	80%	80%	25	\$9,436

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Dry Retail	Goods	Heat Pump	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	3.02	4.2%	10%	80%	25	\$26640
Existing	Dry Retail	Goods	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	5.39	2.0%	10%	75%	9	\$828
Existing	Dry Retail	Goods	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	5.39	6.0%	30%	84%	9	\$1,261
Existing	Dry Retail	Goods	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.5	5.39	15.0%	90%	70%	14	\$2,566
Existing	Dry Retail	Goods	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.5	5.39	20.0%	75%	85%	14	\$5,686
Existing	Dry Retail	Goods	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.5	5.39	25.0%	70%	90%	14	\$8,876
Existing	Dry Retail	Goods	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 30%	Code Required LPD And Control Strategies: LPD = 1.5	5.39	31.5%	50%	95%	14	\$3,675
Existing	Dry Retail	Goods	Lighting	HE Fixtures/Design - Existing to Code	Code Required LPD And Control Strategies: LPD = 1.5	Existing Lighting Design	5.39	38.5%	95%	45%	14	\$12250
Existing	Dry Retail	Goods	Lighting	LED Exit Lighting	5 Watts	CFL Exit Sign (26 Watts)	5.39	1.6%	95%	65%	11	\$53
Existing	Dry Retail	Goods	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	5.39	0.4%	10%	80%	13	\$630
Existing	Dry Retail	Goods	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	5.39	2.3%	10%	95%	14	\$37
Existing	Dry Retail	Goods	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	5.39	4.0%	45%	88%	9	\$196
Existing	Dry Retail	Goods	Lighting	Time Clocks And Timers	Install Time Clock Lighting	No Time Clock	5.39	4.9%	85%	86%	9	\$215
Existing	Dry Retail	Goods	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.78	0.4%	95%	90%	7	\$2
Existing	Dry Retail	Goods	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.78	13.6%	64%	25%	4	\$1
Existing	Dry Retail	Goods	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.78	4.3%	20%	45%	6	\$165
Existing	Dry Retail	Goods	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.78	1.8%	75%	55%	4	\$1
Existing	Dry Retail	Goods	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.78	18.4%	64%	15%	4	\$158
Existing	Dry Retail	Goods	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.78	1.3%	75%	40%	5	\$16

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Dry Retail	Goods	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.78	0.9%	75%	45%	4	\$1
Existing	Dry Retail	Goods	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.78	1.4%	15%	75%	10	\$1
Existing	Dry Retail	Goods	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	2.78	1.8%	95%	30%	3	\$310
Existing	Dry Retail	Goods	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.78	1.0%	95%	86%	7	\$0
Existing	Dry Retail	Goods	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	2.78	1.2%	75%	95%	10	\$86
Existing	Dry Retail	Goods	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.78	0.3%	5%	65%	13	\$126
Existing	Dry Retail	Goods	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.78	3.6%	25%	35%	7	\$578
Existing	Dry Retail	Goods	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.78	6.6%	5%	80%	14	\$189
Existing	Dry Retail	Goods	Plug Load	Vending Miser	Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls	No Vending Miser - No controls	2.78	6.8%	5%	25%	3	\$297
Existing	Dry Retail	Goods	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	2.04	12.5%	90%	40%	3	\$2,071
Existing	Dry Retail	Goods	Space Heat	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	2.04	15.0%	75%	59%	5	\$10103
Existing	Dry Retail	Goods	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	2.04	10.0%	75%	80%	5	\$5,658
Existing	Dry Retail	Goods	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	2.04	15.0%	50%	80%	5	\$4,083
Existing	Dry Retail	Goods	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	2.04	2.5%	45%	45%	18	\$4,203
Existing	Dry Retail	Goods	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	2.04	15.0%	5%	94%	10	\$9,529
Existing	Dry Retail	Goods	Space Heat	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	2.04	10.0%	40%	10%	10	\$2,460
Existing	Dry Retail	Goods	Space Heat	Insulation (Ceiling)	R-49	R-30	2.04	8.0%	75%	98%	25	\$5,463
Existing	Dry Retail	Goods	Space Heat	Insulation (Ceiling) - Existing to Code	R-30	Existing Ceiling Insulation (Average R-9)	2.04	12.5%	75%	85%	25	\$6,409
Existing	Dry Retail	Goods	Space Heat	Insulation (Ceiling) - Zero to Code	R-30	R-0	2.04	25.0%	75%	0%	25	\$6,409

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Dry Retail	Goods	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	2.04 4.4%	10%	15%	25	\$1,175
Existing	Dry Retail	Goods	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	2.04 2.4%	10%	15%	25	\$1,224
Existing	Dry Retail	Goods	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	2.04 6.0%	10%	95%	25	\$2,479
Existing	Dry Retail	Goods	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	2.04 21.1%	10%	35%	25	\$2,716
Existing	Dry Retail	Goods	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	2.04 25.0%	10%	0%	25	\$2,685
Existing	Dry Retail	Goods	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	2.04 5.0%	35%	90%	25	\$946
Existing	Dry Retail	Goods	Space Heat	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	2.04 15.0%	35%	90%	25	\$5,463
Existing	Dry Retail	Goods	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	2.04 25.0%	25%	98%	10	\$22168
Existing	Dry Retail	Goods	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	2.04 3.0%	95%	54%	15	\$145
Existing	Dry Retail	Goods	Space Heat	Windows	U = 0.35	U = 0.40	2.04 3.1%	80%	80%	25	\$2,359
Existing	Dry Retail	Goods	Space Heat	Windows - Existing to Code	U = 0.40	Existing Windows (U=0.65)	2.04 9.3%	10%	80%	25	\$33717
Existing	Dry Retail	Goods	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	0.27 3.3%	NA	NA	20	\$162
Existing	Dry Retail	Goods	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.28 15.1%	5%	95%	10	\$8,704
Existing	Dry Retail	Goods	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.28 9.1%	5%	80%	11	\$305
Existing	Dry Retail	Goods	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	0.28 5.0%	75%	94%	15	\$2,919
Existing	Dry Retail	Goods	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	0.28 4.8%	45%	25%	13	\$32
Existing	Dry Retail	Goods	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	0.28 6.7%	45%	55%	13	\$630
Existing	Dry Retail	Goods	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	0.28 20.0%	5%	92%	25	\$875

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Dry Retail	Goods	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.28 4.0%	95%	25%	10	\$0
Existing	Dry Retail	Goods	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.28 3.8%	95%	15%	10	\$2
Existing	Dry Retail	Goods	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	0.28 58.9%	40%	94%	15	\$9,627
Existing	Dry Retail	Goods	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.28 1.0%	80%	90%	15	\$111
Existing	Dry Retail	Goods	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.28 2.3%	10%	45%	5	\$5
Existing	Dry Retail	Goods	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.28 1.1%	15%	75%	10	\$6
Existing	Dry Retail	Goods	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.28 2.5%	15%	20%	10	\$12
Existing	Dry Retail	Goods	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	0.28 55.6%	20%	95%	20	\$8,930
Existing	Dry Retail	Goods	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.28 3.3%	95%	95%	10	\$207
Existing	Dry Retail	Goods	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.28 7.7%	75%	45%	11	\$107
New	Dry Retail	Goods	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	0.99 20.0%	NA	NA	20	\$3,334
New	Dry Retail	Goods	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	0.99 27.3%	NA	NA	20	\$4,156
New	Dry Retail	Goods	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	0.99 9.5%	NA	NA	20	\$1,196
New	Dry Retail	Goods	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	0.91 7.6%	25%	70%	10	\$7,543
New	Dry Retail	Goods	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	0.91 5.0%	95%	95%	10	\$7,158
New	Dry Retail	Goods	Cooling Chillers	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.91 12.5%	90%	80%	3	\$7,670
New	Dry Retail	Goods	Cooling Chillers	Cooling Tower-Decrease Temperature	Approach 6 Deg F	10 Deg F	0.91 8.0%	50%	94%	15	\$746
New	Dry Retail	Goods	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.91 10.0%	75%	80%	5	\$5,658
New	Dry Retail	Goods	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	0.91 10.0%	15%	98%	30	106431



Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	Dry Retail	Goods	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	0.91	2.0%	75%	95%	25	\$5,463
New	Dry Retail	Goods	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	0.91	3.0%	75%	98%	25	\$7,249
New	Dry Retail	Goods	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.91	3.0%	95%	95%	25	\$2,479
New	Dry Retail	Goods	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.91	1.0%	35%	90%	25	\$946
New	Dry Retail	Goods	Cooling Chillers	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.91	10.0%	40%	98%	25	\$1,628
New	Dry Retail	Goods	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.91	25.0%	50%	98%	10	\$22168
New	Dry Retail	Goods	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	0.91	44.8%	95%	99%	20	\$16350
New	Dry Retail	Goods	Cooling Chillers	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.91	1.9%	75%	75%	30	\$2,960
New	Dry Retail	Goods	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	0.91	0.9%	80%	80%	25	\$9,436
New	Dry Retail	Goods	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	1.08	14.2%	NA	NA	15	\$7,460
New	Dry Retail	Goods	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	1.08	6.4%	NA	NA	15	\$3,971
New	Dry Retail	Goods	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	1.08	10.4%	NA	NA	15	\$6,156
New	Dry Retail	Goods	Cooling DX	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.99	12.5%	90%	80%	3	\$7,670
New	Dry Retail	Goods	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.99	25.0%	50%	85%	15	\$21889
New	Dry Retail	Goods	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.99	10.0%	75%	80%	5	\$5,658
New	Dry Retail	Goods	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.99	10.0%	15%	98%	30	106431
New	Dry Retail	Goods	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.99	2.0%	75%	95%	25	\$5,463
New	Dry Retail	Goods	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.99	3.0%	75%	98%	25	\$7,249

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	Dry Retail	Goods	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.99	3.0%	95%	95%	25	\$2,479
New	Dry Retail	Goods	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.99	1.0%	35%	90%	25	\$946
New	Dry Retail	Goods	Cooling DX	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.99	10.0%	40%	98%	25	\$1,628
New	Dry Retail	Goods	Cooling DX	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.99	1.9%	75%	75%	30	\$2,960
New	Dry Retail	Goods	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.99	0.9%	80%	80%	25	\$9,436
New	Dry Retail	Goods	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	2.23	20.0%	1%	75%	10	\$2,147
New	Dry Retail	Goods	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	2.23	7.5%	25%	65%	10	\$6,829
New	Dry Retail	Goods	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	2.23	3.8%	85%	81%	10	\$274
New	Dry Retail	Goods	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	2.23	33.8%	85%	75%	20	\$2,132
New	Dry Retail	Goods	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	2.23	8.8%	20%	77%	10	\$3,837
New	Dry Retail	Goods	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	2.23	1.6%	5%	94%	10	\$1,791
New	Dry Retail	Goods	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	1.58	16.8%	NA	NA	15	\$5,288
New	Dry Retail	Goods	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	1.58	30.2%	NA	NA	15	\$11,323
New	Dry Retail	Goods	Heat Pump	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.42	12.5%	90%	80%	3	\$7,670
New	Dry Retail	Goods	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.42	10.0%	75%	80%	5	\$5,658
New	Dry Retail	Goods	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.42	4.8%	5%	94%	10	\$9,529
New	Dry Retail	Goods	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	1.42	2.0%	15%	98%	30	106,431
New	Dry Retail	Goods	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	1.42	17.8%	45%	92%	20	\$61,334

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Dry Retail	Goods	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	1.42 40.9%	45%	92%	20	115230
New	Dry Retail	Goods	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.42 19.1%	10%	90%	20	\$12337
New	Dry Retail	Goods	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.42 32.0%	10%	90%	20	\$16294
New	Dry Retail	Goods	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	1.42 5.9%	75%	95%	25	\$5,463
New	Dry Retail	Goods	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	1.42 8.9%	75%	98%	25	\$7,249
New	Dry Retail	Goods	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.42 5.0%	95%	95%	25	\$2,479
New	Dry Retail	Goods	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.42 3.7%	35%	90%	25	\$946
New	Dry Retail	Goods	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.42 10.0%	40%	98%	25	\$1,628
New	Dry Retail	Goods	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	1.42 6.4%	80%	80%	25	\$9,436
New	Dry Retail	Goods	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	4.23 2.0%	10%	75%	9	\$828
New	Dry Retail	Goods	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	4.23 6.0%	60%	84%	9	\$1,261
New	Dry Retail	Goods	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.5	4.23 15.0%	90%	70%	14	\$1,702
New	Dry Retail	Goods	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.5	4.23 20.0%	75%	85%	14	\$4,539
New	Dry Retail	Goods	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.5	4.23 25.0%	70%	90%	14	\$7,438
New	Dry Retail	Goods	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications	Code Required LPD And Control Strategies: LPD = 1.5	4.23 31.5%	50%	95%	14	\$2,711
New	Dry Retail	Goods	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	4.23 0.5%	10%	80%	13	\$630
New	Dry Retail	Goods	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	4.23 2.3%	10%	95%	14	\$37
New	Dry Retail	Goods	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	4.23 4.0%	45%	88%	10	\$196
New	Dry Retail	Goods	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.78 0.4%	95%	90%	7	\$2

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	Dry Retail	Goods	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.78	13.6%	64%	25%	4	\$1
New	Dry Retail	Goods	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.78	4.2%	20%	45%	6	\$165
New	Dry Retail	Goods	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.78	1.8%	75%	55%	4	\$1
New	Dry Retail	Goods	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.78	18.4%	64%	15%	4	\$158
New	Dry Retail	Goods	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.78	1.3%	75%	40%	5	\$16
New	Dry Retail	Goods	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.78	0.9%	75%	45%	4	\$1
New	Dry Retail	Goods	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.78	1.3%	15%	75%	10	\$1
New	Dry Retail	Goods	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	2.78	1.8%	95%	30%	3	\$310
New	Dry Retail	Goods	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.78	1.0%	95%	86%	7	\$0
New	Dry Retail	Goods	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	2.78	1.2%	75%	95%	10	\$86
New	Dry Retail	Goods	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.78	0.3%	5%	65%	13	\$126
New	Dry Retail	Goods	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.78	3.5%	25%	35%	7	\$578
New	Dry Retail	Goods	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.78	6.4%	5%	80%	14	\$189
New	Dry Retail	Goods	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.45	12.5%	90%	80%	3	\$7,670
New	Dry Retail	Goods	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.45	10.0%	75%	80%	5	\$5,658
New	Dry Retail	Goods	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.45	15.0%	5%	94%	10	\$9,529
New	Dry Retail	Goods	Space Heat	Insulation (Ceiling)	R-49	R-30	0.45	8.0%	75%	98%	25	\$5,463
New	Dry Retail	Goods	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.45	6.0%	95%	95%	25	\$2,479
New	Dry Retail	Goods	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.45	5.0%	35%	90%	25	\$946



Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	Dry Retail	Goods	Space Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.45	10.0%	40%	98%	25	\$1,628
New	Dry Retail	Goods	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.45	25.0%	50%	98%	10	\$22168
New	Dry Retail	Goods	Space Heat	Windows	U = 0.35	U = 0.40	0.45	3.1%	80%	80%	25	\$2,359
New	Dry Retail	Goods	Water Heat	Water_Heater (40 Gallon Electric) Residential Sized	EF = 0.95	EF = 0.92	0.28	3.3%	NA	NA	20	\$162
New	Dry Retail	Goods	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.28	15.1%	5%	95%	10	\$8,704
New	Dry Retail	Goods	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.28	9.2%	5%	80%	11	\$305
New	Dry Retail	Goods	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	0.28	5.0%	90%	94%	15	\$2,919
New	Dry Retail	Goods	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	0.28	4.9%	45%	25%	13	\$32
New	Dry Retail	Goods	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	0.28	6.7%	45%	55%	13	\$630
New	Dry Retail	Goods	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	0.28	20.0%	25%	92%	25	\$875
New	Dry Retail	Goods	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.28	4.0%	95%	25%	10	\$0
New	Dry Retail	Goods	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	0.28	58.9%	50%	94%	15	\$9,627
New	Dry Retail	Goods	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.28	2.3%	10%	45%	5	\$5
New	Dry Retail	Goods	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.28	1.1%	15%	75%	10	\$6
New	Dry Retail	Goods	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	0.28	55.6%	20%	95%	20	\$8,930
New	Dry Retail	Goods	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.28	3.3%	95%	95%	10	\$207
New	Dry Retail	Goods	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.28	7.7%	75%	45%	11	\$107
Existing	Grocery	Cooking		Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	2.69	2.5%	35%	70%	12	\$4,946
Existing	Grocery	Cooking		Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	2.69	8.4%	55%	85%	12	\$1,800

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Cooking	Oven - Convection	Convection Oven	Standard Oven	2.69	3.4%	85%	85%	15	\$1,734
Existing	Grocery	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	2.69	2.3%	25%	75%	10	\$1
Existing	Grocery	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	1.51	20.0%	NA	NA	20	\$2,218
Existing	Grocery	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	1.51	27.3%	NA	NA	20	\$2,765
Existing	Grocery	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	1.51	9.5%	NA	NA	20	\$795
Existing	Grocery	Cooling Chillers	Centrifugal Chiller - VSD Remodel for Existing	VSD motor	Constant Speed Motor	1.58	40.0%	43%	45%	10	\$4,139
Existing	Grocery	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	1.58	7.6%	25%	70%	10	\$5,019
Existing	Grocery	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	1.58	5.0%	48%	95%	10	\$5,726
Existing	Grocery	Cooling Chillers	Chiller-Water Side Economizer	Install Economizer	No Economizer	1.58	5.0%	23%	90%	10	\$11,656
Existing	Grocery	Cooling Chillers	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.58	12.5%	45%	40%	3	\$1,657
Existing	Grocery	Cooling Chillers	Cooling Tower-Decrease Temperature	Approach 6 Deg F	10 Deg F	1.58	8.0%	25%	94%	15	\$497
Existing	Grocery	Cooling Chillers	Cooling Tower-Two-Speed Fan Motor	Two-Speed Tower Fans replace Single-Speed	Cooling Tower-One-Speed Fan Motor	1.58	14.0%	48%	35%	10	\$55
Existing	Grocery	Cooling Chillers	Cooling Tower-VSD Fan Control	Variable-Speed Tower Fans replace Two-Speed	Cooling Tower-Two-Speed Fan Motor	1.58	4.0%	48%	75%	10	\$449
Existing	Grocery	Cooling Chillers	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.58	15.0%	75%	61%	5	\$8,082
Existing	Grocery	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.58	10.0%	75%	80%	5	\$4,526
Existing	Grocery	Cooling Chillers	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.58	15.0%	50%	80%	5	\$3,266
Existing	Grocery	Cooling Chillers	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.58	2.5%	45%	45%	18	\$3,362
Existing	Grocery	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.58	4.5%	64%	85%	10	\$5,726
Existing	Grocery	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	1.58	5.0%	15%	98%	30	\$85,145

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Cooling Chillers	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	1.58	5.0%	40%	10%	10	\$1,968
Existing	Grocery	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	1.58	2.0%	75%	45%	25	\$4,371
Existing	Grocery	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	1.58	3.0%	75%	85%	25	\$5,799
Existing	Grocery	Cooling Chillers	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.58	2.4%	75%	10%	25	\$5,127
Existing	Grocery	Cooling Chillers	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.58	6.0%	75%	0%	25	\$5,127
Existing	Grocery	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.58	4.4%	10%	15%	25	\$940
Existing	Grocery	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.58	2.4%	10%	15%	25	\$979
Existing	Grocery	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.58	3.0%	10%	95%	25	\$2,218
Existing	Grocery	Cooling Chillers	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.58	8.4%	10%	35%	25	\$2,430
Existing	Grocery	Cooling Chillers	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.58	10.0%	10%	0%	25	\$2,402
Existing	Grocery	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.58	1.0%	35%	45%	25	\$756
Existing	Grocery	Cooling Chillers	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.58	3.0%	35%	45%	25	\$4,371
Existing	Grocery	Cooling Chillers	Pipe Insulation	R-4	R-0	1.58	1.0%	65%	45%	15	\$172
Existing	Grocery	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.58	25.0%	25%	98%	10	\$17735
Existing	Grocery	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	1.58	44.8%	60%	99%	20	\$13592
Existing	Grocery	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	1.58	0.7%	80%	85%	25	\$5,361
Existing	Grocery	Cooling Chillers	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.58	0.4%	10%	85%	25	\$15137
Existing	Grocery	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	1.65	14.2%	NA	NA	15	\$5,386

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	1.65	6.4%	NA	NA	15	\$2,867
Existing	Grocery	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	1.65	10.4%	NA	NA	15	\$4,444
Existing	Grocery	Cooling DX	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.71	12.5%	90%	40%	3	\$1,657
Existing	Grocery	Cooling DX	Cooling DX Package-Air Side Economizer	Air-Side Economizer	No Economizer	1.71	15.0%	10%	90%	15	\$4,021
Existing	Grocery	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	1.71	25.0%	50%	85%	15	\$17511
Existing	Grocery	Cooling DX	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.71	15.0%	75%	61%	5	\$8,082
Existing	Grocery	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.71	10.0%	75%	80%	5	\$4,526
Existing	Grocery	Cooling DX	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.71	15.0%	50%	80%	5	\$3,266
Existing	Grocery	Cooling DX	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.71	2.5%	45%	45%	18	\$3,362
Existing	Grocery	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.71	4.5%	64%	85%	10	\$5,726
Existing	Grocery	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	1.71	5.0%	15%	98%	30	\$85145
Existing	Grocery	Cooling DX	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	1.71	5.0%	40%	10%	10	\$1,968
Existing	Grocery	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	1.71	2.0%	75%	45%	25	\$4,371
Existing	Grocery	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	1.71	3.0%	75%	85%	25	\$5,799
Existing	Grocery	Cooling DX	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.71	2.4%	75%	10%	25	\$5,127
Existing	Grocery	Cooling DX	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.71	6.0%	75%	0%	25	\$5,127
Existing	Grocery	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.71	4.4%	10%	15%	25	\$940
Existing	Grocery	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.71	2.4%	10%	15%	25	\$979
Existing	Grocery	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.71	3.0%	10%	95%	25	\$2,218
Existing	Grocery	Cooling DX	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.71	8.4%	10%	35%	25	\$2,430
Existing	Grocery	Cooling DX	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.71	10.0%	10%	0%	25	\$2,402
Existing	Grocery	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.71	1.0%	35%	45%	25	\$756
Existing	Grocery	Cooling DX	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.71	3.0%	35%	45%	25	\$4,371
Existing	Grocery	Cooling DX	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	1.71	3.0%	95%	46%	15	\$145
Existing	Grocery	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	1.71	0.7%	80%	85%	25	\$5,361

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Cooling DX	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.71	0.4%	10%	85%	25	\$15137
Existing	Grocery	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	2.15	20.0%	5%	85%	10	\$1,718
Existing	Grocery	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	2.15	7.5%	60%	65%	10	\$13133
Existing	Grocery	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	2.15	3.8%	85%	81%	10	\$395
Existing	Grocery	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	2.15	33.8%	85%	75%	20	\$1,705
Existing	Grocery	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	2.15	8.8%	10%	77%	10	\$3,070
Existing	Grocery	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	2.15	1.6%	0%	94%	10	\$1,791
Existing	Grocery	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	4.53	16.8%	NA	NA	15	\$3,818
Existing	Grocery	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	4.53	30.2%	NA	NA	15	\$8,175
Existing	Grocery	Heat Pump	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	4.70	12.5%	90%	40%	3	\$1,657
Existing	Grocery	Heat Pump	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	4.70	15.0%	75%	61%	5	\$8,082
Existing	Grocery	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	4.70	10.0%	75%	80%	5	\$4,526
Existing	Grocery	Heat Pump	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	4.70	15.0%	50%	80%	5	\$3,266
Existing	Grocery	Heat Pump	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	4.70	2.5%	45%	45%	18	\$3,362
Existing	Grocery	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	4.70	10.0%	5%	94%	10	\$14457
Existing	Grocery	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	4.70	4.5%	64%	85%	10	\$5,726
Existing	Grocery	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	4.70	0.5%	15%	98%	30	\$85145
Existing	Grocery	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	4.70	10.3%	5%	92%	20	\$44280
Existing	Grocery	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	4.70	31.5%	5%	92%	20	\$83190
Existing	Grocery	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	4.70	22.7%	5%	90%	20	\$8,907
Existing	Grocery	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	4.70	33.7%	5%	90%	20	\$11764
Existing	Grocery	Heat Pump	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	4.70	8.3%	40%	10%	10	\$1,968
Existing	Grocery	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	4.70	5.9%	75%	45%	25	\$4,371

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	4.70	8.9%	75%	85%	25	\$5,799
Existing	Grocery	Heat Pump	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	4.70	5.5%	75%	10%	25	\$5,127
Existing	Grocery	Heat Pump	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	4.70	13.8%	75%	0%	25	\$5,127
Existing	Grocery	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	4.70	4.4%	10%	15%	25	\$940
Existing	Grocery	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	4.70	2.4%	10%	15%	25	\$979
Existing	Grocery	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	4.70	5.0%	10%	95%	25	\$2,218
Existing	Grocery	Heat Pump	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	4.70	16.6%	10%	35%	25	\$2,430
Existing	Grocery	Heat Pump	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	4.70	19.8%	10%	0%	25	\$2,402
Existing	Grocery	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	4.70	3.7%	35%	45%	25	\$756
Existing	Grocery	Heat Pump	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	4.70	11.1%	35%	45%	25	\$4,371
Existing	Grocery	Heat Pump	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	4.70	3.0%	95%	46%	15	\$145
Existing	Grocery	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	4.70	5.0%	80%	85%	25	\$5,361
Existing	Grocery	Heat Pump	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	4.70	3.3%	10%	85%	25	\$15137
Existing	Grocery	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	8.15	2.0%	75%	75%	9	\$662
Existing	Grocery	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	8.15	6.0%	30%	96%	9	\$1,009
Existing	Grocery	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.5	8.15	15.0%	90%	70%	14	\$2,053
Existing	Grocery	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.5	8.15	20.0%	75%	85%	14	\$4,549
Existing	Grocery	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.5	8.15	25.0%	70%	90%	14	\$7,101
Existing	Grocery	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications	Code Required LPD And Control Strategies: LPD = 1.5	8.15	31.5%	65%	95%	14	\$2,940
Existing	Grocery	Lighting	HE Fixtures/Design - Existing to Code	Code Required LPD And Control Strategies: LPD = 1.5	Existing Lighting Design	8.15	35.0%	95%	45%	14	\$9,800
Existing	Grocery	Lighting	LED Exit Lighting	5 Watts	CFL Exit Sign (26 Watts)	8.15	1.6%	95%	65%	11	\$53
Existing	Grocery	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	8.15	0.7%	90%	80%	13	\$630
Existing	Grocery	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	8.15	0.8%	10%	95%	14	\$36
Existing	Grocery	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	8.15	4.0%	45%	90%	9	\$157
Existing	Grocery	Lighting	Time Clocks And Timers	Install Time Clock Lighting	No Time Clock	8.15	4.9%	85%	81%	9	\$215

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.51	0.4%	95%	90%	7	\$2
Existing	Grocery	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.51	13.6%	64%	25%	4	\$1
Existing	Grocery	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.51	5.9%	35%	45%	6	\$165
Existing	Grocery	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.51	1.8%	75%	55%	4	\$1
Existing	Grocery	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.51	18.4%	64%	15%	4	\$157
Existing	Grocery	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.51	1.3%	75%	40%	5	\$16
Existing	Grocery	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.51	0.9%	75%	45%	4	\$1
Existing	Grocery	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.51	1.9%	15%	75%	10	\$1
Existing	Grocery	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	2.51	1.8%	95%	30%	3	\$310
Existing	Grocery	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.51	1.0%	95%	86%	7	\$0
Existing	Grocery	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	2.51	1.2%	75%	95%	10	\$86
Existing	Grocery	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.51	0.4%	5%	65%	13	\$126
Existing	Grocery	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.51	5.0%	25%	35%	7	\$578
Existing	Grocery	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.51	9.1%	75%	80%	14	\$189
Existing	Grocery	Plug Load	Vending Miser	Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls	No Vending Miser - No controls	2.51	9.4%	75%	25%	3	\$298
Existing	Grocery	Refrigeration	Anti-Sweat (Humidistat) Controls	Variable Temp. Controls (Humidistat)	Constant Controls	21	35.8%	90%	45%	12	\$5,634
Existing	Grocery	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	21	3.0%	95%	100%	12	\$345
Existing	Grocery	Refrigeration	Compressor VSD Retrofit	Compressor VSD Retrofit	Standard Compressor	21	16.8%	60%	77%	10	\$11,556
Existing	Grocery	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	21	3.6%	85%	65%	10	\$9,595
Existing	Grocery	Refrigeration	Defrost Demand Control - Hot Gas	Refrigerant Defrost w/ Hot Gas	No Defrost Demand Control - Hot Gas	21	2.6%	95%	68%	10	\$5,559
Existing	Grocery	Refrigeration	Display Cases	High-Efficiency Display Cases	Display Cases - Standard	21	3.6%	100%	90%	15	\$7,543
Existing	Grocery	Refrigeration	Evaporative Condenser - High-Efficiency	High-Efficiency Evaporative Condenser	Air-Cooled Condenser	21	0.7%	90%	65%	15	\$9,744
Existing	Grocery	Refrigeration	Floating Head Pressure Control	Install Floating Head Pressure Control	No Floating Head Pressure Control	21	3.0%	50%	81%	14	\$698
Existing	Grocery	Refrigeration	High-Efficiency Compressor	High-Efficiency Compressor (15% More Efficient)	Standard Compressor, 40% Efficiency	21	8.4%	85%	72%	10	\$9,308
Existing	Grocery	Refrigeration	High-Efficiency Evaporator Fans - Walk-ins	High-Efficiency Evaporator Fans, Walk-in Refrigerators	Standard Evaporator Fans	21	1.0%	92%	75%	15	\$1,195
Existing	Grocery	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	21	1.0%	90%	86%	9	\$376
Existing	Grocery	Refrigeration	Motor - Case Fans with ECM motors	ECM motors on evaporator fan, on display cases	48 cf 2-door reach-in commercial refrigerator	21	0.5%	80%	50%	20	\$1,350

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Refrigeration	Night Covers for Display Cases	Night Covers for Display Cases	No Night Covers	21	1.4%	95%	85%	10	\$3,110
Existing	Grocery	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	21	6.0%	75%	70%	10	\$449
Existing	Grocery	Refrigeration	Refrigeration - Retro Commissioning	Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)	No Re-commissioning	21	5.0%	80%	90%	3	\$556
Existing	Grocery	Refrigeration	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	21	28.0%	75%	55%	16	\$7,649
Existing	Grocery	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	21	3.2%	95%	77%	16	\$1,856
Existing	Grocery	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	21	2.0%	95%	20%	4	\$189
Existing	Grocery	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	2.16	12.5%	90%	40%	3	\$1,657
Existing	Grocery	Space Heat	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	2.16	15.0%	75%	61%	5	\$8,082
Existing	Grocery	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	2.16	10.0%	75%	80%	5	\$4,526
Existing	Grocery	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	2.16	15.0%	50%	80%	5	\$3,266
Existing	Grocery	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	2.16	2.5%	45%	45%	18	\$3,362
Existing	Grocery	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	2.16	15.0%	5%	94%	10	\$14457
Existing	Grocery	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	2.16	4.5%	64%	85%	10	\$5,726
Existing	Grocery	Space Heat	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	2.16	10.0%	40%	10%	10	\$1,968
Existing	Grocery	Space Heat	Insulation (Ceiling)	R-49	R-30	2.16	8.0%	75%	85%	25	\$4,371
Existing	Grocery	Space Heat	Insulation (Ceiling) - Existing to Code	R-30	Existing Ceiling Insulation (Average R-9)	2.16	12.5%	75%	10%	25	\$5,127
Existing	Grocery	Space Heat	Insulation (Ceiling) - Zero to Code	R-30	R-0	2.16	25.0%	75%	0%	25	\$5,127
Existing	Grocery	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	2.16	4.4%	10%	15%	25	\$940
Existing	Grocery	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	2.16	2.4%	10%	15%	25	\$979
Existing	Grocery	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	2.16	6.0%	10%	95%	25	\$2,218
Existing	Grocery	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	2.16	21.1%	10%	35%	25	\$2,430
Existing	Grocery	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	2.16	25.0%	10%	0%	25	\$2,402
Existing	Grocery	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	2.16	5.0%	35%	45%	25	\$756
Existing	Grocery	Space Heat	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	2.16	15.0%	35%	45%	25	\$4,371

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	2.16	25.0%	25%	98%	10	\$17735
Existing	Grocery	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	2.16	3.0%	95%	46%	15	\$145
Existing	Grocery	Space Heat	Windows	U = 0.35	U = 0.40	2.16	2.4%	80%	85%	25	\$1,341
Existing	Grocery	Space Heat	Windows - Existing to Code	U = 0.40	Existing Windows (U=0.65)	2.16	7.3%	10%	85%	25	\$19158
Existing	Grocery	Water Heat	Water_Heater (40 Gallon Electric) Residential Sized	EF = 0.95	EF = 0.92	0.29	3.3%	NA	NA	20	\$323
Existing	Grocery	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.30	15.1%	5%	95%	10	\$8,704
Existing	Grocery	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.30	10.7%	5%	80%	11	\$304
Existing	Grocery	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	0.30	5.0%	75%	94%	15	\$2,335
Existing	Grocery	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.30	2.1%	75%	80%	10	\$2,700
Existing	Grocery	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemmical Cost)	High Temp Commercial Dishwasher	0.30	5.6%	75%	95%	10	\$841
Existing	Grocery	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	0.30	5.7%	45%	25%	13	\$32
Existing	Grocery	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	0.30	7.8%	45%	55%	13	\$630
Existing	Grocery	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	0.30	20.0%	5%	92%	25	\$1,751
Existing	Grocery	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.30	4.0%	95%	25%	10	\$0
Existing	Grocery	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.30	3.8%	95%	15%	10	\$2
Existing	Grocery	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	0.30	58.9%	40%	94%	15	\$9,272
Existing	Grocery	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.30	1.0%	80%	90%	15	\$89
Existing	Grocery	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.30	2.3%	95%	40%	5	\$5
Existing	Grocery	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.30	1.1%	15%	75%	10	\$6
Existing	Grocery	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.30	2.5%	15%	20%	10	\$12
Existing	Grocery	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	0.30	38.6%	20%	95%	20	\$8,930
Existing	Grocery	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.30	3.3%	95%	95%	10	\$207
Existing	Grocery	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.30	7.7%	75%	50%	11	\$108
New	Grocery	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	2.69	2.5%	35%	70%	12	\$4,946
New	Grocery	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	2.69	8.3%	55%	85%	12	\$1,800

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Grocery	Cooking	Oven - Convection	Convection Oven	Standard Oven	2.69	3.4%	85%	85%	15	\$1,734
New	Grocery	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	2.69	2.3%	25%	75%	10	\$1
New	Grocery	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	1.37	20.0%	NA	NA	20	\$2,218
New	Grocery	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	1.37	27.3%	NA	NA	20	\$2,765
New	Grocery	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	1.37	9.5%	NA	NA	20	\$795
New	Grocery	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	1.25	7.6%	25%	70%	10	\$5,019
New	Grocery	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	1.25	5.0%	48%	95%	10	\$5,726
New	Grocery	Cooling Chillers	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.25	12.5%	45%	80%	3	\$6,136
New	Grocery	Cooling Chillers	Cooling Tower-Decrease Temperature	Approach 6 Deg F	10 Deg F	1.25	8.0%	25%	94%	15	\$497
New	Grocery	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.25	10.0%	75%	80%	5	\$4,526
New	Grocery	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.25	4.5%	64%	85%	10	\$5,726
New	Grocery	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	1.25	5.0%	15%	98%	30	\$85145
New	Grocery	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	1.25	2.0%	75%	45%	25	\$4,371
New	Grocery	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	1.25	3.0%	75%	85%	25	\$5,799
New	Grocery	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.25	3.0%	95%	95%	25	\$2,218
New	Grocery	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.25	1.0%	35%	45%	25	\$756
New	Grocery	Cooling Chillers	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.25	10.0%	40%	98%	25	\$1,303
New	Grocery	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.25	25.0%	50%	98%	10	\$17735
New	Grocery	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	1.25	44.8%	95%	99%	20	\$11709

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Grocery	Cooling Chillers	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	1.25	0.5%	75%	75%	30	\$1,681
New	Grocery	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	1.25	0.7%	80%	85%	25	\$5,361
New	Grocery	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	1.49	14.2%	NA	NA	15	\$5,386
New	Grocery	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	1.49	6.4%	NA	NA	15	\$2,867
New	Grocery	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	1.49	10.4%	NA	NA	15	\$4,444
New	Grocery	Cooling DX	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.36	12.5%	90%	80%	3	\$6,136
New	Grocery	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	1.36	25.0%	50%	85%	15	\$17,511
New	Grocery	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.36	10.0%	75%	80%	5	\$4,526
New	Grocery	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.36	4.5%	64%	85%	10	\$5,726
New	Grocery	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	1.36	5.0%	15%	98%	30	\$85,145
New	Grocery	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	1.36	2.0%	75%	45%	25	\$4,371
New	Grocery	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	1.36	3.0%	75%	85%	25	\$5,799
New	Grocery	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.36	3.0%	95%	95%	25	\$2,218
New	Grocery	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.36	1.0%	35%	45%	25	\$756
New	Grocery	Cooling DX	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.36	10.0%	40%	98%	25	\$1,303
New	Grocery	Cooling DX	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	1.36	0.5%	75%	75%	30	\$1,681
New	Grocery	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	1.36	0.7%	80%	85%	25	\$5,361
New	Grocery	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	2.58	20.0%	5%	75%	10	\$1,718
New	Grocery	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	2.58	7.5%	60%	65%	10	\$6,829
New	Grocery	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	2.58	3.8%	85%	81%	10	\$395
New	Grocery	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	2.58	33.8%	85%	75%	20	\$1,705

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Grocery	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	2.58	8.8%	20%	77%	10	\$3,070
New	Grocery	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	2.58	1.6%	0%	94%	10	\$1,791
New	Grocery	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	1.78	16.8%	NA	NA	15	\$3,818
New	Grocery	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	1.78	30.2%	NA	NA	15	\$8,175
New	Grocery	Heat Pump	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.62	12.5%	90%	80%	3	\$6,136
New	Grocery	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.62	10.0%	75%	80%	5	\$4,526
New	Grocery	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.62	10.0%	5%	94%	10	\$14,457
New	Grocery	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.62	4.5%	64%	85%	10	\$5,726
New	Grocery	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	1.62	0.5%	15%	98%	30	\$85,145
New	Grocery	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	1.62	10.3%	45%	92%	20	\$44,280
New	Grocery	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	1.62	31.5%	45%	92%	20	\$83,190
New	Grocery	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.62	22.7%	10%	90%	20	\$8,907
New	Grocery	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.62	33.7%	10%	90%	20	\$11,764
New	Grocery	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	1.62	5.9%	75%	45%	25	\$4,371
New	Grocery	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	1.62	8.9%	75%	85%	25	\$5,799
New	Grocery	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.62	5.0%	95%	95%	25	\$2,218
New	Grocery	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.62	3.7%	35%	45%	25	\$756
New	Grocery	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.62	10.0%	40%	98%	25	\$1,303
New	Grocery	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	1.62	5.0%	80%	85%	25	\$5,361
New	Grocery	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	6.49	2.0%	75%	75%	9	\$662
New	Grocery	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	6.49	6.0%	60%	96%	9	\$1,009
New	Grocery	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.5	6.49	15.0%	90%	70%	14	\$1,362
New	Grocery	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.5	6.49	20.0%	75%	85%	14	\$3,631

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Grocery	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.5	6.49	25.0%	70%	90%	14	\$5,951
New	Grocery	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications	Code Required LPD And Control Strategies: LPD = 1.5	6.49	31.5%	65%	95%	14	\$2,168
New	Grocery	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	6.49	0.9%	90%	80%	13	\$630
New	Grocery	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	6.49	0.8%	10%	95%	14	\$36
New	Grocery	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	6.49	4.0%	45%	90%	10	\$157
New	Grocery	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.51	0.4%	95%	90%	7	\$3
New	Grocery	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.51	13.6%	64%	25%	4	\$1
New	Grocery	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.51	5.7%	35%	45%	6	\$165
New	Grocery	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.51	1.8%	75%	55%	4	\$1
New	Grocery	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.51	18.4%	64%	15%	4	\$157
New	Grocery	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.51	1.3%	75%	40%	5	\$16
New	Grocery	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.51	0.9%	75%	45%	4	\$1
New	Grocery	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.51	1.8%	15%	75%	10	\$1
New	Grocery	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	2.51	1.8%	95%	30%	3	\$310
New	Grocery	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.51	1.0%	95%	86%	7	\$0
New	Grocery	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	2.51	1.2%	75%	95%	10	\$86
New	Grocery	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.51	0.4%	5%	65%	13	\$126
New	Grocery	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.51	4.8%	25%	35%	7	\$578
New	Grocery	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.51	8.9%	75%	80%	14	\$189
New	Grocery	Refrigeration	Anti-Sweat (Humidistat) Controls	Variable Temp. Controls (Humidistat)	Constant Controls	21	35.6%	90%	45%	12	\$5,634
New	Grocery	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	21	2.9%	95%	100%	12	\$345
New	Grocery	Refrigeration	Compressor VSD Retrofit	Compressor VSD Retrofit	Standard Compressor	21	16.8%	60%	77%	10	\$11,556
New	Grocery	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	21	3.6%	85%	65%	10	\$9,595
New	Grocery	Refrigeration	Defrost Demand Control - Hot Gas	Refrigerant Defrost w/ Hot Gas	No Defrost Demand Control - Hot Gas	21	2.6%	95%	68%	10	\$5,559
New	Grocery	Refrigeration	Display Cases	High-Efficiency Display Cases	Display Cases - Standard	21	3.6%	100%	90%	15	\$7,543
New	Grocery	Refrigeration	Evaporative Condenser - High-Efficiency	High-Efficiency Evaporative Condenser	Air-Cooled Condenser	21	0.7%	90%	65%	15	\$9,744
New	Grocery	Refrigeration	High-Efficiency Compressor	High-Efficiency Compressor (15% More Efficient)	Standard Compressor, 40% Efficiency	21	8.4%	85%	72%	10	\$9,308

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUJ)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Grocery	Refrigeration	High-Efficiency Evaporator Fans - Walk-ins	High-Efficiency Evaporator Fans, Walk-in Refrigerators	Standard Evaporator Fans	21	1.0%	92%	75%	15	\$1,195
New	Grocery	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	21	1.0%	90%	86%	9	\$376
New	Grocery	Refrigeration	Motor - Case Fans with ECM motors	ECM motors on evaporator fan, on display cases	48 cf 2-door reach-in commercial refrigerator	21	0.5%	95%	50%	20	\$1,350
New	Grocery	Refrigeration	Night Covers for Display Cases	Night Covers for Display Cases	No Night Covers	21	1.4%	95%	85%	10	\$3,110
New	Grocery	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	21	6.0%	75%	70%	10	\$449
New	Grocery	Refrigeration	Refrigeration - Commissioning	Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit)	No Commissioning	21	5.0%	80%	90%	3	\$556
New	Grocery	Refrigeration	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	21	28.0%	75%	55%	16	\$4,287
New	Grocery	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	21	3.2%	95%	77%	16	\$1,856
New	Grocery	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	21	2.0%	95%	20%	4	\$189
New	Grocery	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.19	12.5%	90%	80%	3	\$6,136
New	Grocery	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.19	10.0%	75%	80%	5	\$4,526
New	Grocery	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.19	15.0%	5%	94%	10	\$14457
New	Grocery	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.19	4.5%	64%	85%	10	\$5,726
New	Grocery	Space Heat	Insulation (Ceiling)	R-49	R-30	0.19	8.0%	75%	85%	25	\$4,371
New	Grocery	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.19	6.0%	95%	95%	25	\$2,218
New	Grocery	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.19	5.0%	35%	45%	25	\$756
New	Grocery	Space Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.19	10.0%	40%	98%	25	\$1,303
New	Grocery	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.19	25.0%	50%	98%	10	\$17735
New	Grocery	Space Heat	Windows	U = 0.35	U = 0.40	0.19	2.4%	80%	85%	25	\$1,341
New	Grocery	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	0.30	3.3%	NA	NA	20	\$323
New	Grocery	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.30	15.1%	5%	95%	10	\$8,704
New	Grocery	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.30	10.7%	5%	80%	11	\$304
New	Grocery	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	0.30	5.0%	90%	94%	15	\$2,335
New	Grocery	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.30	2.1%	75%	80%	10	\$2,700

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Grocery	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Chemical Cost)	High Temp Commercial Dishwasher	0.30	5.6%	75%	95%	10	\$841
New	Grocery	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	0.30	5.7%	45%	25%	13	\$32
New	Grocery	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	0.30	7.8%	45%	55%	13	\$630
New	Grocery	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	0.30	20.0%	25%	92%	25	\$1,751
New	Grocery	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.30	4.0%	95%	25%	10	\$0
New	Grocery	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	0.30	58.9%	50%	94%	15	\$9,272
New	Grocery	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.30	2.3%	95%	40%	5	\$5
New	Grocery	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.30	1.1%	15%	75%	10	\$6
New	Grocery	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	0.30	38.6%	20%	95%	20	\$8,930
New	Grocery	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.30	3.3%	95%	95%	10	\$207
New	Grocery	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.30	7.7%	75%	50%	11	\$108
Existing	Hospital	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	0.55	2.5%	35%	70%	12	\$4,946
Existing	Hospital	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	0.55	8.4%	75%	85%	12	\$1,800
Existing	Hospital	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.55	3.4%	85%	55%	15	\$1,734
Existing	Hospital	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	0.55	2.3%	25%	75%	10	\$2
Existing	Hospital	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	1.67	20.0%	NA	NA	20	\$3,708
Existing	Hospital	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	1.67	27.3%	NA	NA	20	\$4,624
Existing	Hospital	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	1.67	9.5%	NA	NA	20	\$1,329
Existing	Hospital	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.75	10.0%	5%	94%	15	\$11583
Existing	Hospital	Cooling Chillers	Centrifugal Chiller - VSD Remodel for Existing	VSD motor	Constant Speed Motor	1.75	40.0%	43%	45%	10	\$6,919
Existing	Hospital	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	1.75	7.6%	25%	70%	10	\$8,391
Existing	Hospital	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	1.75	5.0%	95%	75%	10	\$12526
Existing	Hospital	Cooling Chillers	Chiller-Water Side Economizer	Install Economizer	No Economizer	1.75	5.0%	45%	90%	10	\$19485

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hospital	Cooling Chillers	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.75	12.5%	90%	40%	3	\$3,624
Existing	Hospital	Cooling Chillers	Cooling Tower-Decrease Temperature	Approach 6 Deg F	10 Deg F	1.75	8.0%	50%	94%	15	\$829
Existing	Hospital	Cooling Chillers	Cooling Tower-Two-Speed Fan Motor	Two-Speed Tower Fans replace Single-Speed	Cooling Tower-One-Speed Fan Motor	1.75	14.0%	95%	35%	10	\$94
Existing	Hospital	Cooling Chillers	Cooling Tower-VSD Fan Control	Variable-Speed Tower Fans replace Two-Speed	Cooling Tower-Two-Speed Fan Motor	1.75	4.0%	95%	75%	10	\$750
Existing	Hospital	Cooling Chillers	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.75	15.0%	35%	26%	5	\$17680
Existing	Hospital	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.75	10.0%	75%	80%	5	\$9,901
Existing	Hospital	Cooling Chillers	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.75	15.0%	75%	80%	5	\$7,145
Existing	Hospital	Cooling Chillers	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.75	2.5%	45%	45%	18	\$7,354
Existing	Hospital	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.75	4.5%	62%	85%	10	\$5,725
Existing	Hospital	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	1.75	5.0%	15%	98%	30	\$93127
Existing	Hospital	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	1.75	1.0%	75%	45%	25	\$4,780
Existing	Hospital	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	1.75	1.5%	75%	85%	25	\$6,343
Existing	Hospital	Cooling Chillers	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.75	1.2%	75%	13%	25	\$5,608
Existing	Hospital	Cooling Chillers	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.75	3.0%	75%	0%	25	\$5,608
Existing	Hospital	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.75	4.4%	10%	15%	25	\$2,056
Existing	Hospital	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.75	2.4%	10%	15%	25	\$2,142
Existing	Hospital	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.75	3.0%	10%	95%	25	\$4,639
Existing	Hospital	Cooling Chillers	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.75	8.4%	10%	35%	25	\$5,082
Existing	Hospital	Cooling Chillers	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.75	10.0%	10%	0%	25	\$5,025

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hospital	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.75	0.5%	35%	35%	25	\$827
Existing	Hospital	Cooling Chillers	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.75	1.5%	35%	35%	25	\$4,780
Existing	Hospital	Cooling Chillers	Pipe Insulation	R-4	R-0	1.75	1.0%	65%	45%	15	\$379
Existing	Hospital	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.75	25.0%	25%	98%	10	\$38794
Existing	Hospital	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	1.75	44.8%	60%	99%	20	\$22721
Existing	Hospital	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	1.75	1.2%	80%	60%	25	\$15284
Existing	Hospital	Cooling Chillers	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.75	0.6%	10%	60%	25	\$43155
Existing	Hospital	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	1.82	14.2%	NA	NA	15	\$7,943
Existing	Hospital	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	1.82	6.4%	NA	NA	15	\$4,229
Existing	Hospital	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	1.82	10.4%	NA	NA	15	\$6,555
Existing	Hospital	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.90	10.0%	5%	94%	15	\$11583
Existing	Hospital	Cooling DX	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.90	12.5%	90%	40%	3	\$3,624
Existing	Hospital	Cooling DX	Cooling DX Package-Air Side Economizer	Air-Side Economizer	No Economizer	1.90	15.0%	10%	30%	15	\$6,722
Existing	Hospital	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	1.90	25.0%	50%	85%	15	\$38305
Existing	Hospital	Cooling DX	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.90	15.0%	35%	26%	5	\$17680
Existing	Hospital	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.90	10.0%	75%	80%	5	\$9,901
Existing	Hospital	Cooling DX	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.90	15.0%	75%	80%	5	\$7,145
Existing	Hospital	Cooling DX	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.90	2.5%	45%	45%	18	\$7,354
Existing	Hospital	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.90	4.5%	62%	85%	10	\$5,725
Existing	Hospital	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	1.90	5.0%	15%	98%	30	\$93127

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hospital	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	1.90	1.0%	75%	45%	25	\$4,780
Existing	Hospital	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	1.90	1.5%	75%	85%	25	\$6,343
Existing	Hospital	Cooling DX	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.90	1.2%	75%	13%	25	\$5,608
Existing	Hospital	Cooling DX	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.90	3.0%	75%	0%	25	\$5,608
Existing	Hospital	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.90	4.4%	10%	15%	25	\$2,056
Existing	Hospital	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.90	2.4%	10%	15%	25	\$2,142
Existing	Hospital	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.90	3.0%	10%	95%	25	\$4,639
Existing	Hospital	Cooling DX	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.90	8.4%	10%	35%	25	\$5,082
Existing	Hospital	Cooling DX	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.90	10.0%	10%	0%	25	\$5,025
Existing	Hospital	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.90	0.5%	35%	35%	25	\$827
Existing	Hospital	Cooling DX	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.90	1.5%	35%	35%	25	\$4,780
Existing	Hospital	Cooling DX	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	1.90	3.0%	95%	71%	15	\$145
Existing	Hospital	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	1.90	1.2%	80%	60%	25	\$15284
Existing	Hospital	Cooling DX	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.90	0.6%	10%	60%	25	\$43155
Existing	Hospital	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	5.44	20.0%	20%	85%	10	\$3,758
Existing	Hospital	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	5.44	7.5%	35%	85%	10	\$13133
Existing	Hospital	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	5.44	3.8%	85%	81%	10	\$480
Existing	Hospital	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	5.44	33.8%	85%	75%	20	\$3,731
Existing	Hospital	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	5.44	8.8%	50%	77%	10	\$6,715
Existing	Hospital	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	5.44	1.6%	65%	94%	10	\$1,791
Existing	Hospital	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	3.55	16.8%	NA	NA	15	\$5,630
Existing	Hospital	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	3.55	30.2%	NA	NA	15	\$12056
Existing	Hospital	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	3.71	10.0%	5%	94%	15	\$11583
Existing	Hospital	Heat Pump	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	3.71	12.5%	90%	40%	3	\$3,624



Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hospital	Heat Pump	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	3.71	15.0%	35%	26%	5	\$17680
Existing	Hospital	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	3.71	10.0%	75%	80%	5	\$9,901
Existing	Hospital	Heat Pump	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	3.71	15.0%	75%	80%	5	\$7,145
Existing	Hospital	Heat Pump	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	3.71	2.5%	45%	45%	18	\$7,354
Existing	Hospital	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	3.71	7.3%	5%	94%	10	\$16676
Existing	Hospital	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	3.71	4.5%	62%	85%	10	\$5,725
Existing	Hospital	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	3.71	0.8%	15%	98%	30	\$93127
Existing	Hospital	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	3.71	14.2%	5%	92%	20	\$65303
Existing	Hospital	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	3.71	36.4%	5%	92%	20	122688
Existing	Hospital	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	3.71	20.9%	5%	90%	20	\$13135
Existing	Hospital	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	3.71	32.8%	5%	90%	20	\$17349
Existing	Hospital	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	3.71	3.0%	75%	45%	25	\$4,780
Existing	Hospital	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	3.71	4.4%	75%	85%	25	\$6,343
Existing	Hospital	Heat Pump	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	3.71	2.8%	75%	13%	25	\$5,608
Existing	Hospital	Heat Pump	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	3.71	6.9%	75%	0%	25	\$5,608
Existing	Hospital	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	3.71	4.4%	10%	15%	25	\$2,056
Existing	Hospital	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	3.71	2.4%	10%	15%	25	\$2,142
Existing	Hospital	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	3.71	5.0%	10%	95%	25	\$4,639
Existing	Hospital	Heat Pump	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	3.71	16.6%	10%	35%	25	\$5,082
Existing	Hospital	Heat Pump	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	3.71	19.8%	10%	0%	25	\$5,025
Existing	Hospital	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	3.71	1.9%	35%	35%	25	\$827
Existing	Hospital	Heat Pump	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	3.71	5.6%	35%	35%	25	\$4,780
Existing	Hospital	Heat Pump	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	3.71	3.0%	95%	71%	15	\$145
Existing	Hospital	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	3.71	8.5%	80%	60%	25	\$15284
Existing	Hospital	Heat Pump	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	3.71	5.6%	10%	60%	25	\$43155
Existing	Hospital	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	4.60	2.0%	85%	75%	9	\$1,449

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hospital	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	4.60	6.0%	30%	51%	9	\$2,206
Existing	Hospital	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.1	4.60	15.0%	90%	70%	14	\$2,791
Existing	Hospital	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.1	4.60	20.0%	75%	85%	14	\$7,038
Existing	Hospital	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.1	4.60	25.0%	70%	90%	14	\$11,164
Existing	Hospital	Lighting	HE Fixtures/Design - Existing to Code	Code Required LPD And Control Strategies: LPD = 1.1	Existing Lighting Design	4.60	15.0%	95%	45%	14	\$17,150
Existing	Hospital	Lighting	LED Exit Lighting	5 Watts	CFL Exit Sign (26 Watts)	4.60	1.6%	95%	65%	11	\$53
Existing	Hospital	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	4.60	0.5%	50%	80%	13	\$631
Existing	Hospital	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	4.60	2.3%	10%	95%	14	\$37
Existing	Hospital	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	4.60	4.0%	90%	70%	9	\$344
Existing	Hospital	Lighting	Time Clocks And Timers	Install Time Clock Lighting	No Time Clock	4.60	4.9%	85%	100%	9	\$215
Existing	Hospital	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	3.94	0.4%	95%	90%	7	\$2
Existing	Hospital	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	3.94	13.6%	64%	25%	4	\$2
Existing	Hospital	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	3.94	1.7%	90%	45%	6	\$165
Existing	Hospital	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	3.94	1.8%	75%	55%	4	\$2
Existing	Hospital	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	3.94	18.4%	64%	15%	4	\$158
Existing	Hospital	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	3.94	1.3%	75%	40%	5	\$17
Existing	Hospital	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	3.94	0.9%	75%	45%	4	\$2
Existing	Hospital	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	3.94	0.6%	45%	75%	10	\$2
Existing	Hospital	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	3.94	1.8%	95%	30%	3	\$311
Existing	Hospital	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	3.94	1.0%	95%	86%	7	\$0
Existing	Hospital	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	3.94	1.2%	75%	95%	10	\$171
Existing	Hospital	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	3.94	0.1%	25%	65%	13	\$127
Existing	Hospital	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	3.94	1.4%	25%	35%	7	\$577
Existing	Hospital	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	3.94	2.7%	50%	80%	14	\$189
Existing	Hospital	Plug Load	Vending Miser	Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls	No Vending Miser - No controls	3.94	2.7%	50%	25%	3	\$298

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hospital	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	0.51	27.4%	95%	95%	12	\$344
Existing	Hospital	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	0.51	3.6%	85%	65%	10	\$9,596
Existing	Hospital	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	0.51	1.1%	90%	86%	9	\$375
Existing	Hospital	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	0.51	6.0%	75%	70%	10	\$24
Existing	Hospital	Refrigeration	Refrigeration - Retro Commissioning	Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)	No Re-commissioning	0.51	5.0%	80%	90%	3	\$29
Existing	Hospital	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	0.51	3.2%	95%	77%	16	\$99
Existing	Hospital	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	0.51	2.0%	95%	20%	4	\$189
Existing	Hospital	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.28	10.0%	5%	94%	15	\$11583
Existing	Hospital	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.28	12.5%	90%	40%	3	\$3,624
Existing	Hospital	Space Heat	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.28	15.0%	35%	26%	5	\$17680
Existing	Hospital	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.28	10.0%	75%	80%	5	\$9,901
Existing	Hospital	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.28	15.0%	75%	80%	5	\$7,145
Existing	Hospital	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.28	2.5%	45%	45%	18	\$7,354
Existing	Hospital	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.28	15.0%	5%	94%	10	\$16676
Existing	Hospital	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.28	4.5%	62%	85%	10	\$5,725
Existing	Hospital	Space Heat	Insulation (Ceiling)	R-49	R-30	1.28	4.0%	75%	85%	25	\$4,780
Existing	Hospital	Space Heat	Insulation (Ceiling) - Existing to Code	R-30	Existing Ceiling Insulation (Average R-9)	1.28	6.3%	75%	13%	25	\$5,608
Existing	Hospital	Space Heat	Insulation (Ceiling) - Zero to Code	R-30	R-0	1.28	12.5%	75%	0%	25	\$5,608
Existing	Hospital	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.28	4.4%	10%	15%	25	\$2,056
Existing	Hospital	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.28	2.4%	10%	15%	25	\$2,142
Existing	Hospital	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.28	6.0%	10%	95%	25	\$4,639
Existing	Hospital	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.28	21.1%	10%	35%	25	\$5,082
Existing	Hospital	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.28	25.0%	10%	0%	25	\$5,025
Existing	Hospital	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.28	2.5%	35%	35%	25	\$827
Existing	Hospital	Space Heat	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.28	7.5%	35%	35%	25	\$4,780

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hospital	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.28	25.0%	25%	98%	10	\$38794
Existing	Hospital	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	1.28	3.0%	95%	71%	15	\$145
Existing	Hospital	Space Heat	Windows	U = 0.35	U = 0.40	1.28	4.1%	80%	60%	25	\$3,821
Existing	Hospital	Space Heat	Windows - Existing to Code	U = 0.40	Existing Windows (U=0.65)	1.28	12.3%	10%	60%	25	\$54619
Existing	Hospital	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	1.34	3.3%	NA	NA	20	\$1,938
Existing	Hospital	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	1.38	15.1%	15%	95%	10	\$8,704
Existing	Hospital	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	1.38	2.6%	15%	80%	11	\$305
Existing	Hospital	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	1.38	5.0%	55%	94%	15	\$5,108
Existing	Hospital	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	1.38	2.1%	25%	80%	10	\$2,701
Existing	Hospital	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemmical Cost)	High Temp Commercial Dishwasher	1.38	5.6%	25%	95%	10	\$840
Existing	Hospital	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	1.38	0.6%	20%	25%	13	\$31
Existing	Hospital	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	1.38	0.8%	20%	55%	13	\$631
Existing	Hospital	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	1.38	20.0%	5%	92%	25	\$10506
Existing	Hospital	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	1.38	4.0%	95%	25%	10	\$0
Existing	Hospital	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	1.38	3.8%	95%	15%	10	\$2
Existing	Hospital	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	1.38	58.9%	40%	94%	15	\$5,725
Existing	Hospital	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	1.38	1.0%	80%	70%	15	\$195
Existing	Hospital	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	1.38	2.3%	50%	45%	5	\$6
Existing	Hospital	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	1.38	2.6%	35%	75%	10	\$6
Existing	Hospital	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	1.38	5.8%	35%	20%	10	\$11
Existing	Hospital	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	1.38	66.6%	20%	95%	20	\$89302
Existing	Hospital	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	1.38	3.3%	95%	90%	10	\$206
Existing	Hospital	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	1.38	7.7%	75%	80%	11	\$107
New	Hospital	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	0.55	2.5%	35%	70%	12	\$4,946
New	Hospital	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	0.55	8.3%	75%	85%	12	\$1,800

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hospital	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.55	3.4%	85%	55%	15	\$1,734
New	Hospital	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	0.55	2.3%	25%	75%	10	\$2
New	Hospital	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	0.47	20.0%	NA	NA	20	\$3,708
New	Hospital	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	0.47	27.3%	NA	NA	20	\$4,624
New	Hospital	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	0.47	9.5%	NA	NA	20	\$1,329
New	Hospital	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.43	10.0%	5%	94%	15	\$11583
New	Hospital	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	0.43	7.6%	25%	70%	10	\$8,391
New	Hospital	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	0.43	5.0%	95%	75%	10	\$12526
New	Hospital	Cooling Chillers	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.43	12.5%	90%	80%	3	\$13422
New	Hospital	Cooling Chillers	Cooling Tower-Decrease Approach Temperature	6 Deg F	10 Deg F	0.43	8.0%	50%	94%	15	\$829
New	Hospital	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.43	10.0%	75%	80%	5	\$9,901
New	Hospital	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.43	4.5%	62%	85%	10	\$5,725
New	Hospital	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	0.43	5.0%	15%	98%	30	\$93127
New	Hospital	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	0.43	1.0%	75%	45%	25	\$4,780
New	Hospital	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	0.43	1.5%	75%	85%	25	\$6,343
New	Hospital	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.43	3.0%	95%	95%	25	\$4,639
New	Hospital	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.43	0.5%	35%	35%	25	\$827
New	Hospital	Cooling Chillers	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.43	10.0%	40%	98%	25	\$2,850
New	Hospital	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.43	25.0%	50%	98%	10	\$38794

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hospital	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	0.43	44.8%	95%	99%	20	\$18743
New	Hospital	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	0.43	1.2%	80%	60%	25	\$15284
New	Hospital	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	0.51	14.2%	NA	NA	15	\$7,943
New	Hospital	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	0.51	6.4%	NA	NA	15	\$4,229
New	Hospital	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	0.51	10.4%	NA	NA	15	\$6,555
New	Hospital	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.47	10.0%	5%	94%	15	\$11583
New	Hospital	Cooling DX	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.47	12.5%	90%	80%	3	\$13422
New	Hospital	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.47	25.0%	50%	85%	15	\$38305
New	Hospital	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.47	10.0%	75%	80%	5	\$9,901
New	Hospital	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.47	4.5%	62%	85%	10	\$5,725
New	Hospital	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.47	5.0%	15%	98%	30	\$93127
New	Hospital	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.47	1.0%	75%	45%	25	\$4,780
New	Hospital	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.47	1.5%	75%	85%	25	\$6,343
New	Hospital	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.47	3.0%	95%	95%	25	\$4,639
New	Hospital	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.47	0.5%	35%	35%	25	\$827
New	Hospital	Cooling DX	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.47	10.0%	40%	98%	25	\$2,850
New	Hospital	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.47	1.2%	80%	60%	25	\$15284
New	Hospital	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	4.24	20.0%	20%	75%	10	\$3,758
New	Hospital	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	4.24	7.5%	35%	85%	10	\$6,829
New	Hospital	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	4.24	3.8%	85%	81%	10	\$480
New	Hospital	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	4.24	33.8%	85%	75%	20	\$3,731

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hospital	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	4.24	8.8%	65%	77%	10	\$6,715
New	Hospital	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	4.24	1.6%	65%	94%	10	\$1,791
New	Hospital	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	1.67	16.8%	NA	NA	15	\$5,630
New	Hospital	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	1.67	30.2%	NA	NA	15	\$12056
New	Hospital	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.52	10.0%	5%	94%	15	\$11583
New	Hospital	Heat Pump	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.52	12.5%	90%	80%	3	\$13422
New	Hospital	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.52	10.0%	75%	80%	5	\$9,901
New	Hospital	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.52	7.3%	5%	94%	10	\$16676
New	Hospital	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.52	4.5%	62%	85%	10	\$5,725
New	Hospital	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	1.52	0.8%	15%	98%	30	\$93127
New	Hospital	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	1.52	14.2%	45%	92%	20	\$65303
New	Hospital	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	1.52	36.4%	45%	92%	20	122688
New	Hospital	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.52	20.9%	10%	90%	20	\$13135
New	Hospital	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.52	32.8%	10%	90%	20	\$17349
New	Hospital	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	1.52	3.0%	75%	45%	25	\$4,780
New	Hospital	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	1.52	4.4%	75%	85%	25	\$6,343
New	Hospital	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.52	5.0%	95%	95%	25	\$4,639
New	Hospital	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.52	1.9%	35%	35%	25	\$827
New	Hospital	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.52	10.0%	40%	98%	25	\$2,850
New	Hospital	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	1.52	8.5%	80%	60%	25	\$15284
New	Hospital	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	2.89	2.0%	85%	75%	9	\$1,449
New	Hospital	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	2.89	6.0%	60%	51%	9	\$2,206
New	Hospital	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.1	2.89	15.0%	90%	70%	14	\$1,655

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hospital	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.1	2.89	20.0%	75%	85%	14	\$5,516
New	Hospital	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.1	2.89	25.0%	70%	90%	14	\$9,267
New	Hospital	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	2.89	0.8%	50%	80%	13	\$631
New	Hospital	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	2.89	2.3%	10%	95%	14	\$37
New	Hospital	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	2.89	4.0%	90%	70%	10	\$344
New	Hospital	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	3.94	0.4%	95%	90%	7	\$2
New	Hospital	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	3.94	13.6%	64%	25%	4	\$2
New	Hospital	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	3.94	1.7%	90%	45%	6	\$165
New	Hospital	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	3.94	1.8%	75%	55%	4	\$2
New	Hospital	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	3.94	18.4%	64%	15%	4	\$158
New	Hospital	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	3.94	1.3%	75%	40%	5	\$17
New	Hospital	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	3.94	0.9%	75%	45%	4	\$2
New	Hospital	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	3.94	0.5%	45%	75%	10	\$2
New	Hospital	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	3.94	1.8%	95%	30%	3	\$311
New	Hospital	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	3.94	1.0%	95%	86%	7	\$0
New	Hospital	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	3.94	1.2%	75%	95%	10	\$171
New	Hospital	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	3.94	0.1%	25%	65%	13	\$127
New	Hospital	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	3.94	1.4%	25%	35%	7	\$577
New	Hospital	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	3.94	2.6%	50%	80%	14	\$189
New	Hospital	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	0.51	27.2%	95%	95%	12	\$344
New	Hospital	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-In) includes compressors	Custom Refrigeration System - Standard	0.51	3.6%	85%	65%	10	\$9,596
New	Hospital	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	0.51	1.1%	90%	86%	9	\$375
New	Hospital	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	0.51	6.0%	75%	70%	10	\$24
New	Hospital	Refrigeration	Refrigeration - Commissioning	Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit)	No Commissioning	0.51	5.0%	80%	90%	3	\$29
New	Hospital	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	0.51	3.2%	95%	77%	16	\$99

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hospital	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	0.51	2.0%	95%	20%	4	\$189
New	Hospital	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.70	10.0%	5%	94%	15	\$11583
New	Hospital	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.70	12.5%	90%	80%	3	\$13422
New	Hospital	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.70	10.0%	75%	80%	5	\$9,901
New	Hospital	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.70	15.0%	5%	94%	10	\$16676
New	Hospital	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.70	4.5%	62%	85%	10	\$5,725
New	Hospital	Space Heat	Insulation (Ceiling)	R-49	R-30	0.70	4.0%	75%	85%	25	\$4,780
New	Hospital	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.70	6.0%	95%	95%	25	\$4,639
New	Hospital	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.70	2.5%	35%	35%	25	\$827
New	Hospital	Space Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.70	10.0%	40%	98%	25	\$2,850
New	Hospital	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.70	25.0%	50%	98%	10	\$38794
New	Hospital	Space Heat	Windows	U = 0.35	U = 0.40	0.70	4.1%	80%	60%	25	\$3,821
New	Hospital	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	1.40	3.3%	NA	NA	20	\$1,938
New	Hospital	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	1.38	15.1%	15%	95%	10	\$8,704
New	Hospital	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	1.38	2.6%	15%	80%	11	\$305
New	Hospital	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	1.38	5.0%	55%	94%	15	\$5,108
New	Hospital	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	1.38	2.1%	25%	80%	10	\$2,701
New	Hospital	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	1.38	5.6%	25%	95%	10	\$840
New	Hospital	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	1.38	0.6%	20%	25%	13	\$31
New	Hospital	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	1.38	0.8%	20%	55%	13	\$631
New	Hospital	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	1.38	20.0%	25%	92%	25	\$10506
New	Hospital	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	1.38	4.0%	95%	25%	10	\$0
New	Hospital	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	1.38	58.9%	50%	94%	15	\$5,725
New	Hospital	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	1.38	2.3%	50%	45%	5	\$6

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hospital	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	1.38	2.6%	35%	75%	10	\$6
New	Hospital	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	1.38	66.1%	20%	95%	20	\$89302
New	Hospital	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	1.38	3.3%	95%	90%	10	\$206
New	Hospital	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	1.38	7.7%	75%	80%	11	\$107
Existing	Hotel Motel	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	0.66	2.5%	45%	70%	12	\$4,947
Existing	Hotel Motel	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	0.66	8.4%	55%	85%	12	\$1,800
Existing	Hotel Motel	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.66	3.4%	85%	55%	15	\$1,733
Existing	Hotel Motel	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	0.66	2.3%	15%	75%	10	\$2
Existing	Hotel Motel	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.60	2.0%	50%	94%	15	\$2,269
Existing	Hotel Motel	Cooling Chillers	Centrifugal Chiller - VSD Remodel for Existing	VSD motor	Constant Speed Motor	1.60	40.0%	43%	45%	10	\$5,628
Existing	Hotel Motel	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	1.60	7.6%	25%	70%	10	\$6,827
Existing	Hotel Motel	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	1.60	5.0%	95%	100%	10	\$11453
Existing	Hotel Motel	Cooling Chillers	Chiller-Water Side Economizer	Install Economizer	No Economizer	1.60	5.0%	45%	30%	10	\$15854
Existing	Hotel Motel	Cooling Chillers	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.60	12.5%	90%	40%	3	\$3,313
Existing	Hotel Motel	Cooling Chillers	Cooling Tower-Decrease Temperature	Approach 6 Deg F	10 Deg F	1.60	8.0%	50%	94%	15	\$676
Existing	Hotel Motel	Cooling Chillers	Cooling Tower-Two-Speed Fan Motor	Two-Speed Tower Fans replace Single-Speed	Cooling Tower-One-Speed Fan Motor	1.60	14.0%	95%	35%	10	\$76
Existing	Hotel Motel	Cooling Chillers	Cooling Tower-VSD Fan Control	Variable-Speed Tower Fans replace Two-Speed	Cooling Tower-Two-Speed Fan Motor	1.60	4.0%	95%	75%	10	\$610
Existing	Hotel Motel	Cooling Chillers	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.60	15.0%	5%	52%	5	\$16164
Existing	Hotel Motel	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.60	10.0%	75%	80%	5	\$9,052
Existing	Hotel Motel	Cooling Chillers	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.60	15.0%	50%	80%	5	\$6,532
Existing	Hotel Motel	Cooling Chillers	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.60	2.5%	45%	45%	18	\$6,724

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hotel Motel	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.60	4.5%	58%	85%	10	\$5,725
Existing	Hotel Motel	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	1.60	10.0%	15%	98%	30	\$85144
Existing	Hotel Motel	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	1.60	1.0%	75%	45%	25	\$4,371
Existing	Hotel Motel	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	1.60	1.5%	75%	85%	25	\$5,799
Existing	Hotel Motel	Cooling Chillers	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.60	1.2%	75%	25%	25	\$5,127
Existing	Hotel Motel	Cooling Chillers	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.60	3.0%	75%	0%	25	\$5,127
Existing	Hotel Motel	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.60	4.4%	10%	15%	25	\$1,879
Existing	Hotel Motel	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.60	2.4%	10%	15%	25	\$1,958
Existing	Hotel Motel	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.60	3.0%	10%	95%	25	\$4,436
Existing	Hotel Motel	Cooling Chillers	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.60	8.4%	10%	35%	25	\$4,860
Existing	Hotel Motel	Cooling Chillers	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.60	10.0%	10%	0%	25	\$4,804
Existing	Hotel Motel	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.60	0.5%	35%	35%	25	\$756
Existing	Hotel Motel	Cooling Chillers	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.60	1.5%	35%	35%	25	\$4,371
Existing	Hotel Motel	Cooling Chillers	Pipe Insulation	R-4	R-0	1.60	1.0%	65%	45%	15	\$345
Existing	Hotel Motel	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.60	25.0%	25%	98%	10	\$35469
Existing	Hotel Motel	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	1.60	44.8%	60%	99%	20	\$18486
Existing	Hotel Motel	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	1.60	1.7%	80%	50%	25	\$28774
Existing	Hotel Motel	Cooling Chillers	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.60	0.8%	10%	50%	25	\$81238

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hotel Motel	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	1.59	14.2%	NA	NA	15	\$6,803
Existing	Hotel Motel	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	1.59	6.4%	NA	NA	15	\$3,621
Existing	Hotel Motel	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	1.59	10.4%	NA	NA	15	\$5,613
Existing	Hotel Motel	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.72	2.0%	50%	94%	15	\$2,269
Existing	Hotel Motel	Cooling DX	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.72	12.5%	90%	40%	3	\$3,313
Existing	Hotel Motel	Cooling DX	Cooling DX Package-Air Side Economizer	Air-Side Economizer	No Economizer	1.72	15.0%	10%	30%	15	\$5,468
Existing	Hotel Motel	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	1.72	25.0%	50%	85%	15	\$35022
Existing	Hotel Motel	Cooling DX	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.72	15.0%	5%	52%	5	\$16164
Existing	Hotel Motel	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.72	10.0%	75%	80%	5	\$9,052
Existing	Hotel Motel	Cooling DX	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.72	15.0%	50%	80%	5	\$6,532
Existing	Hotel Motel	Cooling DX	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.72	2.5%	45%	45%	18	\$6,724
Existing	Hotel Motel	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.72	4.5%	58%	85%	10	\$5,725
Existing	Hotel Motel	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	1.72	5.0%	15%	98%	30	\$85144
Existing	Hotel Motel	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	1.72	1.0%	75%	45%	25	\$4,371
Existing	Hotel Motel	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	1.72	1.5%	75%	85%	25	\$5,799
Existing	Hotel Motel	Cooling DX	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.72	1.2%	75%	25%	25	\$5,127
Existing	Hotel Motel	Cooling DX	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.72	3.0%	75%	0%	25	\$5,127
Existing	Hotel Motel	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.72	4.4%	10%	15%	25	\$1,879
Existing	Hotel Motel	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.72	2.4%	10%	15%	25	\$1,958
Existing	Hotel Motel	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.72	3.0%	10%	95%	25	\$4,436
Existing	Hotel Motel	Cooling DX	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.72	8.4%	10%	35%	25	\$4,860
Existing	Hotel Motel	Cooling DX	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.72	10.0%	10%	0%	25	\$4,804
Existing	Hotel Motel	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.72	0.5%	35%	45%	25	\$756
Existing	Hotel Motel	Cooling DX	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.72	1.5%	35%	45%	25	\$4,371

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hotel Motel	Cooling DX	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	1.72	3.0%	95%	78%	15	\$146
Existing	Hotel Motel	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	1.72	1.7%	80%	50%	25	\$28774
Existing	Hotel Motel	Cooling DX	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.72	0.8%	10%	50%	25	\$81238
Existing	Hotel Motel	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	3.30	20.0%	20%	85%	10	\$3,436
Existing	Hotel Motel	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	3.30	7.5%	60%	45%	10	\$13132
Existing	Hotel Motel	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	3.30	3.8%	85%	81%	10	\$439
Existing	Hotel Motel	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD Control	No Pump And Fan System VSD Optimization	3.30	33.8%	85%	75%	20	\$3,411
Existing	Hotel Motel	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	3.30	8.8%	10%	77%	10	\$6,139
Existing	Hotel Motel	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	3.30	1.6%	0%	94%	10	\$1,792
Existing	Hotel Motel	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	3.83	16.8%	NA	NA	15	\$4,823
Existing	Hotel Motel	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	3.83	30.2%	NA	NA	15	\$10326
Existing	Hotel Motel	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	3.99	2.0%	50%	94%	15	\$2,269
Existing	Hotel Motel	Heat Pump	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	3.99	12.5%	90%	40%	3	\$3,313
Existing	Hotel Motel	Heat Pump	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	3.99	15.0%	5%	52%	5	\$16164
Existing	Hotel Motel	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	3.99	10.0%	75%	80%	5	\$9,052
Existing	Hotel Motel	Heat Pump	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	3.99	15.0%	50%	80%	5	\$6,532
Existing	Hotel Motel	Heat Pump	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	3.99	2.5%	45%	45%	18	\$6,724
Existing	Hotel Motel	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	3.99	8.8%	5%	94%	10	\$15247
Existing	Hotel Motel	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	3.99	4.5%	58%	85%	10	\$5,725
Existing	Hotel Motel	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	3.99	0.6%	15%	98%	30	\$85144
Existing	Hotel Motel	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	3.99	12.0%	5%	92%	20	\$55935
Existing	Hotel Motel	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	3.99	33.7%	5%	92%	20	105086
Existing	Hotel Motel	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	3.99	21.9%	0%	90%	20	\$11251

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hotel Motel	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	3.99	33.3%	0%	90%	20	\$14860
Existing	Hotel Motel	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	3.99	3.0%	75%	45%	25	\$4,371
Existing	Hotel Motel	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	3.99	4.4%	75%	85%	25	\$5,799
Existing	Hotel Motel	Heat Pump	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	3.99	2.8%	75%	25%	25	\$5,127
Existing	Hotel Motel	Heat Pump	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	3.99	6.9%	75%	0%	25	\$5,127
Existing	Hotel Motel	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	3.99	4.4%	10%	15%	25	\$1,879
Existing	Hotel Motel	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	3.99	2.4%	10%	15%	25	\$1,958
Existing	Hotel Motel	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	3.99	5.0%	10%	95%	25	\$4,436
Existing	Hotel Motel	Heat Pump	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	3.99	16.6%	10%	35%	25	\$4,860
Existing	Hotel Motel	Heat Pump	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	3.99	19.8%	10%	0%	25	\$4,804
Existing	Hotel Motel	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	3.99	1.9%	35%	45%	25	\$756
Existing	Hotel Motel	Heat Pump	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	3.99	5.6%	35%	45%	25	\$4,371
Existing	Hotel Motel	Heat Pump	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	3.99	3.0%	95%	78%	15	\$146
Existing	Hotel Motel	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	3.99	11.4%	80%	50%	25	\$28774
Existing	Hotel Motel	Heat Pump	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	3.99	7.5%	10%	50%	25	\$81238
Existing	Hotel Motel	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	2.92	2.0%	85%	75%	9	\$1,325
Existing	Hotel Motel	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	2.92	6.0%	30%	92%	9	\$2,017
Existing	Hotel Motel	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.0	2.92	15.0%	90%	70%	14	\$2,179
Existing	Hotel Motel	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.0	2.92	20.0%	75%	85%	14	\$5,396
Existing	Hotel Motel	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.0	2.92	25.0%	70%	90%	14	\$8,613
Existing	Hotel Motel	Lighting	HE Fixtures/Design - Existing to Code	Code Required LPD And Control Strategies: LPD = 1.0	Existing Lighting Design	2.92	53.0%	95%	45%	14	\$13008
Existing	Hotel Motel	Lighting	LED Exit Lighting	5 Watts	CFL Exit Sign (26 Watts)	2.92	1.6%	95%	65%	11	\$52
Existing	Hotel Motel	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	2.92	1.2%	25%	80%	13	\$630
Existing	Hotel Motel	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	2.92	0.8%	10%	95%	14	\$37
Existing	Hotel Motel	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	2.92	4.0%	90%	98%	9	\$314

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hotel Motel	Lighting	Time Clocks And Timers	Install Time Clock Lighting	No Time Clock	2.92	4.9%	85%	100%	9	\$215
Existing	Hotel Motel	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.29	0.4%	95%	90%	7	\$2
Existing	Hotel Motel	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.29	13.6%	64%	25%	4	\$2
Existing	Hotel Motel	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.29	3.3%	90%	45%	6	\$165
Existing	Hotel Motel	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.29	1.8%	75%	55%	4	\$2
Existing	Hotel Motel	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.29	18.4%	64%	15%	4	\$158
Existing	Hotel Motel	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.29	1.3%	75%	40%	5	\$15
Existing	Hotel Motel	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.29	0.9%	75%	45%	4	\$2
Existing	Hotel Motel	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.29	1.0%	5%	75%	10	\$2
Existing	Hotel Motel	Plug Load	Office Computer Network Energy Management	Office Computer Network Energy Management	No Network Management	2.29	1.8%	95%	30%	3	\$309
Existing	Hotel Motel	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.29	1.0%	95%	86%	7	\$0
Existing	Hotel Motel	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	2.29	1.2%	75%	95%	10	\$171
Existing	Hotel Motel	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.29	0.2%	45%	65%	13	\$126
Existing	Hotel Motel	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.29	2.7%	25%	35%	7	\$578
Existing	Hotel Motel	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.29	5.0%	90%	80%	14	\$190
Existing	Hotel Motel	Plug Load	Vending Miser	Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls	No Vending Miser - No controls	2.29	5.2%	90%	25%	3	\$298
Existing	Hotel Motel	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	0.31	24.9%	95%	95%	12	\$345
Existing	Hotel Motel	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	0.31	3.6%	85%	65%	10	\$9,595
Existing	Hotel Motel	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	0.31	1.1%	100%	86%	9	\$377
Existing	Hotel Motel	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	0.31	6.0%	75%	70%	10	\$13
Existing	Hotel Motel	Refrigeration	Refrigeration - Retro Commissioning	Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)	No Re-commissioning	0.31	5.0%	80%	90%	3	\$17
Existing	Hotel Motel	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	0.31	3.2%	95%	77%	16	\$55
Existing	Hotel Motel	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	0.31	2.0%	95%	20%	4	\$188
Existing	Hotel Motel	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	4.09	2.0%	50%	94%	15	\$2,269
Existing	Hotel Motel	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	4.09	12.5%	90%	40%	3	\$3,313

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hotel Motel	Space Heat	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	4.09	15.0%	5%	52%	5	\$16164
Existing	Hotel Motel	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	4.09	10.0%	75%	80%	5	\$9,052
Existing	Hotel Motel	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	4.09	15.0%	50%	80%	5	\$6,532
Existing	Hotel Motel	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	4.09	2.5%	45%	45%	18	\$6,724
Existing	Hotel Motel	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	4.09	15.0%	5%	94%	10	\$15247
Existing	Hotel Motel	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	4.09	4.5%	58%	85%	10	\$5,725
Existing	Hotel Motel	Space Heat	Insulation (Ceiling)	R-49	R-30	4.09	4.0%	75%	85%	25	\$4,371
Existing	Hotel Motel	Space Heat	Insulation (Ceiling) - Existing to Code	R-30	Existing Ceiling Insulation (Average R-9)	4.09	6.3%	75%	25%	25	\$5,127
Existing	Hotel Motel	Space Heat	Insulation (Ceiling) - Zero to Code	R-30	R-0	4.09	12.5%	75%	0%	25	\$5,127
Existing	Hotel Motel	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	4.09	4.4%	10%	15%	25	\$1,879
Existing	Hotel Motel	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	4.09	2.4%	10%	15%	25	\$1,958
Existing	Hotel Motel	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	4.09	6.0%	10%	95%	25	\$4,436
Existing	Hotel Motel	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	4.09	21.1%	10%	35%	25	\$4,860
Existing	Hotel Motel	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	4.09	25.0%	10%	0%	25	\$4,804
Existing	Hotel Motel	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	4.09	2.5%	35%	45%	25	\$756
Existing	Hotel Motel	Space Heat	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	4.09	7.5%	35%	45%	25	\$4,371
Existing	Hotel Motel	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	4.09	25.0%	25%	98%	10	\$35469
Existing	Hotel Motel	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	4.09	3.0%	95%	78%	15	\$146
Existing	Hotel Motel	Space Heat	Windows	U = 0.35	U = 0.40	4.09	5.5%	80%	50%	25	\$7,193
Existing	Hotel Motel	Space Heat	Windows - Existing to Code	U = 0.40	Existing Windows (U=0.65)	4.09	16.6%	10%	50%	25	102818
Existing	Hotel Motel	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	1.69	3.3%	NA	NA	20	\$1,615
Existing	Hotel Motel	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	1.73	15.1%	35%	95%	10	\$8,704
Existing	Hotel Motel	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	1.73	2.3%	35%	80%	11	\$304
Existing	Hotel Motel	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	1.73	5.0%	55%	80%	15	\$4,670
Existing	Hotel Motel	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	1.73	2.1%	45%	80%	10	\$2,700

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hotel Motel	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Chemical Cost)	High Temp Commercial Dishwasher	1.73	5.6%	45%	95%	10	\$841
Existing	Hotel Motel	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	1.73	0.5%	45%	25%	13	\$32
Existing	Hotel Motel	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	1.73	0.7%	45%	55%	13	\$630
Existing	Hotel Motel	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	1.73	20.0%	5%	92%	25	\$8,755
Existing	Hotel Motel	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	1.73	4.0%	95%	25%	10	\$0
Existing	Hotel Motel	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	1.73	3.8%	95%	15%	10	\$2
Existing	Hotel Motel	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	1.73	58.9%	40%	94%	15	\$6,435
Existing	Hotel Motel	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	1.73	1.0%	80%	90%	15	\$178
Existing	Hotel Motel	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	1.73	2.3%	85%	50%	5	\$5
Existing	Hotel Motel	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	1.73	7.5%	100%	75%	10	\$7
Existing	Hotel Motel	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	1.73	16.7%	100%	20%	10	\$12
Existing	Hotel Motel	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	1.73	56.1%	20%	95%	20	\$89303
Existing	Hotel Motel	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	1.73	3.3%	95%	85%	10	\$207
Existing	Hotel Motel	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	1.73	7.7%	75%	5%	11	\$108
New	Hotel Motel	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	0.66	2.5%	45%	70%	12	\$4,947
New	Hotel Motel	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	0.66	8.3%	55%	85%	12	\$1,800
New	Hotel Motel	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.66	3.4%	85%	55%	15	\$1,733
New	Hotel Motel	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	0.66	2.3%	15%	75%	10	\$2
New	Hotel Motel	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.51	2.0%	50%	94%	15	\$2,269
New	Hotel Motel	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	0.51	7.6%	25%	70%	10	\$6,827
New	Hotel Motel	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	0.51	5.0%	95%	100%	10	\$11453
New	Hotel Motel	Cooling Chillers	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.51	12.5%	90%	80%	3	\$12271
New	Hotel Motel	Cooling Chillers	Cooling Tower-Decrease Approach Temperature	6 Deg F	10 Deg F	0.51	8.0%	50%	94%	15	\$676
New	Hotel Motel	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.51	10.0%	75%	80%	5	\$9,052

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hotel Motel	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.51	4.5%	58%	85%	10	\$5,725
New	Hotel Motel	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	0.51	10.0%	15%	98%	30	\$85144
New	Hotel Motel	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	0.51	1.0%	75%	45%	25	\$4,371
New	Hotel Motel	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	0.51	1.5%	75%	85%	25	\$5,799
New	Hotel Motel	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.51	3.0%	95%	95%	25	\$4,436
New	Hotel Motel	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.51	0.5%	35%	35%	25	\$756
New	Hotel Motel	Cooling Chillers	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.51	10.0%	40%	98%	25	\$2,606
New	Hotel Motel	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.51	25.0%	50%	98%	10	\$35469
New	Hotel Motel	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	0.51	44.8%	95%	99%	20	\$13061
New	Hotel Motel	Cooling Chillers	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.51	9.6%	75%	75%	30	\$12033
New	Hotel Motel	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	0.51	1.7%	80%	50%	25	\$28774
New	Hotel Motel	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	0.56	14.2%	NA	NA	15	\$6,803
New	Hotel Motel	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	0.56	6.4%	NA	NA	15	\$3,621
New	Hotel Motel	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	0.56	10.4%	NA	NA	15	\$5,613
New	Hotel Motel	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.51	2.0%	50%	94%	15	\$2,269
New	Hotel Motel	Cooling DX	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.51	12.5%	90%	80%	3	\$12271
New	Hotel Motel	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.51	25.0%	50%	85%	15	\$35022
New	Hotel Motel	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.51	10.0%	75%	80%	5	\$9,052
New	Hotel Motel	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.51	4.5%	58%	85%	10	\$5,725

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hotel Motel	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.51	5.0%	15%	98%	30	\$85144
New	Hotel Motel	Cooling DX	Hotel Key Card Room Energy Control System	Key card system to control room HVAC and lighting during non-occupied periods	325 sqft room, \$100/room	0.51	25.0%	60%	95%	15	\$5,275
New	Hotel Motel	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.51	1.0%	75%	45%	25	\$4,371
New	Hotel Motel	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.51	1.5%	75%	85%	25	\$5,799
New	Hotel Motel	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.51	3.0%	95%	95%	25	\$4,436
New	Hotel Motel	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.51	0.5%	35%	45%	25	\$756
New	Hotel Motel	Cooling DX	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.51	10.0%	40%	98%	25	\$2,606
New	Hotel Motel	Cooling DX	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.51	9.6%	75%	75%	30	\$12033
New	Hotel Motel	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.51	1.7%	80%	50%	25	\$28774
New	Hotel Motel	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	2.06	20.0%	20%	75%	10	\$3,436
New	Hotel Motel	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	2.06	7.5%	60%	45%	10	\$6,828
New	Hotel Motel	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	2.06	3.8%	85%	81%	10	\$439
New	Hotel Motel	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	2.06	33.8%	85%	75%	20	\$3,411
New	Hotel Motel	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	2.06	8.8%	20%	77%	10	\$6,139
New	Hotel Motel	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	2.06	1.6%	0%	94%	10	\$1,792
New	Hotel Motel	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	2.16	16.8%	NA	NA	15	\$4,823
New	Hotel Motel	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	2.16	30.2%	NA	NA	15	\$10326
New	Hotel Motel	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.93	2.0%	50%	94%	15	\$2,269
New	Hotel Motel	Heat Pump	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.93	12.5%	90%	80%	3	\$12271
New	Hotel Motel	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.93	10.0%	75%	80%	5	\$9,052
New	Hotel Motel	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.93	8.8%	5%	94%	10	\$15247
New	Hotel Motel	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.93	4.5%	58%	85%	10	\$5,725
New	Hotel Motel	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	1.93	0.6%	15%	98%	30	\$85144
New	Hotel Motel	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Stnd. Air Source HP 'EER=10.1, COP=3.2	1.93	12.0%	45%	92%	20	\$55935

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hotel Motel	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	1.93	33.7%	45%	92%	20	105086
New	Hotel Motel	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.93	21.9%	0%	90%	20	\$11251
New	Hotel Motel	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.93	33.3%	0%	90%	20	\$14860
New	Hotel Motel	Heat Pump	Hotel Key Card Room Energy Control System	Key card system to control room HVAC and lighting during non-occupied periods	325 sqft room, \$100/room	1.93	25.0%	60%	95%	15	\$5,275
New	Hotel Motel	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	1.93	3.0%	75%	45%	25	\$4,371
New	Hotel Motel	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	1.93	4.4%	75%	85%	25	\$5,799
New	Hotel Motel	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.93	5.0%	95%	95%	25	\$4,436
New	Hotel Motel	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.93	1.9%	35%	45%	25	\$756
New	Hotel Motel	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.93	10.0%	40%	98%	25	\$2,606
New	Hotel Motel	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	1.93	11.4%	80%	50%	25	\$28774
New	Hotel Motel	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	1.93	2.0%	85%	75%	9	\$1,325
New	Hotel Motel	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	1.93	6.0%	60%	92%	9	\$2,017
New	Hotel Motel	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.0	1.93	15.0%	90%	70%	14	\$1,311
New	Hotel Motel	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.0	1.93	20.0%	75%	85%	14	\$4,236
New	Hotel Motel	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.0	1.93	25.0%	70%	90%	14	\$7,161
New	Hotel Motel	Lighting	Hotel Key Card Room Energy Control System	Key card system to control room HVAC and lighting during non-occupied periods	325 sqft room, \$100/room	1.93	25.0%	60%	95%	15	\$5,275
New	Hotel Motel	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	1.93	1.8%	25%	80%	13	\$630
New	Hotel Motel	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	1.93	0.8%	10%	95%	14	\$37
New	Hotel Motel	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	1.93	4.0%	90%	98%	10	\$314
New	Hotel Motel	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.29	0.4%	95%	90%	7	\$2
New	Hotel Motel	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.29	13.6%	64%	25%	4	\$2
New	Hotel Motel	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.29	3.2%	90%	45%	6	\$165
New	Hotel Motel	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.29	1.8%	75%	55%	4	\$2
New	Hotel Motel	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.29	18.4%	64%	15%	4	\$158

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hotel Motel	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.29	1.3%	75%	40%	5	\$15
New	Hotel Motel	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.29	0.9%	75%	45%	4	\$2
New	Hotel Motel	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.29	1.0%	5%	75%	10	\$2
New	Hotel Motel	Plug Load	Office Computer Network Energy Management	Office Computer Network Energy Management	No Network Management	2.29	1.8%	95%	30%	3	\$309
New	Hotel Motel	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.29	1.0%	95%	86%	7	\$0
New	Hotel Motel	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	2.29	1.2%	75%	95%	10	\$171
New	Hotel Motel	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.29	0.2%	45%	65%	13	\$126
New	Hotel Motel	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.29	2.7%	25%	35%	7	\$578
New	Hotel Motel	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.29	4.9%	90%	80%	14	\$190
New	Hotel Motel	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	0.31	24.7%	95%	95%	12	\$345
New	Hotel Motel	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	0.31	3.6%	85%	65%	10	\$9,595
New	Hotel Motel	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	0.31	1.1%	100%	86%	9	\$377
New	Hotel Motel	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	0.31	6.0%	75%	70%	10	\$13
New	Hotel Motel	Refrigeration	Refrigeration - Commissioning	Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit)	No Commissioning	0.31	5.0%	80%	90%	3	\$17
New	Hotel Motel	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	0.31	3.2%	95%	77%	16	\$55
New	Hotel Motel	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	0.31	2.0%	95%	20%	4	\$188
New	Hotel Motel	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	2.60	2.0%	50%	94%	15	\$2,269
New	Hotel Motel	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	2.60	12.5%	90%	80%	3	\$12271
New	Hotel Motel	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	2.60	10.0%	75%	80%	5	\$9,052
New	Hotel Motel	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	2.60	15.0%	5%	94%	10	\$15247
New	Hotel Motel	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	2.60	4.5%	58%	85%	10	\$5,725
New	Hotel Motel	Space Heat	Hotel Key Card Room Energy Control System	Key card system to control room HVAC and lighting during non-occupied periods	325 sqft room, \$100/room	2.60	25.0%	60%	95%	15	\$5,275
New	Hotel Motel	Space Heat	Insulation (Ceiling)	R-49	R-30	2.60	4.0%	75%	85%	25	\$4,371
New	Hotel Motel	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	2.60	6.0%	95%	95%	25	\$4,436
New	Hotel Motel	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	2.60	2.5%	35%	45%	25	\$756

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hotel Motel	Space Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	2.60	10.0%	40%	98%	25	\$2,606
New	Hotel Motel	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	2.60	25.0%	50%	98%	10	\$35469
New	Hotel Motel	Space Heat	Windows	U = 0.35	U = 0.40	2.60	5.5%	80%	50%	25	\$7,193
New	Hotel Motel	Water Heat	Water_Heater (40 Gallon Electric) Residential Sized	EF = 0.95	EF = 0.92	1.76	3.3%	NA	NA	20	\$1,615
New	Hotel Motel	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	1.73	15.1%	35%	95%	10	\$8,704
New	Hotel Motel	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	1.73	2.2%	35%	80%	11	\$304
New	Hotel Motel	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	1.73	5.0%	55%	80%	15	\$4,670
New	Hotel Motel	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	1.73	2.1%	45%	80%	10	\$2,700
New	Hotel Motel	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemmical Cost)	High Temp Commercial Dishwasher	1.73	5.6%	45%	95%	10	\$841
New	Hotel Motel	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	1.73	0.5%	45%	25%	13	\$32
New	Hotel Motel	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	1.73	0.7%	45%	55%	13	\$630
New	Hotel Motel	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	1.73	20.0%	25%	92%	25	\$8,755
New	Hotel Motel	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	1.73	4.0%	95%	25%	10	\$0
New	Hotel Motel	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	1.73	58.9%	50%	94%	15	\$6,435
New	Hotel Motel	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	1.73	2.3%	85%	50%	5	\$5
New	Hotel Motel	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	1.73	7.5%	100%	75%	10	\$7
New	Hotel Motel	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	1.73	56.1%	20%	95%	20	\$89303
New	Hotel Motel	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	1.73	3.3%	95%	85%	10	\$207
New	Hotel Motel	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	1.73	7.7%	75%	5%	11	\$108
Existing	Office	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	1.47	20.0%	NA	NA	20	\$2,205
Existing	Office	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	1.47	27.3%	NA	NA	20	\$2,748
Existing	Office	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	1.47	9.5%	NA	NA	20	\$790
Existing	Office	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.54	10.0%	75%	94%	15	\$5,295

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Office	Cooling Chillers	Centrifugal Chiller - VSD Remodel for Existing	VSD motor	Constant Speed Motor	1.54	40.0%	43%	45%	10	\$4,113
Existing	Office	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	1.54	7.6%	25%	70%	10	\$4,988
Existing	Office	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	1.54	5.0%	95%	95%	10	\$5,726
Existing	Office	Cooling Chillers	Chiller-Water Side Economizer	Install Economizer	No Economizer	1.54	5.0%	45%	45%	10	\$11,583
Existing	Office	Cooling Chillers	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.54	12.5%	90%	40%	3	\$1,657
Existing	Office	Cooling Chillers	Cooling Tower-Decrease Temperature	Approach 6 Deg F	10 Deg F	1.54	8.0%	50%	94%	15	\$493
Existing	Office	Cooling Chillers	Cooling Tower-Two-Speed Fan Motor	Two-Speed Tower Fans replace Single-Speed	Cooling Tower-One-Speed Fan Motor	1.54	14.0%	95%	35%	10	\$55
Existing	Office	Cooling Chillers	Cooling Tower-VSD Fan Control	Variable-Speed Tower Fans replace Two-Speed	Cooling Tower-Two-Speed Fan Motor	1.54	4.0%	95%	75%	10	\$446
Existing	Office	Cooling Chillers	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.54	15.0%	45%	28%	5	\$8,082
Existing	Office	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.54	10.0%	75%	80%	5	\$4,526
Existing	Office	Cooling Chillers	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.54	15.0%	50%	80%	5	\$3,266
Existing	Office	Cooling Chillers	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.54	2.5%	45%	45%	18	\$3,362
Existing	Office	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	1.54	10.0%	15%	98%	30	\$85,145
Existing	Office	Cooling Chillers	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	1.54	5.0%	40%	10%	10	\$1,968
Existing	Office	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	1.54	2.0%	75%	25%	25	\$4,371
Existing	Office	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	1.54	3.0%	75%	65%	25	\$5,799
Existing	Office	Cooling Chillers	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.54	2.4%	75%	4%	25	\$5,127
Existing	Office	Cooling Chillers	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.54	6.0%	75%	0%	25	\$5,127
Existing	Office	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.54	4.4%	10%	15%	25	\$940

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Office	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.54	2.4%	10%	15%	25	\$979
Existing	Office	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.54	3.0%	10%	95%	25	\$2,218
Existing	Office	Cooling Chillers	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.54	8.4%	10%	35%	25	\$2,430
Existing	Office	Cooling Chillers	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.54	10.0%	10%	0%	25	\$2,402
Existing	Office	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.54	1.0%	35%	15%	25	\$756
Existing	Office	Cooling Chillers	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.54	3.0%	35%	15%	25	\$4,371
Existing	Office	Cooling Chillers	Pipe Insulation	R-4	R-0	1.54	1.0%	65%	45%	15	\$172
Existing	Office	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.54	25.0%	25%	98%	10	\$17735
Existing	Office	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	1.54	44.8%	60%	99%	20	\$13507
Existing	Office	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	1.54	1.0%	80%	95%	25	\$8,757
Existing	Office	Cooling Chillers	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.54	0.5%	10%	95%	25	\$24726
Existing	Office	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	1.60	14.2%	NA	NA	15	\$4,521
Existing	Office	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	1.60	6.4%	NA	NA	15	\$2,406
Existing	Office	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	1.60	10.4%	NA	NA	15	\$3,730
Existing	Office	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.67	10.0%	75%	94%	15	\$5,295
Existing	Office	Cooling DX	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.67	12.5%	90%	40%	3	\$1,657
Existing	Office	Cooling DX	Cooling DX Package-Air Side Economizer	Air-Side Economizer	No Economizer	1.67	15.0%	10%	20%	15	\$3,996
Existing	Office	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	1.67	25.0%	50%	85%	15	\$17511
Existing	Office	Cooling DX	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.67	15.0%	5%	28%	5	\$8,082

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Office	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.67	10.0%	75%	80%	5	\$4,526
Existing	Office	Cooling DX	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.67	15.0%	75%	80%	5	\$3,266
Existing	Office	Cooling DX	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.67	2.5%	45%	45%	18	\$3,362
Existing	Office	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	1.67	10.0%	15%	98%	30	\$85145
Existing	Office	Cooling DX	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	1.67	5.0%	40%	10%	10	\$1,968
Existing	Office	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	1.67	2.0%	75%	25%	25	\$4,371
Existing	Office	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	1.67	3.0%	75%	65%	25	\$5,799
Existing	Office	Cooling DX	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.67	2.4%	75%	4%	25	\$5,127
Existing	Office	Cooling DX	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.67	6.0%	75%	0%	25	\$5,127
Existing	Office	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.67	4.4%	10%	15%	25	\$940
Existing	Office	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.67	2.4%	10%	15%	25	\$979
Existing	Office	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.67	3.0%	10%	95%	25	\$2,218
Existing	Office	Cooling DX	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.67	8.4%	10%	35%	25	\$2,430
Existing	Office	Cooling DX	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.67	10.0%	10%	0%	25	\$2,402
Existing	Office	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.67	1.0%	35%	15%	25	\$756
Existing	Office	Cooling DX	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.67	3.0%	35%	15%	25	\$4,371
Existing	Office	Cooling DX	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	1.67	3.0%	95%	67%	15	\$145
Existing	Office	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	1.67	1.0%	80%	95%	25	\$8,757
Existing	Office	Cooling DX	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.67	0.5%	10%	95%	25	\$24726
Existing	Office	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	1.56	20.0%	20%	85%	10	\$1,718
Existing	Office	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	1.56	7.5%	0%	85%	10	\$13133
Existing	Office	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	1.56	3.8%	85%	81%	10	\$395
Existing	Office	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	1.56	33.8%	85%	75%	20	\$1,705
Existing	Office	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	1.56	8.8%	50%	77%	10	\$3,070

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Office	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	1.56	1.6%	0%	94%	10	\$1,791
Existing	Office	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	3.09	16.8%	NA	NA	15	\$3,205
Existing	Office	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	3.09	30.2%	NA	NA	15	\$6,862
Existing	Office	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	3.22	10.0%	75%	94%	15	\$5,295
Existing	Office	Heat Pump	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	3.22	12.5%	90%	40%	3	\$1,657
Existing	Office	Heat Pump	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	3.22	15.0%	5%	28%	5	\$8,082
Existing	Office	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	3.22	10.0%	75%	80%	5	\$4,526
Existing	Office	Heat Pump	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	3.22	15.0%	75%	80%	5	\$3,266
Existing	Office	Heat Pump	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	3.22	2.5%	45%	45%	18	\$3,362
Existing	Office	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	3.22	7.2%	5%	94%	10	\$14457
Existing	Office	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	3.22	1.6%	15%	98%	30	\$85145
Existing	Office	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	3.22	14.3%	5%	92%	20	\$37170
Existing	Office	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	3.22	36.5%	5%	92%	20	\$69833
Existing	Office	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	3.22	20.8%	20%	90%	20	\$7,477
Existing	Office	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	3.22	32.8%	20%	90%	20	\$9,875
Existing	Office	Heat Pump	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	3.22	8.3%	40%	10%	10	\$1,968
Existing	Office	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	3.22	5.9%	75%	25%	25	\$4,371
Existing	Office	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	3.22	8.9%	75%	65%	25	\$5,799
Existing	Office	Heat Pump	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	3.22	5.5%	75%	4%	25	\$5,127
Existing	Office	Heat Pump	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	3.22	13.8%	75%	0%	25	\$5,127
Existing	Office	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	3.22	4.4%	10%	15%	25	\$940
Existing	Office	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	3.22	2.4%	10%	15%	25	\$979
Existing	Office	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	3.22	5.0%	10%	95%	25	\$2,218
Existing	Office	Heat Pump	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	3.22	16.6%	10%	35%	25	\$2,430
Existing	Office	Heat Pump	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	3.22	19.8%	10%	0%	25	\$2,402
Existing	Office	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	3.22	3.7%	35%	15%	25	\$756

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Office	Heat Pump	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	3.22	11.1%	35%	15%	25	\$4,371
Existing	Office	Heat Pump	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	3.22	3.0%	95%	67%	15	\$145
Existing	Office	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	3.22	6.6%	80%	95%	25	\$8,757
Existing	Office	Heat Pump	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	3.22	4.3%	10%	95%	25	\$24726
Existing	Office	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	3.87	2.0%	85%	75%	9	\$662
Existing	Office	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	3.87	15.0%	30%	78%	9	\$2,522
Existing	Office	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.0	3.87	15.0%	90%	70%	14	\$1,089
Existing	Office	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.0	3.87	20.0%	75%	85%	14	\$2,698
Existing	Office	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.0	3.87	25.0%	70%	90%	14	\$4,307
Existing	Office	Lighting	HE Fixtures/Design - Existing to Code	Code Required LPD And Control Strategies: LPD = 1.0	Existing Lighting Design	3.87	39.5%	95%	45%	14	\$6,504
Existing	Office	Lighting	LED Exit Lighting	5 Watts	CFL Exit Sign (26 Watts)	3.87	1.6%	95%	65%	11	\$53
Existing	Office	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	3.87	0.7%	5%	80%	13	\$630
Existing	Office	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	3.87	0.8%	10%	95%	14	\$36
Existing	Office	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	3.87	4.0%	90%	87%	9	\$157
Existing	Office	Lighting	Time Clocks And Timers	Install Time Clock Lighting	No Time Clock	3.87	4.9%	85%	88%	9	\$215
Existing	Office	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.33	0.4%	95%	90%	7	\$3
Existing	Office	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.33	13.6%	64%	25%	4	\$1
Existing	Office	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.33	6.4%	90%	45%	6	\$165
Existing	Office	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.33	1.8%	75%	55%	4	\$1
Existing	Office	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.33	18.4%	64%	15%	4	\$158
Existing	Office	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.33	1.3%	75%	40%	5	\$16
Existing	Office	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.33	0.9%	75%	45%	4	\$1
Existing	Office	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.33	2.1%	65%	75%	10	\$1
Existing	Office	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	2.33	1.8%	95%	30%	3	\$310
Existing	Office	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.33	1.0%	95%	86%	7	\$0

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUJ)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Office	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.33	0.5%	35%	65%	13	\$126
Existing	Office	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.33	5.4%	25%	35%	7	\$578
Existing	Office	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.33	9.9%	10%	80%	14	\$189
Existing	Office	Plug Load	Vending Miser	Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls	No Vending Miser - No controls	2.33	10.2%	10%	25%	3	\$298
Existing	Office	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	3.28	10.0%	75%	94%	15	\$5,295
Existing	Office	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	3.28	12.5%	90%	40%	3	\$1,657
Existing	Office	Space Heat	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	3.28	15.0%	5%	28%	5	\$8,082
Existing	Office	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	3.28	10.0%	75%	80%	5	\$4,526
Existing	Office	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	3.28	15.0%	75%	80%	5	\$3,266
Existing	Office	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	3.28	2.5%	45%	45%	18	\$3,362
Existing	Office	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	3.28	15.0%	5%	94%	10	\$14457
Existing	Office	Space Heat	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	3.28	10.0%	40%	10%	10	\$1,968
Existing	Office	Space Heat	Insulation (Ceiling)	R-49	R-30	3.28	8.0%	75%	65%	25	\$4,371
Existing	Office	Space Heat	Insulation (Ceiling) - Existing to Code	R-30	Existing Ceiling Insulation (Average R-9)	3.28	12.5%	75%	4%	25	\$5,127
Existing	Office	Space Heat	Insulation (Ceiling) - Zero to Code	R-30	R-0	3.28	25.0%	75%	0%	25	\$5,127
Existing	Office	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	3.28	4.4%	10%	15%	25	\$940
Existing	Office	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	3.28	2.4%	10%	15%	25	\$979
Existing	Office	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	3.28	6.0%	10%	95%	25	\$2,218
Existing	Office	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	3.28	21.1%	10%	35%	25	\$2,430
Existing	Office	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	3.28	25.0%	10%	0%	25	\$2,402
Existing	Office	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	3.28	5.0%	35%	15%	25	\$756
Existing	Office	Space Heat	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	3.28	15.0%	35%	15%	25	\$4,371
Existing	Office	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	3.28	25.0%	25%	98%	10	\$17735
Existing	Office	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	3.28	3.0%	95%	67%	15	\$145



Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Office	Space Heat	Windows	U = 0.35	U = 0.40	3.28	3.2%	80%	95%	25	\$2,190
Existing	Office	Space Heat	Windows - Existing to Code	U = 0.40	Existing Windows (U=0.65)	3.28	9.6%	10%	95%	25	\$31294
Existing	Office	Water Heat	Water_Heater (40 Gallon Residential Sized Electric)	EF = 0.95	EF = 0.92	0.46	3.3%	NA	NA	20	\$161
Existing	Office	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.47	15.1%	5%	95%	10	\$8,704
Existing	Office	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.47	6.9%	5%	80%	11	\$304
Existing	Office	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	0.47	5.0%	55%	80%	15	\$2,335
Existing	Office	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.47	2.1%	10%	80%	10	\$2,700
Existing	Office	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.47	5.6%	10%	95%	10	\$841
Existing	Office	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	0.47	3.6%	15%	25%	13	\$32
Existing	Office	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	0.47	5.0%	15%	55%	13	\$630
Existing	Office	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	0.47	20.0%	5%	92%	25	\$876
Existing	Office	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.47	4.0%	95%	25%	10	\$0
Existing	Office	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.47	3.8%	95%	15%	10	\$2
Existing	Office	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	0.47	58.9%	40%	94%	15	\$9,626
Existing	Office	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.47	1.0%	80%	30%	15	\$89
Existing	Office	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.47	1.1%	15%	75%	10	\$6
Existing	Office	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.47	2.5%	15%	20%	10	\$12
Existing	Office	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	0.47	55.8%	20%	95%	20	\$17861
Existing	Office	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.47	3.3%	95%	85%	10	\$207
Existing	Office	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.47	7.7%	75%	40%	11	\$108
New	Office	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	0.58	20.0%	NA	NA	20	\$2,205
New	Office	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	0.58	27.3%	NA	NA	20	\$2,748
New	Office	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	0.58	9.5%	NA	NA	20	\$790
New	Office	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.53	10.0%	75%	94%	15	\$5,295

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Office	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	0.53	7.6%	25%	70%	10	\$4,988
New	Office	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	0.53	5.0%	95%	95%	10	\$5,726
New	Office	Cooling Chillers	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.53	12.5%	90%	80%	3	\$6,136
New	Office	Cooling Chillers	Cooling Tower-Decrease Approach	6 Deg F	10 Deg F	0.53	8.0%	50%	94%	15	\$493
New	Office	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.53	10.0%	75%	80%	5	\$4,526
New	Office	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	0.53	10.0%	15%	98%	30	\$85145
New	Office	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	0.53	2.0%	75%	25%	25	\$4,371
New	Office	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	0.53	3.0%	75%	65%	25	\$5,799
New	Office	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.53	3.0%	95%	95%	25	\$2,218
New	Office	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.53	1.0%	35%	15%	25	\$756
New	Office	Cooling Chillers	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.53	10.0%	40%	98%	25	\$1,303
New	Office	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.53	25.0%	50%	98%	10	\$17735
New	Office	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	0.53	44.8%	95%	99%	20	\$12413
New	Office	Cooling Chillers	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.53	3.1%	75%	75%	30	\$2,747
New	Office	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	0.53	1.0%	80%	95%	25	\$8,757
New	Office	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	0.63	14.2%	NA	NA	15	\$4,521
New	Office	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	0.63	6.4%	NA	NA	15	\$2,406
New	Office	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	0.63	10.4%	NA	NA	15	\$3,730

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Office	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.58	10.0%	75%	94%	15	\$5,295
New	Office	Cooling DX	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.58	12.5%	90%	80%	3	\$6,136
New	Office	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.58	25.0%	50%	85%	15	\$17511
New	Office	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.58	10.0%	75%	80%	5	\$4,526
New	Office	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.58	10.0%	15%	98%	30	\$85145
New	Office	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.58	2.0%	75%	25%	25	\$4,371
New	Office	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.58	3.0%	75%	65%	25	\$5,799
New	Office	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.58	3.0%	95%	95%	25	\$2,218
New	Office	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.58	1.0%	35%	15%	25	\$756
New	Office	Cooling DX	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.58	10.0%	40%	98%	25	\$1,303
New	Office	Cooling DX	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.58	3.1%	75%	75%	30	\$2,747
New	Office	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.58	1.0%	80%	95%	25	\$8,757
New	Office	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	1.31	20.0%	20%	75%	10	\$1,718
New	Office	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	1.31	7.5%	0%	85%	10	\$6,829
New	Office	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	1.31	3.8%	85%	81%	10	\$395
New	Office	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	1.31	33.8%	85%	75%	20	\$1,705
New	Office	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	1.31	8.8%	65%	77%	10	\$3,070
New	Office	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	1.31	1.6%	0%	94%	10	\$1,791
New	Office	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	1.42	16.8%	NA	NA	15	\$3,205
New	Office	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	1.42	30.2%	NA	NA	15	\$6,862
New	Office	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.30	10.0%	75%	94%	15	\$5,295
New	Office	Heat Pump	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.30	12.5%	90%	80%	3	\$6,136
New	Office	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.30	10.0%	75%	80%	5	\$4,526
New	Office	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.30	7.2%	5%	94%	10	\$14457

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Office	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	1.30	1.6%	15%	98%	30	\$85145
New	Office	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	1.30	14.3%	45%	92%	20	\$37170
New	Office	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	1.30	36.5%	45%	92%	20	\$69833
New	Office	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.30	20.8%	40%	90%	20	\$7,477
New	Office	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.30	32.8%	40%	90%	20	\$9,875
New	Office	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	1.30	5.9%	75%	25%	25	\$4,371
New	Office	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	1.30	8.9%	75%	65%	25	\$5,799
New	Office	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.30	5.0%	95%	95%	25	\$2,218
New	Office	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.30	3.7%	35%	15%	25	\$756
New	Office	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.30	10.0%	40%	98%	25	\$1,303
New	Office	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	1.30	6.6%	80%	95%	25	\$8,757
New	Office	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	2.39	2.0%	85%	75%	9	\$662
New	Office	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	2.39	15.0%	60%	78%	9	\$2,522
New	Office	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.0	2.39	15.0%	90%	70%	14	\$656
New	Office	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.0	2.39	20.0%	75%	85%	14	\$2,118
New	Office	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.0	2.39	25.0%	70%	90%	14	\$3,581
New	Office	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	2.39	1.1%	5%	80%	13	\$630
New	Office	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	2.39	0.8%	10%	95%	14	\$36
New	Office	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	2.39	4.0%	90%	87%	10	\$157
New	Office	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.33	0.4%	95%	90%	7	\$3
New	Office	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.33	13.6%	64%	25%	4	\$1
New	Office	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.33	6.2%	90%	45%	6	\$165
New	Office	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.33	1.8%	75%	55%	4	\$1
New	Office	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.33	18.4%	64%	15%	4	\$157
New	Office	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.33	1.3%	75%	40%	5	\$16

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Office	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.33	0.9%	75%	45%	4	\$1
New	Office	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.33	2.0%	65%	75%	10	\$1
New	Office	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	2.33	1.8%	95%	30%	3	\$310
New	Office	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.33	1.0%	95%	86%	7	\$0
New	Office	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.33	0.4%	35%	65%	13	\$126
New	Office	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.33	5.2%	25%	35%	7	\$578
New	Office	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.33	9.6%	10%	80%	14	\$189
New	Office	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.67	10.0%	75%	94%	15	\$5,295
New	Office	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.67	12.5%	90%	80%	3	\$6,136
New	Office	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.67	10.0%	75%	80%	5	\$4,526
New	Office	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.67	15.0%	5%	94%	10	\$14457
New	Office	Space Heat	Insulation (Ceiling)	R-49	R-30	0.67	8.0%	75%	65%	25	\$4,371
New	Office	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.67	6.0%	95%	95%	25	\$2,218
New	Office	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.67	5.0%	35%	15%	25	\$756
New	Office	Space Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.67	10.0%	40%	98%	25	\$1,303
New	Office	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.67	25.0%	50%	98%	10	\$17735
New	Office	Space Heat	Windows	U = 0.35	U = 0.40	0.67	3.2%	80%	95%	25	\$2,190
New	Office	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	0.48	3.3%	NA	NA	20	\$161
New	Office	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.47	15.1%	5%	95%	10	\$8,704
New	Office	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.47	6.8%	5%	80%	11	\$304
New	Office	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	0.47	5.0%	55%	80%	15	\$2,335
New	Office	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.47	2.1%	10%	80%	10	\$2,700
New	Office	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.47	5.6%	10%	95%	10	\$841
New	Office	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	0.47	3.6%	15%	25%	13	\$32

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Office	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	0.47	5.0%	15%	55%	13	\$630
New	Office	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	0.47	20.0%	25%	92%	25	\$876
New	Office	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.47	4.0%	95%	25%	10	\$0
New	Office	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	0.47	58.9%	50%	94%	15	\$9,626
New	Office	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.47	1.1%	15%	75%	10	\$6
New	Office	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	0.47	55.8%	20%	95%	20	\$17861
New	Office	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.47	3.3%	95%	85%	10	\$207
New	Office	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.47	7.7%	75%	40%	11	\$108
Existing	Other	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	0.39	2.5%	25%	70%	12	\$4,946
Existing	Other	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	0.39	8.4%	35%	85%	12	\$1,800
Existing	Other	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.39	3.4%	85%	85%	15	\$1,734
Existing	Other	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	0.39	2.3%	15%	75%	10	\$1
Existing	Other	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	1.64	20.0%	NA	NA	20	\$1,069
Existing	Other	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	1.64	27.3%	NA	NA	20	\$1,333
Existing	Other	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	1.64	9.5%	NA	NA	20	\$383
Existing	Other	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.69	10.0%	50%	94%	15	\$3,640
Existing	Other	Cooling Chillers	Centrifugal Chiller - VSD Remodel for Existing	VSD motor	Constant Speed Motor	1.69	40.0%	43%	45%	10	\$1,995
Existing	Other	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	1.69	7.6%	25%	70%	10	\$2,419
Existing	Other	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	1.69	5.0%	95%	95%	10	\$3,937
Existing	Other	Cooling Chillers	Chiller-Water Side Economizer	Install Economizer	No Economizer	1.69	5.0%	45%	85%	10	\$5,617
Existing	Other	Cooling Chillers	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.69	12.5%	90%	40%	3	\$1,139
Existing	Other	Cooling Chillers	Cooling Tower-Decrease Temperature	Approach 6 Deg F	10 Deg F	1.69	8.0%	50%	94%	15	\$239

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Cooling Chillers	Cooling Tower-Two-Speed Fan Motor	Two-Speed Tower Fans replace Single-Speed	Cooling Tower-One-Speed Fan Motor	1.69	14.0%	95%	35%	10	\$27
Existing	Other	Cooling Chillers	Cooling Tower-VSD Fan Control	Variable-Speed Tower Fans replace Two-Speed	Cooling Tower-Two-Speed Fan Motor	1.69	4.0%	95%	75%	10	\$217
Existing	Other	Cooling Chillers	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.69	15.0%	5%	66%	5	\$5,557
Existing	Other	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.69	10.0%	75%	80%	5	\$3,112
Existing	Other	Cooling Chillers	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.69	15.0%	50%	80%	5	\$2,246
Existing	Other	Cooling Chillers	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.69	2.5%	45%	45%	18	\$2,311
Existing	Other	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.69	4.5%	100%	85%	10	\$5,726
Existing	Other	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	1.69	5.0%	15%	98%	30	\$58537
Existing	Other	Cooling Chillers	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	1.69	5.0%	40%	10%	10	\$1,353
Existing	Other	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	1.69	2.0%	75%	45%	25	\$3,005
Existing	Other	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	1.69	3.0%	75%	85%	25	\$3,987
Existing	Other	Cooling Chillers	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.69	2.4%	75%	30%	25	\$3,525
Existing	Other	Cooling Chillers	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.69	6.0%	75%	0%	25	\$3,525
Existing	Other	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.69	4.4%	10%	15%	25	\$646
Existing	Other	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.69	2.4%	10%	15%	25	\$673
Existing	Other	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.69	3.0%	10%	95%	25	\$1,839
Existing	Other	Cooling Chillers	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.69	8.4%	10%	35%	25	\$2,014
Existing	Other	Cooling Chillers	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.69	10.0%	10%	0%	25	\$1,992
Existing	Other	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.69	1.0%	35%	50%	25	\$520

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Cooling Chillers	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.69	3.0%	35%	50%	25	\$3,005
Existing	Other	Cooling Chillers	Pipe Insulation	R-4	R-0	1.69	1.0%	65%	45%	15	\$119
Existing	Other	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.69	25.0%	25%	98%	10	\$12193
Existing	Other	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	1.69	44.8%	60%	99%	20	\$6,550
Existing	Other	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	1.69	0.7%	80%	70%	25	\$2,851
Existing	Other	Cooling Chillers	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.69	0.4%	10%	70%	25	\$8,049
Existing	Other	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	1.78	14.2%	NA	NA	15	\$2,411
Existing	Other	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	1.78	6.4%	NA	NA	15	\$1,283
Existing	Other	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	1.78	10.4%	NA	NA	15	\$1,989
Existing	Other	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.84	10.0%	50%	94%	15	\$3,640
Existing	Other	Cooling DX	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.84	12.5%	90%	40%	3	\$1,139
Existing	Other	Cooling DX	Cooling DX Package-Air Side Economizer	Air-Side Economizer	No Economizer	1.84	15.0%	10%	70%	15	\$1,938
Existing	Other	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	1.84	25.0%	50%	85%	15	\$12039
Existing	Other	Cooling DX	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.84	15.0%	45%	66%	5	\$5,557
Existing	Other	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.84	10.0%	75%	80%	5	\$3,112
Existing	Other	Cooling DX	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.84	15.0%	50%	80%	5	\$2,246
Existing	Other	Cooling DX	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.84	2.5%	45%	45%	18	\$2,311
Existing	Other	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.84	4.5%	5%	85%	10	\$5,726
Existing	Other	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	1.84	10.0%	15%	98%	30	\$58537
Existing	Other	Cooling DX	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	1.84	5.0%	40%	10%	10	\$1,353



Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	1.84	2.0%	75%	45%	25	\$3,005
Existing	Other	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	1.84	3.0%	75%	85%	25	\$3,987
Existing	Other	Cooling DX	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	1.84	2.4%	75%	30%	25	\$3,525
Existing	Other	Cooling DX	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	1.84	6.0%	75%	0%	25	\$3,525
Existing	Other	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.84	4.4%	10%	15%	25	\$646
Existing	Other	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.84	2.4%	10%	15%	25	\$673
Existing	Other	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.84	3.0%	10%	95%	25	\$1,839
Existing	Other	Cooling DX	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.84	8.4%	10%	35%	25	\$2,014
Existing	Other	Cooling DX	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.84	10.0%	10%	0%	25	\$1,992
Existing	Other	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.84	1.0%	35%	50%	25	\$520
Existing	Other	Cooling DX	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.84	3.0%	35%	50%	25	\$3,005
Existing	Other	Cooling DX	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	1.84	3.0%	95%	63%	15	\$146
Existing	Other	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	1.84	0.7%	80%	70%	25	\$2,851
Existing	Other	Cooling DX	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	1.84	0.4%	10%	70%	25	\$8,049
Existing	Other	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	2.14	20.0%	5%	85%	10	\$1,181
Existing	Other	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	2.14	7.5%	5%	85%	10	\$13133
Existing	Other	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	2.14	3.8%	85%	81%	10	\$272
Existing	Other	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	2.14	33.8%	85%	75%	20	\$1,172
Existing	Other	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	2.14	8.8%	10%	77%	10	\$2,110
Existing	Other	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	2.14	1.6%	5%	94%	10	\$1,791
Existing	Other	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	2.98	16.8%	NA	NA	15	\$1,709
Existing	Other	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	2.98	30.2%	NA	NA	15	\$3,659
Existing	Other	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	3.10	10.0%	50%	94%	15	\$3,640
Existing	Other	Heat Pump	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	3.10	12.5%	90%	40%	3	\$1,139

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Heat Pump	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	3.10	15.0%	45%	66%	5	\$5,557
Existing	Other	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	3.10	10.0%	75%	80%	5	\$3,112
Existing	Other	Heat Pump	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	3.10	15.0%	50%	80%	5	\$2,246
Existing	Other	Heat Pump	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	3.10	2.5%	45%	45%	18	\$2,311
Existing	Other	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	3.10	6.0%	5%	94%	10	\$9,939
Existing	Other	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	3.10	4.5%	5%	85%	10	\$5,726
Existing	Other	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	3.10	1.8%	15%	98%	30	\$58537
Existing	Other	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	3.10	16.0%	5%	92%	20	\$19820
Existing	Other	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	3.10	38.7%	5%	92%	20	\$37237
Existing	Other	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	3.10	20.0%	5%	90%	20	\$3,987
Existing	Other	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	3.10	32.4%	5%	90%	20	\$5,265
Existing	Other	Heat Pump	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	3.10	8.3%	40%	10%	10	\$1,353
Existing	Other	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	3.10	5.9%	75%	45%	25	\$3,005
Existing	Other	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	3.10	8.9%	75%	85%	25	\$3,987
Existing	Other	Heat Pump	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	3.10	5.5%	75%	30%	25	\$3,525
Existing	Other	Heat Pump	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	3.10	13.8%	75%	0%	25	\$3,525
Existing	Other	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	3.10	4.4%	10%	15%	25	\$646
Existing	Other	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	3.10	2.4%	10%	15%	25	\$673
Existing	Other	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	3.10	5.0%	10%	95%	25	\$1,839
Existing	Other	Heat Pump	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	3.10	16.6%	10%	35%	25	\$2,014
Existing	Other	Heat Pump	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	3.10	19.8%	10%	0%	25	\$1,992
Existing	Other	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	3.10	3.7%	35%	50%	25	\$520
Existing	Other	Heat Pump	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	3.10	11.1%	35%	50%	25	\$3,005
Existing	Other	Heat Pump	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	3.10	3.0%	95%	63%	15	\$146
Existing	Other	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	3.10	4.8%	80%	70%	25	\$2,851
Existing	Other	Heat Pump	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	3.10	3.2%	10%	70%	25	\$8,049

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	2.78	2.0%	25%	75%	9	\$455
Existing	Other	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	2.78	15.0%	30%	84%	9	\$1,734
Existing	Other	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.23	2.78	15.0%	90%	70%	14	\$984
Existing	Other	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.23	2.78	20.0%	75%	85%	14	\$2,332
Existing	Other	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.23	2.78	25.0%	70%	90%	14	\$3,683
Existing	Other	Lighting	HE Fixtures/Design - Existing to Code	Code Required LPD And Control Strategies: LPD = 1.23	Existing Lighting Design	2.78	34.2%	95%	45%	14	\$5,404
Existing	Other	Lighting	LED Exit Lighting	5 Watts	CFL Exit Sign (26 Watts)	2.78	1.6%	95%	65%	11	\$53
Existing	Other	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	2.78	1.6%	5%	80%	13	\$630
Existing	Other	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	2.78	1.5%	10%	95%	14	\$36
Existing	Other	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	2.78	4.0%	90%	83%	9	\$108
Existing	Other	Lighting	Time Clocks And Timers	Install Time Clock Lighting	No Time Clock	2.78	4.9%	85%	100%	9	\$216
Existing	Other	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.57	0.4%	95%	90%	7	\$2
Existing	Other	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.57	13.6%	64%	25%	4	\$1
Existing	Other	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.57	8.4%	10%	45%	6	\$165
Existing	Other	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.57	1.8%	75%	55%	4	\$1
Existing	Other	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.57	18.4%	64%	15%	4	\$158
Existing	Other	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.57	1.3%	75%	40%	5	\$16
Existing	Other	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.57	0.9%	75%	45%	4	\$1
Existing	Other	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.57	2.7%	10%	75%	10	\$1
Existing	Other	Plug Load	Office Computer Network Energy Management	Office Computer Network Energy Management	No Network Management	2.57	1.8%	95%	30%	3	\$310
Existing	Other	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.57	1.0%	95%	86%	7	\$1
Existing	Other	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	2.57	1.2%	75%	95%	10	\$86
Existing	Other	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.57	0.6%	5%	65%	13	\$126
Existing	Other	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.57	7.0%	25%	35%	7	\$578
Existing	Other	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.57	13.0%	10%	80%	14	\$189

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Plug Load	Vending Miser	Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls	No Vending Miser - No controls	2.57	13.3%	10%	25%	3	\$298
Existing	Other	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	0.20	108.9%	95%	95%	12	\$344
Existing	Other	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	0.20	3.6%	85%	65%	10	\$9,596
Existing	Other	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	0.20	1.1%	5%	86%	9	\$376
Existing	Other	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	0.20	6.0%	75%	70%	10	\$3
Existing	Other	Refrigeration	Refrigeration - Retro Commissioning	Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)	No Re-commissioning	0.20	5.0%	80%	90%	3	\$4
Existing	Other	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	0.20	3.2%	95%	77%	16	\$13
Existing	Other	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	0.20	2.0%	95%	20%	4	\$189
Existing	Other	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	2.64	10.0%	50%	94%	15	\$3,640
Existing	Other	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	2.64	12.5%	90%	40%	3	\$1,139
Existing	Other	Space Heat	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	2.64	15.0%	45%	66%	5	\$5,557
Existing	Other	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	2.64	10.0%	75%	80%	5	\$3,112
Existing	Other	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	2.64	15.0%	50%	80%	5	\$2,246
Existing	Other	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	2.64	2.5%	45%	45%	18	\$2,311
Existing	Other	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	2.64	15.0%	5%	94%	10	\$9,939
Existing	Other	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	2.64	4.5%	5%	85%	10	\$5,726
Existing	Other	Space Heat	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	2.64	10.0%	40%	10%	10	\$1,353
Existing	Other	Space Heat	Insulation (Ceiling)	R-49	R-30	2.64	8.0%	75%	85%	25	\$3,005
Existing	Other	Space Heat	Insulation (Ceiling) - Existing to Code	R-30	Existing Ceiling Insulation (Average R-9)	2.64	12.5%	75%	30%	25	\$3,525
Existing	Other	Space Heat	Insulation (Ceiling) - Zero to Code	R-30	R-0	2.64	25.0%	75%	0%	25	\$3,525
Existing	Other	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	2.64	4.4%	10%	15%	25	\$646
Existing	Other	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	2.64	2.4%	10%	15%	25	\$673
Existing	Other	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	2.64	6.0%	10%	95%	25	\$1,839
Existing	Other	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	2.64	21.1%	10%	35%	25	\$2,014

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	2.64	25.0%	10%	0%	25	\$1,992
Existing	Other	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	2.64	5.0%	35%	50%	25	\$520
Existing	Other	Space Heat	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	2.64	15.0%	35%	50%	25	\$3,005
Existing	Other	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	2.64	25.0%	25%	98%	10	\$12193
Existing	Other	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	2.64	3.0%	95%	63%	15	\$146
Existing	Other	Space Heat	Windows	U = 0.35	U = 0.40	2.64	2.3%	80%	70%	25	\$712
Existing	Other	Space Heat	Windows - Existing to Code	U = 0.40	Existing Windows (U=0.65)	2.64	7.0%	10%	70%	25	\$10187
Existing	Other	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	0.36	3.3%	NA	NA	20	\$162
Existing	Other	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.37	15.1%	5%	95%	10	\$8,705
Existing	Other	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.37	12.5%	5%	80%	11	\$305
Existing	Other	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	0.37	5.0%	75%	94%	15	\$1,605
Existing	Other	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.37	2.1%	10%	80%	10	\$2,700
Existing	Other	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.37	5.6%	10%	95%	10	\$841
Existing	Other	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	0.37	6.6%	10%	25%	13	\$32
Existing	Other	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	0.37	9.1%	10%	55%	13	\$630
Existing	Other	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	0.37	20.0%	5%	92%	25	\$875
Existing	Other	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.37	4.0%	95%	25%	10	\$0
Existing	Other	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.37	3.8%	95%	15%	10	\$2
Existing	Other	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	0.37	58.9%	40%	94%	15	\$9,626
Existing	Other	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.37	1.0%	80%	90%	15	\$61
Existing	Other	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.37	2.3%	50%	50%	5	\$5
Existing	Other	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.37	1.1%	15%	75%	10	\$6
Existing	Other	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.37	2.5%	15%	20%	10	\$12
Existing	Other	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	0.37	62.3%	20%	95%	20	\$17861
Existing	Other	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.37	3.3%	95%	95%	10	\$206

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.37	7.7%	75%	55%	11	\$107
New	Other	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	0.39	2.5%	25%	70%	12	\$4,946
New	Other	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	0.39	8.3%	35%	85%	12	\$1,800
New	Other	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.39	3.4%	85%	85%	15	\$1,734
New	Other	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	0.39	2.3%	15%	75%	10	\$1
New	Other	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	0.78	20.0%	NA	NA	20	\$1,069
New	Other	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	0.78	27.3%	NA	NA	20	\$1,333
New	Other	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	0.78	9.5%	NA	NA	20	\$383
New	Other	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.72	10.0%	50%	94%	15	\$3,640
New	Other	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	0.72	7.6%	25%	70%	10	\$2,419
New	Other	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	0.72	5.0%	95%	95%	10	\$3,937
New	Other	Cooling Chillers	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.72	12.5%	90%	80%	3	\$4,218
New	Other	Cooling Chillers	Cooling Tower-Decrease Temperature Approach	6 Deg F	10 Deg F	0.72	8.0%	50%	94%	15	\$239
New	Other	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.72	10.0%	75%	80%	5	\$3,112
New	Other	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.72	4.5%	100%	85%	10	\$5,726
New	Other	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	0.72	5.0%	15%	98%	30	\$58537
New	Other	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	0.72	2.0%	75%	45%	25	\$3,005
New	Other	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	0.72	3.0%	75%	85%	25	\$3,987
New	Other	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.72	3.0%	95%	95%	25	\$1,839
New	Other	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.72	1.0%	35%	50%	25	\$520

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Other	Cooling Chillers	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.72	10.0%	40%	98%	25	\$896
New	Other	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.72	25.0%	50%	98%	10	\$12193
New	Other	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	0.72	44.8%	95%	99%	20	\$4,629
New	Other	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	0.72	0.7%	80%	70%	25	\$2,851
New	Other	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	0.85	14.2%	NA	NA	15	\$2,411
New	Other	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	0.85	6.4%	NA	NA	15	\$1,283
New	Other	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	0.85	10.4%	NA	NA	15	\$1,989
New	Other	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.78	10.0%	50%	94%	15	\$3,640
New	Other	Cooling DX	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.78	12.5%	90%	80%	3	\$4,218
New	Other	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.78	25.0%	50%	85%	15	\$12039
New	Other	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.78	10.0%	75%	80%	5	\$3,112
New	Other	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.78	4.5%	5%	85%	10	\$5,726
New	Other	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.78	10.0%	15%	98%	30	\$58537
New	Other	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.78	2.0%	75%	45%	25	\$3,005
New	Other	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.78	3.0%	75%	85%	25	\$3,987
New	Other	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.78	3.0%	95%	95%	25	\$1,839
New	Other	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.78	1.0%	35%	50%	25	\$520
New	Other	Cooling DX	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.78	10.0%	40%	98%	25	\$896
New	Other	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.78	0.7%	80%	70%	25	\$2,851
New	Other	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	1.77	20.0%	5%	75%	10	\$1,181
New	Other	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	1.77	7.5%	5%	85%	10	\$6,829

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Other	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	1.77	3.8%	85%	81%	10	\$272
New	Other	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD Control	No Pump And Fan System VSD Optimization	1.77	33.8%	85%	75%	20	\$1,172
New	Other	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	1.77	8.8%	20%	77%	10	\$2,110
New	Other	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	1.77	1.6%	5%	94%	10	\$1,791
New	Other	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	1.49	16.8%	NA	NA	15	\$1,709
New	Other	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	1.49	30.2%	NA	NA	15	\$3,659
New	Other	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.35	10.0%	50%	94%	15	\$3,640
New	Other	Heat Pump	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.35	12.5%	90%	80%	3	\$4,218
New	Other	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.35	10.0%	75%	80%	5	\$3,112
New	Other	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.35	6.0%	5%	94%	10	\$9,939
New	Other	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.35	4.5%	5%	85%	10	\$5,726
New	Other	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	1.35	1.8%	15%	98%	30	\$58537
New	Other	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	1.35	16.0%	45%	92%	20	\$19820
New	Other	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	1.35	38.7%	45%	92%	20	\$37237
New	Other	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.35	20.0%	10%	90%	20	\$3,987
New	Other	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.35	32.4%	10%	90%	20	\$5,265
New	Other	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	1.35	5.9%	75%	45%	25	\$3,005
New	Other	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	1.35	8.9%	75%	85%	25	\$3,987
New	Other	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.35	5.0%	95%	95%	25	\$1,839
New	Other	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.35	3.7%	35%	50%	25	\$520
New	Other	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.35	10.0%	40%	98%	25	\$896
New	Other	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	1.35	4.8%	80%	70%	25	\$2,851
New	Other	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	1.97	2.0%	25%	75%	9	\$455
New	Other	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	1.97	15.0%	60%	84%	9	\$1,734

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Other	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.23	1.97	15.0%	90%	70%	14	\$617
New	Other	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.23	1.97	20.0%	75%	85%	14	\$1,842
New	Other	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.23	1.97	25.0%	70%	90%	14	\$3,070
New	Other	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	1.97	2.2%	5%	80%	13	\$630
New	Other	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	1.97	1.5%	10%	95%	14	\$36
New	Other	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	1.97	4.0%	90%	83%	10	\$108
New	Other	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.57	0.4%	95%	90%	7	\$2
New	Other	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.57	13.6%	64%	25%	4	\$1
New	Other	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.57	8.2%	10%	45%	6	\$165
New	Other	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.57	1.8%	75%	55%	4	\$1
New	Other	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.57	18.4%	64%	15%	4	\$158
New	Other	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.57	1.3%	75%	40%	5	\$16
New	Other	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.57	0.9%	75%	45%	4	\$1
New	Other	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.57	2.6%	10%	75%	10	\$1
New	Other	Plug Load	Office Computer Network Energy Management	Office Computer Network Energy Management	No Network Management	2.57	1.8%	95%	30%	3	\$310
New	Other	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.57	1.0%	95%	86%	7	\$1
New	Other	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	2.57	1.2%	75%	95%	10	\$86
New	Other	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.57	0.6%	5%	65%	13	\$126
New	Other	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.57	6.9%	25%	35%	7	\$578
New	Other	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.57	12.6%	10%	80%	14	\$189
New	Other	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	0.20	54.2%	95%	95%	12	\$344
New	Other	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	0.20	3.6%	85%	65%	10	\$9,596
New	Other	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	0.20	1.1%	5%	86%	9	\$376
New	Other	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	0.20	6.0%	75%	70%	10	\$3
New	Other	Refrigeration	Refrigeration - Commissioning	Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit)	No Commissioning	0.20	5.0%	80%	90%	3	\$4

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Other	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	0.20	3.2%	95%	77%	16	\$13
New	Other	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	0.20	2.0%	95%	20%	4	\$189
New	Other	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.56	10.0%	50%	94%	15	\$3,640
New	Other	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.56	12.5%	90%	80%	3	\$4,218
New	Other	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.56	10.0%	75%	80%	5	\$3,112
New	Other	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.56	15.0%	5%	94%	10	\$9,939
New	Other	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.56	4.5%	5%	85%	10	\$5,726
New	Other	Space Heat	Insulation (Ceiling)	R-49	R-30	0.56	8.0%	75%	85%	25	\$3,005
New	Other	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.56	6.0%	95%	95%	25	\$1,839
New	Other	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.56	5.0%	35%	50%	25	\$520
New	Other	Space Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.56	10.0%	40%	98%	25	\$896
New	Other	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.56	25.0%	50%	98%	10	\$12193
New	Other	Space Heat	Windows	U = 0.35	U = 0.40	0.56	2.3%	80%	70%	25	\$712
New	Other	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	0.38	3.3%	NA	NA	20	\$162
New	Other	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.37	15.1%	5%	95%	10	\$8,705
New	Other	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.37	12.5%	5%	80%	11	\$305
New	Other	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	0.37	5.0%	90%	94%	15	\$1,605
New	Other	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.37	2.1%	10%	80%	10	\$2,700
New	Other	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.37	5.6%	10%	95%	10	\$841
New	Other	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	0.37	6.6%	10%	25%	13	\$32
New	Other	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	0.37	9.1%	10%	55%	13	\$630
New	Other	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	0.37	20.0%	25%	92%	25	\$875
New	Other	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.37	4.0%	95%	25%	10	\$0
New	Other	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	0.37	58.9%	50%	94%	15	\$9,626

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Other	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.37	2.3%	50%	50%	5	\$5
New	Other	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.37	1.1%	15%	75%	10	\$6
New	Other	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	0.37	62.3%	20%	95%	20	\$17861
New	Other	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.37	3.3%	95%	95%	10	\$206
New	Other	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.37	7.7%	75%	55%	11	\$107
Existing	Restaurant	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	9.60	2.5%	45%	70%	12	\$4,946
Existing	Restaurant	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	9.60	8.4%	35%	85%	12	\$1,800
Existing	Restaurant	Cooking	Oven - Convection	Convection Oven	Standard Oven	9.60	3.4%	85%	85%	15	\$1,734
Existing	Restaurant	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	9.60	5.5%	35%	75%	10	\$1
Existing	Restaurant	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	4.00	14.2%	NA	NA	15	\$4,353
Existing	Restaurant	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	4.00	6.4%	NA	NA	15	\$2,317
Existing	Restaurant	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	4.00	10.4%	NA	NA	15	\$3,592
Existing	Restaurant	Cooling DX	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	4.16	12.5%	90%	40%	3	\$1,035
Existing	Restaurant	Cooling DX	Cooling DX Package-Air Side Economizer	Air-Side Economizer	No Economizer	4.16	15.0%	10%	50%	15	\$3,173
Existing	Restaurant	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	4.16	25.0%	50%	85%	15	\$10944
Existing	Restaurant	Cooling DX	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	4.16	15.0%	5%	100%	5	\$5,051
Existing	Restaurant	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	4.16	10.0%	75%	100%	5	\$2,829
Existing	Restaurant	Cooling DX	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	4.16	15.0%	50%	100%	5	\$2,041
Existing	Restaurant	Cooling DX	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	4.16	2.5%	45%	45%	18	\$2,101
Existing	Restaurant	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	4.16	4.5%	100%	85%	10	\$5,726
Existing	Restaurant	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	4.16	5.0%	15%	98%	30	\$53216
Existing	Restaurant	Cooling DX	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	4.16	5.0%	40%	10%	10	\$1,230
Existing	Restaurant	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	4.16	2.0%	75%	95%	25	\$2,732
Existing	Restaurant	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	4.16	3.0%	75%	98%	25	\$3,625

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Restaurant	Cooling DX	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	4.16	2.4%	75%	85%	25	\$3,204
Existing	Restaurant	Cooling DX	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	4.16	6.0%	75%	0%	25	\$3,204
Existing	Restaurant	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	4.16	4.4%	10%	15%	25	\$587
Existing	Restaurant	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	4.16	2.4%	10%	15%	25	\$612
Existing	Restaurant	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	4.16	3.0%	10%	95%	25	\$1,753
Existing	Restaurant	Cooling DX	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	4.16	8.4%	10%	35%	25	\$1,921
Existing	Restaurant	Cooling DX	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	4.16	10.0%	10%	0%	25	\$1,899
Existing	Restaurant	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	4.16	1.0%	35%	90%	25	\$473
Existing	Restaurant	Cooling DX	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	4.16	3.0%	35%	90%	25	\$2,732
Existing	Restaurant	Cooling DX	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	4.16	3.0%	95%	42%	15	\$146
Existing	Restaurant	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	4.16	1.0%	80%	80%	25	\$6,876
Existing	Restaurant	Cooling DX	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	4.16	0.5%	10%	80%	25	\$19413
Existing	Restaurant	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	3.64	20.0%	1%	85%	10	\$1,074
Existing	Restaurant	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	3.64	7.5%	100%	25%	10	\$13133
Existing	Restaurant	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	3.64	3.8%	85%	81%	10	\$247
Existing	Restaurant	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD Control	No Pump And Fan System VSD Optimization	3.64	33.8%	85%	75%	20	\$1,066
Existing	Restaurant	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	3.64	8.8%	10%	77%	10	\$1,918
Existing	Restaurant	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	3.64	1.6%	0%	94%	10	\$1,791
Existing	Restaurant	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	4.79	16.8%	NA	NA	15	\$3,086
Existing	Restaurant	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	4.79	30.2%	NA	NA	15	\$6,607
Existing	Restaurant	Heat Pump	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	5.06	12.5%	90%	40%	3	\$1,035
Existing	Restaurant	Heat Pump	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	5.06	15.0%	5%	100%	5	\$5,051
Existing	Restaurant	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	5.06	10.0%	75%	100%	5	\$2,829
Existing	Restaurant	Heat Pump	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	5.06	15.0%	50%	100%	5	\$2,041

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Restaurant	Heat Pump	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	5.06	2.5%	45%	45%	18	\$2,101
Existing	Restaurant	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	5.06	2.5%	5%	94%	10	\$9,035
Existing	Restaurant	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	5.06	4.5%	100%	85%	10	\$5,726
Existing	Restaurant	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	5.06	1.3%	15%	98%	30	\$53216
Existing	Restaurant	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	5.06	21.1%	5%	92%	20	\$35790
Existing	Restaurant	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	5.06	45.0%	5%	92%	20	\$67238
Existing	Restaurant	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	5.06	17.6%	0%	90%	20	\$7,199
Existing	Restaurant	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	5.06	31.2%	0%	90%	20	\$9,508
Existing	Restaurant	Heat Pump	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	5.06	8.3%	40%	10%	10	\$1,230
Existing	Restaurant	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	5.06	5.9%	75%	95%	25	\$2,732
Existing	Restaurant	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	5.06	8.9%	75%	98%	25	\$3,625
Existing	Restaurant	Heat Pump	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	5.06	5.5%	75%	85%	25	\$3,204
Existing	Restaurant	Heat Pump	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	5.06	13.8%	75%	0%	25	\$3,204
Existing	Restaurant	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	5.06	4.4%	10%	15%	25	\$587
Existing	Restaurant	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	5.06	2.4%	10%	15%	25	\$612
Existing	Restaurant	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	5.06	5.0%	10%	95%	25	\$1,753
Existing	Restaurant	Heat Pump	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	5.06	16.6%	10%	35%	25	\$1,921
Existing	Restaurant	Heat Pump	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	5.06	19.8%	10%	0%	25	\$1,899
Existing	Restaurant	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	5.06	3.7%	35%	90%	25	\$473
Existing	Restaurant	Heat Pump	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	5.06	11.1%	35%	90%	25	\$2,732
Existing	Restaurant	Heat Pump	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	5.06	3.0%	95%	42%	15	\$146
Existing	Restaurant	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	5.06	6.8%	80%	80%	25	\$6,876
Existing	Restaurant	Heat Pump	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	5.06	4.5%	10%	80%	25	\$19413
Existing	Restaurant	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	5.82	2.0%	10%	75%	9	\$414
Existing	Restaurant	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	5.82	6.0%	30%	98%	9	\$631

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Restaurant	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.43	5.82	15.0%	90%	70%	14	\$1,283
Existing	Restaurant	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.43	5.82	20.0%	75%	85%	14	\$2,843
Existing	Restaurant	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.43	5.82	25.0%	70%	90%	14	\$4,438
Existing	Restaurant	Lighting	HE Fixtures/Design - Existing to Code	Code Required LPD And Control Strategies: LPD = 1.43	Existing Lighting Design	5.82	22.0%	95%	45%	14	\$6,125
Existing	Restaurant	Lighting	LED Exit Lighting	5 Watts	CFL Exit Sign (26 Watts)	5.82	1.6%	95%	65%	11	\$53
Existing	Restaurant	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	5.82	1.1%	50%	80%	13	\$630
Existing	Restaurant	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	5.82	1.5%	10%	95%	14	\$37
Existing	Restaurant	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	5.82	4.0%	45%	100%	9	\$98
Existing	Restaurant	Lighting	Time Clocks And Timers	Install Time Clock Lighting	No Time Clock	5.82	4.9%	85%	100%	9	\$215
Existing	Restaurant	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.25	0.4%	95%	90%	7	\$2
Existing	Restaurant	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.25	13.6%	64%	25%	4	\$1
Existing	Restaurant	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.25	10.6%	5%	45%	6	\$165
Existing	Restaurant	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.25	1.8%	75%	55%	4	\$1
Existing	Restaurant	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.25	18.4%	64%	15%	4	\$158
Existing	Restaurant	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.25	1.3%	75%	40%	5	\$16
Existing	Restaurant	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.25	0.9%	75%	45%	4	\$1
Existing	Restaurant	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.25	3.4%	35%	75%	10	\$1
Existing	Restaurant	Plug Load	Office Computer Network Energy Management	Office Computer Network Energy Management	No Network Management	2.25	1.8%	95%	30%	3	\$310
Existing	Restaurant	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.25	1.0%	95%	86%	7	\$1
Existing	Restaurant	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	2.25	1.2%	75%	95%	10	\$86
Existing	Restaurant	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.25	0.8%	35%	65%	13	\$126
Existing	Restaurant	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.25	8.9%	25%	35%	7	\$578
Existing	Restaurant	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.25	16.5%	5%	80%	14	\$189
Existing	Restaurant	Plug Load	Vending Miser	Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls	No Vending Miser - No controls	2.25	16.9%	5%	25%	3	\$298
Existing	Restaurant	Refrigeration	Anti-Sweat (Humidistat) Controls	Variable Temp. Controls (Humidistat)	Constant Controls	5.60	35.8%	25%	45%	12	\$954
Existing	Restaurant	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	5.60	17.4%	95%	100%	12	\$345

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Restaurant	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	5.60	3.6%	85%	65%	10	\$9,595
Existing	Restaurant	Refrigeration	Display Cases	High-Efficiency Display Cases	Display Cases - Standard	5.60	3.6%	40%	90%	15	\$1,278
Existing	Restaurant	Refrigeration	High-Efficiency Compressor	High-Efficiency Compressor (15% More Efficient)	Standard Compressor, 40% Efficiency	5.60	8.4%	85%	72%	10	\$1,578
Existing	Restaurant	Refrigeration	High-Efficiency Evaporator Fans - Walk-ins	High-Efficiency Evaporator Fans, Walk-in Refrigerators	Standard Evaporator Fans	5.60	1.0%	92%	75%	15	\$203
Existing	Restaurant	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	5.60	5.8%	85%	86%	9	\$376
Existing	Restaurant	Refrigeration	Motor - Case Fans with ECM motors	ECM motors on evaporator fan, on display cases	48 cf 2-door reach-in commercial refrigerator	5.60	0.5%	80%	50%	20	\$229
Existing	Restaurant	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	5.60	6.0%	75%	70%	10	\$76
Existing	Restaurant	Refrigeration	Refrigeration - Retro Commissioning	Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)	No Re-commissioning	5.60	5.0%	80%	90%	3	\$94
Existing	Restaurant	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	5.60	3.2%	95%	77%	16	\$315
Existing	Restaurant	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	5.60	2.0%	95%	20%	4	\$189
Existing	Restaurant	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.38	12.5%	90%	40%	3	\$1,035
Existing	Restaurant	Space Heat	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.38	15.0%	5%	100%	5	\$5,051
Existing	Restaurant	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.38	10.0%	75%	100%	5	\$2,829
Existing	Restaurant	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.38	15.0%	50%	100%	5	\$2,041
Existing	Restaurant	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.38	2.5%	45%	45%	18	\$2,101
Existing	Restaurant	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.38	15.0%	5%	94%	10	\$9,035
Existing	Restaurant	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.38	4.5%	100%	85%	10	\$5,726
Existing	Restaurant	Space Heat	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	1.38	10.0%	40%	10%	10	\$1,230
Existing	Restaurant	Space Heat	Insulation (Ceiling)	R-49	R-30	1.38	8.0%	75%	98%	25	\$2,732
Existing	Restaurant	Space Heat	Insulation (Ceiling) - Existing to Code	R-30	Existing Ceiling Insulation (Average R-9)	1.38	12.5%	75%	85%	25	\$3,204
Existing	Restaurant	Space Heat	Insulation (Ceiling) - Zero to Code	R-30	R-0	1.38	25.0%	75%	0%	25	\$3,204
Existing	Restaurant	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.38	4.4%	10%	15%	25	\$587
Existing	Restaurant	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.38	2.4%	10%	15%	25	\$612
Existing	Restaurant	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.38	6.0%	10%	95%	25	\$1,753
Existing	Restaurant	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.38	21.1%	10%	35%	25	\$1,921

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Restaurant	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.38	25.0%	10%	0%	25	\$1,899
Existing	Restaurant	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.38	5.0%	35%	90%	25	\$473
Existing	Restaurant	Space Heat	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.38	15.0%	35%	90%	25	\$2,732
Existing	Restaurant	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.38	25.0%	25%	98%	10	\$11084
Existing	Restaurant	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	1.38	3.0%	95%	42%	15	\$146
Existing	Restaurant	Space Heat	Windows	U = 0.35	U = 0.40	1.38	3.3%	80%	80%	25	\$1,719
Existing	Restaurant	Space Heat	Windows - Existing to Code	U = 0.40	Existing Windows (U=0.65)	1.38	9.9%	10%	80%	25	\$24570
Existing	Restaurant	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	8.57	3.3%	NA	NA	20	\$420
Existing	Restaurant	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	8.81	15.1%	5%	95%	10	\$8,704
Existing	Restaurant	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	8.81	0.6%	5%	80%	11	\$305
Existing	Restaurant	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	8.81	5.0%	75%	94%	15	\$1,459
Existing	Restaurant	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	8.81	2.1%	100%	80%	10	\$2,700
Existing	Restaurant	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	8.81	5.6%	100%	95%	10	\$841
Existing	Restaurant	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	8.81	0.3%	85%	25%	13	\$32
Existing	Restaurant	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	8.81	0.4%	85%	55%	13	\$630
Existing	Restaurant	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	8.81	20.0%	5%	92%	25	\$2,276
Existing	Restaurant	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	8.81	4.0%	95%	25%	10	\$0
Existing	Restaurant	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	8.81	3.8%	95%	15%	10	\$2
Existing	Restaurant	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	8.81	58.9%	40%	94%	15	\$9,059
Existing	Restaurant	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	8.81	1.0%	80%	90%	15	\$56
Existing	Restaurant	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	8.81	2.3%	95%	25%	5	\$5
Existing	Restaurant	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	8.81	1.1%	15%	75%	10	\$6
Existing	Restaurant	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	8.81	2.5%	15%	20%	10	\$12
Existing	Restaurant	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	8.81	39.5%	20%	95%	20	107164
Existing	Restaurant	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	8.81	3.3%	95%	75%	10	\$206

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Savings		Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
						Baseline kWh (UEC or EUJ)	as Percent of Use				
Existing	Restaurant	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	8.81	7.7%	75%	75%	11	\$108
New	Restaurant	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	9.60	2.5%	45%	70%	12	\$4,946
New	Restaurant	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	9.60	8.3%	35%	85%	12	\$1,800
New	Restaurant	Cooking	Oven - Convection	Convection Oven	Standard Oven	9.60	3.4%	85%	85%	15	\$1,734
New	Restaurant	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	9.60	5.5%	35%	75%	10	\$1
New	Restaurant	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	1.61	14.2%	NA	NA	15	\$4,353
New	Restaurant	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	1.61	6.4%	NA	NA	15	\$2,317
New	Restaurant	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	1.61	10.4%	NA	NA	15	\$3,592
New	Restaurant	Cooling DX	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.48	12.5%	90%	80%	3	\$3,835
New	Restaurant	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	1.48	25.0%	50%	85%	15	\$10944
New	Restaurant	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.48	10.0%	75%	100%	5	\$2,829
New	Restaurant	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.48	4.5%	100%	85%	10	\$5,726
New	Restaurant	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	1.48	5.0%	15%	98%	30	\$53216
New	Restaurant	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	1.48	2.0%	75%	95%	25	\$2,732
New	Restaurant	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	1.48	3.0%	75%	98%	25	\$3,625
New	Restaurant	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.48	3.0%	95%	95%	25	\$1,753
New	Restaurant	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.48	1.0%	35%	90%	25	\$473
New	Restaurant	Cooling DX	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.48	10.0%	40%	98%	25	\$814
New	Restaurant	Cooling DX	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	1.48	2.3%	75%	75%	30	\$2,156
New	Restaurant	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	1.48	1.0%	80%	80%	25	\$6,876
New	Restaurant	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	2.90	20.0%	1%	75%	10	\$1,074
New	Restaurant	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	2.90	7.5%	100%	25%	10	\$6,829
New	Restaurant	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	2.90	3.8%	85%	81%	10	\$247

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Restaurant	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	2.90	33.8%	85%	75%	20	\$1,066
New	Restaurant	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	2.90	8.8%	20%	77%	10	\$1,918
New	Restaurant	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	2.90	1.6%	0%	94%	10	\$1,791
New	Restaurant	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	2.28	16.8%	NA	NA	15	\$3,086
New	Restaurant	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	2.28	30.2%	NA	NA	15	\$6,607
New	Restaurant	Heat Pump	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.94	12.5%	90%	80%	3	\$3,835
New	Restaurant	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.94	10.0%	75%	100%	5	\$2,829
New	Restaurant	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.94	2.5%	5%	94%	10	\$9,035
New	Restaurant	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.94	4.5%	100%	85%	10	\$5,726
New	Restaurant	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	1.94	1.3%	15%	98%	30	\$53216
New	Restaurant	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	1.94	21.1%	45%	92%	20	\$35790
New	Restaurant	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	1.94	45.0%	45%	92%	20	\$67238
New	Restaurant	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.94	17.6%	0%	90%	20	\$7,199
New	Restaurant	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.94	31.2%	0%	90%	20	\$9,508
New	Restaurant	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	1.94	5.9%	75%	95%	25	\$2,732
New	Restaurant	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	1.94	8.9%	75%	98%	25	\$3,625
New	Restaurant	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.94	5.0%	95%	95%	25	\$1,753
New	Restaurant	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.94	3.7%	35%	90%	25	\$473
New	Restaurant	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.94	10.0%	40%	98%	25	\$814
New	Restaurant	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	1.94	6.8%	80%	80%	25	\$6,876
New	Restaurant	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	3.29	2.0%	10%	75%	9	\$414
New	Restaurant	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	3.29	6.0%	60%	98%	9	\$631
New	Restaurant	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.43	3.29	15.0%	90%	70%	14	\$851

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Restaurant	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.43	3.29	20.0%	75%	85%	14	\$2,269
New	Restaurant	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.43	3.29	25.0%	70%	90%	14	\$3,719
New	Restaurant	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	3.29	1.9%	50%	80%	13	\$630
New	Restaurant	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	3.29	1.5%	10%	95%	14	\$36
New	Restaurant	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	3.29	4.0%	45%	100%	10	\$98
New	Restaurant	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	2.25	0.4%	95%	90%	7	\$2
New	Restaurant	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	2.25	13.6%	64%	25%	4	\$1
New	Restaurant	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	2.25	10.3%	5%	45%	6	\$165
New	Restaurant	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	2.25	1.8%	75%	55%	4	\$1
New	Restaurant	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	2.25	18.4%	64%	15%	4	\$158
New	Restaurant	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	2.25	1.3%	75%	40%	5	\$16
New	Restaurant	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	2.25	0.9%	75%	45%	4	\$1
New	Restaurant	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	2.25	3.3%	35%	75%	10	\$1
New	Restaurant	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	2.25	1.8%	95%	30%	3	\$310
New	Restaurant	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	2.25	1.0%	95%	86%	7	\$1
New	Restaurant	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	2.25	1.2%	75%	95%	10	\$86
New	Restaurant	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	2.25	0.7%	35%	65%	13	\$126
New	Restaurant	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	2.25	8.7%	25%	35%	7	\$578
New	Restaurant	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	2.25	16.0%	5%	80%	14	\$189
New	Restaurant	Refrigeration	Anti-Sweat (Humidistat) Controls	Variable Temp. Controls (Humidistat)	Constant Controls	5.60	35.4%	25%	45%	12	\$954
New	Restaurant	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	5.60	17.3%	95%	100%	12	\$345
New	Restaurant	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	5.60	3.6%	85%	65%	10	\$9,595
New	Restaurant	Refrigeration	Display Cases	High-Efficiency Display Cases	Display Cases - Standard	5.60	3.6%	40%	90%	15	\$1,278
New	Restaurant	Refrigeration	High-Efficiency Compressor	High-Efficiency Compressor (15% More Efficient)	Standard Compressor, 40% Efficiency	5.60	8.4%	85%	72%	10	\$1,578
New	Restaurant	Refrigeration	High-Efficiency Evaporator Fans - Walk-ins	High-Efficiency Evaporator Fans, Walk-in Refrigerators	Standard Evaporator Fans	5.60	1.0%	92%	75%	15	\$203
New	Restaurant	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	5.60	5.8%	85%	86%	9	\$376
New	Restaurant	Refrigeration	Motor - Case Fans with ECM motors	ECM motors on evaporator fan, on display cases	48 cf 2-door reach-in commercial refrigerator	5.60	0.5%	95%	50%	20	\$229

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Restaurant	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	5.60	6.0%	75%	70%	10	\$76
New	Restaurant	Refrigeration	Refrigeration - Commissioning	Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit)	No Commissioning	5.60	5.0%	80%	90%	3	\$94
New	Restaurant	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	5.60	3.2%	95%	77%	16	\$315
New	Restaurant	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	5.60	2.0%	95%	20%	4	\$189
New	Restaurant	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.32	12.5%	90%	80%	3	\$3,835
New	Restaurant	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.32	10.0%	75%	100%	5	\$2,829
New	Restaurant	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.32	15.0%	5%	94%	10	\$9,035
New	Restaurant	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.32	4.5%	100%	85%	10	\$5,726
New	Restaurant	Space Heat	Insulation (Ceiling)	R-49	R-30	0.32	8.0%	75%	98%	25	\$2,732
New	Restaurant	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.32	6.0%	95%	95%	25	\$1,753
New	Restaurant	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.32	5.0%	35%	90%	25	\$473
New	Restaurant	Space Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.32	10.0%	40%	98%	25	\$814
New	Restaurant	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.32	25.0%	50%	98%	10	\$11084
New	Restaurant	Space Heat	Windows	U = 0.35	U = 0.40	0.32	3.3%	80%	80%	25	\$1,719
New	Restaurant	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	8.76	3.3%	NA	NA	20	\$420
New	Restaurant	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	8.61	15.1%	5%	95%	10	\$8,704
New	Restaurant	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	8.61	0.6%	5%	80%	11	\$305
New	Restaurant	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	8.61	5.0%	90%	94%	15	\$1,459
New	Restaurant	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	8.61	2.1%	100%	80%	10	\$2,700
New	Restaurant	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	8.61	5.6%	100%	95%	10	\$841
New	Restaurant	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	8.61	0.3%	85%	25%	13	\$32
New	Restaurant	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	8.61	0.4%	85%	55%	13	\$630
New	Restaurant	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	8.61	20.0%	25%	92%	25	\$2,276
New	Restaurant	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	8.61	4.0%	95%	25%	10	\$0

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Restaurant	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	8.61	58.9%	50%	94%	15	\$9,059
New	Restaurant	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	8.61	2.3%	95%	25%	5	\$5
New	Restaurant	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	8.61	1.1%	15%	75%	10	\$6
New	Restaurant	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	8.61	40.3%	20%	95%	20	107164
New	Restaurant	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	8.61	3.3%	95%	75%	10	\$206
New	Restaurant	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	8.61	7.7%	75%	75%	11	\$108
Existing	School	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	0.22	2.5%	35%	70%	12	\$4,948
Existing	School	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	0.22	8.4%	75%	85%	12	\$1,800
Existing	School	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.22	3.4%	85%	40%	15	\$1,736
Existing	School	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	0.22	2.3%	35%	75%	10	\$0
Existing	School	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	0.29	20.0%	NA	NA	20	\$7,619
Existing	School	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	0.29	27.3%	NA	NA	20	\$9,496
Existing	School	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	0.29	9.5%	NA	NA	20	\$2,730
Existing	School	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.32	10.0%	25%	94%	15	\$37066
Existing	School	Cooling Chillers	Centrifugal Chiller - VSD Remodel for Existing	VSD motor	Constant Speed Motor	0.32	40.0%	43%	45%	10	\$14209
Existing	School	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	0.32	7.6%	25%	70%	10	\$17233
Existing	School	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	0.32	5.0%	95%	85%	10	\$40084
Existing	School	Cooling Chillers	Chiller-Water Side Economizer	Install Economizer	No Economizer	0.32	5.0%	45%	90%	10	\$40025
Existing	School	Cooling Chillers	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.32	12.5%	90%	40%	3	\$11596
Existing	School	Cooling Chillers	Cooling Tower-Decrease Temperature	Approach 6 Deg F	10 Deg F	0.32	8.0%	50%	94%	15	\$1,706
Existing	School	Cooling Chillers	Cooling Tower-Two-Speed Fan Motor	Two-Speed Tower Fans replace Single-Speed	Cooling Tower-One-Speed Fan Motor	0.32	14.0%	95%	35%	10	\$188

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	School	Cooling Chillers	Cooling Tower-VSD Fan Control	Variable-Speed Tower Fans replace Two-Speed	Cooling Tower-Two-Speed Fan Motor	0.32	4.0%	95%	75%	10	\$1,541
Existing	School	Cooling Chillers	Direct Digital Control System-Installation	DDC Retrofit	Pnuematic	0.32	15.0%	5%	34%	5	\$56576
Existing	School	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.32	10.0%	75%	80%	5	\$31683
Existing	School	Cooling Chillers	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pnuematic	0.32	15.0%	50%	80%	5	\$22863
Existing	School	Cooling Chillers	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.32	2.5%	45%	45%	18	\$23534
Existing	School	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.32	4.5%	73%	85%	10	\$5,725
Existing	School	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	0.32	5.0%	15%	98%	30	298005
Existing	School	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	0.32	1.0%	75%	45%	25	\$15297
Existing	School	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	0.32	1.5%	75%	85%	25	\$20298
Existing	School	Cooling Chillers	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.32	1.2%	75%	15%	25	\$17945
Existing	School	Cooling Chillers	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	0.32	3.0%	75%	0%	25	\$17945
Existing	School	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.32	4.4%	10%	15%	25	\$6,578
Existing	School	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.32	2.4%	10%	15%	25	\$6,854
Existing	School	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.32	3.0%	10%	95%	25	\$8,296
Existing	School	Cooling Chillers	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.32	8.4%	10%	35%	25	\$9,090
Existing	School	Cooling Chillers	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.32	10.0%	10%	0%	25	\$8,990
Existing	School	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.32	0.5%	35%	35%	25	\$2,648
Existing	School	Cooling Chillers	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	0.32	1.5%	35%	35%	25	\$15297
Existing	School	Cooling Chillers	Pipe Insulation	R-4	R-0	0.32	1.0%	65%	45%	15	\$1,206



Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	School	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.32	25.0%	25%	98%	10	124142
Existing	School	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	0.32	44.8%	60%	99%	20	\$46674
Existing	School	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	0.32	2.2%	80%	60%	25	\$49751
Existing	School	Cooling Chillers	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.32	1.1%	10%	60%	25	140474
Existing	School	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	0.32	14.2%	NA	NA	15	\$19910
Existing	School	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	0.32	6.4%	NA	NA	15	\$10602
Existing	School	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	0.32	10.4%	NA	NA	15	\$16433
Existing	School	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.35	10.0%	25%	94%	15	\$37066
Existing	School	Cooling DX	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.35	12.5%	90%	40%	3	\$11596
Existing	School	Cooling DX	Cooling DX Package-Air Side Economizer	Air-Side Economizer	No Economizer	0.35	15.0%	10%	30%	15	\$13809
Existing	School	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.35	25.0%	50%	85%	15	122577
Existing	School	Cooling DX	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	0.35	15.0%	5%	34%	5	\$56576
Existing	School	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.35	10.0%	75%	80%	5	\$31683
Existing	School	Cooling DX	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.35	15.0%	50%	80%	5	\$22863
Existing	School	Cooling DX	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.35	2.5%	45%	45%	18	\$23534
Existing	School	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.35	4.5%	73%	85%	10	\$5,725
Existing	School	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.35	5.0%	15%	98%	30	298005
Existing	School	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.35	1.0%	75%	45%	25	\$15297
Existing	School	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.35	1.5%	75%	85%	25	\$20298
Existing	School	Cooling DX	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.35	1.2%	75%	15%	25	\$17945
Existing	School	Cooling DX	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	0.35	3.0%	75%	0%	25	\$17945
Existing	School	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.35	4.4%	10%	15%	25	\$6,578

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	School	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.35	2.4%	10%	15%	25	\$6,854
Existing	School	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.35	3.0%	10%	95%	25	\$8,296
Existing	School	Cooling DX	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.35	8.4%	10%	35%	25	\$9,090
Existing	School	Cooling DX	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.35	10.0%	10%	0%	25	\$8,990
Existing	School	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.35	0.5%	35%	35%	25	\$2,648
Existing	School	Cooling DX	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	0.35	1.5%	35%	35%	25	\$15297
Existing	School	Cooling DX	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.35	3.0%	95%	79%	15	\$147
Existing	School	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.35	2.2%	80%	60%	25	\$49751
Existing	School	Cooling DX	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.35	1.1%	10%	60%	25	140474
Existing	School	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	1.34	20.0%	1%	85%	10	\$12026
Existing	School	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	1.34	7.5%	60%	85%	10	\$13132
Existing	School	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	1.34	3.8%	85%	81%	10	\$1,536
Existing	School	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD Control	No Pump And Fan System VSD Optimization	1.34	33.8%	85%	75%	20	\$11938
Existing	School	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	1.34	8.8%	50%	77%	10	\$21487
Existing	School	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	1.34	1.6%	50%	94%	10	\$1,789
Existing	School	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	2.62	16.8%	NA	NA	15	\$14115
Existing	School	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	2.62	30.2%	NA	NA	15	\$30224
Existing	School	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	2.78	10.0%	25%	94%	15	\$37066
Existing	School	Heat Pump	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	2.78	12.5%	90%	40%	3	\$11596
Existing	School	Heat Pump	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	2.78	15.0%	5%	34%	5	\$56576
Existing	School	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	2.78	10.0%	75%	80%	5	\$31683
Existing	School	Heat Pump	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	2.78	15.0%	50%	80%	5	\$22863
Existing	School	Heat Pump	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	2.78	2.5%	45%	45%	18	\$23534
Existing	School	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	2.78	13.2%	5%	94%	10	\$53363

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	School	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	2.78	4.5%	73%	85%	10	\$5,725
Existing	School	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	2.78	0.2%	15%	98%	30	298005
Existing	School	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	2.78	5.7%	5%	92%	20	163708
Existing	School	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	2.78	25.8%	5%	92%	20	307566
Existing	School	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	2.78	24.9%	5%	90%	20	\$32930
Existing	School	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	2.78	34.8%	5%	90%	20	\$43491
Existing	School	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	2.78	3.0%	75%	45%	25	\$15297
Existing	School	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	2.78	4.4%	75%	85%	25	\$20298
Existing	School	Heat Pump	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	2.78	2.8%	75%	15%	25	\$17945
Existing	School	Heat Pump	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	2.78	6.9%	75%	0%	25	\$17945
Existing	School	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	2.78	4.4%	10%	15%	25	\$6,578
Existing	School	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	2.78	2.4%	10%	15%	25	\$6,854
Existing	School	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	2.78	5.0%	10%	95%	25	\$8,296
Existing	School	Heat Pump	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	2.78	16.6%	10%	35%	25	\$9,090
Existing	School	Heat Pump	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	2.78	19.8%	10%	0%	25	\$8,990
Existing	School	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	2.78	1.9%	35%	35%	25	\$2,648
Existing	School	Heat Pump	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	2.78	5.6%	35%	35%	25	\$15297
Existing	School	Heat Pump	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	2.78	3.0%	95%	79%	15	\$147
Existing	School	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	2.78	14.9%	80%	60%	25	\$49751
Existing	School	Heat Pump	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	2.78	9.8%	10%	60%	25	140474
Existing	School	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	2.75	2.0%	50%	75%	9	\$4,636
Existing	School	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	2.75	15.0%	20%	81%	9	\$17651
Existing	School	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.2	2.75	15.0%	90%	70%	14	\$8,931
Existing	School	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.2	2.75	20.0%	75%	85%	14	\$22522

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	School	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.2	2.75	25.0%	70%	90%	14	\$35725
Existing	School	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications	Code Required LPD And Control Strategies: LPD = 1.2	2.75	5.3%	65%	95%	14	\$28347
Existing	School	Lighting	HE Fixtures/Design - Existing to Code	Code Required LPD And Control Strategies: LPD = 1.2	Existing Lighting Design	2.75	36.0%	95%	45%	14	\$54881
Existing	School	Lighting	LED Exit Lighting	5 Watts	CFL Exit Sign (26 Watts)	2.75	1.6%	95%	65%	11	\$53
Existing	School	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	2.75	0.1%	50%	80%	13	\$630
Existing	School	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	2.75	0.8%	10%	95%	14	\$35
Existing	School	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	2.75	4.0%	90%	65%	9	\$1,100
Existing	School	Lighting	Time Clocks And Timers	Install Time Clock Lighting	No Time Clock	2.75	4.9%	85%	98%	9	\$218
Existing	School	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	1.57	0.4%	95%	90%	7	\$0
Existing	School	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	1.57	13.6%	64%	25%	4	\$0
Existing	School	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	1.57	1.3%	90%	45%	6	\$165
Existing	School	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	1.57	1.8%	75%	55%	4	\$0
Existing	School	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	1.57	18.4%	64%	15%	4	\$159
Existing	School	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	1.57	1.3%	75%	40%	5	\$18
Existing	School	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	1.57	0.9%	75%	45%	4	\$0
Existing	School	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	1.57	0.4%	10%	75%	10	\$0
Existing	School	Plug Load	Office Computer Network Energy Management	Office Computer Network Energy Management	No Network Management	1.57	1.8%	95%	30%	3	\$312
Existing	School	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	1.57	1.0%	95%	86%	7	\$0
Existing	School	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	1.57	1.2%	75%	95%	10	\$171
Existing	School	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	1.57	0.1%	75%	65%	13	\$124
Existing	School	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	1.57	1.1%	25%	35%	7	\$577
Existing	School	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	1.57	2.1%	75%	80%	14	\$188
Existing	School	Plug Load	Vending Miser	Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls	No Vending Miser - No controls	1.57	2.1%	75%	25%	3	\$300
Existing	School	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	0.50	12.8%	95%	100%	12	\$347
Existing	School	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	0.50	3.6%	85%	65%	10	\$9,596
Existing	School	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	0.50	1.1%	85%	86%	9	\$377

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUJ)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	School	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	0.50	6.0%	75%	70%	10	\$76
Existing	School	Refrigeration	Refrigeration - Retro Commissioning	Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)	No Re-commissioning	0.50	5.0%	80%	90%	3	\$94
Existing	School	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	0.50	3.2%	95%	77%	16	\$318
Existing	School	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	0.50	2.0%	95%	20%	4	\$188
Existing	School	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	5.72	10.0%	25%	94%	15	\$37066
Existing	School	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	5.72	12.5%	90%	40%	3	\$11596
Existing	School	Space Heat	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	5.72	15.0%	5%	34%	5	\$56576
Existing	School	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	5.72	10.0%	75%	80%	5	\$31683
Existing	School	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	5.72	15.0%	50%	80%	5	\$22863
Existing	School	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	5.72	2.5%	45%	45%	18	\$23534
Existing	School	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	5.72	15.0%	5%	94%	10	\$53363
Existing	School	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	5.72	4.5%	73%	85%	10	\$5,725
Existing	School	Space Heat	Insulation (Ceiling)	R-49	R-30	5.72	4.0%	75%	85%	25	\$15297
Existing	School	Space Heat	Insulation (Ceiling) - Existing to Code	R-30	Existing Ceiling Insulation (Average R-9)	5.72	6.3%	75%	15%	25	\$17945
Existing	School	Space Heat	Insulation (Ceiling) - Zero to Code	R-30	R-0	5.72	12.5%	75%	0%	25	\$17945
Existing	School	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	5.72	4.4%	10%	15%	25	\$6,578
Existing	School	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	5.72	2.4%	10%	15%	25	\$6,854
Existing	School	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	5.72	6.0%	10%	95%	25	\$8,296
Existing	School	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	5.72	21.1%	10%	35%	25	\$9,090
Existing	School	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	5.72	25.0%	10%	0%	25	\$8,990
Existing	School	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	5.72	2.5%	35%	35%	25	\$2,648
Existing	School	Space Heat	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	5.72	7.5%	35%	35%	25	\$15297
Existing	School	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	5.72	25.0%	25%	98%	10	124142
Existing	School	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	5.72	3.0%	95%	79%	15	\$147

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	School	Space Heat	Windows	U = 0.35	U = 0.40	5.72	7.3%	80%	60%	25	\$12438
Existing	School	Space Heat	Windows - Existing to Code	U = 0.40	Existing Windows (U=0.65)	5.72	21.8%	10%	60%	25	177788
Existing	School	Water Heat	Water_Heater (40 Gallon Residential Sized Electric)	EF = 0.95	EF = 0.92	1.44	3.3%	NA	NA	20	\$1,294
Existing	School	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	1.44	15.1%	35%	95%	10	\$8,702
Existing	School	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	1.44	0.8%	35%	80%	11	\$306
Existing	School	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	1.44	5.0%	55%	94%	15	\$16344
Existing	School	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	1.44	2.1%	85%	80%	10	\$2,701
Existing	School	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	1.44	5.6%	85%	95%	10	\$841
Existing	School	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	1.44	0.2%	65%	25%	13	\$29
Existing	School	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	1.44	0.2%	65%	55%	13	\$630
Existing	School	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	1.44	20.0%	5%	92%	25	\$7,001
Existing	School	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	1.44	4.0%	95%	25%	10	\$0
Existing	School	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	1.44	3.8%	95%	15%	10	\$0
Existing	School	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	1.44	58.9%	40%	94%	15	\$7,143
Existing	School	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	1.44	1.0%	80%	8%	15	\$624
Existing	School	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	1.44	2.3%	95%	25%	5	\$6
Existing	School	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	1.44	3.4%	45%	75%	10	\$6
Existing	School	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	1.44	7.5%	45%	20%	10	\$12
Existing	School	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	1.44	7.2%	20%	95%	20	\$17862
Existing	School	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	1.44	3.3%	95%	75%	10	\$206
Existing	School	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	1.44	7.7%	75%	15%	11	\$106
New	School	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	0.22	2.5%	35%	70%	12	\$4,948
New	School	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	0.22	8.3%	75%	85%	12	\$1,800
New	School	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.22	3.4%	85%	40%	15	\$1,736
New	School	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	0.22	2.3%	35%	75%	10	\$0

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	School	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	0.16	20.0%	NA	NA	20	\$7,619
New	School	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	0.16	27.3%	NA	NA	20	\$9,496
New	School	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	0.16	9.5%	NA	NA	20	\$2,730
New	School	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.14	10.0%	25%	94%	15	\$37066
New	School	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	0.14	7.6%	25%	70%	10	\$17233
New	School	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	0.14	5.0%	95%	85%	10	\$40084
New	School	Cooling Chillers	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.14	12.5%	90%	80%	3	\$42950
New	School	Cooling Chillers	Cooling Tower-Decrease Approach Temperature	6 Deg F	10 Deg F	0.14	8.0%	50%	94%	15	\$1,706
New	School	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.14	10.0%	75%	80%	5	\$31683
New	School	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.14	4.5%	73%	85%	10	\$5,725
New	School	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	0.14	5.0%	15%	98%	30	298005
New	School	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	0.14	1.0%	75%	45%	25	\$15297
New	School	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	0.14	1.5%	75%	85%	25	\$20298
New	School	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.14	3.0%	95%	95%	25	\$8,296
New	School	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.14	0.5%	35%	35%	25	\$2,648
New	School	Cooling Chillers	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.14	10.0%	40%	98%	25	\$9,119
New	School	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.14	25.0%	50%	98%	10	124142
New	School	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	0.14	44.8%	95%	99%	20	\$43991

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	School	Cooling Chillers	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.14	8.5%	75%	75%	30	\$15603
New	School	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	0.14	2.2%	80%	60%	25	\$49751
New	School	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	0.17	14.2%	NA	NA	15	\$19910
New	School	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	0.17	6.4%	NA	NA	15	\$10602
New	School	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	0.17	10.4%	NA	NA	15	\$16433
New	School	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.16	10.0%	25%	94%	15	\$37066
New	School	Cooling DX	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.16	12.5%	90%	80%	3	\$42950
New	School	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.16	25.0%	50%	85%	15	122577
New	School	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.16	10.0%	75%	80%	5	\$31683
New	School	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.16	4.5%	73%	85%	10	\$5,725
New	School	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.16	5.0%	15%	98%	30	298005
New	School	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.16	1.0%	75%	45%	25	\$15297
New	School	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.16	1.5%	75%	85%	25	\$20298
New	School	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.16	3.0%	95%	95%	25	\$8,296
New	School	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.16	0.5%	35%	35%	25	\$2,648
New	School	Cooling DX	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.16	10.0%	40%	98%	25	\$9,119
New	School	Cooling DX	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.16	8.5%	75%	75%	30	\$15603
New	School	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.16	2.2%	80%	60%	25	\$49751
New	School	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	0.90	20.0%	1%	75%	10	\$12026
New	School	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	0.90	7.5%	60%	85%	10	\$6,831
New	School	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	0.90	3.8%	85%	81%	10	\$1,536
New	School	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	0.90	33.8%	85%	75%	20	\$11938

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	School	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	0.90	8.8%	65%	77%	10	\$21487
New	School	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	0.90	1.6%	50%	94%	10	\$1,789
New	School	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	1.24	16.8%	NA	NA	15	\$14115
New	School	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	1.24	30.2%	NA	NA	15	\$30224
New	School	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.13	10.0%	25%	94%	15	\$37066
New	School	Heat Pump	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.13	12.5%	90%	80%	3	\$42950
New	School	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.13	10.0%	75%	80%	5	\$31683
New	School	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.13	13.2%	5%	94%	10	\$53363
New	School	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.13	4.5%	73%	85%	10	\$5,725
New	School	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	1.13	0.2%	15%	98%	30	298005
New	School	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	1.13	5.7%	45%	92%	20	163708
New	School	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	1.13	25.8%	45%	92%	20	307566
New	School	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.13	24.9%	10%	90%	20	\$32930
New	School	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.13	34.8%	10%	90%	20	\$43491
New	School	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	1.13	3.0%	75%	45%	25	\$15297
New	School	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	1.13	4.4%	75%	85%	25	\$20298
New	School	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.13	5.0%	95%	95%	25	\$8,296
New	School	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.13	1.9%	35%	35%	25	\$2,648
New	School	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.13	10.0%	40%	98%	25	\$9,119
New	School	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	1.13	14.9%	80%	60%	25	\$49751
New	School	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	1.98	2.0%	50%	75%	9	\$4,636
New	School	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	1.98	15.0%	45%	81%	9	\$17651
New	School	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.2	1.98	15.0%	90%	70%	14	\$5,295

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	School	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.2	1.98	20.0%	75%	85%	14	\$17651
New	School	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.2	1.98	25.0%	70%	90%	14	\$29653
New	School	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications	Code Required LPD And Control Strategies: LPD = 1.2	1.98	5.3%	65%	95%	14	\$22946
New	School	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	1.98	0.1%	50%	80%	13	\$630
New	School	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	1.98	0.8%	10%	95%	14	\$35
New	School	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	1.98	4.0%	90%	65%	10	\$1,100
New	School	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	1.57	0.4%	95%	90%	7	\$0
New	School	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	1.57	13.6%	64%	25%	4	\$0
New	School	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	1.57	1.3%	90%	45%	6	\$165
New	School	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	1.57	1.8%	75%	55%	4	\$0
New	School	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	1.57	18.4%	64%	15%	4	\$159
New	School	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	1.57	1.3%	75%	40%	5	\$18
New	School	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	1.57	0.9%	75%	45%	4	\$0
New	School	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	1.57	0.4%	10%	75%	10	\$0
New	School	Plug Load	Office Computer Network Energy Management	Office Computer Network Energy Management	No Network Management	1.57	1.8%	95%	30%	3	\$312
New	School	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	1.57	1.0%	95%	86%	7	\$0
New	School	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	1.57	1.2%	75%	95%	10	\$171
New	School	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	1.57	0.1%	75%	65%	13	\$124
New	School	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	1.57	1.1%	25%	35%	7	\$577
New	School	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	1.57	2.0%	75%	80%	14	\$188
New	School	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	0.50	8.5%	95%	100%	12	\$347
New	School	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	0.50	3.6%	85%	65%	10	\$9,596
New	School	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	0.50	1.1%	85%	86%	9	\$377
New	School	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	0.50	6.0%	75%	70%	10	\$76
New	School	Refrigeration	Refrigeration - Commissioning	Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit)	No Commissioning	0.50	5.0%	80%	90%	3	\$94

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	School	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	0.50	3.2%	95%	77%	16	\$318
New	School	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	0.50	2.0%	95%	20%	4	\$188
New	School	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.85	10.0%	25%	94%	15	\$37066
New	School	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.85	12.5%	90%	80%	3	\$42950
New	School	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.85	10.0%	75%	80%	5	\$31683
New	School	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.85	15.0%	5%	94%	10	\$53363
New	School	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.85	4.5%	73%	85%	10	\$5,725
New	School	Space Heat	Insulation (Ceiling)	R-49	R-30	1.85	4.0%	75%	85%	25	\$15297
New	School	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.85	6.0%	95%	95%	25	\$8,296
New	School	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.85	2.5%	35%	35%	25	\$2,648
New	School	Space Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.85	10.0%	40%	98%	25	\$9,119
New	School	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.85	25.0%	50%	98%	10	124142
New	School	Space Heat	Windows	U = 0.35	U = 0.40	1.85	7.3%	80%	60%	25	\$12438
New	School	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	1.44	3.3%	NA	NA	20	\$1,294
New	School	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	1.42	15.1%	35%	95%	10	\$8,702
New	School	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	1.42	0.8%	35%	80%	11	\$306
New	School	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	1.42	5.0%	55%	94%	15	\$16344
New	School	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	1.42	2.1%	85%	80%	10	\$2,701
New	School	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	1.42	5.6%	85%	95%	10	\$841
New	School	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	1.42	0.2%	65%	25%	13	\$29
New	School	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	1.42	0.2%	65%	55%	13	\$630
New	School	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	1.42	20.0%	25%	92%	25	\$7,001
New	School	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	1.42	4.0%	95%	25%	10	\$0
New	School	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	1.42	58.9%	50%	94%	15	\$7,143



Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	School	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	1.42	2.3%	95%	25%	5	\$6
New	School	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	1.42	3.4%	45%	75%	10	\$6
New	School	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	1.42	7.2%	20%	95%	20	\$17862
New	School	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	1.42	3.3%	95%	75%	10	\$206
New	School	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	1.42	7.7%	75%	15%	11	\$106
Existing	University	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	0.42	2.5%	35%	70%	12	\$4,944
Existing	University	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	0.42	8.4%	75%	85%	12	\$1,800
Existing	University	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.42	3.4%	85%	40%	15	\$1,734
Existing	University	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	0.42	2.3%	35%	75%	10	\$0
Existing	University	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	0.29	20.0%	NA	NA	20	\$8,572
Existing	University	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	0.29	27.3%	NA	NA	20	\$10683
Existing	University	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	0.29	9.5%	NA	NA	20	\$3,071
Existing	University	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.32	10.0%	25%	94%	15	\$41699
Existing	University	Cooling Chillers	Centrifugal Chiller - VSD Remodel for Existing	VSD motor	Constant Speed Motor	0.32	40.0%	43%	45%	10	\$15985
Existing	University	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	0.32	7.6%	25%	70%	10	\$19387
Existing	University	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	0.32	5.0%	95%	85%	10	\$45095
Existing	University	Cooling Chillers	Chiller-Water Side Economizer	Install Economizer	No Economizer	0.32	5.0%	45%	90%	10	\$45029
Existing	University	Cooling Chillers	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.32	12.5%	90%	40%	3	\$13046
Existing	University	Cooling Chillers	Cooling Tower-Decrease Temperature Approach	6 Deg F	10 Deg F	0.32	8.0%	50%	94%	15	\$1,919
Existing	University	Cooling Chillers	Cooling Tower-Two-Speed Fan Motor	Two-Speed Tower Fans replace Single-Speed	Cooling Tower-One-Speed Fan Motor	0.32	14.0%	95%	35%	10	\$212
Existing	University	Cooling Chillers	Cooling Tower-VSD Fan Control	Variable-Speed Tower Fans replace Two-Speed	Cooling Tower-Two-Speed Fan Motor	0.32	4.0%	95%	75%	10	\$1,734

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Cooling Chillers	Direct Digital Control System-Installation	DDC Retrofit	Pnuematic	0.32	15.0%	5%	34%	5	\$63648
Existing	University	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.32	10.0%	75%	80%	5	\$35643
Existing	University	Cooling Chillers	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pnuematic	0.32	15.0%	50%	80%	5	\$25721
Existing	University	Cooling Chillers	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.32	2.5%	45%	45%	18	\$26476
Existing	University	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.32	4.5%	73%	85%	10	\$5,725
Existing	University	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	0.32	10.0%	15%	98%	30	335256
Existing	University	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	0.32	1.0%	75%	45%	25	\$17209
Existing	University	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	0.32	1.5%	75%	85%	25	\$22835
Existing	University	Cooling Chillers	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.32	1.2%	75%	13%	25	\$20188
Existing	University	Cooling Chillers	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	0.32	3.0%	75%	0%	25	\$20188
Existing	University	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.32	4.4%	10%	15%	25	\$7,400
Existing	University	Cooling Chillers	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.32	2.4%	10%	15%	25	\$7,711
Existing	University	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.32	3.0%	10%	95%	25	\$8,803
Existing	University	Cooling Chillers	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.32	8.4%	10%	35%	25	\$9,644
Existing	University	Cooling Chillers	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.32	10.0%	10%	0%	25	\$9,531
Existing	University	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.32	0.5%	35%	35%	25	\$2,979
Existing	University	Cooling Chillers	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	0.32	1.5%	35%	35%	25	\$17209
Existing	University	Cooling Chillers	Pipe Insulation	R-4	R-0	0.32	1.0%	65%	45%	15	\$1,357

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EUJ)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.32	25.0%	25%	98%	10	139660
Existing	University	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	0.32	44.8%	60%	99%	20	\$52508
Existing	University	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	0.32	2.2%	80%	60%	25	\$55970
Existing	University	Cooling Chillers	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.32	1.1%	10%	60%	25	158034
Existing	University	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	0.32	14.2%	NA	NA	15	\$22398
Existing	University	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	0.32	6.4%	NA	NA	15	\$11927
Existing	University	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	0.32	10.4%	NA	NA	15	\$18487
Existing	University	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.35	10.0%	25%	94%	15	\$41699
Existing	University	Cooling DX	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.35	12.5%	90%	40%	3	\$13046
Existing	University	Cooling DX	Cooling DX Package-Air Side Economizer	Air-Side Economizer	No Economizer	0.35	15.0%	10%	90%	15	\$15535
Existing	University	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.35	25.0%	50%	85%	15	137899
Existing	University	Cooling DX	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	0.35	15.0%	5%	34%	5	\$63648
Existing	University	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.35	10.0%	75%	80%	5	\$35643
Existing	University	Cooling DX	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.35	15.0%	50%	80%	5	\$25721
Existing	University	Cooling DX	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.35	2.5%	45%	45%	18	\$26476
Existing	University	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.35	4.5%	73%	85%	10	\$5,725
Existing	University	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.35	10.0%	15%	98%	30	335256
Existing	University	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.35	1.0%	75%	45%	25	\$17209
Existing	University	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.35	1.5%	75%	85%	25	\$22835
Existing	University	Cooling DX	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.35	1.2%	75%	13%	25	\$20188
Existing	University	Cooling DX	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	0.35	3.0%	75%	0%	25	\$20188
Existing	University	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.35	4.4%	10%	15%	25	\$7,400

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.35	2.4%	10%	15%	25	\$7,711
Existing	University	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.35	3.0%	10%	95%	25	\$8,803
Existing	University	Cooling DX	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.35	8.4%	10%	35%	25	\$9,644
Existing	University	Cooling DX	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.35	10.0%	10%	0%	25	\$9,531
Existing	University	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.35	0.5%	35%	35%	25	\$2,979
Existing	University	Cooling DX	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	0.35	1.5%	35%	35%	25	\$17209
Existing	University	Cooling DX	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.35	3.0%	95%	66%	15	\$146
Existing	University	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.35	2.2%	80%	60%	25	\$55970
Existing	University	Cooling DX	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.35	1.1%	10%	60%	25	158034
Existing	University	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	1.34	20.0%	20%	85%	10	\$13529
Existing	University	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	1.34	7.5%	60%	85%	10	\$13132
Existing	University	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	1.34	3.8%	85%	81%	10	\$1,728
Existing	University	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD Control	No Pump And Fan System VSD Optimization	1.34	33.8%	85%	75%	20	\$13430
Existing	University	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	1.34	8.8%	50%	77%	10	\$24172
Existing	University	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	1.34	1.6%	75%	94%	10	\$1,794
Existing	University	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	2.63	16.8%	NA	NA	15	\$15879
Existing	University	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	2.63	30.2%	NA	NA	15	\$34001
Existing	University	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	2.79	10.0%	25%	94%	15	\$41699
Existing	University	Heat Pump	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	2.79	12.5%	90%	40%	3	\$13046
Existing	University	Heat Pump	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	2.79	15.0%	5%	34%	5	\$63648
Existing	University	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	2.79	10.0%	75%	80%	5	\$35643
Existing	University	Heat Pump	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	2.79	15.0%	50%	80%	5	\$25721
Existing	University	Heat Pump	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	2.79	2.5%	45%	45%	18	\$26476
Existing	University	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	2.79	13.2%	5%	94%	10	\$60034

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	2.79	4.5%	73%	85%	10	\$5,725
Existing	University	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	2.79	0.4%	15%	98%	30	335256
Existing	University	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	2.79	5.7%	5%	92%	20	184172
Existing	University	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	2.79	25.8%	5%	92%	20	346012
Existing	University	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	2.79	24.9%	5%	90%	20	\$37046
Existing	University	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	2.79	34.8%	5%	90%	20	\$48927
Existing	University	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	2.79	3.0%	75%	45%	25	\$17209
Existing	University	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	2.79	4.4%	75%	85%	25	\$22835
Existing	University	Heat Pump	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	2.79	2.8%	75%	13%	25	\$20188
Existing	University	Heat Pump	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	2.79	6.9%	75%	0%	25	\$20188
Existing	University	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	2.79	4.4%	10%	15%	25	\$7,400
Existing	University	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	2.79	2.4%	10%	15%	25	\$7,711
Existing	University	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	2.79	5.0%	10%	95%	25	\$8,803
Existing	University	Heat Pump	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	2.79	16.6%	10%	35%	25	\$9,644
Existing	University	Heat Pump	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	2.79	19.8%	10%	0%	25	\$9,531
Existing	University	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	2.79	1.9%	35%	35%	25	\$2,979
Existing	University	Heat Pump	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	2.79	5.6%	35%	35%	25	\$17209
Existing	University	Heat Pump	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	2.79	3.0%	95%	66%	15	\$146
Existing	University	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	2.79	14.9%	80%	60%	25	\$55970
Existing	University	Heat Pump	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	2.79	9.8%	10%	60%	25	158034
Existing	University	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	3.83	2.0%	50%	75%	9	\$5,216
Existing	University	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	3.83	15.0%	30%	63%	9	\$19857
Existing	University	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.2	3.83	15.0%	90%	70%	14	\$10048
Existing	University	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.2	3.83	20.0%	75%	85%	14	\$25337

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.2	3.83	25.0%	70%	90%	14	\$40190
Existing	University	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications	Code Required LPD And Control Strategies: LPD = 1.2	3.83	5.3%	65%	95%	14	\$31890
Existing	University	Lighting	HE Fixtures/Design - Existing to Code	Code Required LPD And Control Strategies: LPD = 1.2	Existing Lighting Design	3.83	36.0%	95%	45%	14	\$61741
Existing	University	Lighting	LED Exit Lighting	5 Watts	CFL Exit Sign (26 Watts)	3.83	1.6%	95%	65%	11	\$53
Existing	University	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	3.83	0.2%	50%	80%	13	\$629
Existing	University	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	3.83	0.8%	10%	95%	14	\$40
Existing	University	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	3.83	4.0%	90%	37%	9	\$1,238
Existing	University	Lighting	Time Clocks And Timers	Install Time Clock Lighting	No Time Clock	3.83	4.9%	85%	92%	9	\$218
Existing	University	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	1.16	0.4%	95%	90%	7	\$0
Existing	University	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	1.16	13.6%	64%	25%	4	\$0
Existing	University	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	1.16	1.6%	90%	45%	6	\$165
Existing	University	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	1.16	1.8%	75%	55%	4	\$0
Existing	University	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	1.16	18.4%	64%	15%	4	\$159
Existing	University	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	1.16	1.3%	75%	40%	5	\$13
Existing	University	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	1.16	0.9%	75%	45%	4	\$0
Existing	University	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	1.16	0.5%	10%	75%	10	\$0
Existing	University	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	1.16	1.8%	95%	30%	3	\$311
Existing	University	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	1.16	1.0%	95%	86%	7	\$0
Existing	University	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	1.16	1.2%	75%	95%	10	\$172
Existing	University	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	1.16	0.1%	75%	65%	13	\$126
Existing	University	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	1.16	1.4%	25%	35%	7	\$576
Existing	University	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	1.16	2.5%	90%	80%	14	\$192
Existing	University	Plug Load	Vending Miser	Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls	No Vending Miser - No controls	1.16	2.6%	90%	25%	3	\$298
Existing	University	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	0.51	7.6%	95%	100%	12	\$344
Existing	University	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	0.51	3.6%	85%	65%	10	\$9,597
Existing	University	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	0.51	1.1%	85%	86%	9	\$377

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	0.51	6.0%	75%	70%	10	\$86
Existing	University	Refrigeration	Refrigeration - Retro Commissioning	Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)	No Re-commissioning	0.51	5.0%	80%	90%	3	\$106
Existing	University	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	0.51	3.2%	95%	77%	16	\$357
Existing	University	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	0.51	2.0%	95%	20%	4	\$192
Existing	University	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	5.74	10.0%	25%	94%	15	\$41699
Existing	University	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	5.74	12.5%	90%	40%	3	\$13046
Existing	University	Space Heat	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	5.74	15.0%	5%	34%	5	\$63648
Existing	University	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	5.74	10.0%	75%	80%	5	\$35643
Existing	University	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	5.74	15.0%	50%	80%	5	\$25721
Existing	University	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	5.74	2.5%	45%	45%	18	\$26476
Existing	University	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	5.74	15.0%	5%	94%	10	\$60034
Existing	University	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	5.74	4.5%	73%	85%	10	\$5,725
Existing	University	Space Heat	Insulation (Ceiling)	R-49	R-30	5.74	4.0%	75%	85%	25	\$17209
Existing	University	Space Heat	Insulation (Ceiling) - Existing to Code	R-30	Existing Ceiling Insulation (Average R-9)	5.74	6.3%	75%	13%	25	\$20188
Existing	University	Space Heat	Insulation (Ceiling) - Zero to Code	R-30	R-0	5.74	12.5%	75%	0%	25	\$20188
Existing	University	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	5.74	4.4%	10%	15%	25	\$7,400
Existing	University	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	5.74	2.4%	10%	15%	25	\$7,711
Existing	University	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	5.74	6.0%	10%	95%	25	\$8,803
Existing	University	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	5.74	21.1%	10%	35%	25	\$9,644
Existing	University	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	5.74	25.0%	10%	0%	25	\$9,531
Existing	University	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	5.74	2.5%	35%	35%	25	\$2,979
Existing	University	Space Heat	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	5.74	7.5%	35%	35%	25	\$17209
Existing	University	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	5.74	25.0%	25%	98%	10	139660
Existing	University	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	5.74	3.0%	95%	66%	15	\$146

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Space Heat	Windows	U = 0.35	U = 0.40	5.74	7.3%	80%	60%	25	\$13992
Existing	University	Space Heat	Windows - Existing to Code	U = 0.40	Existing Windows (U=0.65)	5.74	21.8%	10%	60%	25	200011
Existing	University	Water Heat	Water_Heater (40 Gallon Residential Sized Electric)	EF = 0.95	EF = 0.92	1.45	3.3%	NA	NA	20	\$2,264
Existing	University	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	1.45	15.1%	35%	95%	10	\$8,704
Existing	University	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	1.45	0.7%	35%	80%	11	\$304
Existing	University	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	1.45	5.0%	55%	94%	15	\$18387
Existing	University	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	1.45	2.1%	85%	80%	10	\$2,701
Existing	University	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	1.45	5.6%	85%	95%	10	\$841
Existing	University	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	1.45	0.2%	65%	25%	13	\$33
Existing	University	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	1.45	0.2%	65%	55%	13	\$629
Existing	University	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	1.45	20.0%	5%	92%	25	\$12258
Existing	University	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	1.45	4.0%	95%	25%	10	\$0
Existing	University	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	1.45	3.8%	95%	15%	10	\$0
Existing	University	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	1.45	58.9%	40%	94%	15	\$5,017
Existing	University	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	1.45	1.0%	80%	70%	15	\$702
Existing	University	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	1.45	2.3%	95%	45%	5	\$7
Existing	University	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	1.45	3.4%	45%	75%	10	\$7
Existing	University	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	1.45	7.5%	45%	20%	10	\$13
Existing	University	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	1.45	6.9%	20%	95%	20	\$26793
Existing	University	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	1.45	3.3%	95%	75%	10	\$205
Existing	University	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	1.45	7.7%	75%	15%	11	\$106
New	University	Cooking	Cooking Fryers - Commercial	Energy Star Commercial Fryer	Non-Energy Star Fryer	0.42	2.5%	35%	70%	12	\$4,944
New	University	Cooking	Hot Food Holding Cabinets - Commercial	Energy Star Commercial Hot Food Holding Cabinets	Non-Energy Star Commercial Hot Food Holding Cabinets	0.42	8.3%	75%	85%	12	\$1,800
New	University	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.42	3.4%	85%	40%	15	\$1,734
New	University	Cooking	Steam Cookers - Commercial	Energy Star Commercial Steam Cookers (50% efficiency)	Non-Energy Star Commercial Steam Cooker (35% efficiency)	0.42	2.3%	35%	75%	10	\$0

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	University	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	0.16	20.0%	NA	NA	20	\$8,572
New	University	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	0.16	27.3%	NA	NA	20	\$10683
New	University	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	0.16	9.5%	NA	NA	20	\$3,071
New	University	Cooling Chillers	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.14	10.0%	25%	94%	15	\$41699
New	University	Cooling Chillers	Chilled Water Piping Loop w/ VSD Control	VSD for Secondary Chilled Water Loop	Primary Loop Only w/ Constant Speed Pump	0.14	7.6%	25%	70%	10	\$19387
New	University	Cooling Chillers	Chilled Water Reset	Install Chilled Water Reset	No Chilled Water Reset	0.14	5.0%	95%	85%	10	\$45095
New	University	Cooling Chillers	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.14	12.5%	90%	80%	3	\$48318
New	University	Cooling Chillers	Cooling Tower-Decrease Approach Temperature	6 Deg F	10 Deg F	0.14	8.0%	50%	94%	15	\$1,919
New	University	Cooling Chillers	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.14	10.0%	75%	80%	5	\$35643
New	University	Cooling Chillers	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.14	4.5%	73%	85%	10	\$5,725
New	University	Cooling Chillers	Green Roof	Vegetation on Roof	Standard roofing techniques	0.14	10.0%	15%	98%	30	335256
New	University	Cooling Chillers	Insulation (Ceiling)	R-38	R-21 (Code)	0.14	1.0%	75%	45%	25	\$17209
New	University	Cooling Chillers	Insulation (Ceiling)	R-49	R-21 (Code)	0.14	1.5%	75%	85%	25	\$22835
New	University	Cooling Chillers	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.14	3.0%	95%	95%	25	\$8,803
New	University	Cooling Chillers	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.14	0.5%	35%	35%	25	\$2,979
New	University	Cooling Chillers	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.14	10.0%	40%	98%	25	\$10259
New	University	Cooling Chillers	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.14	25.0%	50%	98%	10	139660
New	University	Cooling Chillers	Turbocor Compressor	0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)	0.634 kW/ton (Code) chiller water cooled	0.14	44.8%	95%	99%	20	\$49490

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	University	Cooling Chillers	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.14	8.5%	75%	75%	30	\$17553
New	University	Cooling Chillers	Windows	U = 0.35	U = 0.55 (Code)	0.14	2.2%	80%	60%	25	\$55970
New	University	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	0.17	14.2%	NA	NA	15	\$22398
New	University	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	0.17	6.4%	NA	NA	15	\$11927
New	University	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	0.17	10.4%	NA	NA	15	\$18487
New	University	Cooling DX	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	0.16	10.0%	25%	94%	15	\$41699
New	University	Cooling DX	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.16	12.5%	90%	80%	3	\$48318
New	University	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.16	25.0%	50%	85%	15	137899
New	University	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.16	10.0%	75%	80%	5	\$35643
New	University	Cooling DX	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.16	4.5%	73%	85%	10	\$5,725
New	University	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.16	10.0%	15%	98%	30	335256
New	University	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.16	1.0%	75%	45%	25	\$17209
New	University	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.16	1.5%	75%	85%	25	\$22835
New	University	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.16	3.0%	95%	95%	25	\$8,803
New	University	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.16	0.5%	35%	35%	25	\$2,979
New	University	Cooling DX	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.16	10.0%	40%	98%	25	\$10259
New	University	Cooling DX	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.16	8.5%	75%	75%	30	\$17553
New	University	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.16	2.2%	80%	60%	25	\$55970
New	University	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	0.90	20.0%	20%	75%	10	\$13529
New	University	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	0.90	7.5%	60%	85%	10	\$6,831
New	University	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	0.90	3.8%	85%	81%	10	\$1,728
New	University	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD Control	No Pump And Fan System VSD Optimization	0.90	33.8%	85%	75%	20	\$13430

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	University	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	0.90	8.8%	65%	77%	10	\$24172
New	University	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	0.90	1.6%	75%	94%	10	\$1,794
New	University	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	1.24	16.8%	NA	NA	15	\$15879
New	University	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	1.24	30.2%	NA	NA	15	\$34001
New	University	Heat Pump	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.13	10.0%	25%	94%	15	\$41699
New	University	Heat Pump	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.13	12.5%	90%	80%	3	\$48318
New	University	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.13	10.0%	75%	80%	5	\$35643
New	University	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.13	13.2%	5%	94%	10	\$60034
New	University	Heat Pump	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.13	4.5%	73%	85%	10	\$5,725
New	University	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	1.13	0.4%	15%	98%	30	335256
New	University	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	1.13	5.7%	45%	92%	20	184172
New	University	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	1.13	25.8%	45%	92%	20	346012
New	University	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.13	24.9%	10%	90%	20	\$37046
New	University	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	1.13	34.8%	10%	90%	20	\$48927
New	University	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	1.13	3.0%	75%	45%	25	\$17209
New	University	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	1.13	4.4%	75%	85%	25	\$22835
New	University	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.13	5.0%	95%	95%	25	\$8,803
New	University	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.13	1.9%	35%	35%	25	\$2,979
New	University	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.13	10.0%	40%	98%	25	\$10259
New	University	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	1.13	14.9%	80%	60%	25	\$55970
New	University	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	2.76	2.0%	50%	75%	9	\$5,216
New	University	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	2.76	15.0%	60%	63%	9	\$19857
New	University	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 1.2	2.76	15.0%	90%	70%	14	\$5,957

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	University	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 1.2	2.76	20.0%	75%	85%	14	\$19857
New	University	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 1.2	2.76	25.0%	70%	90%	14	\$33359
New	University	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications	Code Required LPD And Control Strategies: LPD = 1.2	2.76	5.3%	65%	95%	14	\$25814
New	University	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	2.76	0.2%	50%	80%	13	\$629
New	University	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	2.76	0.8%	10%	95%	14	\$40
New	University	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	2.76	4.0%	90%	37%	10	\$1,238
New	University	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	1.16	0.4%	95%	90%	7	\$0
New	University	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	1.16	13.6%	64%	25%	4	\$0
New	University	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	1.16	1.6%	90%	45%	6	\$165
New	University	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	1.16	1.8%	75%	55%	4	\$0
New	University	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	1.16	18.4%	64%	15%	4	\$159
New	University	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	1.16	1.3%	75%	40%	5	\$13
New	University	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	1.16	0.9%	75%	45%	4	\$0
New	University	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	1.16	0.5%	10%	75%	10	\$0
New	University	Plug Load	Office Computer Network Energy Management	Office Computer Network Energy Management	No Network Management	1.16	1.8%	95%	30%	3	\$311
New	University	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	1.16	1.0%	95%	86%	7	\$0
New	University	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	1.16	1.2%	75%	95%	10	\$172
New	University	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	1.16	0.1%	75%	65%	13	\$126
New	University	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	1.16	1.3%	25%	35%	7	\$576
New	University	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	1.16	2.5%	90%	80%	14	\$192
New	University	Refrigeration	Commercial Reach-In Refrigerator	Energy Star Commercial Reach-In Refrigerator	Commercial-Size Refrigerator - Standard	0.51	7.6%	95%	100%	12	\$344
New	University	Refrigeration	Custom Refrigeration System	High-Efficiency Custom Refrigeration System (Walk-in) includes compressors	Custom Refrigeration System - Standard	0.51	3.6%	85%	65%	10	\$9,597
New	University	Refrigeration	Ice Maker	Energy Star Ice Maker - High-Efficiency	Standard Ice Maker	0.51	1.1%	85%	86%	9	\$377
New	University	Refrigeration	Reduced Speed or Cycling of Evaporator Fans	VFD on Evaporator Fans (Evap Fan Control on Walk-In)	Constant Speed Evaporator Fans	0.51	6.0%	75%	70%	10	\$86
New	University	Refrigeration	Refrigeration - Commissioning	Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit)	No Commissioning	0.51	5.0%	80%	90%	3	\$106

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	University	Refrigeration	Special Glass Doors for Refrigerated Reach-in Cases	Do Not Require Anti-Sweat Heating	Standard Glass Doors	0.51	3.2%	95%	77%	16	\$357
New	University	Refrigeration	Strip Curtains for Walk-Ins	Strip Curtains for Walk-Ins	No Strip Curtains for Walk-Ins	0.51	2.0%	95%	20%	4	\$192
New	University	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 sensors)	Constant Ventilation	1.86	10.0%	25%	94%	15	\$41699
New	University	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	1.86	12.5%	90%	80%	3	\$48318
New	University	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.86	10.0%	75%	80%	5	\$35643
New	University	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.86	15.0%	5%	94%	10	\$60034
New	University	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	1.86	4.5%	73%	85%	10	\$5,725
New	University	Space Heat	Insulation (Ceiling)	R-49	R-30	1.86	4.0%	75%	85%	25	\$17209
New	University	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.86	6.0%	95%	95%	25	\$8,803
New	University	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.86	2.5%	35%	35%	25	\$2,979
New	University	Space Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	1.86	10.0%	40%	98%	25	\$10259
New	University	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.86	25.0%	50%	98%	10	139660
New	University	Space Heat	Windows	U = 0.35	U = 0.40	1.86	7.3%	80%	60%	25	\$13992
New	University	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	1.45	3.3%	NA	NA	20	\$2,264
New	University	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	1.42	15.1%	35%	95%	10	\$8,704
New	University	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	1.42	0.7%	35%	80%	11	\$304
New	University	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	1.42	5.0%	55%	94%	15	\$18387
New	University	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	1.42	2.1%	85%	80%	10	\$2,701
New	University	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	1.42	5.6%	85%	95%	10	\$841
New	University	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	1.42	0.2%	65%	25%	13	\$33
New	University	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	1.42	0.2%	65%	55%	13	\$629
New	University	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	1.42	20.0%	25%	92%	25	\$12258
New	University	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	1.42	4.0%	95%	25%	10	\$0
New	University	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	1.42	58.9%	50%	94%	15	\$5,017



Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	University	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	1.42	2.3%	95%	45%	5	\$7
New	University	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	1.42	3.4%	45%	75%	10	\$7
New	University	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	1.42	6.9%	20%	95%	20	\$26793
New	University	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	1.42	3.3%	95%	75%	10	\$205
New	University	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	1.42	7.7%	75%	15%	11	\$106
Existing	Warehouse	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	0.17	20.0%	NA	NA	20	\$3,055
Existing	Warehouse	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	0.17	27.3%	NA	NA	20	\$3,811
Existing	Warehouse	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	0.17	9.5%	NA	NA	20	\$1,094
Existing	Warehouse	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	0.18	14.2%	NA	NA	15	\$6,830
Existing	Warehouse	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	0.18	6.4%	NA	NA	15	\$3,635
Existing	Warehouse	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	0.18	10.4%	NA	NA	15	\$5,635
Existing	Warehouse	Cooling DX	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.19	12.5%	90%	40%	3	\$6,419
Existing	Warehouse	Cooling DX	Cooling DX Package-Air Side Economizer	Air-Side Economizer	No Economizer	0.19	15.0%	10%	40%	15	\$5,540
Existing	Warehouse	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.19	25.0%	50%	85%	15	\$67855
Existing	Warehouse	Cooling DX	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	0.19	15.0%	5%	93%	5	\$31319
Existing	Warehouse	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.19	10.0%	75%	98%	5	\$17539
Existing	Warehouse	Cooling DX	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.19	15.0%	50%	98%	5	\$12656
Existing	Warehouse	Cooling DX	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.19	2.5%	45%	45%	18	\$13028
Existing	Warehouse	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.19	10.0%	15%	98%	30	329938
Existing	Warehouse	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.19	2.0%	75%	45%	25	\$16936
Existing	Warehouse	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.19	3.0%	75%	85%	25	\$22473
Existing	Warehouse	Cooling DX	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.19	2.4%	75%	10%	25	\$19867
Existing	Warehouse	Cooling DX	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	0.19	6.0%	75%	0%	25	\$19867
Existing	Warehouse	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.19	4.4%	10%	15%	25	\$3,641

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Warehouse	Cooling DX	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.19	2.4%	10%	15%	25	\$3,794
Existing	Warehouse	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.19	3.0%	10%	95%	25	\$4,364
Existing	Warehouse	Cooling DX	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.19	8.4%	10%	35%	25	\$4,781
Existing	Warehouse	Cooling DX	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.19	10.0%	10%	0%	25	\$4,729
Existing	Warehouse	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.19	1.0%	35%	45%	25	\$2,931
Existing	Warehouse	Cooling DX	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	0.19	3.0%	35%	45%	25	\$16936
Existing	Warehouse	Cooling DX	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.19	3.0%	95%	20%	15	\$147
Existing	Warehouse	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.19	0.3%	80%	98%	25	\$7,364
Existing	Warehouse	Cooling DX	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.19	0.2%	10%	98%	25	\$20789
Existing	Warehouse	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	0.59	20.0%	1%	85%	10	\$6,657
Existing	Warehouse	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	0.59	7.5%	0%	85%	10	\$13132
Existing	Warehouse	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	0.59	3.8%	85%	81%	10	\$850
Existing	Warehouse	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD Control	No Pump And Fan System VSD Optimization	0.59	33.8%	85%	75%	20	\$6,608
Existing	Warehouse	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	0.59	8.8%	10%	77%	10	\$11894
Existing	Warehouse	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	0.59	1.6%	0%	94%	10	\$1,791
Existing	Warehouse	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	0.72	16.8%	NA	NA	15	\$4,840
Existing	Warehouse	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	0.72	30.2%	NA	NA	15	\$10367
Existing	Warehouse	Heat Pump	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.76	12.5%	90%	40%	3	\$6,419
Existing	Warehouse	Heat Pump	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	0.76	15.0%	5%	93%	5	\$31319
Existing	Warehouse	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.76	10.0%	75%	98%	5	\$17539
Existing	Warehouse	Heat Pump	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.76	15.0%	50%	98%	5	\$12656
Existing	Warehouse	Heat Pump	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.76	2.5%	45%	45%	18	\$13028
Existing	Warehouse	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.76	11.2%	5%	94%	10	\$29540
Existing	Warehouse	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	0.76	0.8%	15%	98%	30	329938



Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Warehouse	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	0.76	8.6%	5%	92%	20	\$56150
Existing	Warehouse	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	0.76	29.3%	5%	92%	20	105492
Existing	Warehouse	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	0.76	23.6%	20%	90%	20	\$11295
Existing	Warehouse	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	0.76	34.1%	20%	90%	20	\$14917
Existing	Warehouse	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	0.76	5.9%	75%	45%	25	\$16936
Existing	Warehouse	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	0.76	8.9%	75%	85%	25	\$22473
Existing	Warehouse	Heat Pump	Insulation (Ceiling) - Existing to Code	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.76	5.5%	75%	10%	25	\$19867
Existing	Warehouse	Heat Pump	Insulation (Ceiling) - Zero to Code	R-21 (Code)	R-0	0.76	13.8%	75%	0%	25	\$19867
Existing	Warehouse	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.76	4.4%	10%	15%	25	\$3,641
Existing	Warehouse	Heat Pump	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.76	2.4%	10%	15%	25	\$3,794
Existing	Warehouse	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.76	5.0%	10%	95%	25	\$4,364
Existing	Warehouse	Heat Pump	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.76	16.6%	10%	35%	25	\$4,781
Existing	Warehouse	Heat Pump	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.76	19.8%	10%	0%	25	\$4,729
Existing	Warehouse	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.76	3.7%	35%	45%	25	\$2,931
Existing	Warehouse	Heat Pump	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	0.76	11.1%	35%	45%	25	\$16936
Existing	Warehouse	Heat Pump	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.76	3.0%	95%	20%	15	\$147
Existing	Warehouse	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	0.76	2.1%	80%	98%	25	\$7,364
Existing	Warehouse	Heat Pump	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.76	1.4%	10%	98%	25	\$20789
Existing	Warehouse	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	2.54	2.0%	10%	75%	9	\$2,566
Existing	Warehouse	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	2.54	6.0%	30%	98%	9	\$3,908
Existing	Warehouse	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 0.80	2.54	15.0%	90%	70%	14	\$2,775
Existing	Warehouse	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 0.80	2.54	20.0%	75%	85%	14	\$7,074
Existing	Warehouse	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 0.80	2.54	25.0%	70%	90%	14	\$11588
Existing	Warehouse	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications	Code Required LPD And Control Strategies: LPD = 0.80	2.54	35.0%	65%	95%	14	\$15887

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Warehouse	Lighting	HE Fixtures/Design - Existing to Code	Code Required LPD And Control Strategies: LPD = 0.80	Existing Lighting Design	2.54	33.0%	95%	45%	14	\$18643
Existing	Warehouse	Lighting	LED Exit Lighting	5 Watts	CFL Exit Sign (26 Watts)	2.54	1.6%	95%	65%	11	\$52
Existing	Warehouse	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	2.54	0.4%	0%	80%	13	\$632
Existing	Warehouse	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	2.54	0.8%	10%	95%	14	\$36
Existing	Warehouse	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	2.54	4.0%	90%	83%	9	\$609
Existing	Warehouse	Lighting	Time Clocks And Timers	Install Time Clock Lighting	No Time Clock	2.54	4.9%	85%	100%	9	\$215
Existing	Warehouse	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	0.53	0.4%	95%	90%	7	\$3
Existing	Warehouse	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	0.53	13.6%	64%	25%	4	\$0
Existing	Warehouse	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	0.53	7.3%	5%	45%	6	\$166
Existing	Warehouse	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	0.53	1.8%	75%	55%	4	\$0
Existing	Warehouse	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	0.53	18.4%	64%	15%	4	\$156
Existing	Warehouse	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	0.53	1.3%	75%	40%	5	\$16
Existing	Warehouse	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	0.53	0.9%	75%	45%	4	\$0
Existing	Warehouse	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	0.53	2.3%	75%	75%	10	\$0
Existing	Warehouse	Plug Load	Office Computer Network Management	Office Computer Network Energy Management	No Network Management	0.53	1.8%	95%	30%	3	\$309
Existing	Warehouse	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	0.53	1.0%	95%	86%	7	\$0
Existing	Warehouse	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	0.53	1.2%	75%	95%	10	\$85
Existing	Warehouse	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	0.53	0.5%	65%	65%	13	\$127
Existing	Warehouse	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	0.53	6.1%	25%	35%	7	\$576
Existing	Warehouse	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	0.53	11.3%	10%	80%	14	\$189
Existing	Warehouse	Plug Load	Vending Miser	Passive Infrared Sensor on Vending Machine Monitoring, Vacancy of Area And Cycles Cooling - Controls	No Vending Miser - No controls	0.53	11.6%	10%	25%	3	\$296
Existing	Warehouse	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	1.15	12.5%	90%	40%	3	\$6,419
Existing	Warehouse	Space Heat	Direct Digital Control System-Installation	DDC Retrofit	Pneumatic	1.15	15.0%	5%	93%	5	\$31319
Existing	Warehouse	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	1.15	10.0%	75%	98%	5	\$17539
Existing	Warehouse	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	1.15	15.0%	50%	98%	5	\$12656
Existing	Warehouse	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	1.15	2.5%	45%	45%	18	\$13028
Existing	Warehouse	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	1.15	15.0%	5%	94%	10	\$29540

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Warehouse	Space Heat	Insulation (Ceiling)	R-49	R-30	1.15	8.0%	75%	85%	25	\$16936
Existing	Warehouse	Space Heat	Insulation (Ceiling) - Existing to Code	R-30	Existing Ceiling Insulation (Average R-9)	1.15	12.5%	75%	10%	25	\$19867
Existing	Warehouse	Space Heat	Insulation (Ceiling) - Zero to Code	R-30	R-0	1.15	25.0%	75%	0%	25	\$19867
Existing	Warehouse	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	1.15	4.4%	10%	15%	25	\$3,641
Existing	Warehouse	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	1.15	2.4%	10%	15%	25	\$3,794
Existing	Warehouse	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	1.15	6.0%	10%	95%	25	\$4,364
Existing	Warehouse	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	1.15	21.1%	10%	35%	25	\$4,781
Existing	Warehouse	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	1.15	25.0%	10%	0%	25	\$4,729
Existing	Warehouse	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	1.15	5.0%	35%	45%	25	\$2,931
Existing	Warehouse	Space Heat	Insulation - Floor (Non-Slab) - Existing to Code	R-10 (Code)	R-0	1.15	15.0%	35%	45%	25	\$16936
Existing	Warehouse	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	1.15	25.0%	25%	98%	10	\$68721
Existing	Warehouse	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	1.15	3.0%	95%	20%	15	\$147
Existing	Warehouse	Space Heat	Windows	U = 0.35	U = 0.40	1.15	1.0%	80%	98%	25	\$1,840
Existing	Warehouse	Space Heat	Windows - Existing to Code	U = 0.40	Existing Windows (U=0.65)	1.15	3.0%	10%	98%	25	\$26313
Existing	Warehouse	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	0.19	3.3%	NA	NA	20	\$114
Existing	Warehouse	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.20	15.1%	5%	95%	10	\$8,706
Existing	Warehouse	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.20	4.3%	5%	80%	11	\$306
Existing	Warehouse	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	0.20	5.0%	55%	94%	15	\$9,048
Existing	Warehouse	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	0.20	2.3%	5%	25%	13	\$33
Existing	Warehouse	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	0.20	3.1%	5%	55%	13	\$632
Existing	Warehouse	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	0.20	20.0%	5%	92%	25	\$612
Existing	Warehouse	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.20	4.0%	95%	25%	10	\$0
Existing	Warehouse	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.20	3.8%	95%	15%	10	\$3
Existing	Warehouse	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	0.20	58.9%	40%	94%	15	\$9,732
Existing	Warehouse	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.20	1.0%	80%	90%	15	\$173
Existing	Warehouse	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.20	1.1%	15%	75%	10	\$7

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Warehouse	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.20	2.5%	15%	20%	10	\$13
Existing	Warehouse	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	0.20	32.7%	20%	95%	20	\$8,931
Existing	Warehouse	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.20	3.3%	95%	95%	10	\$205
Existing	Warehouse	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.20	7.7%	75%	45%	11	\$107
New	Warehouse	Cooling Chillers	Chiller - Premium Efficiency	0.507 kW/ton	0.634 kW/ton	0.22	20.0%	NA	NA	20	\$3,055
New	Warehouse	Cooling Chillers	Chiller - Advanced Technology	0.461 kW/ton	0.634 kW/ton	0.22	27.3%	NA	NA	20	\$3,811
New	Warehouse	Cooling Chillers	Chiller - High Efficiency	0.574 kW/ton	0.634 kW/ton	0.22	9.5%	NA	NA	20	\$1,094
New	Warehouse	Cooling Chillers	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.20	4.9%	75%	75%	30	\$2,309
New	Warehouse	Cooling DX	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)	10.3 EER Rooftop Unit (State Code)	0.24	14.2%	NA	NA	15	\$6,830
New	Warehouse	Cooling DX	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)	10.3 EER Rooftop Unit (State Code)	0.24	6.4%	NA	NA	15	\$3,635
New	Warehouse	Cooling DX	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)	10.3 EER Rooftop Unit (State Code)	0.24	10.4%	NA	NA	15	\$5,635
New	Warehouse	Cooling DX	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.22	12.5%	90%	80%	3	\$23776
New	Warehouse	Cooling DX	Direct / Indirect Evaporative Cooling, Pre-Cooling	Direct / Indirect Evaporative Cooling, Pre-Cooling	No modification to DX system	0.22	25.0%	50%	85%	15	\$67855
New	Warehouse	Cooling DX	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.22	10.0%	75%	98%	5	\$17539
New	Warehouse	Cooling DX	Green Roof	Vegetation on Roof	Standard roofing techniques	0.22	10.0%	15%	98%	30	\$29938
New	Warehouse	Cooling DX	Insulation (Ceiling)	R-38	R-21 (Code)	0.22	2.0%	75%	45%	25	\$16936
New	Warehouse	Cooling DX	Insulation (Ceiling)	R-49	R-21 (Code)	0.22	3.0%	75%	85%	25	\$22473
New	Warehouse	Cooling DX	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.22	3.0%	95%	95%	25	\$4,364
New	Warehouse	Cooling DX	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.22	1.0%	35%	45%	25	\$2,931
New	Warehouse	Cooling DX	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.22	10.0%	40%	98%	25	\$5,048
New	Warehouse	Cooling DX	Window RE - Window Overhangs	Overhangs over windows for shading	No window overhangs	0.22	4.9%	75%	75%	30	\$2,309
New	Warehouse	Cooling DX	Windows	U = 0.35	U = 0.55 (Code)	0.22	0.3%	80%	98%	25	\$7,364
New	Warehouse	HVAC Aux	Automated Exhaust VFD Control - Parking Garage CO sensor	CO Sensors	No CO Sensors	0.57	20.0%	1%	75%	10	\$6,657



Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Warehouse	HVAC Aux	Cooking Hood Controls	Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air	No Cooking Hood Controls	0.57	7.5%	0%	85%	10	\$6,830
New	Warehouse	HVAC Aux	Motor - Premium-Efficiency	PE Motors for HVAC Applications	Standard Efficiency Motors	0.57	3.8%	85%	81%	10	\$850
New	Warehouse	HVAC Aux	Motor - Pump & Fan System - Variable Speed Control	Pump And Fan System Optimization w/ VSD	No Pump And Fan System VSD Optimization	0.57	33.8%	85%	75%	20	\$6,608
New	Warehouse	HVAC Aux	Motor - VAV Box High-Efficiency	ECM Motors	Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control	0.57	8.8%	20%	77%	10	\$11894
New	Warehouse	HVAC Aux	Optimized Variable Volume Lab Hood Design	Optimized Variable Volume Lab Hood Design	Constant Volume Lab Hood Design	0.57	1.6%	0%	94%	10	\$1,791
New	Warehouse	Heat Pump	High-Efficiency EER=11.0, COP=3.5	High-Efficiency EER=11.0, COP=3.5	EER=10.1, COP=3.2	0.57	16.8%	NA	NA	15	\$4,840
New	Warehouse	Heat Pump	Premium-Efficiency EER=11.8, COP=3.8	Premium-Efficiency EER=11.8, COP=3.8	EER=10.1, COP=3.2	0.57	30.2%	NA	NA	15	\$10367
New	Warehouse	Heat Pump	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.52	12.5%	90%	80%	3	\$23776
New	Warehouse	Heat Pump	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.52	10.0%	75%	98%	5	\$17539
New	Warehouse	Heat Pump	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.52	11.2%	5%	94%	10	\$29540
New	Warehouse	Heat Pump	Green Roof	Vegetation on Roof	Standard roofing techniques	0.52	0.8%	15%	98%	30	329938
New	Warehouse	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=3.1, EER=13.4	Std. Air Source HP 'EER=10.1, COP=3.2	0.52	8.6%	45%	92%	20	\$56150
New	Warehouse	Heat Pump	Heat Pump - Ground Source (Closed Loop)	GSHP: COP=4.0, EER=20	Std. Air Source HP 'EER=10.1, COP=3.2	0.52	29.3%	45%	92%	20	105492
New	Warehouse	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.2, EER=12.0	Std. Air Source Heat Pump'EER=10.1, COP=3.2	0.52	23.6%	40%	90%	20	\$11295
New	Warehouse	Heat Pump	Heat Pump - Water Source (Closed Loop)	WSHP: COP=4.8, EER=14.5	Std. Air Source Heat Pump'EER=10.1, COP=3.2	0.52	34.1%	40%	90%	20	\$14917
New	Warehouse	Heat Pump	Insulation (Ceiling)	R-38	R-21 (Code)	0.52	5.9%	75%	45%	25	\$16936
New	Warehouse	Heat Pump	Insulation (Ceiling)	R-49	R-21 (Code)	0.52	8.9%	75%	85%	25	\$22473
New	Warehouse	Heat Pump	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.52	5.0%	95%	95%	25	\$4,364
New	Warehouse	Heat Pump	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.52	3.7%	35%	45%	25	\$2,931
New	Warehouse	Heat Pump	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.52	10.0%	40%	98%	25	\$5,048
New	Warehouse	Heat Pump	Windows	U = 0.35	U = 0.55 (Code)	0.52	2.1%	80%	98%	25	\$7,364
New	Warehouse	Lighting	Bi-Level Control, Stairwell Lighting	Occupancy Sensor Control, 50% Lighting Power during unoccupied Time	Continuous Full Power Lighting in Stairways	1.70	2.0%	10%	75%	9	\$2,566
New	Warehouse	Lighting	Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures	Continuous Dimming, Fluorescent Fixtures (Day-Lighting)	No Dimming Controls	1.70	6.0%	60%	98%	9	\$3,908

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Warehouse	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 15%	Code Required LPD And Control Strategies: LPD = 0.80	1.70	15.0%	90%	70%	14	\$1,563
New	Warehouse	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 20%	Code Required LPD And Control Strategies: LPD = 0.80	1.70	20.0%	75%	85%	14	\$5,472
New	Warehouse	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 25%	Code Required LPD And Control Strategies: LPD = 0.80	1.70	25.0%	70%	90%	14	\$9,575
New	Warehouse	Lighting	HE Fixtures/Design	Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications	Code Required LPD And Control Strategies: LPD = 0.80	1.70	35.0%	65%	95%	14	\$13,484
New	Warehouse	Lighting	LED Refrigeration Case Lights	LED Refrigeration Case Lights (28W)	Fluorescent Refrigeration Case Lights (60W)	1.70	0.6%	0%	80%	13	\$632
New	Warehouse	Lighting	LED Solid State White Lighting Package	Landscape, merchandise, signage, structure & task lighting	50W 10hrs/day, 365 day/yr	1.70	0.8%	10%	95%	14	\$36
New	Warehouse	Lighting	Occupancy Sensor Control, Fluorescent	Occupancy Sensor Control, Fluorescent	No Occupancy Sensor	1.70	4.0%	90%	83%	10	\$609
New	Warehouse	Plug Load	Energy Star - Battery Charging System	Energy Star Battery Charging System	Non-Energy Star Battery Chargers	0.53	0.4%	95%	90%	7	\$3
New	Warehouse	Plug Load	Energy Star - Computer	Energy Star Features Enabled	Non-Energy Star Features	0.53	13.6%	64%	25%	4	\$0
New	Warehouse	Plug Load	Energy Star - Copiers	Energy Star or Better Office Equipment: Copiers,	Office Equipment: Copiers, Standard	0.53	7.1%	5%	45%	6	\$166
New	Warehouse	Plug Load	Energy Star - Fax	Energy Star Features Enabled	Non-Energy Star Features	0.53	1.8%	75%	55%	4	\$0
New	Warehouse	Plug Load	Energy Star - Monitors	Energy Star Features Enabled	Non-Energy Star Features	0.53	18.4%	64%	15%	4	\$156
New	Warehouse	Plug Load	Energy Star - Printers	Energy Star Features Enabled	Non-Energy Star Features	0.53	1.3%	75%	40%	5	\$16
New	Warehouse	Plug Load	Energy Star - Scanners	Energy Star Features Enabled	Non-Energy Star Features	0.53	0.9%	75%	45%	4	\$0
New	Warehouse	Plug Load	Energy Star - Water Cooler	Energy Star Water Cooler (Hot/Cold Water)	Non-Energy Star Water Cooler	0.53	2.3%	75%	75%	10	\$0
New	Warehouse	Plug Load	Office Computer Network Energy Management	Office Computer Network Energy Management	No Network Management	0.53	1.8%	95%	30%	3	\$309
New	Warehouse	Plug Load	Power Supply 80+ Office Measure	80% Efficient Power supply	No 80+	0.53	1.0%	95%	86%	7	\$0
New	Warehouse	Plug Load	Refrigerator eCube	Refrigerator eCube	No Refrigerator eCube	0.53	1.2%	75%	95%	10	\$85
New	Warehouse	Plug Load	Residential-Size Refrigerator	Energy Star Residential-Size Refrigerator	Residential-Size Refrigerator - Standard	0.53	0.5%	65%	65%	13	\$127
New	Warehouse	Plug Load	Residential-Size Refrigerator/Freezer - Early Replacement	Energy Star Refrigerator/Freezer	Baseline Refrigerator/Freezer	0.53	5.9%	25%	35%	7	\$576
New	Warehouse	Plug Load	Vending Machine	Energy Star Vending Machines - High-Efficiency	Vending Machines - Standard	0.53	10.9%	10%	80%	14	\$189
New	Warehouse	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.38	12.5%	90%	80%	3	\$23,776
New	Warehouse	Space Heat	Direct Digital Control System-Optimization	DDC System (Optimized)	DDC System (Basic)	0.38	10.0%	75%	98%	5	\$17,539
New	Warehouse	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.38	15.0%	5%	94%	10	\$29,540
New	Warehouse	Space Heat	Insulation (Ceiling)	R-49	R-30	0.38	8.0%	75%	85%	25	\$16,936
New	Warehouse	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.38	6.0%	95%	95%	25	\$4,364

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline kWh (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Warehouse	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.38	5.0%	35%	45%	25	\$2,931
New	Warehouse	Space Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.38	10.0%	40%	98%	25	\$5,048
New	Warehouse	Space Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness	No Heat Recovery	0.38	25.0%	50%	98%	10	\$68721
New	Warehouse	Space Heat	Windows	U = 0.35	U = 0.40	0.38	1.0%	80%	98%	25	\$1,840
New	Warehouse	Water Heat	Water_Heater (40 Gallon Electric) - Residential Sized	EF = 0.95	EF = 0.92	0.20	3.3%	NA	NA	20	\$114
New	Warehouse	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.20	15.1%	5%	95%	10	\$8,706
New	Warehouse	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.72	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.20	4.2%	5%	80%	11	\$306
New	Warehouse	Water Heat	Demand controlled Circulating Systems	Install demand-based control system (VFD Control by Demand)	No demand control systems in place	0.20	5.0%	55%	94%	15	\$9,048
New	Warehouse	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Standard Dishwasher (FED Std. EF=0.46)	0.20	2.2%	5%	25%	13	\$33
New	Warehouse	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Standard Dishwasher (FED Std. EF=0.46)	0.20	3.1%	5%	55%	13	\$632
New	Warehouse	Water Heat	Drainwater Heat Recovery Water Heater	Install (Power-Pipe or GFX) - Heat Recovery Water Heater	No Heat Recovery System	0.20	20.0%	25%	92%	25	\$612
New	Warehouse	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.20	4.0%	95%	25%	10	\$0
New	Warehouse	Water Heat	Heat Pump Water Heater	EF = 2.9	EF=0.93 Baseline Electric Water Heater	0.20	58.9%	50%	94%	15	\$9,732
New	Warehouse	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.20	1.1%	15%	75%	10	\$7
New	Warehouse	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Non-solar hot water heater	0.20	32.7%	20%	95%	20	\$8,931
New	Warehouse	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.20	3.3%	95%	95%	10	\$205
New	Warehouse	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replecement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.20	7.7%	75%	45%	11	\$107

Commercial Gas Measures

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Dry Retail	Goods	Space Heat	Gas Boiler - Greater than 300 kBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.07 5.9%	NA	NA	20	\$3,796
Existing	Dry Retail	Goods	Space Heat	Gas Boiler - Greater than 300 kBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.07 11.1%	NA	NA	20	\$7,744
Existing	Dry Retail	Goods	Space Heat	Boiler Economizer	Economizer	No Economizer	0.07 5.5%	40%	90%	20	\$15,356
Existing	Dry Retail	Goods	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.07 12.5%	90%	40%	3	\$9,319
Existing	Dry Retail	Goods	Space Heat	Direct Digital Control System-Installation	DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)	Pneumatic	0.07 5.0%	75%	59%	15	\$13,134
Existing	Dry Retail	Goods	Space Heat	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.07 10.0%	75%	80%	5	\$25,459
Existing	Dry Retail	Goods	Space Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.07 15.0%	50%	80%	5	\$18,372
Existing	Dry Retail	Goods	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.07 2.5%	45%	45%	18	\$18,911
Existing	Dry Retail	Goods	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.07 15.0%	5%	94%	10	\$42,881
Existing	Dry Retail	Goods	Space Heat	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	0.07 10.0%	40%	10%	10	\$11,068
Existing	Dry Retail	Goods	Space Heat	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.07 7.2%	75%	85%	25	\$28,840
Existing	Dry Retail	Goods	Space Heat	Insulation (Ceiling)	R-21 (Code)	R-0	0.07 20.0%	75%	0%	25	\$28,840
Existing	Dry Retail	Goods	Space Heat	Insulation (Ceiling)	R-38	R-21 (Code)	0.07 8.0%	75%	95%	25	\$24,585
Existing	Dry Retail	Goods	Space Heat	Insulation (Ceiling)	R-49	R-21 (Code)	0.07 12.0%	75%	98%	25	\$32,622
Existing	Dry Retail	Goods	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.07 4.4%	10%	15%	25	\$5,286
Existing	Dry Retail	Goods	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.07 2.4%	10%	15%	25	\$5,508
Existing	Dry Retail	Goods	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.07 6.0%	10%	95%	25	\$5,262

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Dry Retail	Goods	Space Boiler	Heat Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.07	21.1%	10%	35%	25	\$5,697
Existing	Dry Retail	Goods	Space Boiler	Heat Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.07	25.0%	10%	0%	25	\$5,697
Existing	Dry Retail	Goods	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.07	15.0%	35%	90%	25	\$24585
Existing	Dry Retail	Goods	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.07	5.0%	35%	90%	25	\$4,255
Existing	Dry Retail	Goods	Space Boiler	Heat Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.07	25.0%	25%	98%	10	\$99757
Existing	Dry Retail	Goods	Space Boiler	Heat Steam Pipe Insulation	R-4	R-0	0.07	12.1%	75%	65%	20	\$3,229
Existing	Dry Retail	Goods	Space Boiler	Heat Steam Trap Maintenance	Actively stop steam trap leaks	No Maintenance	0.07	17.0%	90%	45%	3	\$6,383
Existing	Dry Retail	Goods	Space Boiler	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.07	3.0%	95%	54%	15	\$147
Existing	Dry Retail	Goods	Space Boiler	Heat Windows	U = 0.35	U = 0.55 (Code)	0.07	4.7%	80%	80%	25	\$42460
Existing	Dry Retail	Goods	Space Boiler	Heat Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.07	3.1%	10%	80%	25	119878
Existing	Dry Retail	Goods	Space Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.11	11.1%	NA	NA	18	\$3,943
Existing	Dry Retail	Goods	Space Furnace	Heat Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.11	14.9%	NA	NA	18	\$3,943
Existing	Dry Retail	Goods	Space Furnace	Heat Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.10	12.5%	90%	80%	3	\$9,319
Existing	Dry Retail	Goods	Space Furnace	Heat Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.10	2.5%	45%	45%	18	\$18911
Existing	Dry Retail	Goods	Space Furnace	Heat Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.10	15.0%	5%	94%	10	\$42881
Existing	Dry Retail	Goods	Space Furnace	Heat Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	0.10	10.0%	40%	10%	10	\$11068
Existing	Dry Retail	Goods	Space Furnace	Heat Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.10	7.2%	75%	85%	25	\$28840
Existing	Dry Retail	Goods	Space Furnace	Heat Insulation (Ceiling)	R-21 (Code)	R-0	0.10	20.0%	75%	0%	25	\$28840
Existing	Dry Retail	Goods	Space Furnace	Heat Insulation (Ceiling)	R-38	R-21 (Code)	0.10	8.0%	75%	95%	25	\$24585

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Dry Retail	Goods	Space Heat	Insulation (Ceiling)	R-49	R-21 (Code)	0.10	12.0%	75%	98%	25	\$32622
Existing	Dry Retail	Goods	Space Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.10	4.4%	10%	15%	25	\$5,286
Existing	Dry Retail	Goods	Space Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.10	2.4%	10%	15%	25	\$5,508
Existing	Dry Retail	Goods	Space Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.10	6.0%	10%	95%	25	\$5,262
Existing	Dry Retail	Goods	Space Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.10	21.1%	10%	35%	25	\$5,697
Existing	Dry Retail	Goods	Space Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.10	25.0%	10%	0%	25	\$5,697
Existing	Dry Retail	Goods	Space Heat	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.10	15.0%	35%	90%	25	\$24585
Existing	Dry Retail	Goods	Space Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.10	5.0%	35%	90%	25	\$4,255
Existing	Dry Retail	Goods	Space Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.10	3.0%	95%	54%	15	\$147
Existing	Dry Retail	Goods	Space Heat	Windows	U = 0.35	U = 0.55 (Code)	0.10	4.7%	80%	80%	25	\$42460
Existing	Dry Retail	Goods	Space Heat	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.10	3.1%	10%	80%	25	119878
Existing	Dry Retail	Goods	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.03	34.4%	NA	NA	13	\$3,626
Existing	Dry Retail	Goods	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.03	15.1%	5%	95%	10	\$8,704
Existing	Dry Retail	Goods	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.03	0.9%	5%	75%	10	\$303
Existing	Dry Retail	Goods	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.03	5.0%	75%	94%	15	\$13134
Existing	Dry Retail	Goods	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.03	0.6%	45%	25%	13	\$33
Existing	Dry Retail	Goods	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.03	0.8%	45%	55%	13	\$629
Existing	Dry Retail	Goods	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.03	20.0%	5%	92%	25	\$2,804
Existing	Dry Retail	Goods	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.03	4.0%	95%	25%	10	\$0

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Dry Retail	Goods	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.03	3.8%	95%	15%	10	\$0
Existing	Dry Retail	Goods	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.03	1.0%	75%	90%	15	\$501
Existing	Dry Retail	Goods	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.03	2.3%	10%	45%	5	\$5
Existing	Dry Retail	Goods	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.03	1.1%	15%	75%	10	\$5
Existing	Dry Retail	Goods	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.03	2.5%	15%	20%	10	\$9
Existing	Dry Retail	Goods	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.03	28.0%	75%	74%	16	\$43023
Existing	Dry Retail	Goods	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.03	55.6%	20%	95%	20	\$62587
Existing	Dry Retail	Goods	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.03	30.0%	25%	90%	14	\$2,265
Existing	Dry Retail	Goods	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.03	28.0%	25%	90%	20	\$695
Existing	Dry Retail	Goods	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.03	3.3%	95%	95%	10	\$208
Existing	Dry Retail	Goods	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.03	7.7%	75%	45%	11	\$539
New	Dry Retail	Goods	Space Heat	Gas Boiler - Greater than 300 kBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.04	5.9%	NA	NA	20	\$3,796
New	Dry Retail	Goods	Space Heat	Gas Boiler - Greater than 300 kBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.04	11.1%	NA	NA	20	\$7,744
New	Dry Retail	Goods	Space Heat	Boiler Economizer	Economizer	No Economizer	0.04	5.5%	40%	90%	20	\$15356
New	Dry Retail	Goods	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.04	12.5%	90%	40%	3	\$34513
New	Dry Retail	Goods	Space Heat	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.04	10.0%	75%	80%	5	\$25459
New	Dry Retail	Goods	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.04	2.5%	45%	45%	18	\$18911
New	Dry Retail	Goods	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.04	15.0%	5%	94%	10	\$42881
New	Dry Retail	Goods	Space Heat	Insulation (Ceiling)	R-38	R-21 (Code)	0.04	8.0%	75%	95%	25	\$24585

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	Dry Retail	Goods	Space Boiler	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.04	12.0%	75%	98%	25	\$32622
New	Dry Retail	Goods	Space Boiler	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.04	6.0%	95%	95%	25	\$5,262
New	Dry Retail	Goods	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.04	5.0%	35%	90%	25	\$4,255
New	Dry Retail	Goods	Space Boiler	Heat Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.04	5.0%	50%	95%	15	\$10865
New	Dry Retail	Goods	Space Boiler	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.04	10.0%	40%	98%	25	\$7,328
New	Dry Retail	Goods	Space Boiler	Heat Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.04	25.0%	50%	98%	10	\$99757
New	Dry Retail	Goods	Space Boiler	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.04	3.0%	95%	54%	15	\$147
New	Dry Retail	Goods	Space Boiler	Heat Windows	U = 0.35	U = 0.55 (Code)	0.04	4.7%	80%	80%	25	\$42460
New	Dry Retail	Goods	Space Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.06	11.1%	NA	NA	18	\$3,943
New	Dry Retail	Goods	Space Furnace	Heat Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.06	14.9%	NA	NA	18	\$3,943
New	Dry Retail	Goods	Space Furnace	Heat Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.06	12.5%	90%	80%	3	\$34513
New	Dry Retail	Goods	Space Furnace	Heat Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.06	2.5%	45%	45%	18	\$18911
New	Dry Retail	Goods	Space Furnace	Heat Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.06	15.0%	5%	94%	10	\$42881
New	Dry Retail	Goods	Space Furnace	Heat Insulation (Ceiling)	R-38	R-21 (Code)	0.06	8.0%	75%	95%	25	\$24585
New	Dry Retail	Goods	Space Furnace	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.06	12.0%	75%	98%	25	\$32622
New	Dry Retail	Goods	Space Furnace	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.06	6.0%	95%	95%	25	\$5,262
New	Dry Retail	Goods	Space Furnace	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.06	5.0%	35%	90%	25	\$4,255
New	Dry Retail	Goods	Space Furnace	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.06	10.0%	40%	98%	25	\$7,328
New	Dry Retail	Goods	Space Furnace	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.06	3.0%	95%	54%	15	\$147

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	Dry Retail	Goods	Space Heat	Windows	U = 0.35	U = 0.55 (Code)	0.06	4.7%	80%	80%	25	\$42460
New	Dry Retail	Goods	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.03	34.4%	NA	NA	13	\$3,626
New	Dry Retail	Goods	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.03	15.1%	5%	95%	10	\$8,704
New	Dry Retail	Goods	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.03	0.9%	5%	75%	10	\$303
New	Dry Retail	Goods	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.03	5.0%	90%	94%	15	\$13134
New	Dry Retail	Goods	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.03	0.6%	45%	25%	13	\$33
New	Dry Retail	Goods	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.03	0.8%	45%	55%	13	\$629
New	Dry Retail	Goods	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.03	20.0%	25%	92%	25	\$2,804
New	Dry Retail	Goods	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.03	4.0%	95%	25%	10	\$0
New	Dry Retail	Goods	Water Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.03	5.0%	50%	95%	15	\$10865
New	Dry Retail	Goods	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.03	2.3%	10%	45%	5	\$5
New	Dry Retail	Goods	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.03	1.1%	15%	75%	10	\$5
New	Dry Retail	Goods	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.03	28.0%	75%	74%	16	\$24112
New	Dry Retail	Goods	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.03	55.6%	20%	95%	20	\$62587
New	Dry Retail	Goods	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.03	30.0%	25%	90%	14	\$2,265
New	Dry Retail	Goods	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.03	28.0%	25%	90%	20	\$695
New	Dry Retail	Goods	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.03	3.3%	95%	95%	10	\$208
New	Dry Retail	Goods	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.03	7.7%	75%	45%	11	\$539
Existing	Grocery	Cooking		Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.20	1.9%	95%	75%	10	\$210

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.20	3.1%	45%	65%	8	\$1,112
Existing	Grocery	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.20	0.3%	45%	75%	12	\$1,223
Existing	Grocery	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.20	1.2%	85%	85%	12	\$420
Existing	Grocery	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.20	10.4%	5%	85%	10	\$3,541
Existing	Grocery	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.20	3.8%	25%	90%	12	\$5,358
Existing	Grocery	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.20	6.9%	25%	75%	10	\$2,181
Existing	Grocery	Space Heat Boiler	Gas Boiler - Greater than 300 kBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.24	5.9%	NA	NA	20	\$2,080
Existing	Grocery	Space Heat Boiler	Gas Boiler - Greater than 300 kBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.24	11.1%	NA	NA	20	\$4,242
Existing	Grocery	Space Heat Boiler	Boiler Economizer	Economizer	No Economizer	0.24	5.5%	40%	90%	20	\$8,413
Existing	Grocery	Space Heat Boiler	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.24	12.5%	90%	40%	3	\$4,142
Existing	Grocery	Space Heat Boiler	Direct Digital Control System-Installation	DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)	Pneumatic	0.24	5.0%	75%	61%	15	\$5,837
Existing	Grocery	Space Heat Boiler	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.24	10.0%	75%	80%	5	\$11,315
Existing	Grocery	Space Heat Boiler	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.24	15.0%	50%	80%	5	\$8,165
Existing	Grocery	Space Heat Boiler	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.24	2.5%	45%	45%	18	\$8,405
Existing	Grocery	Space Heat Boiler	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.24	15.0%	5%	94%	10	\$19,058
Existing	Grocery	Space Heat Boiler	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.24	4.5%	64%	85%	10	\$5,726
Existing	Grocery	Space Heat Boiler	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	0.24	10.0%	40%	10%	10	\$4,919
Existing	Grocery	Space Heat Boiler	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.24	7.2%	75%	10%	25	\$12,818
Existing	Grocery	Space Heat Boiler	Insulation (Ceiling)	R-21 (Code)	R-0	0.24	20.0%	75%	0%	25	\$12,818
Existing	Grocery	Space Heat Boiler	Insulation (Ceiling)	R-38	R-21 (Code)	0.24	8.0%	75%	45%	25	\$10,927

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Space Boiler	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.24	12.0%	75%	85%	25	\$14499
Existing	Grocery	Space Boiler	Heat Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.24	4.4%	10%	15%	25	\$2,349
Existing	Grocery	Space Boiler	Heat Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.24	2.4%	10%	15%	25	\$2,448
Existing	Grocery	Space Boiler	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.24	6.0%	10%	95%	25	\$3,507
Existing	Grocery	Space Boiler	Heat Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.24	21.1%	10%	35%	25	\$3,799
Existing	Grocery	Space Boiler	Heat Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.24	25.0%	10%	0%	25	\$3,799
Existing	Grocery	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.24	15.0%	35%	45%	25	\$10927
Existing	Grocery	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.24	5.0%	35%	45%	25	\$1,891
Existing	Grocery	Space Boiler	Heat Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.24	25.0%	25%	98%	10	\$44336
Existing	Grocery	Space Boiler	Heat Steam Pipe Insulation	R-4	R-0	0.24	12.1%	75%	65%	20	\$2,152
Existing	Grocery	Space Boiler	Heat Steam Trap Maintenance	Actively stop steam trap leaks	No Maintenance	0.24	17.0%	90%	45%	3	\$2,837
Existing	Grocery	Space Boiler	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.24	3.0%	95%	46%	15	\$145
Existing	Grocery	Space Boiler	Heat Windows	U = 0.35	U = 0.55 (Code)	0.24	3.7%	80%	85%	25	\$13402
Existing	Grocery	Space Boiler	Heat Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.24	2.4%	10%	85%	25	\$37841
Existing	Grocery	Space Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.35	11.1%	NA	NA	18	\$2,160
Existing	Grocery	Space Furnace	Heat Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.35	14.9%	NA	NA	18	\$2,160
Existing	Grocery	Space Furnace	Heat Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.35	12.5%	90%	80%	3	\$4,142
Existing	Grocery	Space Furnace	Heat Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.35	2.5%	45%	45%	18	\$8,405
Existing	Grocery	Space Furnace	Heat Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.35	15.0%	5%	94%	10	\$19058

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Space Heat Furnace	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.35	4.5%	64%	85%	10	\$5,726
Existing	Grocery	Space Heat Furnace	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	0.35	10.0%	40%	10%	10	\$4,919
Existing	Grocery	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.35	7.2%	75%	10%	25	\$12818
Existing	Grocery	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	R-0	0.35	20.0%	75%	0%	25	\$12818
Existing	Grocery	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.35	8.0%	75%	45%	25	\$10927
Existing	Grocery	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.35	12.0%	75%	85%	25	\$14499
Existing	Grocery	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.35	4.4%	10%	15%	25	\$2,349
Existing	Grocery	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.35	2.4%	10%	15%	25	\$2,448
Existing	Grocery	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.35	6.0%	10%	95%	25	\$3,507
Existing	Grocery	Space Heat Furnace	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.35	21.1%	10%	35%	25	\$3,799
Existing	Grocery	Space Heat Furnace	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.35	25.0%	10%	0%	25	\$3,799
Existing	Grocery	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.35	15.0%	35%	45%	25	\$10927
Existing	Grocery	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.35	5.0%	35%	45%	25	\$1,891
Existing	Grocery	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.35	3.0%	95%	46%	15	\$145
Existing	Grocery	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.35	3.7%	80%	85%	25	\$13402
Existing	Grocery	Space Heat Furnace	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.35	2.4%	10%	85%	25	\$37841
Existing	Grocery	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.12	34.4%	NA	NA	13	\$3,625
Existing	Grocery	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.12	15.1%	5%	95%	10	\$8,705
Existing	Grocery	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.12	0.5%	5%	75%	10	\$305

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Grocery	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.12	5.0%	75%	94%	15	\$5,837
Existing	Grocery	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.12	3.0%	75%	80%	13	\$2,700
Existing	Grocery	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.12	6.0%	75%	95%	10	\$841
Existing	Grocery	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.12	0.3%	45%	25%	13	\$32
Existing	Grocery	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.12	0.4%	45%	55%	13	\$630
Existing	Grocery	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.12	20.0%	5%	92%	25	\$2,801
Existing	Grocery	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.12	4.0%	95%	25%	10	\$0
Existing	Grocery	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.12	3.8%	95%	15%	10	\$2
Existing	Grocery	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.12	1.0%	75%	90%	15	\$223
Existing	Grocery	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.12	2.3%	95%	40%	5	\$6
Existing	Grocery	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.12	1.1%	15%	75%	10	\$6
Existing	Grocery	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.12	2.5%	15%	20%	10	\$11
Existing	Grocery	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.12	28.0%	75%	55%	16	\$19121
Existing	Grocery	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.12	38.6%	20%	95%	20	\$20678
Existing	Grocery	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.12	30.0%	25%	90%	14	\$2,265
Existing	Grocery	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.12	28.0%	25%	90%	20	\$696
Existing	Grocery	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.12	3.3%	95%	95%	10	\$206
Existing	Grocery	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.12	7.7%	75%	50%	11	\$538
New	Grocery	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.20	1.9%	95%	75%	10	\$210
New	Grocery	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.20	3.1%	45%	65%	8	\$1,112
New	Grocery	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.20	0.3%	45%	75%	12	\$1,223
New	Grocery	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.20	1.2%	85%	85%	12	\$420
New	Grocery	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.20	10.4%	5%	85%	10	\$2,832
New	Grocery	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.20	3.8%	25%	90%	12	\$5,358
New	Grocery	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.20	6.9%	25%	75%	10	\$2,181

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Grocery	Space Boiler	Heat Gas Boiler - Greater than 300 KBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.05	5.9%	NA	NA	20	\$2,080
New	Grocery	Space Boiler	Heat Gas Boiler - Greater than 300 KBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.05	11.1%	NA	NA	20	\$4,242
New	Grocery	Space Boiler	Heat Boiler Economizer	Economizer	No Economizer	0.05	5.5%	40%	90%	20	\$8,413
New	Grocery	Space Boiler	Heat Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.05	12.5%	90%	40%	3	\$15339
New	Grocery	Space Boiler	Heat Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.05	10.0%	75%	80%	5	\$11315
New	Grocery	Space Boiler	Heat Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.05	2.5%	45%	45%	18	\$8,405
New	Grocery	Space Boiler	Heat Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.05	15.0%	5%	94%	10	\$19058
New	Grocery	Space Boiler	Heat Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.05	4.5%	64%	85%	10	\$5,726
New	Grocery	Space Boiler	Heat Insulation (Ceiling)	R-38	R-21 (Code)	0.05	8.0%	75%	45%	25	\$10927
New	Grocery	Space Boiler	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.05	12.0%	75%	85%	25	\$14499
New	Grocery	Space Boiler	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.05	6.0%	95%	95%	25	\$3,507
New	Grocery	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.05	5.0%	35%	45%	25	\$1,891
New	Grocery	Space Boiler	Heat Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.05	5.0%	50%	95%	15	\$5,953
New	Grocery	Space Boiler	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.05	10.0%	40%	98%	25	\$3,257
New	Grocery	Space Boiler	Heat Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.05	25.0%	50%	98%	10	\$44336
New	Grocery	Space Boiler	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.05	3.0%	95%	46%	15	\$145
New	Grocery	Space Boiler	Heat Windows	U = 0.35	U = 0.55 (Code)	0.05	3.7%	80%	85%	25	\$13402
New	Grocery	Space Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.08	11.1%	NA	NA	18	\$2,160
New	Grocery	Space Furnace	Heat Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.08	14.9%	NA	NA	18	\$2,160

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Grocery	Space Heat Furnace	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.08	12.5%	90%	80%	3	\$15339
New	Grocery	Space Heat Furnace	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.08	2.5%	45%	45%	18	\$8,405
New	Grocery	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.08	15.0%	5%	94%	10	\$19058
New	Grocery	Space Heat Furnace	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.08	4.5%	64%	85%	10	\$5,726
New	Grocery	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.08	8.0%	75%	45%	25	\$10927
New	Grocery	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.08	12.0%	75%	85%	25	\$14499
New	Grocery	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.08	6.0%	95%	95%	25	\$3,507
New	Grocery	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.08	5.0%	35%	45%	25	\$1,891
New	Grocery	Space Heat Furnace	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.08	10.0%	40%	98%	25	\$3,257
New	Grocery	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.08	3.0%	95%	46%	15	\$145
New	Grocery	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.08	3.7%	80%	85%	25	\$13402
New	Grocery	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.13	34.4%	NA	NA	13	\$3,625
New	Grocery	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.12	15.1%	5%	95%	10	\$8,705
New	Grocery	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.12	0.4%	5%	75%	10	\$305
New	Grocery	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.12	5.0%	90%	94%	15	\$5,837
New	Grocery	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.12	3.0%	75%	80%	13	\$2,700
New	Grocery	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.12	6.0%	75%	95%	10	\$841
New	Grocery	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.12	0.3%	45%	25%	13	\$32
New	Grocery	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.12	0.4%	45%	55%	13	\$630
New	Grocery	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.12	20.0%	25%	92%	25	\$2,801

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Grocery	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.12	4.0%	95%	25%	10	\$0
New	Grocery	Water Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.12	5.0%	50%	95%	15	\$5,953
New	Grocery	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.12	2.3%	95%	40%	5	\$6
New	Grocery	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.12	1.1%	15%	75%	10	\$6
New	Grocery	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.12	28.0%	75%	55%	16	\$10716
New	Grocery	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.12	38.6%	20%	95%	20	\$20678
New	Grocery	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.12	30.0%	25%	90%	14	\$2,265
New	Grocery	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.12	28.0%	25%	90%	20	\$696
New	Grocery	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.12	3.3%	95%	95%	10	\$206
New	Grocery	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.12	7.7%	75%	50%	11	\$538
Existing	Hospital	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.04	1.9%	95%	75%	10	\$210
Existing	Hospital	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.04	3.1%	45%	65%	8	\$1,112
Existing	Hospital	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.04	0.3%	45%	75%	12	\$1,223
Existing	Hospital	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.04	1.2%	85%	55%	12	\$420
Existing	Hospital	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.04	10.4%	5%	85%	10	\$3,541
Existing	Hospital	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.04	3.8%	25%	90%	12	\$5,358
Existing	Hospital	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.04	6.9%	25%	75%	10	\$2,181
Existing	Hospital	Space Heat	Gas Boiler - Greater than 300 KBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.32	5.9%	NA	NA	20	\$4,453
Existing	Hospital	Space Heat	Gas Boiler - Greater than 300 KBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.32	11.1%	NA	NA	20	\$9,084
Existing	Hospital	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.33	10.0%	5%	94%	15	\$13238
Existing	Hospital	Space Heat	Boiler Economizer	Economizer	No Economizer	0.33	5.5%	40%	90%	20	\$18008
Existing	Hospital	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.33	12.5%	90%	40%	3	\$4,142
Existing	Hospital	Space Heat	Direct Digital Control System-Installation	DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)	Pneumatic	0.33	5.0%	35%	26%	15	\$5,837

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Hospital	Space Boiler	Heat	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.33	10.0%	75%	80%	5	\$11315
Existing	Hospital	Space Boiler	Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pnuematic	0.33	15.0%	75%	80%	5	\$8,165
Existing	Hospital	Space Boiler	Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.33	2.5%	45%	45%	18	\$8,405
Existing	Hospital	Space Boiler	Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.33	15.0%	5%	94%	10	\$19058
Existing	Hospital	Space Boiler	Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.33	4.5%	62%	85%	10	\$5,726
Existing	Hospital	Space Boiler	Heat	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.33	3.6%	75%	13%	25	\$6,409
Existing	Hospital	Space Boiler	Heat	Insulation (Ceiling)	R-21 (Code)	R-0	0.33	10.0%	75%	0%	25	\$6,409
Existing	Hospital	Space Boiler	Heat	Insulation (Ceiling)	R-38	R-21 (Code)	0.33	4.0%	75%	45%	25	\$5,463
Existing	Hospital	Space Boiler	Heat	Insulation (Ceiling)	R-49	R-21 (Code)	0.33	6.0%	75%	85%	25	\$7,249
Existing	Hospital	Space Boiler	Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.33	4.4%	10%	15%	25	\$2,349
Existing	Hospital	Space Boiler	Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.33	2.4%	10%	15%	25	\$2,448
Existing	Hospital	Space Boiler	Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.33	6.0%	10%	95%	25	\$4,959
Existing	Hospital	Space Boiler	Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.33	21.1%	10%	35%	25	\$5,371
Existing	Hospital	Space Boiler	Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.33	25.0%	10%	0%	25	\$5,371
Existing	Hospital	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.33	7.5%	35%	35%	25	\$5,463
Existing	Hospital	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.33	2.5%	35%	35%	25	\$946
Existing	Hospital	Space Boiler	Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.33	25.0%	25%	98%	10	\$44336
Existing	Hospital	Space Boiler	Heat	Steam Pipe Insulation	R-4	R-0	0.33	12.1%	75%	65%	20	\$2,152
Existing	Hospital	Space Boiler	Heat	Steam Trap Maintenance	Actively stop steam trap leaks	No Maintenance	0.33	17.0%	90%	45%	3	\$2,837

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Hospital	Space Boiler	Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.33	3.0%	95%	71%	15	\$145
Existing	Hospital	Space Boiler	Heat	Windows	U = 0.35	U = 0.55 (Code)	0.33	6.2%	80%	60%	25	\$17468
Existing	Hospital	Space Boiler	Heat	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.33	4.1%	10%	60%	25	\$49321
Existing	Hospital	Space Furnace	Heat	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.48	11.1%	NA	NA	18	\$4,623
Existing	Hospital	Space Furnace	Heat	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.48	14.9%	NA	NA	18	\$4,623
Existing	Hospital	Space Furnace	Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.48	10.0%	5%	94%	15	\$13238
Existing	Hospital	Space Furnace	Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.48	12.5%	90%	80%	3	\$4,142
Existing	Hospital	Space Furnace	Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.48	2.5%	45%	45%	18	\$8,405
Existing	Hospital	Space Furnace	Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.48	15.0%	5%	94%	10	\$19058
Existing	Hospital	Space Furnace	Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Hood Pulls Conditioned Air (No Make-up Air)	Hood Pulls Conditioned Air (No Make-up Air)	0.48	4.5%	62%	85%	10	\$5,726
Existing	Hospital	Space Furnace	Heat	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.48	3.6%	75%	13%	25	\$6,409
Existing	Hospital	Space Furnace	Heat	Insulation (Ceiling)	R-21 (Code)	R-0	0.48	10.0%	75%	0%	25	\$6,409
Existing	Hospital	Space Furnace	Heat	Insulation (Ceiling)	R-38	R-21 (Code)	0.48	4.0%	75%	45%	25	\$5,463
Existing	Hospital	Space Furnace	Heat	Insulation (Ceiling)	R-49	R-21 (Code)	0.48	6.0%	75%	85%	25	\$7,249
Existing	Hospital	Space Furnace	Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.48	4.4%	10%	15%	25	\$2,349
Existing	Hospital	Space Furnace	Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.48	2.4%	10%	15%	25	\$2,448
Existing	Hospital	Space Furnace	Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.48	6.0%	10%	95%	25	\$4,959
Existing	Hospital	Space Furnace	Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.48	21.1%	10%	35%	25	\$5,371
Existing	Hospital	Space Furnace	Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.48	25.0%	10%	0%	25	\$5,371

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline	Savings	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
						therm (UEC or EU)	as Percent of End Use				
Existing	Hospital	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.48	7.5%	35%	35%	25	\$5,463
Existing	Hospital	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.48	2.5%	35%	35%	25	\$946
Existing	Hospital	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.48	3.0%	95%	71%	15	\$145
Existing	Hospital	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.48	6.2%	80%	60%	25	\$17468
Existing	Hospital	Space Heat Furnace	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.48	4.1%	10%	60%	25	\$49321
Existing	Hospital	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.40	34.4%	NA	NA	13	\$12324
Existing	Hospital	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.41	15.1%	15%	95%	10	\$8,705
Existing	Hospital	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.41	0.3%	15%	75%	10	\$305
Existing	Hospital	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.41	5.0%	55%	94%	15	\$5,837
Existing	Hospital	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.41	3.0%	25%	80%	13	\$2,700
Existing	Hospital	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.41	6.0%	25%	95%	10	\$841
Existing	Hospital	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.41	0.1%	20%	25%	13	\$32
Existing	Hospital	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.41	0.1%	20%	55%	13	\$630
Existing	Hospital	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.41	20.0%	5%	92%	25	\$9,525
Existing	Hospital	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.41	4.0%	95%	25%	10	\$0
Existing	Hospital	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.41	3.8%	95%	15%	10	\$2
Existing	Hospital	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.41	1.0%	75%	70%	15	\$223
Existing	Hospital	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.41	2.3%	50%	45%	5	\$6
Existing	Hospital	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.41	2.6%	35%	75%	10	\$6
Existing	Hospital	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.41	5.8%	35%	20%	10	\$11
Existing	Hospital	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.41	28.0%	75%	50%	16	\$19121
Existing	Hospital	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.41	66.6%	20%	95%	20	120656
Existing	Hospital	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.41	30.0%	10%	90%	14	\$2,267

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hospital	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.41	28.0%	10%	90%	20	\$696
Existing	Hospital	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.41	3.3%	95%	90%	10	\$206
Existing	Hospital	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.41	7.7%	75%	80%	11	\$1,828
New	Hospital	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.04	1.9%	95%	75%	10	\$210
New	Hospital	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.04	3.1%	45%	65%	8	\$1,112
New	Hospital	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.04	0.3%	45%	75%	12	\$1,223
New	Hospital	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.04	1.2%	85%	55%	12	\$420
New	Hospital	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.04	10.4%	5%	85%	10	\$2,832
New	Hospital	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.04	3.8%	25%	90%	12	\$5,358
New	Hospital	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.04	6.9%	25%	75%	10	\$2,181
New	Hospital	Space Heat	Gas Boiler - Greater than 300 KBTUH Boiler	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.32	5.9%	NA	NA	20	\$4,453
New	Hospital	Space Heat	Gas Boiler - Greater than 300 KBTUH Boiler	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.32	11.1%	NA	NA	20	\$9,084
New	Hospital	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.32	10.0%	5%	94%	15	\$13238
New	Hospital	Space Heat	Boiler Economizer	Economizer	No Economizer	0.32	5.5%	40%	90%	20	\$18008
New	Hospital	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.32	12.5%	90%	40%	3	\$15339
New	Hospital	Space Heat	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.32	10.0%	75%	80%	5	\$11315
New	Hospital	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.32	2.5%	45%	45%	18	\$8,405
New	Hospital	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.32	15.0%	5%	94%	10	\$19058
New	Hospital	Space Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.32	4.5%	62%	85%	10	\$5,726
New	Hospital	Space Heat	Insulation (Ceiling)	R-38	R-21 (Code)	0.32	4.0%	75%	45%	25	\$5,463
New	Hospital	Space Heat	Insulation (Ceiling)	R-49	R-21 (Code)	0.32	6.0%	75%	85%	25	\$7,249

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hospital	Space Boiler	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.32	6.0%	95%	95%	25	\$4,959
New	Hospital	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.32	2.5%	35%	35%	25	\$946
New	Hospital	Space Boiler	Heat Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.32	5.0%	50%	95%	15	\$12742
New	Hospital	Space Boiler	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.32	10.0%	40%	98%	25	\$3,257
New	Hospital	Space Boiler	Heat Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.32	25.0%	50%	98%	10	\$44336
New	Hospital	Space Boiler	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.32	3.0%	95%	71%	15	\$145
New	Hospital	Space Boiler	Heat Windows	U = 0.35	U = 0.55 (Code)	0.32	6.2%	80%	60%	25	\$17468
New	Hospital	Space Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.47	11.1%	NA	NA	18	\$4,623
New	Hospital	Space Furnace	Heat Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.47	14.9%	NA	NA	18	\$4,623
New	Hospital	Space Furnace	Heat Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.47	10.0%	5%	94%	15	\$13238
New	Hospital	Space Furnace	Heat Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.47	12.5%	90%	80%	3	\$15339
New	Hospital	Space Furnace	Heat Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.47	2.5%	45%	45%	18	\$8,405
New	Hospital	Space Furnace	Heat Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.47	15.0%	5%	94%	10	\$19058
New	Hospital	Space Furnace	Heat Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.47	4.5%	62%	85%	10	\$5,726
New	Hospital	Space Furnace	Heat Insulation (Ceiling)	R-38	R-21 (Code)	0.47	4.0%	75%	45%	25	\$5,463
New	Hospital	Space Furnace	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.47	6.0%	75%	85%	25	\$7,249
New	Hospital	Space Furnace	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.47	6.0%	95%	95%	25	\$4,959
New	Hospital	Space Furnace	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.47	2.5%	35%	35%	25	\$946
New	Hospital	Space Furnace	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.47	10.0%	40%	98%	25	\$3,257

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hospital	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.47	3.0%	95%	71%	15	\$145
New	Hospital	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.47	6.2%	80%	60%	25	\$17468
New	Hospital	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.43	34.4%	NA	NA	13	\$12324
New	Hospital	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.41	15.1%	15%	95%	10	\$8,705
New	Hospital	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.41	0.3%	15%	75%	10	\$305
New	Hospital	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.41	5.0%	55%	94%	15	\$5,837
New	Hospital	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.41	3.0%	25%	80%	13	\$2,700
New	Hospital	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.41	6.0%	25%	95%	10	\$841
New	Hospital	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.41	0.1%	20%	25%	13	\$32
New	Hospital	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.41	0.1%	20%	55%	13	\$630
New	Hospital	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.41	20.0%	25%	92%	25	\$9,525
New	Hospital	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.41	4.0%	95%	25%	10	\$0
New	Hospital	Water Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.41	5.0%	50%	95%	15	\$12742
New	Hospital	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.41	2.3%	50%	45%	5	\$6
New	Hospital	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.41	2.6%	35%	75%	10	\$6
New	Hospital	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.41	28.0%	75%	50%	16	\$10716
New	Hospital	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.41	66.6%	20%	95%	20	120656
New	Hospital	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.41	30.0%	10%	90%	14	\$2,267
New	Hospital	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.41	28.0%	10%	90%	20	\$696
New	Hospital	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.41	3.3%	95%	90%	10	\$206
New	Hospital	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replecement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.41	7.7%	75%	80%	11	\$1,828
Existing	Hotel Motel	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.08	1.9%	95%	75%	10	\$210
Existing	Hotel Motel	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.08	3.1%	35%	65%	8	\$1,112

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hotel Motel	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.08	0.3%	45%	75%	12	\$1,225
Existing	Hotel Motel	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.08	1.2%	85%	55%	12	\$421
Existing	Hotel Motel	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.08	10.4%	5%	85%	10	\$3,541
Existing	Hotel Motel	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.08	3.8%	15%	90%	12	\$5,358
Existing	Hotel Motel	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.08	6.9%	25%	75%	10	\$2,180
Existing	Hotel Motel	Pool Heat	Solar RE - Installation of Solar Pool/Spa Heating Systems	Solar Pool/Spa Heating Systems	No Solar Pool Heating System	0.11	10.1%	30%	90%	12	\$16506
Existing	Hotel Motel	Pool Heat	Swimming Pool/Spa Covers	Plastic Or Foam Pool Covers (50-65% Energy Savings)	No Pool Covers	0.11	50.0%	95%	35%	10	\$2,237
Existing	Hotel Motel	Space Heat Boiler	Gas Boiler - Less than 300 kBTHU	AFUE=85%	AFUE=80%	0.17	5.9%	NA	NA	20	\$3,421
Existing	Hotel Motel	Space Heat Boiler	Gas Boiler - Less than 300 kBTHU	AFUE=90%	AFUE=80%	0.17	11.1%	NA	NA	20	\$6,842
Existing	Hotel Motel	Space Heat Boiler	Automated Ventilation Sensors / CO2 Sensors	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.17	2.0%	50%	94%	15	\$3,120
Existing	Hotel Motel	Space Heat Boiler	Boiler Economizer	Economizer	No Economizer	0.17	5.5%	40%	30%	20	\$3,338
Existing	Hotel Motel	Space Heat Boiler	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.17	12.5%	90%	40%	3	\$4,556
Existing	Hotel Motel	Space Heat Boiler	Direct Digital Control System-Installation	DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)	Pneumatic	0.17	5.0%	5%	52%	15	\$6,421
Existing	Hotel Motel	Space Heat Boiler	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.17	10.0%	75%	80%	5	\$12447
Existing	Hotel Motel	Space Heat Boiler	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.17	15.0%	50%	80%	5	\$8,982
Existing	Hotel Motel	Space Heat Boiler	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.17	2.5%	45%	45%	18	\$9,246
Existing	Hotel Motel	Space Heat Boiler	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.17	15.0%	5%	94%	10	\$20964
Existing	Hotel Motel	Space Heat Boiler	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.17	4.5%	58%	85%	10	\$5,725
Existing	Hotel Motel	Space Heat Boiler	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.17	3.6%	75%	25%	25	\$7,050
Existing	Hotel Motel	Space Heat Boiler	Insulation (Ceiling)	R-21 (Code)	R-0	0.17	10.0%	75%	0%	25	\$7,050
Existing	Hotel Motel	Space Heat Boiler	Insulation (Ceiling)	R-38	R-21 (Code)	0.17	4.0%	75%	45%	25	\$6,010

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Hotel Motel	Space Boiler	Heat	Insulation (Ceiling)	R-49	R-21 (Code)	0.17	6.0%	75%	85%	25	\$7,974
Existing	Hotel Motel	Space Boiler	Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.17	4.4%	10%	15%	25	\$2,584
Existing	Hotel Motel	Space Boiler	Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.17	2.4%	10%	15%	25	\$2,693
Existing	Hotel Motel	Space Boiler	Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.17	6.0%	10%	95%	25	\$5,201
Existing	Hotel Motel	Space Boiler	Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.17	21.1%	10%	35%	25	\$5,633
Existing	Hotel Motel	Space Boiler	Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.17	25.0%	10%	0%	25	\$5,633
Existing	Hotel Motel	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.17	7.5%	35%	45%	25	\$6,010
Existing	Hotel Motel	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.17	2.5%	35%	45%	25	\$1,040
Existing	Hotel Motel	Space Boiler	Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.17	25.0%	25%	98%	10	\$48770
Existing	Hotel Motel	Space Boiler	Heat	Steam Pipe Insulation	R-4	R-0	0.17	12.1%	75%	65%	20	\$2,258
Existing	Hotel Motel	Space Boiler	Heat	Steam Trap Maintenance	Actively stop steam trap leaks	No Maintenance	0.17	17.0%	90%	45%	3	\$3,120
Existing	Hotel Motel	Space Boiler	Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.17	3.0%	95%	78%	15	\$146
Existing	Hotel Motel	Space Boiler	Heat	Windows	U = 0.35	U = 0.55 (Code)	0.17	8.3%	80%	50%	25	\$39564
Existing	Hotel Motel	Space Boiler	Heat	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.17	5.5%	10%	50%	25	111702
Existing	Hotel Motel	Space Furnace	Heat	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.25	11.1%	NA	NA	18	\$2,570
Existing	Hotel Motel	Space Furnace	Heat	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.25	14.9%	NA	NA	18	\$2,570
Existing	Hotel Motel	Space Furnace	Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.25	2.0%	50%	94%	15	\$3,120
Existing	Hotel Motel	Space Furnace	Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.25	12.5%	90%	80%	3	\$4,556
Existing	Hotel Motel	Space Furnace	Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.25	2.5%	45%	45%	18	\$9,246

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hotel Motel	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.25	15.0%	5%	94%	10	\$20964
Existing	Hotel Motel	Space Heat Furnace	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.25	4.5%	58%	85%	10	\$5,725
Existing	Hotel Motel	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.25	3.6%	75%	25%	25	\$7,050
Existing	Hotel Motel	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	R-0	0.25	10.0%	75%	0%	25	\$7,050
Existing	Hotel Motel	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.25	4.0%	75%	45%	25	\$6,010
Existing	Hotel Motel	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.25	6.0%	75%	85%	25	\$7,974
Existing	Hotel Motel	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.25	4.4%	10%	15%	25	\$2,584
Existing	Hotel Motel	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.25	2.4%	10%	15%	25	\$2,693
Existing	Hotel Motel	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.25	6.0%	10%	95%	25	\$5,201
Existing	Hotel Motel	Space Heat Furnace	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.25	21.1%	10%	35%	25	\$5,633
Existing	Hotel Motel	Space Heat Furnace	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.25	25.0%	10%	0%	25	\$5,633
Existing	Hotel Motel	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.25	7.5%	35%	45%	25	\$6,010
Existing	Hotel Motel	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.25	2.5%	35%	45%	25	\$1,040
Existing	Hotel Motel	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.25	3.0%	95%	78%	15	\$146
Existing	Hotel Motel	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.25	8.3%	80%	50%	25	\$39564
Existing	Hotel Motel	Space Heat Furnace	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.25	5.5%	10%	50%	25	111702
Existing	Hotel Motel	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.30	34.4%	NA	NA	13	\$12324
Existing	Hotel Motel	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.31	15.1%	35%	95%	10	\$8,705
Existing	Hotel Motel	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.31	0.4%	35%	75%	10	\$305

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Hotel Motel	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.31	5.0%	55%	80%	15	\$6,421
Existing	Hotel Motel	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.31	3.0%	45%	80%	13	\$2,700
Existing	Hotel Motel	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.31	6.0%	45%	95%	10	\$841
Existing	Hotel Motel	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.31	0.1%	45%	25%	13	\$32
Existing	Hotel Motel	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.31	0.1%	45%	55%	13	\$631
Existing	Hotel Motel	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.31	20.0%	5%	92%	25	\$9,525
Existing	Hotel Motel	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.31	4.0%	95%	25%	10	\$0
Existing	Hotel Motel	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.31	3.8%	95%	15%	10	\$2
Existing	Hotel Motel	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.31	1.0%	75%	90%	15	\$245
Existing	Hotel Motel	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.31	2.3%	85%	50%	5	\$5
Existing	Hotel Motel	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.31	7.5%	100%	75%	10	\$7
Existing	Hotel Motel	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.31	16.7%	100%	20%	10	\$12
Existing	Hotel Motel	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.31	28.0%	75%	35%	16	\$21034
Existing	Hotel Motel	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.31	56.1%	20%	95%	20	153827
Existing	Hotel Motel	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.31	30.0%	10%	90%	14	\$2,265
Existing	Hotel Motel	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.31	28.0%	10%	90%	20	\$696
Existing	Hotel Motel	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.31	3.3%	95%	85%	10	\$206
Existing	Hotel Motel	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.31	7.7%	75%	5%	11	\$1,828
New	Hotel Motel	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.08	1.9%	95%	75%	10	\$210
New	Hotel Motel	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.08	3.1%	35%	65%	8	\$1,112
New	Hotel Motel	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.08	0.3%	45%	75%	12	\$1,225
New	Hotel Motel	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.08	1.2%	85%	55%	12	\$421
New	Hotel Motel	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.08	10.4%	5%	85%	10	\$2,834
New	Hotel Motel	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.08	3.8%	15%	90%	12	\$5,358
New	Hotel Motel	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.08	6.9%	25%	75%	10	\$2,180

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hotel Motel	Pool Heat	Solar RE - Installation of Solar Pool/Spa Heating Systems	Solar Pool/Spa Heating Systems	No Solar Pool Heating System	0.06	10.1%	30%	90%	12	\$16506
New	Hotel Motel	Pool Heat	Swimming Pool/Spa Covers	Plastic Or Foam Pool Covers (50-65% Energy Savings)	No Pool Covers	0.06	50.0%	95%	35%	10	\$2,237
New	Hotel Motel	Space Boiler	Heat Gas Boiler - Less than 300 kBТУH	AFUE=85%	AFUE=80%	0.12	5.9%	NA	NA	20	\$3,421
New	Hotel Motel	Space Boiler	Heat Gas Boiler - Less than 300 kBТУH	AFUE=90%	AFUE=80%	0.12	11.1%	NA	NA	20	\$6,842
New	Hotel Motel	Space Boiler	Heat Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.12	2.0%	50%	94%	15	\$3,120
New	Hotel Motel	Space Boiler	Heat Boiler Economizer	Economizer	No Economizer	0.12	5.5%	40%	30%	20	\$3,338
New	Hotel Motel	Space Boiler	Heat Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.12	12.5%	90%	40%	3	\$16873
New	Hotel Motel	Space Boiler	Heat Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.12	10.0%	75%	80%	5	\$12447
New	Hotel Motel	Space Boiler	Heat Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.12	2.5%	45%	45%	18	\$9,246
New	Hotel Motel	Space Boiler	Heat Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.12	15.0%	5%	94%	10	\$20964
New	Hotel Motel	Space Boiler	Heat Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.12	4.5%	58%	85%	10	\$5,725
New	Hotel Motel	Space Boiler	Heat Insulation (Ceiling)	R-38	R-21 (Code)	0.12	4.0%	75%	45%	25	\$6,010
New	Hotel Motel	Space Boiler	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.12	6.0%	75%	85%	25	\$7,974
New	Hotel Motel	Space Boiler	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.12	6.0%	95%	95%	25	\$5,201
New	Hotel Motel	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.12	2.5%	35%	45%	25	\$1,040
New	Hotel Motel	Space Boiler	Heat Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.12	5.0%	50%	95%	15	\$2,362
New	Hotel Motel	Space Boiler	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.12	10.0%	40%	98%	25	\$3,583
New	Hotel Motel	Space Boiler	Heat Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.12	25.0%	50%	98%	10	\$48770
New	Hotel Motel	Space Boiler	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.12	3.0%	95%	78%	15	\$146

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hotel Motel	Space Heat Boiler	Windows	U = 0.35	U = 0.55 (Code)	0.12	8.3%	80%	50%	25	\$39564
New	Hotel Motel	Space Heat Furnace	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.18	11.1%	NA	NA	18	\$2,570
New	Hotel Motel	Space Heat Furnace	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.18	14.9%	NA	NA	18	\$2,570
New	Hotel Motel	Space Heat Furnace	Automated Ventilation Sensors / CO2 Sensors	VFD Control (Occupancy Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.18	2.0%	50%	94%	15	\$3,120
New	Hotel Motel	Space Heat Furnace	Commissioning - New Building	Commissioning	No Commissioning	0.18	12.5%	90%	80%	3	\$16873
New	Hotel Motel	Space Heat Furnace	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.18	2.5%	45%	45%	18	\$9,246
New	Hotel Motel	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.18	15.0%	5%	94%	10	\$20964
New	Hotel Motel	Space Heat Furnace	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.18	4.5%	58%	85%	10	\$5,725
New	Hotel Motel	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.18	4.0%	75%	45%	25	\$6,010
New	Hotel Motel	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.18	6.0%	75%	85%	25	\$7,974
New	Hotel Motel	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.18	6.0%	95%	95%	25	\$5,201
New	Hotel Motel	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.18	2.5%	35%	45%	25	\$1,040
New	Hotel Motel	Space Heat Furnace	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.18	10.0%	40%	98%	25	\$3,583
New	Hotel Motel	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.18	3.0%	95%	78%	15	\$146
New	Hotel Motel	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.18	8.3%	80%	50%	25	\$39564
New	Hotel Motel	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.33	34.4%	NA	NA	13	\$12324
New	Hotel Motel	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.31	15.1%	35%	95%	10	\$8,705
New	Hotel Motel	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.31	0.4%	35%	75%	10	\$305
New	Hotel Motel	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.31	5.0%	55%	80%	15	\$6,421
New	Hotel Motel	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.31	3.0%	45%	80%	13	\$2,700

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Hotel Motel	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.31	6.0%	45%	95%	10	\$841
New	Hotel Motel	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.31	0.1%	45%	25%	13	\$32
New	Hotel Motel	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.31	0.1%	45%	55%	13	\$631
New	Hotel Motel	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.31	20.0%	25%	92%	25	\$9,525
New	Hotel Motel	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.31	4.0%	95%	25%	10	\$0
New	Hotel Motel	Water Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.31	5.0%	50%	95%	15	\$2,362
New	Hotel Motel	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.31	2.3%	85%	50%	5	\$5
New	Hotel Motel	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.31	7.5%	100%	75%	10	\$7
New	Hotel Motel	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.31	28.0%	75%	35%	16	\$11788
New	Hotel Motel	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.31	56.1%	20%	95%	20	153827
New	Hotel Motel	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.31	30.0%	10%	90%	14	\$2,265
New	Hotel Motel	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.31	28.0%	10%	90%	20	\$696
New	Hotel Motel	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.31	3.3%	95%	85%	10	\$206
New	Hotel Motel	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replecement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.31	7.7%	75%	5%	11	\$1,828
Existing	Office	Space Heat Boiler	Gas Boiler - Greater than 300 KBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.23	5.9%	NA	NA	20	\$10979
Existing	Office	Space Heat Boiler	Gas Boiler - Greater than 300 KBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.23	11.1%	NA	NA	20	\$22399
Existing	Office	Space Heat Boiler	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.23	10.0%	75%	94%	15	\$33095
Existing	Office	Space Heat Boiler	Boiler Economizer	Economizer	No Economizer	0.23	5.5%	40%	45%	20	\$39813
Existing	Office	Space Heat Boiler	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.23	12.5%	90%	40%	3	\$10354
Existing	Office	Space Heat Boiler	Direct Digital Control System-Installation	DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)	Pneumatic	0.23	5.0%	5%	28%	15	\$14593
Existing	Office	Space Heat Boiler	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.23	10.0%	75%	80%	5	\$28288

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Office	Space Boiler	Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.23	15.0%	75%	80%	5	\$20414
Existing	Office	Space Boiler	Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.23	2.5%	45%	45%	18	\$21013
Existing	Office	Space Boiler	Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.23	15.0%	5%	94%	10	\$47646
Existing	Office	Space Boiler	Heat	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	0.23	10.0%	40%	10%	10	\$12298
Existing	Office	Space Boiler	Heat	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.23	1.8%	75%	4%	25	\$8,011
Existing	Office	Space Boiler	Heat	Insulation (Ceiling)	R-21 (Code)	R-0	0.23	5.0%	75%	0%	25	\$8,011
Existing	Office	Space Boiler	Heat	Insulation (Ceiling)	R-38	R-21 (Code)	0.23	2.0%	75%	25%	25	\$6,829
Existing	Office	Space Boiler	Heat	Insulation (Ceiling)	R-49	R-21 (Code)	0.23	3.0%	75%	65%	25	\$9,062
Existing	Office	Space Boiler	Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.23	4.4%	10%	15%	25	\$5,873
Existing	Office	Space Boiler	Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.23	2.4%	10%	15%	25	\$6,120
Existing	Office	Space Boiler	Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.23	6.0%	10%	95%	25	\$11089
Existing	Office	Space Boiler	Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.23	21.1%	10%	35%	25	\$12009
Existing	Office	Space Boiler	Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.23	25.0%	10%	0%	25	\$12009
Existing	Office	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.23	3.8%	35%	15%	25	\$6,829
Existing	Office	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.23	1.3%	35%	15%	25	\$1,182
Existing	Office	Space Boiler	Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.23	25.0%	25%	98%	10	110841
Existing	Office	Space Boiler	Heat	Steam Pipe Insulation	R-4	R-0	0.23	12.1%	75%	65%	20	\$3,404
Existing	Office	Space Boiler	Heat	Steam Trap Maintenance	Actively stop steam trap leaks	No Maintenance	0.23	17.0%	90%	45%	3	\$7,092
Existing	Office	Space Boiler	Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.23	3.0%	95%	67%	15	\$147

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Office	Space Heat Boiler	Windows	U = 0.35	U = 0.55 (Code)	0.23	4.8%	80%	95%	25	\$54732	
Existing	Office	Space Heat Boiler	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.23	3.2%	10%	95%	25	154536	
Existing	Office	Space Heat Furnace	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.34	11.1%	NA	NA	18	\$11399	
Existing	Office	Space Heat Furnace	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.34	14.9%	NA	NA	18	\$11399	
Existing	Office	Space Heat Furnace	Automated Ventilation Sensors / CO2 Sensors	VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.34	10.0%	75%	94%	15	\$33095
Existing	Office	Space Heat Furnace	Commissioning - Retro Building	Commissioning - Retro Building	Commissioning	No Commissioning	0.34	12.5%	90%	80%	3	\$10354
Existing	Office	Space Heat Furnace	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.34	2.5%	45%	45%	18	\$21013	
Existing	Office	Space Heat Furnace	Exhaust Air to Ventilation	Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.34	15.0%	5%	94%	10	\$47646
Existing	Office	Space Heat Furnace	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	0.34	10.0%	40%	10%	10	\$12298	
Existing	Office	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.34	1.8%	75%	4%	25	\$8,011	
Existing	Office	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	R-0	0.34	5.0%	75%	0%	25	\$8,011	
Existing	Office	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.34	2.0%	75%	25%	25	\$6,829	
Existing	Office	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.34	3.0%	75%	65%	25	\$9,062	
Existing	Office	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.34	4.4%	10%	15%	25	\$5,873	
Existing	Office	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.34	2.4%	10%	15%	25	\$6,120	
Existing	Office	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.34	6.0%	10%	95%	25	\$11089	
Existing	Office	Space Heat Furnace	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.34	21.1%	10%	35%	25	\$12009	
Existing	Office	Space Heat Furnace	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.34	25.0%	10%	0%	25	\$12009	
Existing	Office	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.34	3.8%	35%	15%	25	\$6,829	

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Office	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.34	1.3%	35%	15%	25	\$1,182
Existing	Office	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.34	3.0%	95%	67%	15	\$147
Existing	Office	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.34	4.8%	80%	95%	25	\$54732
Existing	Office	Space Heat Furnace	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.34	3.2%	10%	95%	25	154536
Existing	Office	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.04	34.4%	NA	NA	13	\$5,437
Existing	Office	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.04	15.1%	5%	95%	10	\$8,704
Existing	Office	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.04	0.6%	5%	75%	10	\$305
Existing	Office	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.04	5.0%	55%	80%	15	\$14593
Existing	Office	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.04	3.0%	10%	80%	13	\$2,700
Existing	Office	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.04	6.0%	10%	95%	10	\$841
Existing	Office	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.04	0.4%	15%	25%	13	\$32
Existing	Office	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.04	0.6%	15%	55%	13	\$630
Existing	Office	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.04	20.0%	5%	92%	25	\$4,203
Existing	Office	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.04	4.0%	95%	25%	10	\$0
Existing	Office	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.04	3.8%	95%	15%	10	\$0
Existing	Office	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.04	1.0%	75%	30%	15	\$557
Existing	Office	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.04	1.1%	15%	75%	10	\$5
Existing	Office	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.04	2.5%	15%	20%	10	\$11
Existing	Office	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.04	28.0%	75%	92%	16	\$47803
Existing	Office	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.04	55.8%	20%	95%	20	\$93758
Existing	Office	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.04	30.0%	25%	90%	14	\$2,264
Existing	Office	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.04	28.0%	25%	90%	20	\$699
Existing	Office	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.04	3.3%	95%	85%	10	\$205

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Savings		Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
						Baseline therm (UEC or EUI)	as Percent of End Use				
Existing	Office	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.04	7.7%	75%	40%	11	\$809
New	Office	Space Heat Boiler	Gas Boiler - Greater than 300 kBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.11	5.9%	NA	NA	20	\$10979
New	Office	Space Heat Boiler	Gas Boiler - Greater than 300 kBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.11	11.1%	NA	NA	20	\$22399
New	Office	Space Heat Boiler	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.11	10.0%	75%	94%	15	\$33095
New	Office	Space Heat Boiler	Boiler Economizer	Economizer	No Economizer	0.11	5.5%	40%	45%	20	\$39813
New	Office	Space Heat Boiler	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.11	12.5%	90%	40%	3	\$38348
New	Office	Space Heat Boiler	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.11	10.0%	75%	80%	5	\$28288
New	Office	Space Heat Boiler	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.11	2.5%	45%	45%	18	\$21013
New	Office	Space Heat Boiler	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.11	15.0%	5%	94%	10	\$47646
New	Office	Space Heat Boiler	Insulation (Ceiling)	R-38	R-21 (Code)	0.11	2.0%	75%	25%	25	\$6,829
New	Office	Space Heat Boiler	Insulation (Ceiling)	R-49	R-21 (Code)	0.11	3.0%	75%	65%	25	\$9,062
New	Office	Space Heat Boiler	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.11	6.0%	95%	95%	25	\$11089
New	Office	Space Heat Boiler	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.11	1.3%	35%	15%	25	\$1,182
New	Office	Space Heat Boiler	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.11	5.0%	50%	95%	15	\$31419
New	Office	Space Heat Boiler	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.11	10.0%	40%	98%	25	\$8,142
New	Office	Space Heat Boiler	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.11	25.0%	50%	98%	10	110841
New	Office	Space Heat Boiler	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.11	3.0%	95%	67%	15	\$147
New	Office	Space Heat Boiler	Windows	U = 0.35	U = 0.55 (Code)	0.11	4.8%	80%	95%	25	\$54732
New	Office	Space Heat Furnace	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.17	11.1%	NA	NA	18	\$11399

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline	Savings	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
						therm (UEC or EU)	as Percent of End Use				
New	Office	Space Heat Furnace	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.17	14.9%	NA	NA	18	\$11399
New	Office	Space Heat Furnace	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.17	10.0%	75%	94%	15	\$33095
New	Office	Space Heat Furnace	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.17	12.5%	90%	80%	3	\$38348
New	Office	Space Heat Furnace	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.17	2.5%	45%	45%	18	\$21013
New	Office	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.17	15.0%	5%	94%	10	\$47646
New	Office	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.17	2.0%	75%	25%	25	\$6,829
New	Office	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.17	3.0%	75%	65%	25	\$9,062
New	Office	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.17	6.0%	95%	95%	25	\$11089
New	Office	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.17	1.3%	35%	15%	25	\$1,182
New	Office	Space Heat Furnace	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.17	10.0%	40%	98%	25	\$8,142
New	Office	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.17	3.0%	95%	67%	15	\$147
New	Office	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.17	4.8%	80%	95%	25	\$54732
New	Office	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.04	34.4%	NA	NA	13	\$5,437
New	Office	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.04	15.1%	5%	95%	10	\$8,704
New	Office	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.04	0.6%	5%	75%	10	\$305
New	Office	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.04	5.0%	55%	80%	15	\$14593
New	Office	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.04	3.0%	10%	80%	13	\$2,700
New	Office	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.04	6.0%	10%	95%	10	\$841
New	Office	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.04	0.4%	15%	25%	13	\$32
New	Office	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.04	0.5%	15%	55%	13	\$630

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUJ)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Office	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.04	20.0%	25%	92%	25	\$4,203
New	Office	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.04	4.0%	95%	25%	10	\$0
New	Office	Water Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.04	5.0%	50%	95%	15	\$31419
New	Office	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.04	1.1%	15%	75%	10	\$5
New	Office	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.04	28.0%	75%	92%	16	\$26791
New	Office	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.04	55.8%	20%	95%	20	\$93758
New	Office	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.04	30.0%	25%	90%	14	\$2,264
New	Office	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.04	28.0%	25%	90%	20	\$699
New	Office	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.04	3.3%	95%	85%	10	\$205
New	Office	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replecement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.04	7.7%	75%	40%	11	\$809
Existing	Other	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.04	1.9%	95%	75%	10	\$210
Existing	Other	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.04	3.1%	20%	65%	8	\$1,112
Existing	Other	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.04	0.3%	20%	75%	12	\$1,225
Existing	Other	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.04	1.2%	85%	85%	12	\$419
Existing	Other	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.04	10.4%	5%	85%	10	\$3,541
Existing	Other	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.04	3.8%	5%	90%	12	\$5,359
Existing	Other	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.04	6.9%	15%	75%	10	\$2,180
Existing	Other	Space Heat	Gas Boiler - Greater than 300 KBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.15	5.9%	NA	NA	20	\$1,902
Existing	Other	Space Heat	Gas Boiler - Greater than 300 KBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.15	11.1%	NA	NA	20	\$3,881
Existing	Other	Space Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.15	10.0%	50%	94%	15	\$13900
Existing	Other	Space Heat	Boiler Economizer	Economizer	No Economizer	0.15	5.5%	40%	90%	20	\$7,696
Existing	Other	Space Heat	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.15	12.5%	90%	40%	3	\$4,349
Existing	Other	Space Heat	Direct Digital Control System-Installation	DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)	Pneumatic	0.15	5.0%	45%	66%	15	\$6,129

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	Other	Space Boiler	Heat	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.15	10.0%	75%	80%	5	\$11881
Existing	Other	Space Boiler	Heat	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.15	15.0%	50%	80%	5	\$8,574
Existing	Other	Space Boiler	Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.15	2.5%	45%	45%	18	\$8,825
Existing	Other	Space Boiler	Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.15	15.0%	5%	94%	10	\$20011
Existing	Other	Space Boiler	Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.15	4.5%	5%	85%	10	\$5,725
Existing	Other	Space Boiler	Heat	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	0.15	10.0%	40%	10%	10	\$5,165
Existing	Other	Space Boiler	Heat	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.15	7.2%	75%	30%	25	\$13459
Existing	Other	Space Boiler	Heat	Insulation (Ceiling)	R-21 (Code)	R-0	0.15	20.0%	75%	0%	25	\$13459
Existing	Other	Space Boiler	Heat	Insulation (Ceiling)	R-38	R-21 (Code)	0.15	8.0%	75%	45%	25	\$11473
Existing	Other	Space Boiler	Heat	Insulation (Ceiling)	R-49	R-21 (Code)	0.15	12.0%	75%	85%	25	\$15224
Existing	Other	Space Boiler	Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.15	4.4%	10%	15%	25	\$2,467
Existing	Other	Space Boiler	Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.15	2.4%	10%	15%	25	\$2,570
Existing	Other	Space Boiler	Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.15	6.0%	10%	95%	25	\$3,594
Existing	Other	Space Boiler	Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.15	21.1%	10%	35%	25	\$3,892
Existing	Other	Space Boiler	Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.15	25.0%	10%	0%	25	\$3,892
Existing	Other	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.15	15.0%	35%	50%	25	\$11473
Existing	Other	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.15	5.0%	35%	50%	25	\$1,986
Existing	Other	Space Boiler	Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.15	25.0%	25%	98%	10	\$46553
Existing	Other	Space Boiler	Heat	Steam Pipe Insulation	R-4	R-0	0.15	12.1%	75%	65%	20	\$2,206

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Space Heat Boiler	Steam Trap Maintenance	Actively stop steam trap leaks	No Maintenance	0.15	17.0%	90%	45%	3	\$2,979
Existing	Other	Space Heat Boiler	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.15	3.0%	95%	63%	15	\$146
Existing	Other	Space Heat Boiler	Windows	U = 0.35	U = 0.55 (Code)	0.15	3.5%	80%	70%	25	\$10884
Existing	Other	Space Heat Boiler	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.15	2.3%	10%	70%	25	\$30732
Existing	Other	Space Heat Furnace	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.22	11.1%	NA	NA	18	\$1,975
Existing	Other	Space Heat Furnace	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.22	14.9%	NA	NA	18	\$1,975
Existing	Other	Space Heat Furnace	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.21	10.0%	50%	94%	15	\$13900
Existing	Other	Space Heat Furnace	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.21	12.5%	90%	80%	3	\$4,349
Existing	Other	Space Heat Furnace	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.21	2.5%	45%	45%	18	\$8,825
Existing	Other	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.21	15.0%	5%	94%	10	\$20011
Existing	Other	Space Heat Furnace	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.21	4.5%	5%	85%	10	\$5,725
Existing	Other	Space Heat Furnace	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	0.21	10.0%	40%	10%	10	\$5,165
Existing	Other	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.21	7.2%	75%	30%	25	\$13459
Existing	Other	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	R-0	0.21	20.0%	75%	0%	25	\$13459
Existing	Other	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.21	8.0%	75%	45%	25	\$11473
Existing	Other	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.21	12.0%	75%	85%	25	\$15224
Existing	Other	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.21	4.4%	10%	15%	25	\$2,467
Existing	Other	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.21	2.4%	10%	15%	25	\$2,570
Existing	Other	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.21	6.0%	10%	95%	25	\$3,594

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Space Heat Furnace	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.21	21.1%	10%	35%	25	\$3,892
Existing	Other	Space Heat Furnace	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.21	25.0%	10%	0%	25	\$3,892
Existing	Other	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.21	15.0%	35%	50%	25	\$11473
Existing	Other	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.21	5.0%	35%	50%	25	\$1,986
Existing	Other	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.21	3.0%	95%	63%	15	\$146
Existing	Other	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.21	3.5%	80%	70%	25	\$10884
Existing	Other	Space Heat Furnace	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.21	2.3%	10%	70%	25	\$30732
Existing	Other	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.03	34.4%	NA	NA	13	\$3,444
Existing	Other	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.03	15.1%	5%	95%	10	\$8,704
Existing	Other	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.03	1.7%	5%	75%	10	\$304
Existing	Other	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.03	5.0%	75%	94%	15	\$6,129
Existing	Other	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.03	3.0%	10%	80%	13	\$2,701
Existing	Other	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.03	6.0%	10%	95%	10	\$841
Existing	Other	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.03	1.1%	10%	25%	13	\$31
Existing	Other	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.03	1.5%	10%	55%	13	\$631
Existing	Other	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.03	20.0%	5%	92%	25	\$2,661
Existing	Other	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.03	4.0%	95%	25%	10	\$0
Existing	Other	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.03	3.8%	95%	15%	10	\$2
Existing	Other	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.03	1.0%	75%	90%	15	\$234
Existing	Other	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.03	2.3%	50%	50%	5	\$4
Existing	Other	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.03	1.1%	15%	75%	10	\$7
Existing	Other	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.03	2.5%	15%	20%	10	\$11

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Other	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.03	28.0%	75%	100%	16	\$20077
Existing	Other	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.03	62.3%	20%	95%	20	\$35056
Existing	Other	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.03	30.0%	25%	90%	14	\$2,266
Existing	Other	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.03	28.0%	25%	90%	20	\$697
Existing	Other	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.03	3.3%	95%	95%	10	\$207
Existing	Other	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.03	7.7%	75%	55%	11	\$510
New	Other	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.04	1.9%	95%	75%	10	\$210
New	Other	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.04	3.1%	20%	65%	8	\$1,112
New	Other	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.04	0.3%	20%	75%	12	\$1,225
New	Other	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.04	1.2%	85%	85%	12	\$419
New	Other	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.04	10.4%	5%	85%	10	\$2,833
New	Other	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.04	3.8%	5%	90%	12	\$5,359
New	Other	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.04	6.9%	15%	75%	10	\$2,180
New	Other	Space Heat Boiler	Gas Boiler - Greater than 300 kBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.08	5.9%	NA	NA	20	\$1,902
New	Other	Space Heat Boiler	Gas Boiler - Greater than 300 kBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.08	11.1%	NA	NA	20	\$3,881
New	Other	Space Heat Boiler	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.07	10.0%	50%	94%	15	\$13900
New	Other	Space Heat Boiler	Boiler Economizer	Economizer	No Economizer	0.07	5.5%	40%	90%	20	\$7,696
New	Other	Space Heat Boiler	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.07	12.5%	90%	40%	3	\$16106
New	Other	Space Heat Boiler	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.07	10.0%	75%	80%	5	\$11881
New	Other	Space Heat Boiler	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.07	2.5%	45%	45%	18	\$8,825
New	Other	Space Heat Boiler	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.07	15.0%	5%	94%	10	\$20011
New	Other	Space Heat Boiler	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.07	4.5%	5%	85%	10	\$5,725

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Other	Space Boiler	Heat Insulation (Ceiling)	R-38	R-21 (Code)	0.07	8.0%	75%	45%	25	\$11473
New	Other	Space Boiler	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.07	12.0%	75%	85%	25	\$15224
New	Other	Space Boiler	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.07	6.0%	95%	95%	25	\$3,594
New	Other	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.07	5.0%	35%	50%	25	\$1,986
New	Other	Space Boiler	Heat Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.07	5.0%	50%	95%	15	\$5,445
New	Other	Space Boiler	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.07	10.0%	40%	98%	25	\$3,420
New	Other	Space Boiler	Heat Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.07	25.0%	50%	98%	10	\$46553
New	Other	Space Boiler	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.07	3.0%	95%	63%	15	\$146
New	Other	Space Boiler	Heat Windows	U = 0.35	U = 0.55 (Code)	0.07	3.5%	80%	70%	25	\$10884
New	Other	Space Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.11	11.1%	NA	NA	18	\$1,975
New	Other	Space Furnace	Heat Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.11	14.9%	NA	NA	18	\$1,975
New	Other	Space Furnace	Heat Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.11	10.0%	50%	94%	15	\$13900
New	Other	Space Furnace	Heat Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.11	12.5%	90%	80%	3	\$16106
New	Other	Space Furnace	Heat Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.11	2.5%	45%	45%	18	\$8,825
New	Other	Space Furnace	Heat Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.11	15.0%	5%	94%	10	\$20011
New	Other	Space Furnace	Heat Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.11	4.5%	5%	85%	10	\$5,725
New	Other	Space Furnace	Heat Insulation (Ceiling)	R-38	R-21 (Code)	0.11	8.0%	75%	45%	25	\$11473
New	Other	Space Furnace	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.11	12.0%	75%	85%	25	\$15224
New	Other	Space Furnace	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.11	6.0%	95%	95%	25	\$3,594

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Other	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.11	5.0%	35%	50%	25	\$1,986
New	Other	Space Heat Furnace	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.11	10.0%	40%	98%	25	\$3,420
New	Other	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.11	3.0%	95%	63%	15	\$146
New	Other	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.11	3.5%	80%	70%	25	\$10884
New	Other	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.03	34.4%	NA	NA	13	\$3,444
New	Other	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.03	15.1%	5%	95%	10	\$8,704
New	Other	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.03	1.7%	5%	75%	10	\$304
New	Other	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.03	5.0%	90%	94%	15	\$6,129
New	Other	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.03	3.0%	10%	80%	13	\$2,701
New	Other	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.03	6.0%	10%	95%	10	\$841
New	Other	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.03	1.1%	10%	25%	13	\$31
New	Other	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.03	1.5%	10%	55%	13	\$631
New	Other	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.03	20.0%	25%	92%	25	\$2,661
New	Other	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.03	4.0%	95%	25%	10	\$0
New	Other	Water Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.03	5.0%	50%	95%	15	\$5,445
New	Other	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.03	2.3%	50%	50%	5	\$4
New	Other	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.03	1.1%	15%	75%	10	\$7
New	Other	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.03	28.0%	75%	100%	16	\$11252
New	Other	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.03	62.3%	20%	95%	20	\$35056
New	Other	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.03	30.0%	25%	90%	14	\$2,266
New	Other	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.03	28.0%	25%	90%	20	\$697
New	Other	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.03	3.3%	95%	95%	10	\$207
New	Other	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replecement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.03	7.7%	75%	55%	11	\$510

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Restaurant	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	1.61	1.9%	95%	75%	10	\$210
Existing	Restaurant	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	1.61	6.2%	65%	65%	8	\$1,111
Existing	Restaurant	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	1.61	0.5%	75%	75%	12	\$1,224
Existing	Restaurant	Cooking	Oven - Convection	Convection Oven	Standard Oven	1.61	1.2%	85%	85%	12	\$420
Existing	Restaurant	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	1.61	10.4%	35%	85%	10	\$3,541
Existing	Restaurant	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	1.61	3.8%	45%	80%	12	\$5,358
Existing	Restaurant	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	1.61	6.9%	65%	75%	10	\$2,180
Existing	Restaurant	Space Heat Furnace	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.06	11.1%	NA	NA	18	\$1,414
Existing	Restaurant	Space Heat Furnace	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.06	14.9%	NA	NA	18	\$1,414
Existing	Restaurant	Space Heat Furnace	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.06	12.5%	90%	80%	3	\$663
Existing	Restaurant	Space Heat Furnace	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.06	2.5%	45%	45%	18	\$1,345
Existing	Restaurant	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.06	15.0%	5%	94%	10	\$5,783
Existing	Restaurant	Space Heat Furnace	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.06	4.5%	100%	85%	10	\$5,726
Existing	Restaurant	Space Heat Furnace	Infiltration Control (Caulking, Weather Stripping, etc.)	Install Caulking And Weatherstripping (ACH 0.65)	Infiltration Conditions (ACH 1.0)	0.06	10.0%	40%	10%	10	\$787
Existing	Restaurant	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.06	7.2%	75%	85%	25	\$2,051
Existing	Restaurant	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	R-0	0.06	20.0%	75%	0%	25	\$2,051
Existing	Restaurant	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.06	8.0%	75%	95%	25	\$1,748
Existing	Restaurant	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.06	12.0%	75%	98%	25	\$2,320
Existing	Restaurant	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.06	4.4%	10%	15%	25	\$376
Existing	Restaurant	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.06	2.4%	10%	15%	25	\$392
Existing	Restaurant	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.06	6.0%	10%	95%	25	\$1,403

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Restaurant	Space Heat Furnace	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.06	21.1%	10%	35%	25	\$1,519
Existing	Restaurant	Space Heat Furnace	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.06	25.0%	10%	0%	25	\$1,519
Existing	Restaurant	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.06	15.0%	35%	90%	25	\$1,748
Existing	Restaurant	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.06	5.0%	35%	90%	25	\$303
Existing	Restaurant	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.06	3.0%	95%	42%	15	\$146
Existing	Restaurant	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.06	5.0%	80%	80%	25	\$4,401
Existing	Restaurant	Space Heat Furnace	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.06	3.3%	10%	80%	25	\$12425
Existing	Restaurant	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.41	34.4%	NA	NA	13	\$2,356
Existing	Restaurant	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.42	15.1%	5%	95%	10	\$8,705
Existing	Restaurant	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.42	0.8%	5%	75%	10	\$305
Existing	Restaurant	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.42	5.0%	75%	94%	15	\$934
Existing	Restaurant	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.42	3.0%	100%	80%	13	\$2,700
Existing	Restaurant	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.42	6.0%	100%	95%	10	\$841
Existing	Restaurant	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.42	0.5%	85%	25%	13	\$32
Existing	Restaurant	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.42	0.7%	85%	55%	13	\$630
Existing	Restaurant	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.42	20.0%	5%	92%	25	\$1,821
Existing	Restaurant	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.42	4.0%	95%	25%	10	\$0
Existing	Restaurant	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.42	3.8%	95%	15%	10	\$2
Existing	Restaurant	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.42	1.0%	75%	90%	15	\$36
Existing	Restaurant	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.42	2.3%	95%	25%	5	\$5
Existing	Restaurant	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.42	1.1%	15%	75%	10	\$6
Existing	Restaurant	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.42	2.5%	15%	20%	10	\$11

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Restaurant	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.42	28.0%	75%	100%	16	\$3,059
Existing	Restaurant	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.42	39.5%	20%	95%	20	\$72978
Existing	Restaurant	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.42	30.0%	25%	90%	14	\$2,266
Existing	Restaurant	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.42	28.0%	25%	90%	20	\$697
Existing	Restaurant	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.42	3.3%	95%	75%	10	\$206
Existing	Restaurant	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.42	7.7%	75%	75%	11	\$349
New	Restaurant	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	1.61	1.9%	95%	75%	10	\$210
New	Restaurant	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	1.61	6.2%	65%	65%	8	\$1,111
New	Restaurant	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	1.61	0.5%	75%	75%	12	\$1,224
New	Restaurant	Cooking	Oven - Convection	Convection Oven	Standard Oven	1.61	1.2%	85%	85%	12	\$420
New	Restaurant	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	1.61	10.4%	35%	85%	10	\$2,833
New	Restaurant	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	1.61	3.8%	45%	80%	12	\$5,358
New	Restaurant	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	1.61	6.9%	65%	75%	10	\$2,180
New	Restaurant	Space Heat Furnace	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.05	11.1%	NA	NA	18	\$1,414
New	Restaurant	Space Heat Furnace	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.05	14.9%	NA	NA	18	\$1,414
New	Restaurant	Space Heat Furnace	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.05	12.5%	90%	80%	3	\$2,454
New	Restaurant	Space Heat Furnace	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.05	2.5%	45%	45%	18	\$1,345
New	Restaurant	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.05	15.0%	5%	94%	10	\$5,783
New	Restaurant	Space Heat Furnace	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.05	4.5%	100%	85%	10	\$5,726
New	Restaurant	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.05	8.0%	75%	95%	25	\$1,748
New	Restaurant	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.05	12.0%	75%	98%	25	\$2,320
New	Restaurant	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.05	6.0%	95%	95%	25	\$1,403

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Restaurant	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.05	5.0%	35%	90%	25	\$303
New	Restaurant	Space Heat Furnace	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.05	10.0%	40%	98%	25	\$521
New	Restaurant	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.05	3.0%	95%	42%	15	\$146
New	Restaurant	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.05	5.0%	80%	80%	25	\$4,401
New	Restaurant	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.44	34.4%	NA	NA	13	\$2,356
New	Restaurant	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.42	15.1%	5%	95%	10	\$8,705
New	Restaurant	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.42	0.8%	5%	75%	10	\$305
New	Restaurant	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.42	5.0%	90%	94%	15	\$934
New	Restaurant	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.42	3.0%	100%	80%	13	\$2,700
New	Restaurant	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.42	6.0%	100%	95%	10	\$841
New	Restaurant	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.42	0.5%	85%	25%	13	\$32
New	Restaurant	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.42	0.7%	85%	55%	13	\$630
New	Restaurant	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.42	20.0%	25%	92%	25	\$1,821
New	Restaurant	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.42	4.0%	95%	25%	10	\$0
New	Restaurant	Water Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.42	5.0%	50%	95%	15	\$1,299
New	Restaurant	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.42	2.3%	95%	25%	5	\$5
New	Restaurant	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.42	1.1%	15%	75%	10	\$6
New	Restaurant	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.42	28.0%	75%	100%	16	\$1,715
New	Restaurant	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.42	39.5%	20%	95%	20	\$72978
New	Restaurant	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.42	30.0%	25%	90%	14	\$2,266
New	Restaurant	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.42	28.0%	25%	90%	20	\$697
New	Restaurant	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.42	3.3%	95%	75%	10	\$206
New	Restaurant	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replecement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.42	7.7%	75%	75%	11	\$349

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	School	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.02	1.9%	95%	75%	10	\$209
Existing	School	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.02	3.1%	45%	65%	8	\$1,107
Existing	School	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.02	0.3%	65%	75%	12	\$1,221
Existing	School	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.02	1.2%	85%	40%	12	\$419
Existing	School	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.02	10.4%	5%	85%	10	\$3,540
Existing	School	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.02	3.8%	25%	90%	12	\$5,354
Existing	School	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.02	6.9%	25%	75%	10	\$2,180
Existing	School	Pool Heat	Solar RE - Installation of Solar Pool/Spa Heating Systems	Solar Pool/Spa Heating Systems	No Solar Pool Heating System	0.17	10.1%	5%	90%	12	\$35761
Existing	School	Pool Heat	Swimming Pool/Spa Covers	Plastic Or Foam Pool Covers (50-65% Energy Savings)	No Pool Covers	0.17	50.0%	95%	35%	10	\$2,241
Existing	School	Space Heat Boiler	Gas Boiler - Greater than 300 KBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.11	5.9%	NA	NA	20	\$12705
Existing	School	Space Heat Boiler	Gas Boiler - Greater than 300 KBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.11	11.1%	NA	NA	20	\$25916
Existing	School	Space Heat Boiler	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.11	10.0%	25%	94%	15	\$54937
Existing	School	Space Heat Boiler	Boiler Economizer	Economizer	No Economizer	0.11	5.5%	40%	65%	20	\$46077
Existing	School	Space Heat Boiler	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.11	12.5%	90%	40%	3	\$17187
Existing	School	Space Heat Boiler	Direct Digital Control System-Installation	DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)	Pneumatic	0.11	5.0%	5%	34%	15	\$24225
Existing	School	Space Heat Boiler	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.11	10.0%	75%	80%	5	\$46958
Existing	School	Space Heat Boiler	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.11	15.0%	50%	80%	5	\$33887
Existing	School	Space Heat Boiler	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.11	2.5%	45%	45%	18	\$34881
Existing	School	Space Heat Boiler	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.11	15.0%	5%	94%	10	\$79092
Existing	School	Space Heat Boiler	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.11	4.5%	73%	85%	10	\$5,729
Existing	School	Space Heat Boiler	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.11	3.6%	75%	15%	25	\$26597

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
Existing	School	Space Boiler	Heat	Insulation (Ceiling)	R-21 (Code)	R-0	0.11	10.0%	75%	0%	25	\$26597
Existing	School	Space Boiler	Heat	Insulation (Ceiling)	R-38	R-21 (Code)	0.11	4.0%	75%	45%	25	\$22672
Existing	School	Space Boiler	Heat	Insulation (Ceiling)	R-49	R-21 (Code)	0.11	6.0%	75%	85%	25	\$30085
Existing	School	Space Boiler	Heat	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.11	4.4%	10%	15%	25	\$9,749
Existing	School	Space Boiler	Heat	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.11	2.4%	10%	15%	25	\$10159
Existing	School	Space Boiler	Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.11	6.0%	10%	95%	25	\$10098
Existing	School	Space Boiler	Heat	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.11	21.1%	10%	35%	25	\$10944
Existing	School	Space Boiler	Heat	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.11	25.0%	10%	0%	25	\$10944
Existing	School	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.11	7.5%	35%	35%	25	\$22672
Existing	School	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.11	2.5%	35%	35%	25	\$3,924
Existing	School	Space Boiler	Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.11	25.0%	25%	98%	10	183996
Existing	School	Space Boiler	Heat	Steam Pipe Insulation	R-4	R-0	0.11	12.1%	75%	65%	20	\$4,386
Existing	School	Space Boiler	Heat	Steam Trap Maintenance	Actively stop steam trap leaks	No Maintenance	0.11	17.0%	90%	45%	3	\$11772
Existing	School	Space Boiler	Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.11	3.0%	95%	79%	15	\$148
Existing	School	Space Boiler	Heat	Windows	U = 0.35	U = 0.55 (Code)	0.11	10.9%	80%	60%	25	\$73738
Existing	School	Space Boiler	Heat	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.11	7.3%	10%	60%	25	208203
Existing	School	Space Furnace	Heat	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.17	11.1%	NA	NA	18	\$13194
Existing	School	Space Furnace	Heat	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.17	14.9%	NA	NA	18	\$13194
Existing	School	Space Furnace	Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.17	10.0%	25%	94%	15	\$54937

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	School	Space Heat Furnace	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.17	12.5%	90%	80%	3	\$17187
Existing	School	Space Heat Furnace	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.17	2.5%	45%	45%	18	\$34881
Existing	School	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.17	15.0%	5%	94%	10	\$79092
Existing	School	Space Heat Furnace	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.17	4.5%	73%	85%	10	\$5,729
Existing	School	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.17	3.6%	75%	15%	25	\$26597
Existing	School	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	R-0	0.17	10.0%	75%	0%	25	\$26597
Existing	School	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.17	4.0%	75%	45%	25	\$22672
Existing	School	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.17	6.0%	75%	85%	25	\$30085
Existing	School	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.17	4.4%	10%	15%	25	\$9,749
Existing	School	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.17	2.4%	10%	15%	25	\$10159
Existing	School	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.17	6.0%	10%	95%	25	\$10098
Existing	School	Space Heat Furnace	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.17	21.1%	10%	35%	25	\$10944
Existing	School	Space Heat Furnace	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.17	25.0%	10%	0%	25	\$10944
Existing	School	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.17	7.5%	35%	35%	25	\$22672
Existing	School	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.17	2.5%	35%	35%	25	\$3,924
Existing	School	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.17	3.0%	95%	79%	15	\$148
Existing	School	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.17	10.9%	80%	60%	25	\$73738
Existing	School	Space Heat Furnace	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.17	7.3%	10%	60%	25	208203
Existing	School	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.05	34.4%	NA	NA	13	\$10691

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline	Savings	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
						therm (UEC or EUI)	as Percent of End Use				
Existing	School	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.06	15.1%	35%	95%	10	\$8,703
Existing	School	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.06	0.6%	35%	75%	10	\$305
Existing	School	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.06	5.0%	55%	94%	15	\$24225
Existing	School	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.06	3.0%	85%	80%	13	\$2,703
Existing	School	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.06	6.0%	85%	95%	10	\$837
Existing	School	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.06	0.1%	65%	25%	13	\$35
Existing	School	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.06	0.2%	65%	55%	13	\$628
Existing	School	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.06	20.0%	5%	92%	25	\$8,267
Existing	School	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.06	4.0%	95%	25%	10	\$0
Existing	School	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.06	3.8%	95%	15%	10	\$0
Existing	School	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.06	1.0%	75%	70%	15	\$924
Existing	School	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.06	2.3%	95%	25%	5	\$9
Existing	School	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.06	3.4%	45%	75%	10	\$9
Existing	School	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.06	7.5%	45%	20%	10	\$9
Existing	School	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.06	28.0%	75%	93%	16	\$79354
Existing	School	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.06	7.2%	20%	95%	20	\$66657
Existing	School	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.06	30.0%	10%	90%	14	\$2,267
Existing	School	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.06	28.0%	10%	90%	20	\$698
Existing	School	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.06	3.3%	95%	75%	10	\$209
Existing	School	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.06	7.7%	75%	15%	11	\$1,587
New	School	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.02	1.9%	95%	75%	10	\$209
New	School	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.02	3.1%	45%	65%	8	\$1,107
New	School	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.02	0.3%	65%	75%	12	\$1,221
New	School	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.02	1.2%	85%	40%	12	\$419

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	School	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.02	10.4%	5%	85%	10	\$2,834
New	School	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.02	3.8%	25%	90%	12	\$5,354
New	School	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.02	6.9%	25%	75%	10	\$2,180
New	School	Pool Heat	Solar RE - Installation of Solar Pool/Spa Heating Systems	Solar Pool/Spa Heating Systems	No Solar Pool Heating System	0.03	10.1%	5%	90%	12	\$35761
New	School	Pool Heat	Swimming Pool/Spa Covers	Plastic Or Foam Pool Covers (50-65% Energy Savings)	No Pool Covers	0.03	50.0%	95%	35%	10	\$2,241
New	School	Space Heat Boiler	Gas Boiler - Greater than 300 KBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.10	5.9%	NA	NA	20	\$12705
New	School	Space Heat Boiler	Gas Boiler - Greater than 300 KBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.10	11.1%	NA	NA	20	\$25916
New	School	Space Heat Boiler	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.10	10.0%	25%	94%	15	\$54937
New	School	Space Heat Boiler	Boiler Economizer	Economizer	No Economizer	0.10	5.5%	40%	65%	20	\$46077
New	School	Space Heat Boiler	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.10	12.5%	90%	40%	3	\$63657
New	School	Space Heat Boiler	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.10	10.0%	75%	80%	5	\$46958
New	School	Space Heat Boiler	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.10	2.5%	45%	45%	18	\$34881
New	School	Space Heat Boiler	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.10	15.0%	5%	94%	10	\$79092
New	School	Space Heat Boiler	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.10	4.5%	73%	85%	10	\$5,729
New	School	Space Heat Boiler	Insulation (Ceiling)	R-38	R-21 (Code)	0.10	4.0%	75%	45%	25	\$22672
New	School	Space Heat Boiler	Insulation (Ceiling)	R-49	R-21 (Code)	0.10	6.0%	75%	85%	25	\$30085
New	School	Space Heat Boiler	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.10	6.0%	95%	95%	25	\$10098
New	School	Space Heat Boiler	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.10	2.5%	35%	35%	25	\$3,924
New	School	Space Heat Boiler	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.10	5.0%	50%	95%	15	\$36363
New	School	Space Heat Boiler	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.10	10.0%	40%	98%	25	\$13516

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	School	Space Heat Boiler	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.10	25.0%	50%	98%	10	183996
New	School	Space Heat Boiler	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.10	3.0%	95%	79%	15	\$148
New	School	Space Heat Boiler	Windows	U = 0.35	U = 0.55 (Code)	0.10	10.9%	80%	60%	25	\$73738
New	School	Space Heat Furnace	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.14	11.1%	NA	NA	18	\$13194
New	School	Space Heat Furnace	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.14	14.9%	NA	NA	18	\$13194
New	School	Space Heat Furnace	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.14	10.0%	25%	94%	15	\$54937
New	School	Space Heat Furnace	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.14	12.5%	90%	80%	3	\$63657
New	School	Space Heat Furnace	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.14	2.5%	45%	45%	18	\$34881
New	School	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.14	15.0%	5%	94%	10	\$79092
New	School	Space Heat Furnace	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.14	4.5%	73%	85%	10	\$5,729
New	School	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.14	4.0%	75%	45%	25	\$22672
New	School	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.14	6.0%	75%	85%	25	\$30085
New	School	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.14	6.0%	95%	95%	25	\$10098
New	School	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.14	2.5%	35%	35%	25	\$3,924
New	School	Space Heat Furnace	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.14	10.0%	40%	98%	25	\$13516
New	School	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.14	3.0%	95%	79%	15	\$148
New	School	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.14	10.9%	80%	60%	25	\$73738
New	School	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.06	34.4%	NA	NA	13	\$10691
New	School	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.06	15.1%	35%	95%	10	\$8,703

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	School	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.06	0.6%	35%	75%	10	\$305
New	School	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.06	5.0%	55%	94%	15	\$24225
New	School	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.06	3.0%	85%	80%	13	\$2,703
New	School	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.06	6.0%	85%	95%	10	\$837
New	School	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.06	0.1%	65%	25%	13	\$35
New	School	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.06	0.2%	65%	55%	13	\$628
New	School	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.06	20.0%	25%	92%	25	\$8,267
New	School	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.06	4.0%	95%	25%	10	\$0
New	School	Water Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.06	5.0%	50%	95%	15	\$36363
New	School	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.06	2.3%	95%	25%	5	\$9
New	School	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.06	3.4%	45%	75%	10	\$9
New	School	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.06	28.0%	75%	93%	16	\$44473
New	School	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.06	7.2%	20%	95%	20	\$66657
New	School	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.06	30.0%	10%	90%	14	\$2,267
New	School	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.06	28.0%	10%	90%	20	\$698
New	School	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.06	3.3%	95%	75%	10	\$209
New	School	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replacement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.06	7.7%	75%	15%	11	\$1,587
Existing	University	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.05	1.9%	95%	75%	10	\$214
Existing	University	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.05	3.1%	45%	65%	8	\$1,109
Existing	University	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.05	0.3%	65%	75%	12	\$1,223
Existing	University	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.05	1.2%	85%	40%	12	\$416
Existing	University	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.05	10.4%	5%	85%	10	\$3,543
Existing	University	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.05	3.8%	25%	90%	12	\$5,358
Existing	University	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.05	6.9%	25%	75%	10	\$2,181

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Pool Heat	Solar RE - Installation of Solar Pool/Spa Heating Systems	Solar Pool/Spa Heating Systems	No Solar Pool Heating System	0.13	10.1%	50%	90%	12	\$35503
Existing	University	Pool Heat	Swimming Pool/Spa Covers	Plastic Or Foam Pool Covers (50-65% Energy Savings)	No Pool Covers	0.13	50.0%	95%	35%	10	\$2,232
Existing	University	Space Heat Boiler	Gas Boiler - Greater than 300 KBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.22	5.9%	NA	NA	20	\$18369
Existing	University	Space Heat Boiler	Gas Boiler - Greater than 300 KBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.22	11.1%	NA	NA	20	\$37469
Existing	University	Space Heat Boiler	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.23	10.0%	25%	94%	15	\$79427
Existing	University	Space Heat Boiler	Boiler Economizer	Economizer	No Economizer	0.23	5.5%	40%	90%	20	\$66618
Existing	University	Space Heat Boiler	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.23	12.5%	90%	40%	3	\$24849
Existing	University	Space Heat Boiler	Direct Digital Control System-Installation	DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)	Pneumatic	0.23	5.0%	5%	34%	15	\$35024
Existing	University	Space Heat Boiler	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.23	10.0%	75%	80%	5	\$67891
Existing	University	Space Heat Boiler	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.23	15.0%	50%	80%	5	\$48993
Existing	University	Space Heat Boiler	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.23	2.5%	45%	45%	18	\$50430
Existing	University	Space Heat Boiler	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.23	15.0%	5%	94%	10	114350
Existing	University	Space Heat Boiler	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.23	4.5%	73%	85%	10	\$5,724
Existing	University	Space Heat Boiler	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.23	3.6%	75%	13%	25	\$38453
Existing	University	Space Heat Boiler	Insulation (Ceiling)	R-21 (Code)	R-0	0.23	10.0%	75%	0%	25	\$38453
Existing	University	Space Heat Boiler	Insulation (Ceiling)	R-38	R-21 (Code)	0.23	4.0%	75%	45%	25	\$32780
Existing	University	Space Heat Boiler	Insulation (Ceiling)	R-49	R-21 (Code)	0.23	6.0%	75%	85%	25	\$43496
Existing	University	Space Heat Boiler	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.23	4.4%	10%	15%	25	\$14095
Existing	University	Space Heat Boiler	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.23	2.4%	10%	15%	25	\$14688

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Space Boiler	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.23	6.0%	10%	95%	25	\$12141
Existing	University	Space Boiler	Heat Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.23	21.1%	10%	35%	25	\$13162
Existing	University	Space Boiler	Heat Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.23	25.0%	10%	0%	25	\$13162
Existing	University	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.23	7.5%	35%	35%	25	\$32780
Existing	University	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.23	2.5%	35%	35%	25	\$5,673
Existing	University	Space Boiler	Heat Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.23	25.0%	25%	98%	10	266018
Existing	University	Space Boiler	Heat Steam Pipe Insulation	R-4	R-0	0.23	12.1%	75%	65%	20	\$5,270
Existing	University	Space Boiler	Heat Steam Trap Maintenance	Actively stop steam trap leaks	No Maintenance	0.23	17.0%	90%	45%	3	\$17020
Existing	University	Space Boiler	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.23	3.0%	95%	66%	15	\$151
Existing	University	Space Boiler	Heat Windows	U = 0.35	U = 0.55 (Code)	0.23	10.9%	80%	60%	25	106609
Existing	University	Space Boiler	Heat Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.23	7.3%	10%	60%	25	301017
Existing	University	Space Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.33	11.1%	NA	NA	18	\$19075
Existing	University	Space Furnace	Heat Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.33	14.9%	NA	NA	18	\$19075
Existing	University	Space Furnace	Heat Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.33	10.0%	25%	94%	15	\$79427
Existing	University	Space Furnace	Heat Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.33	12.5%	90%	80%	3	\$24849
Existing	University	Space Furnace	Heat Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.33	2.5%	45%	45%	18	\$50430
Existing	University	Space Furnace	Heat Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.33	15.0%	5%	94%	10	114350
Existing	University	Space Furnace	Heat Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.33	4.5%	73%	85%	10	\$5,724
Existing	University	Space Furnace	Heat Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.33	3.6%	75%	13%	25	\$38453

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	R-0	0.33	10.0%	75%	0%	25	\$38453
Existing	University	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.33	4.0%	75%	45%	25	\$32780
Existing	University	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.33	6.0%	75%	85%	25	\$43496
Existing	University	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.33	4.4%	10%	15%	25	\$14095
Existing	University	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.33	2.4%	10%	15%	25	\$14688
Existing	University	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.33	6.0%	10%	95%	25	\$12141
Existing	University	Space Heat Furnace	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.33	21.1%	10%	35%	25	\$13162
Existing	University	Space Heat Furnace	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.33	25.0%	10%	0%	25	\$13162
Existing	University	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.33	7.5%	35%	35%	25	\$32780
Existing	University	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.33	2.5%	35%	35%	25	\$5,673
Existing	University	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.33	3.0%	95%	66%	15	\$151
Existing	University	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.33	10.9%	80%	60%	25	106609
Existing	University	Space Heat Furnace	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.33	7.3%	10%	60%	25	301017
Existing	University	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.09	34.4%	NA	NA	13	\$18117
Existing	University	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.09	15.1%	35%	95%	10	\$8,699
Existing	University	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.09	0.2%	35%	75%	10	\$303
Existing	University	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.09	5.0%	55%	94%	15	\$35024
Existing	University	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.09	3.0%	85%	80%	13	\$2,698
Existing	University	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.09	6.0%	85%	95%	10	\$845
Existing	University	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.09	0.1%	65%	25%	13	\$25

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	University	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.09	0.1%	65%	55%	13	\$630
Existing	University	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.09	20.0%	5%	92%	25	\$14007
Existing	University	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.09	4.0%	95%	25%	10	\$0
Existing	University	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.09	3.8%	95%	15%	10	\$0
Existing	University	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.09	1.0%	75%	70%	15	\$1,336
Existing	University	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.09	2.3%	95%	45%	5	\$0
Existing	University	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.09	3.4%	45%	75%	10	\$0
Existing	University	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.09	7.5%	45%	20%	10	\$13
Existing	University	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.09	28.0%	75%	100%	16	114728
Existing	University	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.09	6.9%	20%	95%	20	\$99246
Existing	University	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.09	30.0%	10%	90%	14	\$2,269
Existing	University	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.09	28.0%	10%	90%	20	\$693
Existing	University	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.09	3.3%	95%	75%	10	\$202
Existing	University	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replcement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.09	7.7%	75%	15%	11	\$2,685
New	University	Cooking	Broiler	High-Efficiency Broiler (34% Efficient)	Standard Broiler (15% Efficient)	0.05	1.9%	95%	75%	10	\$214
New	University	Cooking	Fryers - Commercial Gas Cooking	Energy Star Commercial Fryer (50% efficient)	Non-Energy Star Fryer (35% efficient)	0.05	3.1%	45%	65%	8	\$1,109
New	University	Cooking	Griddle	High-Efficiency Griddle (40% Efficient)	Standard Griddle (32% Efficient)	0.05	0.3%	65%	75%	12	\$1,223
New	University	Cooking	Oven - Convection	Convection Oven	Standard Oven	0.05	1.2%	85%	40%	12	\$416
New	University	Cooking	Oven - Conveyor	High-Efficiency Model (23% Efficient)	Standard Model (15% Efficient)	0.05	10.4%	5%	85%	10	\$2,837
New	University	Cooking	Oven - Power Burner	Power Burner Oven - Improved Atmospheric Burner (60% Efficient)	Standard (40%-50% Efficiency)	0.05	3.8%	25%	90%	12	\$5,358
New	University	Cooking	Steam Cooker	Energy Star Steam Cooker (38% Efficient)	Standard Cooker (30% Efficient)	0.05	6.9%	25%	75%	10	\$2,181
New	University	Pool Heat	Solar RE - Installation of Solar Pool/Spa Heating Systems	Solar Pool/Spa Heating Systems	No Solar Pool Heating System	0.04	10.1%	50%	90%	12	\$35503
New	University	Pool Heat	Swimming Pool/Spa Covers	Plastic Or Foam Pool Covers (50-65% Energy Savings)	No Pool Covers	0.04	50.0%	95%	35%	10	\$2,232
New	University	Space Heat	Gas Boiler - Greater than 300 kBTUH Boiler	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.19	5.9%	NA	NA	20	\$18369
New	University	Space Heat	Gas Boiler - Greater than 300 kBTUH Boiler	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.19	11.1%	NA	NA	20	\$37469

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost	
New	University	Space Boiler	Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.19	10.0%	25%	94%	15	\$79427
New	University	Space Boiler	Heat	Boiler Economizer	Economizer	No Economizer	0.19	5.5%	40%	90%	20	\$66618
New	University	Space Boiler	Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.19	12.5%	90%	40%	3	\$92035
New	University	Space Boiler	Heat	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.19	10.0%	75%	80%	5	\$67891
New	University	Space Boiler	Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.19	2.5%	45%	45%	18	\$50430
New	University	Space Boiler	Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.19	15.0%	5%	94%	10	114350
New	University	Space Boiler	Heat	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.19	4.5%	73%	85%	10	\$5,724
New	University	Space Boiler	Heat	Insulation (Ceiling)	R-38	R-21 (Code)	0.19	4.0%	75%	45%	25	\$32780
New	University	Space Boiler	Heat	Insulation (Ceiling)	R-49	R-21 (Code)	0.19	6.0%	75%	85%	25	\$43496
New	University	Space Boiler	Heat	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.19	6.0%	95%	95%	25	\$12141
New	University	Space Boiler	Heat	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.19	2.5%	35%	35%	25	\$5,673
New	University	Space Boiler	Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.19	5.0%	50%	95%	15	\$52573
New	University	Space Boiler	Heat	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.19	10.0%	40%	98%	25	\$19542
New	University	Space Boiler	Heat	Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.19	25.0%	50%	98%	10	266018
New	University	Space Boiler	Heat	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.19	3.0%	95%	66%	15	\$151
New	University	Space Boiler	Heat	Windows	U = 0.35	U = 0.55 (Code)	0.19	10.9%	80%	60%	25	106609
New	University	Space Furnace	Heat	Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.28	11.1%	NA	NA	18	\$19075
New	University	Space Furnace	Heat	Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.28	14.9%	NA	NA	18	\$19075
New	University	Space Furnace	Heat	Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	Demand Controlled Ventilation (CO2 Sensors)	Constant Ventilation	0.28	10.0%	25%	94%	15	\$79427

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	University	Space Heat Furnace	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.28	12.5%	90%	80%	3	\$92035
New	University	Space Heat Furnace	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.28	2.5%	45%	45%	18	\$50430
New	University	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.28	15.0%	5%	94%	10	114350
New	University	Space Heat Furnace	Exhaust Hood Makeup Air	Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air	Hood Pulls Conditioned Air (No Make-up Air)	0.28	4.5%	73%	85%	10	\$5,724
New	University	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.28	4.0%	75%	45%	25	\$32780
New	University	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.28	6.0%	75%	85%	25	\$43496
New	University	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.28	6.0%	95%	95%	25	\$12141
New	University	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.28	2.5%	35%	35%	25	\$5,673
New	University	Space Heat Furnace	Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.28	10.0%	40%	98%	25	\$19542
New	University	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.28	3.0%	95%	66%	15	\$151
New	University	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.28	10.9%	80%	60%	25	106609
New	University	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.10	34.4%	NA	NA	13	\$18117
New	University	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.09	15.1%	35%	95%	10	\$8,699
New	University	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.09	0.2%	35%	75%	10	\$303
New	University	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.09	5.0%	55%	94%	15	\$35024
New	University	Water Heat	Dishwashing - Commercial - High Efficiency	High Efficiency Dishwasher	Standard Dishwasher	0.09	3.0%	85%	80%	13	\$2,698
New	University	Water Heat	Dishwashing - Commercial Chemical System	Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)	High Temp Commercial Dishwasher	0.09	6.0%	85%	95%	10	\$845
New	University	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.09	0.1%	65%	25%	13	\$25
New	University	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.09	0.1%	65%	55%	13	\$630
New	University	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.09	20.0%	25%	92%	25	\$14007

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	University	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.09	4.0%	95%	25%	10	\$0
New	University	Water Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.09	5.0%	50%	95%	15	\$52573
New	University	Water Heat	Low Flow Spray Heads	1.6 GPM	3.0 GPM	0.09	2.3%	95%	45%	5	\$0
New	University	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.09	3.4%	45%	75%	10	\$0
New	University	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.09	28.0%	75%	100%	16	\$64298
New	University	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.09	6.9%	20%	95%	20	\$99246
New	University	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.09	30.0%	10%	90%	14	\$2,269
New	University	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.09	28.0%	10%	90%	20	\$693
New	University	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.09	3.3%	95%	75%	10	\$202
New	University	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replecement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.09	7.7%	75%	15%	11	\$2,685
Existing	Warehouse	Space Heat Boiler	Gas Boiler - Greater than 300 kBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.09	5.9%	NA	NA	20	\$11670
Existing	Warehouse	Space Heat Boiler	Gas Boiler - Greater than 300 kBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.09	11.1%	NA	NA	20	\$23805
Existing	Warehouse	Space Heat Boiler	Boiler Economizer	Economizer	No Economizer	0.09	5.5%	40%	90%	20	\$42306
Existing	Warehouse	Space Heat Boiler	Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.09	12.5%	90%	40%	3	\$15531
Existing	Warehouse	Space Heat Boiler	Direct Digital Control System-Installation	DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)	Pneumatic	0.09	5.0%	5%	93%	15	\$21890
Existing	Warehouse	Space Heat Boiler	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.09	10.0%	75%	98%	5	\$42432
Existing	Warehouse	Space Heat Boiler	Direct Digital Control System-Wireless Performance Monitoring	DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control	Pneumatic	0.09	15.0%	75%	98%	5	\$30620
Existing	Warehouse	Space Heat Boiler	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.09	2.5%	45%	45%	18	\$31519
Existing	Warehouse	Space Heat Boiler	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.09	15.0%	5%	94%	10	\$71469
Existing	Warehouse	Space Heat Boiler	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.09	7.2%	75%	10%	25	\$48066
Existing	Warehouse	Space Heat Boiler	Insulation (Ceiling)	R-21 (Code)	R-0	0.09	20.0%	75%	0%	25	\$48066

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Warehouse	Space Boiler	Heat Insulation (Ceiling)	R-38	R-21 (Code)	0.09	8.0%	75%	45%	25	\$40974
Existing	Warehouse	Space Boiler	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.09	12.0%	75%	85%	25	\$54370
Existing	Warehouse	Space Boiler	Heat Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.09	4.4%	10%	15%	25	\$8,809
Existing	Warehouse	Space Boiler	Heat Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.09	2.4%	10%	15%	25	\$9,180
Existing	Warehouse	Space Boiler	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.09	6.0%	10%	95%	25	\$6,792
Existing	Warehouse	Space Boiler	Heat Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.09	21.1%	10%	35%	25	\$7,352
Existing	Warehouse	Space Boiler	Heat Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.09	25.0%	10%	0%	25	\$7,352
Existing	Warehouse	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.09	15.0%	35%	45%	25	\$40974
Existing	Warehouse	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.09	5.0%	35%	45%	25	\$7,092
Existing	Warehouse	Space Boiler	Heat Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.09	25.0%	25%	98%	10	166261
Existing	Warehouse	Space Boiler	Heat Steam Pipe Insulation	R-4	R-0	0.09	12.1%	75%	65%	20	\$4,168
Existing	Warehouse	Space Boiler	Heat Steam Trap Maintenance	Actively stop steam trap leaks	No Maintenance	0.09	17.0%	90%	45%	3	\$10638
Existing	Warehouse	Space Boiler	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.09	3.0%	95%	20%	15	\$142
Existing	Warehouse	Space Boiler	Heat Windows	U = 0.35	U = 0.55 (Code)	0.09	1.5%	80%	98%	25	\$17816
Existing	Warehouse	Space Boiler	Heat Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.09	1.0%	10%	98%	25	\$50296
Existing	Warehouse	Space Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.13	11.1%	NA	NA	18	\$12119
Existing	Warehouse	Space Furnace	Heat Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.13	14.9%	NA	NA	18	\$12119
Existing	Warehouse	Space Furnace	Heat Commissioning - Retro Building Commissioning	Commissioning - Retro Building Commissioning	No Commissioning	0.13	12.5%	90%	80%	3	\$15531
Existing	Warehouse	Space Furnace	Heat Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.13	2.5%	45%	45%	18	\$31519

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Warehouse	Space Heat Furnace	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.13	15.0%	5%	94%	10	\$71469
Existing	Warehouse	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	Existing Ceiling Insulation (Average R-9)	0.13	7.2%	75%	10%	25	\$48066
Existing	Warehouse	Space Heat Furnace	Insulation (Ceiling)	R-21 (Code)	R-0	0.13	20.0%	75%	0%	25	\$48066
Existing	Warehouse	Space Heat Furnace	Insulation (Ceiling)	R-38	R-21 (Code)	0.13	8.0%	75%	45%	25	\$40974
Existing	Warehouse	Space Heat Furnace	Insulation (Ceiling)	R-49	R-21 (Code)	0.13	12.0%	75%	85%	25	\$54370
Existing	Warehouse	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	Install New Duct Insulation (R-8)	R-0	0.13	4.4%	10%	15%	25	\$8,809
Existing	Warehouse	Space Heat Furnace	Insulation (Duct) (Unconditioned Spaces)	R-4	R-0	0.13	2.4%	10%	15%	25	\$9,180
Existing	Warehouse	Space Heat Furnace	Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.13	6.0%	10%	95%	25	\$6,792
Existing	Warehouse	Space Heat Furnace	Insulation (Wall) - Existing to Code	R-19 (2x6 Framing) - (Code)	Existing R-value (Average R-3)	0.13	21.1%	10%	35%	25	\$7,352
Existing	Warehouse	Space Heat Furnace	Insulation (Wall) - Zero to Code	R-19 (2x6 Framing) - (Code)	R-0	0.13	25.0%	10%	0%	25	\$7,352
Existing	Warehouse	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-10 (Code)	R-0	0.13	15.0%	35%	45%	25	\$40974
Existing	Warehouse	Space Heat Furnace	Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.13	5.0%	35%	45%	25	\$7,092
Existing	Warehouse	Space Heat Furnace	Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.13	3.0%	95%	20%	15	\$142
Existing	Warehouse	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.13	1.5%	80%	98%	25	\$17816
Existing	Warehouse	Space Heat Furnace	Windows - Existing to Code	U = 0.55 (Code)	Existing Windows (U=0.65)	0.13	1.0%	10%	98%	25	\$50296
Existing	Warehouse	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.02	34.4%	NA	NA	13	\$1,450
Existing	Warehouse	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.02	15.1%	5%	95%	10	\$8,707
Existing	Warehouse	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.02	0.8%	5%	75%	10	\$307
Existing	Warehouse	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.02	5.0%	55%	94%	15	\$21890

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
Existing	Warehouse	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.02	0.5%	5%	25%	13	\$32
Existing	Warehouse	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.02	0.7%	5%	55%	13	\$630
Existing	Warehouse	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.02	20.0%	5%	92%	25	\$1,119
Existing	Warehouse	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.02	4.0%	95%	25%	10	\$0
Existing	Warehouse	Water Heat	Faucet Aerators - Existing to Code	2.5 GPM Aerator (Federal Code)	4.0 GPM Aerator	0.02	3.8%	95%	15%	10	\$0
Existing	Warehouse	Water Heat	Hot Water (SHW) Pipe Insulation	Install Insulation (R-4)	No Pipe Insulation	0.02	1.0%	75%	90%	15	\$835
Existing	Warehouse	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.02	1.1%	15%	75%	10	\$8
Existing	Warehouse	Water Heat	Low-Flow Showerheads - Existing to Code	2.5 GPM Showerhead (Federal Code)	4.5 GPM Showerhead	0.02	2.5%	15%	20%	10	\$8
Existing	Warehouse	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.02	28.0%	75%	49%	16	\$71705
Existing	Warehouse	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.02	32.7%	20%	95%	20	\$43819
Existing	Warehouse	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.02	30.0%	25%	90%	14	\$2,269
Existing	Warehouse	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.02	28.0%	25%	90%	20	\$693
Existing	Warehouse	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.02	3.3%	95%	95%	10	\$205
Existing	Warehouse	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replecement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.02	7.7%	75%	45%	11	\$213
New	Warehouse	Space Heat	Gas Boiler - Greater than 300 kBTUH	85% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.05	5.9%	NA	NA	20	\$11670
New	Warehouse	Space Heat	Gas Boiler - Greater than 300 kBTUH	90% Thermal Efficiency	80% Thermal Efficiency (State Code)	0.05	11.1%	NA	NA	20	\$23805
New	Warehouse	Space Heat	Boiler Economizer	Economizer	No Economizer	0.05	5.5%	40%	90%	20	\$42306
New	Warehouse	Space Heat	Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.05	12.5%	90%	40%	3	\$57522
New	Warehouse	Space Heat	Direct Digital Control System-Optimization	Premium-Efficiency EMS System	High-Efficiency EMS System	0.05	10.0%	75%	98%	5	\$42432
New	Warehouse	Space Heat	Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.05	2.5%	45%	45%	18	\$31519
New	Warehouse	Space Heat	Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.05	15.0%	5%	94%	10	\$71469
New	Warehouse	Space Heat	Insulation (Ceiling)	R-38	R-21 (Code)	0.05	8.0%	75%	45%	25	\$40974

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EU)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Warehouse	Space Boiler	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.05	12.0%	75%	85%	25	\$54370
New	Warehouse	Space Boiler	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.05	6.0%	95%	95%	25	\$6,792
New	Warehouse	Space Boiler	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.05	5.0%	35%	45%	25	\$7,092
New	Warehouse	Space Boiler	Heat Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.05	5.0%	50%	95%	15	\$33386
New	Warehouse	Space Boiler	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.05	10.0%	40%	98%	25	\$12214
New	Warehouse	Space Boiler	Heat Sensible And Total Heat Recovery Devices	Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness	No Heat Recovery	0.05	25.0%	50%	98%	10	166261
New	Warehouse	Space Boiler	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.05	3.0%	95%	20%	15	\$142
New	Warehouse	Space Boiler	Heat Windows	U = 0.35	U = 0.55 (Code)	0.05	1.5%	80%	98%	25	\$17816
New	Warehouse	Space Furnace	Heat Gas Furnace	AFUE = 90% (Condensing Furnace)	AFUE=80%	0.07	11.1%	NA	NA	18	\$12119
New	Warehouse	Space Furnace	Heat Gas Furnace	AFUE = 94% (Condensing Furnace)	AFUE=80%	0.07	14.9%	NA	NA	18	\$12119
New	Warehouse	Space Furnace	Heat Commissioning - New Building Commissioning	Commissioning - New Building Commissioning	No Commissioning	0.07	12.5%	90%	80%	3	\$57522
New	Warehouse	Space Furnace	Heat Duct Repair And Sealing	Reduction In Duct Losses to 5%	No Repair or Sealing, 15% duct losses	0.07	2.5%	45%	45%	18	\$31519
New	Warehouse	Space Furnace	Heat Exhaust Air to Ventilation Air Heat Recovery	Exhaust Air Heat Recovery	No Heat Recovery	0.07	15.0%	5%	94%	10	\$71469
New	Warehouse	Space Furnace	Heat Insulation (Ceiling)	R-38	R-21 (Code)	0.07	8.0%	75%	45%	25	\$40974
New	Warehouse	Space Furnace	Heat Insulation (Ceiling)	R-49	R-21 (Code)	0.07	12.0%	75%	85%	25	\$54370
New	Warehouse	Space Furnace	Heat Insulation (Wall)	R-25 (2x6 Framing) - Advanced	R-19 (2x6 Framing) - (Code)	0.07	6.0%	95%	95%	25	\$6,792
New	Warehouse	Space Furnace	Heat Insulation - Floor (Non-Slab)	R-19	R-10 (Code)	0.07	5.0%	35%	45%	25	\$7,092
New	Warehouse	Space Furnace	Heat Leak Proof Duct Fittings	Quick connect fittings that do not require mastic or drawbands	Std duct workmanship	0.07	10.0%	40%	98%	25	\$12214
New	Warehouse	Space Furnace	Heat Thermostat - Programmable	Energy Star Programmable Thermostat	Manual Thermostat	0.07	3.0%	95%	20%	15	\$142

Construction Vintage	Customer Segment	End Use	Measure Name	Measure Description	Base Equipment	Baseline therm (UEC or EUI)	Savings as Percent of End Use	Percent of Installations Technically Feasible	Percent of Installations Incomplete	Measure Life	Measure Cost
New	Warehouse	Space Heat Furnace	Windows	U = 0.35	U = 0.55 (Code)	0.07	1.5%	80%	98%	25	\$17816
New	Warehouse	Water Heat	Water Heater - Condensing	EF = 0.90	EF = 0.59	0.02	34.4%	NA	NA	13	\$1,450
New	Warehouse	Water Heat	Clothes Washer - Ozonating	Ozonating Clothes Washer	Standard Commercial Clothes Washer	0.02	15.1%	5%	95%	10	\$8,707
New	Warehouse	Water Heat	Clothes Washer Commercial	Energy Star Commercial Clothes Washer MEF=1.73	Standard Commercial Clothes Washer MEF=1.26 (Federal Code)	0.02	0.8%	5%	75%	10	\$307
New	Warehouse	Water Heat	Demand controlled Circulating Systems	Demand Controlled Circulating Systems (VFD Control by Demand)	Constant Circulation	0.02	5.0%	55%	94%	15	\$21890
New	Warehouse	Water Heat	Dishwashing - Residential Sized System	EF = 0.65 (ENERGY STAR)	Existing Dishwasher (FED Std. EF=0.46)	0.02	0.5%	5%	25%	13	\$32
New	Warehouse	Water Heat	Dishwashing - Residential Sized System	EF = 0.77	Existing Dishwasher (FED Std. EF=0.46)	0.02	0.7%	5%	55%	13	\$630
New	Warehouse	Water Heat	Drainwater Heat Recovery (Power-Pipe or GFX)	Install Power-Pipe or GFX System	No GFX or Power-Pipe System	0.02	20.0%	25%	92%	25	\$1,119
New	Warehouse	Water Heat	Faucet Aerators	1.5 GPM Aerator	2.5 GPM Aerator (Federal Code)	0.02	4.0%	95%	25%	10	\$0
New	Warehouse	Water Heat	Integrated Space Heating/Water Heating	Integrated System	Separate Boiler And HW Heater	0.02	5.0%	50%	95%	15	\$33386
New	Warehouse	Water Heat	Low-Flow Showerheads	2.0 GPM Showerhead	2.5 GPM Showerhead (Federal Code)	0.02	1.1%	15%	75%	10	\$8
New	Warehouse	Water Heat	Refrigeration with Heat Recovery	Heat Recovery from Refrigeration System. Applied to Water Heating	No Heat Recovery	0.02	28.0%	75%	49%	16	\$40186
New	Warehouse	Water Heat	Solar RE - Solar Water Heater	Passive solar water heating	Standard Water Heater EF = 0.93	0.02	32.7%	20%	95%	20	\$43819
New	Warehouse	Water Heat	Tankless Water Heater - Commercial	EF = 0.82	Thermal Efficiency = 80%	0.02	30.0%	25%	90%	14	\$2,269
New	Warehouse	Water Heat	Tankless Water Heater - Residential	EF = 0.82	EF = 0.59 (40 Gal)	0.02	28.0%	25%	90%	20	\$693
New	Warehouse	Water Heat	Ultrasonic Faucet Control	Install Ultrasonic Motion Faucet Control	No Faucet Control	0.02	3.3%	95%	95%	10	\$205
New	Warehouse	Water Heat	Water Heater Thermostat Setback	Thermostat Setback and Replecement (120 Degrees)	No Thermostat Setback (130 Degrees)	0.02	7.7%	75%	45%	11	\$213

Industrial Electric Measures

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EUJ)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Chemical Mfg	Fans	Motor Improvements	105,893	2.6%	15	\$298
Existing	Chemical Mfg	Fans	Motor O&M	105,893	5.5%	2	\$53
Existing	Chemical Mfg	HVAC	HVAC Improvements	89,911	12.1%	15	\$415
Existing	Chemical Mfg	HVAC	HVAC O&M	89,911	12.0%	2	\$432
Existing	Chemical Mfg	Lighting	Lighting Improvements	66,306	5.0%	10	\$321
Existing	Chemical Mfg	Motors Other	Motor Improvements	237,600	2.6%	15	\$669
Existing	Chemical Mfg	Motors Other	Motor O&M	237,600	5.5%	2	\$120
Existing	Chemical Mfg	Other	Bldg Improvements	26,703	12.1%	15	\$774
Existing	Chemical Mfg	Process AirComp	Air Comp Improvements	246,511	3.9%	15	\$414
Existing	Chemical Mfg	Process AirComp	Air Comp O&M	246,511	4.6%	2	\$231
Existing	Chemical Mfg	Process AirComp	Motor Improvements	246,511	2.6%	15	\$694
Existing	Chemical Mfg	Process AirComp	Motor O&M	246,511	5.5%	2	\$125
Existing	Chemical Mfg	Process Cool	Cool Improvements	130,817	9.2%	15	\$1,380
Existing	Chemical Mfg	Process Heat	Heat Improvements	51,321	12.2%	15	\$633
Existing	Chemical Mfg	Process Heat	Heat O&M	51,321	8.0%	2	\$70
Existing	Chemical Mfg	Process Heat	Steam Distribution	51,321	29.1%	15	\$981
Existing	Chemical Mfg	Process Other	Other Improvements	2,029	44.1%	15	\$270
Existing	Chemical Mfg	Process Other	Other O&M	2,029	2.5%	2	\$2
Existing	Chemical Mfg	Process Refrig	Motor Improvements	68,530	2.6%	15	\$193
Existing	Chemical Mfg	Process Refrig	Motor O&M	68,530	5.5%	2	\$35
Existing	Chemical Mfg	Pumps	Motor Improvements	231,373	2.6%	15	\$651
Existing	Chemical Mfg	Pumps	Motor O&M	231,373	5.5%	2	\$117
Existing	Computer Electronic Mfg	Fans	Motor Improvements	16,024	3.7%	15	\$47
Existing	Computer Electronic Mfg	Fans	Motor O&M	16,024	0.3%	2	\$11
Existing	Computer Electronic Mfg	HVAC	HVAC Improvements	101,509	11.7%	15	\$1,065
Existing	Computer Electronic Mfg	HVAC	HVAC O&M	101,509	6.8%	2	\$60
Existing	Computer Electronic Mfg	Lighting	Lighting Improvements	45,454	8.7%	10	\$499
Existing	Computer Electronic Mfg	Motors Other	Motor Improvements	31,721	3.7%	15	\$93
Existing	Computer Electronic Mfg	Motors Other	Motor O&M	31,721	0.3%	2	\$21

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EU)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Computer Electronic Mfg	Other	Bldg Improvements	40,204	0.8%	15	\$56
Existing	Computer Electronic Mfg	Process AirComp	Air Comp Improvements	3,723	23.6%	15	\$52
Existing	Computer Electronic Mfg	Process AirComp	Air Comp O&M	3,723	31.7%	2	\$42
Existing	Computer Electronic Mfg	Process AirComp	Motor Improvements	3,723	3.7%	15	\$11
Existing	Computer Electronic Mfg	Process AirComp	Motor O&M	3,723	0.3%	2	\$3
Existing	Computer Electronic Mfg	Process Cool	Cool Improvements	31,899	12.4%	15	\$946
Existing	Computer Electronic Mfg	Process Heat	Heat Improvements	40,101	0.8%	15	\$29
Existing	Computer Electronic Mfg	Process Heat	Heat O&M	40,101	32.9%	2	\$87
Existing	Computer Electronic Mfg	Process Heat	Steam Distribution	40,101	1.1%	15	\$30
Existing	Computer Electronic Mfg	Process Other	Other Improvements	9,811	12.4%	15	\$115
Existing	Computer Electronic Mfg	Process Other	Other O&M	9,811	26.4%	2	\$78
Existing	Computer Electronic Mfg	Process Refrig	Motor Improvements	4,046	3.7%	15	\$12
Existing	Computer Electronic Mfg	Process Refrig	Motor O&M	4,046	0.3%	2	\$3
Existing	Computer Electronic Mfg	Pumps	Motor Improvements	25,409	3.7%	15	\$74
Existing	Computer Electronic Mfg	Pumps	Motor O&M	25,409	0.3%	2	\$17
Existing	Electrical Equipment Mfg	Fans	Motor Improvements	5,860	2.4%	15	\$11
Existing	Electrical Equipment Mfg	Fans	Motor O&M	5,860	2.9%	2	\$6
Existing	Electrical Equipment Mfg	HVAC	HVAC Improvements	23,487	14.9%	15	\$234
Existing	Electrical Equipment Mfg	HVAC	HVAC O&M	23,487	12.1%	2	\$10
Existing	Electrical Equipment Mfg	Lighting	Lighting Improvements	17,790	6.2%	10	\$104
Existing	Electrical Equipment Mfg	Motors Other	Motor Improvements	13,149	2.4%	15	\$25
Existing	Electrical Equipment Mfg	Motors Other	Motor O&M	13,149	2.9%	2	\$14
Existing	Electrical Equipment Mfg	Other	Bldg Improvements	10,432	1.4%	15	\$7
Existing	Electrical Equipment Mfg	Process AirComp	Air Comp Improvements	13,642	8.8%	15	\$67
Existing	Electrical Equipment Mfg	Process AirComp	Air Comp O&M	13,642	8.8%	2	\$35
Existing	Electrical Equipment Mfg	Process AirComp	Motor Improvements	13,642	2.4%	15	\$26
Existing	Electrical Equipment Mfg	Process AirComp	Motor O&M	13,642	2.9%	2	\$14
Existing	Electrical Equipment Mfg	Process Cool	Cool Improvements	6,072	11.3%	15	\$32
Existing	Electrical Equipment Mfg	Process Heat	Heat Improvements	25,682	5.4%	15	\$30
Existing	Electrical Equipment Mfg	Process Heat	Heat O&M	25,682	2.4%	2	\$9
Existing	Electrical Equipment Mfg	Process Heat	Steam Distribution	25,682	2.2%	15	\$10

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EU)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Electrical Equipment Mfg	Process Other	Other Improvements	831	40.1%	15	\$30
Existing	Electrical Equipment Mfg	Process Other	Other O&M	831	18.7%	2	\$16
Existing	Electrical Equipment Mfg	Process Refrig	Motor Improvements	3,792	2.4%	15	\$7
Existing	Electrical Equipment Mfg	Process Refrig	Motor O&M	3,792	2.9%	2	\$4
Existing	Electrical Equipment Mfg	Process Refrig	Refrig Improvements	3,792	16.4%	15	\$38
Existing	Electrical Equipment Mfg	Pumps	Motor Improvements	12,804	2.4%	15	\$24
Existing	Electrical Equipment Mfg	Pumps	Motor O&M	12,804	2.9%	2	\$14
Existing	Fabricated Metal Products	Fans	Motor Improvements	22,481	4.2%	15	\$122
Existing	Fabricated Metal Products	Fans	Motor O&M	22,481	7.3%	2	\$30
Existing	Fabricated Metal Products	HVAC	HVAC Improvements	37,690	10.0%	15	\$528
Existing	Fabricated Metal Products	HVAC	HVAC O&M	37,690	11.2%	2	\$281
Existing	Fabricated Metal Products	Lighting	Lighting Improvements	35,135	8.9%	10	\$344
Existing	Fabricated Metal Products	Motors Other	Motor Improvements	63,998	4.2%	15	\$347
Existing	Fabricated Metal Products	Motors Other	Motor O&M	63,998	7.3%	2	\$87
Existing	Fabricated Metal Products	Other	Bldg Improvements	33,684	5.5%	15	\$551
Existing	Fabricated Metal Products	Process AirComp	Air Comp Improvements	25,929	10.9%	15	\$100
Existing	Fabricated Metal Products	Process AirComp	Air Comp O&M	25,929	14.2%	2	\$62
Existing	Fabricated Metal Products	Process AirComp	Motor Improvements	25,929	4.2%	15	\$141
Existing	Fabricated Metal Products	Process AirComp	Motor O&M	25,929	7.3%	2	\$35
Existing	Fabricated Metal Products	Process Cool	Cool Improvements	12,899	12.1%	15	\$182
Existing	Fabricated Metal Products	Process Heat	Heat Improvements	85,352	6.2%	15	\$159
Existing	Fabricated Metal Products	Process Heat	Heat O&M	85,352	4.7%	2	\$75
Existing	Fabricated Metal Products	Process Heat	Steam Distribution	85,352	33.3%	15	\$245
Existing	Fabricated Metal Products	Process Other	Other Improvements	691	44.8%	15	\$55
Existing	Fabricated Metal Products	Process Other	Other O&M	691	27.4%	2	\$22
Existing	Fabricated Metal Products	Process Refrig	Motor Improvements	10,995	4.2%	15	\$60
Existing	Fabricated Metal Products	Process Refrig	Motor O&M	10,995	7.3%	2	\$15
Existing	Fabricated Metal Products	Process Refrig	Refrig Improvements	10,995	11.5%	15	\$14
Existing	Fabricated Metal Products	Pumps	Motor Improvements	40,695	4.2%	15	\$221
Existing	Fabricated Metal Products	Pumps	Motor O&M	40,695	7.3%	2	\$55
Existing	Food Mfg	Fans	Motor Improvements	19,516	3.3%	15	\$61

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EUJ)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Food Mfg	Fans	Motor O&M	19,516	1.6%	2	\$5
Existing	Food Mfg	HVAC	HVAC Improvements	35,927	9.2%	15	\$376
Existing	Food Mfg	HVAC	HVAC O&M	35,927	10.9%	2	\$70
Existing	Food Mfg	Lighting	Lighting Improvements	34,421	7.8%	10	\$263
Existing	Food Mfg	Motors Other	Motor Improvements	101,472	3.3%	15	\$315
Existing	Food Mfg	Motors Other	Motor O&M	101,472	1.6%	2	\$24
Existing	Food Mfg	Other	Bldg Improvements	37,401	0.6%	15	\$27
Existing	Food Mfg	Process AirComp	Air Comp Improvements	20,032	10.2%	15	\$84
Existing	Food Mfg	Process AirComp	Air Comp O&M	20,032	13.0%	2	\$58
Existing	Food Mfg	Process AirComp	Motor Improvements	20,032	3.3%	15	\$62
Existing	Food Mfg	Process AirComp	Motor O&M	20,032	1.6%	2	\$5
Existing	Food Mfg	Process Cool	Cool Improvements	129,766	11.9%	15	\$2,450
Existing	Food Mfg	Process Heat	Heat Improvements	15,900	33.0%	15	\$906
Existing	Food Mfg	Process Heat	Heat O&M	15,900	8.9%	2	\$67
Existing	Food Mfg	Process Heat	Steam Distribution	15,900	22.6%	15	\$804
Existing	Food Mfg	Process Other	Other Improvements	1,334	29.5%	15	\$37
Existing	Food Mfg	Process Other	Other O&M	1,334	28.1%	2	\$100
Existing	Food Mfg	Process Refrig	Motor Improvements	76,496	3.3%	15	\$238
Existing	Food Mfg	Process Refrig	Motor O&M	76,496	1.6%	2	\$18
Existing	Food Mfg	Process Refrig	Refrig Improvements	76,496	15.6%	15	\$855
Existing	Food Mfg	Pumps	Motor Improvements	42,668	3.3%	15	\$133
Existing	Food Mfg	Pumps	Motor O&M	42,668	1.6%	2	\$10
Existing	Industrial Machinery	Fans	Motor Improvements	10,864	3.1%	15	\$29
Existing	Industrial Machinery	Fans	Motor O&M	10,864	1.0%	2	\$5
Existing	Industrial Machinery	HVAC	HVAC Improvements	30,134	12.8%	15	\$521
Existing	Industrial Machinery	HVAC	HVAC O&M	30,134	7.5%	2	\$91
Existing	Industrial Machinery	Lighting	Lighting Improvements	22,418	6.9%	10	\$166
Existing	Industrial Machinery	Motors Other	Motor Improvements	30,926	3.1%	15	\$84
Existing	Industrial Machinery	Motors Other	Motor O&M	30,926	1.0%	2	\$15
Existing	Industrial Machinery	Other	Bldg Improvements	11,525	9.3%	15	\$225
Existing	Industrial Machinery	Process AirComp	Air Comp Improvements	12,529	11.9%	15	\$129

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EUJ)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Industrial Machinery	Process AirComp	Air Comp O&M	12,529	15.5%	2	\$48
Existing	Industrial Machinery	Process AirComp	Motor Improvements	12,529	3.1%	15	\$34
Existing	Industrial Machinery	Process AirComp	Motor O&M	12,529	1.0%	2	\$6
Existing	Industrial Machinery	Process Cool	Cool Improvements	5,338	31.5%	15	\$190
Existing	Industrial Machinery	Process Heat	Heat Improvements	12,146	6.4%	15	\$92
Existing	Industrial Machinery	Process Heat	Heat O&M	12,146	8.5%	2	\$57
Existing	Industrial Machinery	Process Heat	Steam Distribution	12,146	6.7%	15	\$11
Existing	Industrial Machinery	Process Other	Other Improvements	888	39.0%	15	\$40
Existing	Industrial Machinery	Process Other	Other O&M	888	17.3%	2	\$58
Existing	Industrial Machinery	Process Refrig	Motor Improvements	5,314	3.1%	15	\$14
Existing	Industrial Machinery	Process Refrig	Motor O&M	5,314	1.0%	2	\$3
Existing	Industrial Machinery	Process Refrig	Refrig Improvements	5,314	9.5%	15	\$52
Existing	Industrial Machinery	Pumps	Motor Improvements	19,666	3.1%	15	\$53
Existing	Industrial Machinery	Pumps	Motor O&M	19,666	1.0%	2	\$10
Existing	Miscellaneous Mfg	Fans	Motor Improvements	9,058	4.4%	15	\$71
Existing	Miscellaneous Mfg	Fans	Motor O&M	9,058	2.4%	2	\$2
Existing	Miscellaneous Mfg	HVAC	HVAC Improvements	33,107	8.7%	15	\$844
Existing	Miscellaneous Mfg	HVAC	HVAC O&M	33,107	9.5%	2	\$18
Existing	Miscellaneous Mfg	Lighting	Lighting Improvements	23,729	6.3%	10	\$145
Existing	Miscellaneous Mfg	Motors Other	Motor Improvements	36,470	4.4%	15	\$285
Existing	Miscellaneous Mfg	Motors Other	Motor O&M	36,470	2.4%	2	\$8
Existing	Miscellaneous Mfg	Other	Bldg Improvements	6,914	6.8%	15	\$37
Existing	Miscellaneous Mfg	Process AirComp	Air Comp Improvements	8,466	11.8%	15	\$102
Existing	Miscellaneous Mfg	Process AirComp	Air Comp O&M	8,466	13.3%	2	\$27
Existing	Miscellaneous Mfg	Process AirComp	Motor Improvements	8,466	4.4%	15	\$66
Existing	Miscellaneous Mfg	Process AirComp	Motor O&M	8,466	2.4%	2	\$2
Existing	Miscellaneous Mfg	Process Cool	Cool Improvements	9,725	23.2%	15	\$188
Existing	Miscellaneous Mfg	Process Heat	Heat O&M	15,045	4.9%	2	\$38
Existing	Miscellaneous Mfg	Process Heat	Steam Distribution	15,045	15.3%	15	\$41
Existing	Miscellaneous Mfg	Process Other	Other Improvements	710	22.5%	15	\$20
Existing	Miscellaneous Mfg	Process Other	Other O&M	710	27.1%	2	\$5

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EU)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Miscellaneous Mfg	Process Refrig	Motor Improvements	59	4.4%	15	\$0
Existing	Miscellaneous Mfg	Process Refrig	Motor O&M	59	2.4%	2	\$0
Existing	Miscellaneous Mfg	Pumps	Motor Improvements	5,150	4.4%	15	\$40
Existing	Miscellaneous Mfg	Pumps	Motor O&M	5,150	2.4%	2	\$1
Existing	Nonmetallic Mineral Products	Fans	Motor Improvements	34,135	3.0%	15	\$106
Existing	Nonmetallic Mineral Products	Fans	Motor O&M	34,135	1.2%	2	\$21
Existing	Nonmetallic Mineral Products	HVAC	HVAC Improvements	26,038	10.0%	15	\$97
Existing	Nonmetallic Mineral Products	HVAC	HVAC O&M	26,038	8.5%	2	\$145
Existing	Nonmetallic Mineral Products	Lighting	Lighting Improvements	20,223	8.0%	10	\$160
Existing	Nonmetallic Mineral Products	Motors Other	Motor Improvements	97,170	3.0%	15	\$302
Existing	Nonmetallic Mineral Products	Motors Other	Motor O&M	97,170	1.2%	2	\$59
Existing	Nonmetallic Mineral Products	Other	Bldg Improvements	18,578	17.9%	15	\$439
Existing	Nonmetallic Mineral Products	Process AirComp	Air Comp Improvements	39,367	10.0%	15	\$245
Existing	Nonmetallic Mineral Products	Process AirComp	Air Comp O&M	39,367	5.7%	2	\$41
Existing	Nonmetallic Mineral Products	Process AirComp	Motor Improvements	39,367	3.0%	15	\$122
Existing	Nonmetallic Mineral Products	Process AirComp	Motor O&M	39,367	1.2%	2	\$24
Existing	Nonmetallic Mineral Products	Process Cool	Cool Improvements	14,508	9.2%	15	\$104
Existing	Nonmetallic Mineral Products	Process Heat	Heat Improvements	84,841	8.7%	15	\$446
Existing	Nonmetallic Mineral Products	Process Heat	Heat O&M	84,841	4.8%	2	\$138
Existing	Nonmetallic Mineral Products	Process Other	Other Improvements	2,539	18.0%	15	\$13
Existing	Nonmetallic Mineral Products	Process Other	Other O&M	2,539	17.8%	2	\$23
Existing	Nonmetallic Mineral Products	Process Refrig	Motor Improvements	16,695	3.0%	15	\$52
Existing	Nonmetallic Mineral Products	Process Refrig	Motor O&M	16,695	1.2%	2	\$10
Existing	Nonmetallic Mineral Products	Pumps	Motor Improvements	61,789	3.0%	15	\$192
Existing	Nonmetallic Mineral Products	Pumps	Motor O&M	61,789	1.2%	2	\$37
Existing	Paper Mfg	Fans	Motor Improvements	303,153	1.4%	15	\$302
Existing	Paper Mfg	Fans	Motor O&M	303,153	1.2%	2	\$127
Existing	Paper Mfg	HVAC	HVAC Improvements	77,029	6.0%	15	\$482
Existing	Paper Mfg	HVAC	HVAC O&M	77,029	9.6%	2	\$439
Existing	Paper Mfg	Indirect Boiler	Boiler Improvements	55,154	11.8%	15	\$3,798
Existing	Paper Mfg	Lighting	Lighting Improvements	74,623	12.7%	10	\$969

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EUJ)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Paper Mfg	Motors Other	Motor Improvements	600,185	1.4%	15	\$597
Existing	Paper Mfg	Motors Other	Motor O&M	600,185	1.2%	2	\$251
Existing	Paper Mfg	Other	Bldg Improvements	39,832	1.2%	15	\$83
Existing	Paper Mfg	Process AirComp	Air Comp Improvements	70,435	14.1%	15	\$382
Existing	Paper Mfg	Process AirComp	Air Comp O&M	70,435	11.6%	2	\$188
Existing	Paper Mfg	Process AirComp	Motor Improvements	70,435	1.4%	15	\$70
Existing	Paper Mfg	Process AirComp	Motor O&M	70,435	1.2%	2	\$29
Existing	Paper Mfg	Process Cool	Cool Improvements	28,367	17.6%	15	\$171
Existing	Paper Mfg	Process Heat	Heat Improvements	47,089	23.8%	15	\$3,363
Existing	Paper Mfg	Process Heat	Heat O&M	47,089	14.0%	2	\$207
Existing	Paper Mfg	Process Other	Other Improvements	9,151	33.3%	15	\$103
Existing	Paper Mfg	Process Other	Other O&M	9,151	13.2%	2	\$41
Existing	Paper Mfg	Process Refrig	Motor Improvements	76,556	1.4%	15	\$76
Existing	Paper Mfg	Process Refrig	Motor O&M	76,556	1.2%	2	\$32
Existing	Paper Mfg	Process Refrig	Refrig Improvements	76,556	18.8%	15	\$256
Existing	Paper Mfg	Pumps	Motor Improvements	480,747	1.4%	15	\$479
Existing	Paper Mfg	Pumps	Motor O&M	480,747	1.2%	2	\$201
Existing	Petroleum Coal Products	Fans	Motor Improvements	3,387,337	1.5%	15	\$5,993
Existing	Petroleum Coal Products	Fans	Motor O&M	3,387,337	10.8%	2	\$4,166
Existing	Petroleum Coal Products	HVAC	HVAC Improvements	984,388	32.9%	15	\$47772
Existing	Petroleum Coal Products	HVAC	HVAC O&M	984,388	11.7%	2	\$4,658
Existing	Petroleum Coal Products	Lighting	Lighting Improvements	755,361	6.4%	10	\$4,178
Existing	Petroleum Coal Products	Motors Other	Motor Improvements	9,642,720	1.5%	15	\$17059
Existing	Petroleum Coal Products	Motors Other	Motor O&M	9,642,720	10.8%	2	\$11860
Existing	Petroleum Coal Products	Process AirComp	Air Comp Improvements	3,906,629	23.2%	15	\$41975
Existing	Petroleum Coal Products	Process AirComp	Air Comp O&M	3,906,629	13.7%	2	\$9,559
Existing	Petroleum Coal Products	Process AirComp	Motor Improvements	3,906,629	1.5%	15	\$6,911
Existing	Petroleum Coal Products	Process AirComp	Motor O&M	3,906,629	10.8%	2	\$4,805
Existing	Petroleum Coal Products	Process Cool	Cool Improvements	1,710,356	3.8%	15	\$4,717
Existing	Petroleum Coal Products	Process Refrig	Motor Improvements	1,656,467	1.5%	15	\$2,931
Existing	Petroleum Coal Products	Process Refrig	Motor O&M	1,656,467	10.8%	2	\$2,037

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EUJ)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Petroleum Coal Products	Pumps	Motor Improvements	6,131,683	1.5%	15	\$10848
Existing	Petroleum Coal Products	Pumps	Motor O&M	6,131,683	10.8%	2	\$7,542
Existing	Plastics Rubber Products	Fans	Motor Improvements	69,629	4.4%	15	\$379
Existing	Plastics Rubber Products	Fans	Motor O&M	69,629	1.6%	2	\$115
Existing	Plastics Rubber Products	HVAC	HVAC Improvements	93,747	10.6%	15	\$831
Existing	Plastics Rubber Products	HVAC	HVAC O&M	93,747	7.0%	2	\$323
Existing	Plastics Rubber Products	Lighting	Lighting Improvements	76,701	6.4%	10	\$485
Existing	Plastics Rubber Products	Motors Other	Motor Improvements	198,215	4.4%	15	\$1,080
Existing	Plastics Rubber Products	Motors Other	Motor O&M	198,215	1.6%	2	\$327
Existing	Plastics Rubber Products	Other	Bldg Improvements	24,929	26.6%	15	\$1,777
Existing	Plastics Rubber Products	Process AirComp	Air Comp Improvements	80,302	8.5%	15	\$207
Existing	Plastics Rubber Products	Process AirComp	Air Comp O&M	80,302	10.6%	2	\$166
Existing	Plastics Rubber Products	Process AirComp	Motor Improvements	80,302	4.4%	15	\$438
Existing	Plastics Rubber Products	Process AirComp	Motor O&M	80,302	1.6%	2	\$133
Existing	Plastics Rubber Products	Process Cool	Cool Improvements	78,021	15.5%	15	\$779
Existing	Plastics Rubber Products	Process Heat	Heat Improvements	145,953	12.6%	15	\$971
Existing	Plastics Rubber Products	Process Heat	Heat O&M	145,953	8.7%	2	\$288
Existing	Plastics Rubber Products	Process Heat	Steam Distribution	145,953	1.4%	15	\$41
Existing	Plastics Rubber Products	Process Other	Other Improvements	8,355	21.6%	15	\$168
Existing	Plastics Rubber Products	Process Other	Other O&M	8,355	16.6%	2	\$96
Existing	Plastics Rubber Products	Process Refrig	Motor Improvements	34,056	4.4%	15	\$186
Existing	Plastics Rubber Products	Process Refrig	Motor O&M	34,056	1.6%	2	\$56
Existing	Plastics Rubber Products	Pumps	Motor Improvements	126,049	4.4%	15	\$687
Existing	Plastics Rubber Products	Pumps	Motor O&M	126,049	1.6%	2	\$208
Existing	Primary Metal Mfg	Fans	Motor Improvements	17,015	3.5%	15	\$112
Existing	Primary Metal Mfg	Fans	Motor O&M	17,015	3.0%	2	\$34
Existing	Primary Metal Mfg	HVAC	HVAC Improvements	12,703	7.6%	15	\$60
Existing	Primary Metal Mfg	HVAC	HVAC O&M	12,703	9.6%	2	\$41
Existing	Primary Metal Mfg	Indirect Boiler	Boiler Improvements	623	25.0%	15	\$1
Existing	Primary Metal Mfg	Lighting	Lighting Improvements	10,174	11.2%	10	\$157
Existing	Primary Metal Mfg	Motors Other	Motor Improvements	68,504	3.5%	15	\$453

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EUJ)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Primary Metal Mfg	Motors Other	Motor O&M	68,504	3.0%	2	\$136
Existing	Primary Metal Mfg	Other	Bldg Improvements	4,554	2.9%	15	\$22
Existing	Primary Metal Mfg	Process AirComp	Air Comp Improvements	15,904	11.3%	15	\$31
Existing	Primary Metal Mfg	Process AirComp	Air Comp O&M	15,904	11.6%	2	\$29
Existing	Primary Metal Mfg	Process AirComp	Motor Improvements	15,904	3.5%	15	\$105
Existing	Primary Metal Mfg	Process AirComp	Motor O&M	15,904	3.0%	2	\$32
Existing	Primary Metal Mfg	Process Cool	Cool Improvements	2,831	40.9%	15	\$24
Existing	Primary Metal Mfg	Process Heat	Heat Improvements	97,170	12.7%	15	\$531
Existing	Primary Metal Mfg	Process Heat	Heat O&M	97,170	6.0%	2	\$304
Existing	Primary Metal Mfg	Process Heat	Steam Distribution	97,170	7.2%	15	\$304
Existing	Primary Metal Mfg	Process Other	Other Improvements	467	45.7%	15	\$88
Existing	Primary Metal Mfg	Process Other	Other O&M	467	35.1%	2	\$9
Existing	Primary Metal Mfg	Process Refrig	Motor Improvements	111	3.5%	15	\$1
Existing	Primary Metal Mfg	Process Refrig	Motor O&M	111	3.0%	2	\$0
Existing	Primary Metal Mfg	Pumps	Motor Improvements	9,675	3.5%	15	\$64
Existing	Primary Metal Mfg	Pumps	Motor O&M	9,675	3.0%	2	\$19
Existing	Printing Related Support	Fans	Motor Improvements	5,617	3.2%	15	\$17
Existing	Printing Related Support	Fans	Motor O&M	5,617	2.5%	2	\$13
Existing	Printing Related Support	HVAC	HVAC Improvements	15,020	11.5%	15	\$207
Existing	Printing Related Support	HVAC	HVAC O&M	15,020	11.8%	2	\$123
Existing	Printing Related Support	Lighting	Lighting Improvements	9,395	10.5%	10	\$107
Existing	Printing Related Support	Motors Other	Motor Improvements	15,991	3.2%	15	\$47
Existing	Printing Related Support	Motors Other	Motor O&M	15,991	2.5%	2	\$37
Existing	Printing Related Support	Other	Bldg Improvements	11,998	47.9%	15	\$8
Existing	Printing Related Support	Process AirComp	Air Comp Improvements	6,478	9.3%	15	\$23
Existing	Printing Related Support	Process AirComp	Air Comp O&M	6,478	12.7%	2	\$14
Existing	Printing Related Support	Process AirComp	Motor Improvements	6,478	3.2%	15	\$19
Existing	Printing Related Support	Process AirComp	Motor O&M	6,478	2.5%	2	\$15
Existing	Printing Related Support	Process Cool	Cool Improvements	3,701	41.3%	15	\$241
Existing	Printing Related Support	Process Heat	Heat Improvements	2,088	18.8%	15	\$32
Existing	Printing Related Support	Process Heat	Heat O&M	2,088	18.7%	2	\$57

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EUJ)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Printing Related Support	Process Other	Other Improvements	153	30.3%	15	\$8
Existing	Printing Related Support	Process Refrig	Motor Improvements	2,747	3.2%	15	\$8
Existing	Printing Related Support	Process Refrig	Motor O&M	2,747	2.5%	2	\$6
Existing	Printing Related Support	Process Refrig	Refrig Improvements	2,747	20.4%	15	\$120
Existing	Printing Related Support	Pumps	Motor Improvements	10,169	3.2%	15	\$30
Existing	Printing Related Support	Pumps	Motor O&M	10,169	2.5%	2	\$24
Existing	Transportation Equipment Mfg	Fans	Motor Improvements	60,863	2.4%	15	\$161
Existing	Transportation Equipment Mfg	Fans	Motor O&M	60,863	2.4%	2	\$86
Existing	Transportation Equipment Mfg	HVAC	HVAC Improvements	224,719	13.2%	15	\$2,119
Existing	Transportation Equipment Mfg	HVAC	HVAC O&M	224,719	2.1%	2	\$243
Existing	Transportation Equipment Mfg	Indirect Boiler	Boiler Improvements	2,307	33.4%	15	\$472
Existing	Transportation Equipment Mfg	Lighting	Lighting Improvements	175,929	8.2%	10	\$1,275
Existing	Transportation Equipment Mfg	Motors Other	Motor Improvements	136,552	2.4%	15	\$361
Existing	Transportation Equipment Mfg	Motors Other	Motor O&M	136,552	2.4%	2	\$193
Existing	Transportation Equipment Mfg	Other	Bldg Improvements	48,813	38.8%	15	\$177
Existing	Transportation Equipment Mfg	Process AirComp	Air Comp Improvements	141,664	8.2%	15	\$362
Existing	Transportation Equipment Mfg	Process AirComp	Air Comp O&M	141,664	9.6%	2	\$378
Existing	Transportation Equipment Mfg	Process AirComp	Motor Improvements	141,664	2.4%	15	\$374
Existing	Transportation Equipment Mfg	Process AirComp	Motor O&M	141,664	2.4%	2	\$200
Existing	Transportation Equipment Mfg	Process Cool	Cool Improvements	53,115	15.2%	15	\$973
Existing	Transportation Equipment Mfg	Process Heat	Heat Improvements	112,903	7.1%	15	\$315
Existing	Transportation Equipment Mfg	Process Heat	Heat O&M	112,903	9.5%	2	\$154
Existing	Transportation Equipment Mfg	Process Heat	Steam Distribution	112,903	8.6%	15	\$293
Existing	Transportation Equipment Mfg	Process Other	Other Improvements	15,361	22.3%	15	\$139
Existing	Transportation Equipment Mfg	Process Other	Other O&M	15,361	23.4%	2	\$114
Existing	Transportation Equipment Mfg	Process Refrig	Motor Improvements	39,377	2.4%	15	\$104
Existing	Transportation Equipment Mfg	Process Refrig	Motor O&M	39,377	2.4%	2	\$56
Existing	Transportation Equipment Mfg	Process Refrig	Refrig Improvements	39,377	37.9%	15	\$2,421
Existing	Transportation Equipment Mfg	Pumps	Motor Improvements	132,979	2.4%	15	\$351
Existing	Transportation Equipment Mfg	Pumps	Motor O&M	132,979	2.4%	2	\$187
Existing	Wood Product Mfg	Fans	Motor Improvements	39,578	3.4%	15	\$122

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline MWh (UEC or EUJ)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Wood Product Mfg	Fans	Motor O&M	39,578	2.0%	2	\$27
Existing	Wood Product Mfg	HVAC	HVAC Improvements	27,116	19.0%	15	\$1,468
Existing	Wood Product Mfg	HVAC	HVAC O&M	27,116	1.2%	2	\$19
Existing	Wood Product Mfg	Lighting	Lighting Improvements	28,702	7.3%	10	\$146
Existing	Wood Product Mfg	Motors Other	Motor Improvements	112,670	3.4%	15	\$348
Existing	Wood Product Mfg	Motors Other	Motor O&M	112,670	0.4%	2	\$514
Existing	Wood Product Mfg	Other	Bldg Improvements	31,237	32.2%	15	\$241
Existing	Wood Product Mfg	Process AirComp	Air Comp Improvements	45,646	6.9%	15	\$127
Existing	Wood Product Mfg	Process AirComp	Air Comp O&M	45,646	9.6%	2	\$82
Existing	Wood Product Mfg	Process AirComp	Motor Improvements	45,646	3.4%	15	\$141
Existing	Wood Product Mfg	Process AirComp	Motor O&M	45,646	2.0%	2	\$31
Existing	Wood Product Mfg	Process Cool	Cool Improvements	2,535	34.9%	15	\$8
Existing	Wood Product Mfg	Process Heat	Heat Improvements	21,024	27.0%	15	\$39
Existing	Wood Product Mfg	Process Heat	Heat O&M	21,024	21.4%	2	\$82
Existing	Wood Product Mfg	Process Heat	Steam Distribution	21,024	23.6%	15	\$229
Existing	Wood Product Mfg	Process Other	Other Improvements	693	1.2%	15	\$9
Existing	Wood Product Mfg	Process Other	Other O&M	693	26.8%	2	\$22
Existing	Wood Product Mfg	Process Refrig	Motor Improvements	19,354	3.4%	15	\$60
Existing	Wood Product Mfg	Process Refrig	Motor O&M	19,354	0.4%	2	\$88
Existing	Wood Product Mfg	Pumps	Motor Improvements	71,648	3.4%	15	\$221
Existing	Wood Product Mfg	Pumps	Motor O&M	71,648	2.0%	2	\$49

Industrial Gas Measures

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline decatherms (UEC or EU)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Chemical Mfg	HVAC	HVAC Improvements	294	20.5%	15	\$60
Existing	Chemical Mfg	HVAC	HVAC O&M	294	13.7%	2	\$47
Existing	Chemical Mfg	Indirect Boiler	Boiler Improvements	8,291	2.2%	15	\$51
Existing	Chemical Mfg	Indirect Boiler	Boiler O&M	8,291	3.3%	2	\$47
Existing	Chemical Mfg	Process Heat	Boiler Improvements	5,261	20.7%	15	\$74
Existing	Chemical Mfg	Process Heat	Heat Improvements	5,261	10.5%	15	\$210
Existing	Chemical Mfg	Process Heat	Heat O&M	5,261	0.6%	2	\$17
Existing	Chemical Mfg	Process Heat	Steam Distribution	5,261	14.3%	15	\$43
Existing	Chemical Mfg	Process Other	Other O&M	863	9.7%	2	\$25
Existing	Computer Electronic Mfg	HVAC	HVAC Improvements	749	11.0%	15	\$65
Existing	Computer Electronic Mfg	HVAC	HVAC O&M	749	13.7%	2	\$41
Existing	Computer Electronic Mfg	Indirect Boiler	Boiler Improvements	974	11.7%	15	\$140
Existing	Computer Electronic Mfg	Indirect Boiler	Boiler O&M	974	8.9%	2	\$12
Existing	Computer Electronic Mfg	Process Heat	Boiler Improvements	337	4.4%	15	\$26
Existing	Computer Electronic Mfg	Process Heat	Heat Improvements	337	23.9%	15	\$31
Existing	Computer Electronic Mfg	Process Heat	Heat O&M	337	4.3%	2	\$9
Existing	Computer Electronic Mfg	Process Heat	Steam Distribution	337	9.7%	15	\$17
Existing	Electrical Equipment Mfg	HVAC	HVAC Improvements	439	10.4%	15	\$29
Existing	Electrical Equipment Mfg	HVAC	HVAC O&M	439	4.6%	2	\$4
Existing	Electrical Equipment Mfg	Indirect Boiler	Boiler Improvements	176	12.0%	15	\$25
Existing	Electrical Equipment Mfg	Indirect Boiler	Boiler O&M	176	12.8%	2	\$5
Existing	Electrical Equipment Mfg	Process Heat	Boiler Improvements	790	7.3%	15	\$32
Existing	Electrical Equipment Mfg	Process Heat	Heat Improvements	790	17.1%	15	\$80
Existing	Electrical Equipment Mfg	Process Heat	Heat O&M	790	2.5%	2	\$9
Existing	Electrical Equipment Mfg	Process Heat	Steam Distribution	790	6.3%	15	\$18
Existing	Fabricated Metal Products	HVAC	HVAC Improvements	1,158	14.5%	15	\$216
Existing	Fabricated Metal Products	HVAC	HVAC O&M	1,158	13.0%	2	\$109
Existing	Fabricated Metal Products	Indirect Boiler	Boiler Improvements	883	17.3%	15	\$252
Existing	Fabricated Metal Products	Indirect Boiler	Boiler O&M	883	11.8%	2	\$12

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline decatherms (UEC or EUJ)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Fabricated Metal Products	Process Heat	Boiler Improvements	3,475	6.0%	15	\$103
Existing	Fabricated Metal Products	Process Heat	Heat Improvements	3,475	6.8%	15	\$227
Existing	Fabricated Metal Products	Process Heat	Heat O&M	3,475	3.5%	2	\$61
Existing	Fabricated Metal Products	Process Heat	Steam Distribution	3,475	5.2%	15	\$123
Existing	Fabricated Metal Products	Process Other	Other O&M	55	12.4%	2	\$4
Existing	Food Mfg	HVAC	HVAC Improvements	856	20.4%	15	\$107
Existing	Food Mfg	HVAC	HVAC O&M	856	5.6%	2	\$11
Existing	Food Mfg	Indirect Boiler	Boiler Improvements	6,372	6.0%	15	\$327
Existing	Food Mfg	Indirect Boiler	Boiler O&M	6,372	4.1%	2	\$99
Existing	Food Mfg	Process Heat	Boiler Improvements	4,731	7.1%	15	\$112
Existing	Food Mfg	Process Heat	Heat Improvements	4,731	12.9%	15	\$324
Existing	Food Mfg	Process Heat	Heat O&M	4,731	3.5%	2	\$61
Existing	Food Mfg	Process Heat	Steam Distribution	4,731	5.2%	15	\$119
Existing	Food Mfg	Process Other	Other O&M	594	28.1%	2	\$24
Existing	Industrial Machinery	HVAC	HVAC Improvements	1,327	14.4%	15	\$164
Existing	Industrial Machinery	HVAC	HVAC O&M	1,327	14.6%	2	\$70
Existing	Industrial Machinery	Indirect Boiler	Boiler Improvements	641	18.8%	15	\$131
Existing	Industrial Machinery	Indirect Boiler	Boiler O&M	641	15.1%	2	\$18
Existing	Industrial Machinery	Process Heat	Boiler Improvements	1,327	2.1%	15	\$32
Existing	Industrial Machinery	Process Heat	Heat Improvements	1,327	13.2%	15	\$94
Existing	Industrial Machinery	Process Heat	Heat O&M	1,327	9.7%	2	\$77
Existing	Industrial Machinery	Process Heat	Steam Distribution	1,327	6.2%	15	\$31
Existing	Miscellaneous Mfg	HVAC	HVAC Improvements	754	16.6%	15	\$92
Existing	Miscellaneous Mfg	HVAC	HVAC O&M	754	20.2%	2	\$7
Existing	Miscellaneous Mfg	Indirect Boiler	Boiler Improvements	679	14.3%	15	\$60
Existing	Miscellaneous Mfg	Indirect Boiler	Boiler O&M	679	5.5%	2	\$8
Existing	Miscellaneous Mfg	Process Heat	Boiler Improvements	603	4.4%	15	\$29
Existing	Miscellaneous Mfg	Process Heat	Heat Improvements	603	8.1%	15	\$24
Existing	Miscellaneous Mfg	Process Heat	Heat O&M	603	3.5%	2	\$7
Existing	Miscellaneous Mfg	Process Heat	Steam Distribution	603	11.7%	15	\$16
New	Miscellaneous Mfg	HVAC	HVAC Improvements	754	16.6%	15	\$92

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline decatherms (UEC or EU)	Savings as Percent of End Use	Measure Life	Measure Cost
New	Miscellaneous Mfg	HVAC	HVAC O&M	754	20.2%	2	\$7
New	Miscellaneous Mfg	Indirect Boiler	Boiler Improvements	679	14.3%	15	\$60
New	Miscellaneous Mfg	Indirect Boiler	Boiler O&M	679	5.5%	2	\$8
New	Miscellaneous Mfg	Process Heat	Boiler Improvements	603	4.4%	15	\$29
New	Miscellaneous Mfg	Process Heat	Heat Improvements	603	8.1%	15	\$24
New	Miscellaneous Mfg	Process Heat	Heat O&M	603	3.5%	2	\$7
New	Miscellaneous Mfg	Process Heat	Steam Distribution	603	11.7%	15	\$16
Existing	Nonmetallic Mineral Products	HVAC	HVAC Improvements	3,832	10.8%	15	\$502
Existing	Nonmetallic Mineral Products	HVAC	HVAC O&M	3,832	1.9%	2	\$36
Existing	Nonmetallic Mineral Products	Indirect Boiler	Boiler O&M	2,299	4.5%	2	\$7
Existing	Nonmetallic Mineral Products	Process Heat	Boiler Improvements	66,686	21.8%	15	\$3,054
Existing	Nonmetallic Mineral Products	Process Heat	Heat Improvements	66,686	12.9%	15	\$8,142
Existing	Nonmetallic Mineral Products	Process Heat	Heat O&M	66,686	3.0%	2	\$642
Existing	Nonmetallic Mineral Products	Process Heat	Steam Distribution	66,686	4.6%	15	\$1,330
Existing	Nonmetallic Mineral Products	Process Other	Other O&M	383	15.3%	2	\$120
Existing	Paper Mfg	HVAC	HVAC Improvements	7,319	18.3%	15	\$934
Existing	Paper Mfg	HVAC	HVAC O&M	7,319	22.0%	2	\$232
Existing	Paper Mfg	Indirect Boiler	Boiler Improvements	114,806	7.8%	15	\$4,456
Existing	Paper Mfg	Indirect Boiler	Boiler O&M	114,806	4.1%	2	\$605
Existing	Paper Mfg	Process Heat	Boiler Improvements	48,543	6.2%	15	\$1,544
Existing	Paper Mfg	Process Heat	Heat Improvements	48,543	10.4%	15	\$3,596
Existing	Paper Mfg	Process Heat	Heat O&M	48,543	3.1%	2	\$382
Existing	Paper Mfg	Process Heat	Steam Distribution	48,543	3.8%	15	\$341
Existing	Paper Mfg	Process Other	Other O&M	8,861	20.0%	2	\$1,235
Existing	Petroleum Coal Products	Indirect Boiler	Boiler Improvements	54,472	8.8%	15	\$4,614
Existing	Petroleum Coal Products	Indirect Boiler	Boiler O&M	54,472	5.8%	2	\$569
Existing	Petroleum Coal Products	Process Heat	Boiler Improvements	99,253	1.9%	15	\$1,532
Existing	Petroleum Coal Products	Process Heat	Heat Improvements	99,253	4.8%	15	\$3,757
Existing	Petroleum Coal Products	Process Heat	Heat O&M	99,253	2.3%	2	\$457
Existing	Petroleum Coal Products	Process Heat	Steam Distribution	99,253	3.0%	15	\$157
Existing	Plastics Rubber Products	HVAC	HVAC Improvements	1,322	9.3%	15	\$81

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline decatherms (UEC or EU)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Plastics Rubber Products	HVAC	HVAC O&M	1,322	12.4%	2	\$5,385
Existing	Plastics Rubber Products	Indirect Boiler	Boiler Improvements	2,644	12.4%	15	\$106
Existing	Plastics Rubber Products	Indirect Boiler	Boiler O&M	2,644	6.4%	2	\$40
Existing	Plastics Rubber Products	Process Heat	Boiler Improvements	1,983	10.3%	15	\$135
Existing	Plastics Rubber Products	Process Heat	Heat Improvements	1,983	13.1%	15	\$172
Existing	Plastics Rubber Products	Process Heat	Heat O&M	1,983	8.4%	2	\$109
Existing	Plastics Rubber Products	Process Heat	Steam Distribution	1,983	6.8%	15	\$22
Existing	Plastics Rubber Products	Process Other	Other O&M	165	16.6%	2	\$6
Existing	Primary Metal Mfg	HVAC	HVAC Improvements	9,682	13.9%	15	\$655
Existing	Primary Metal Mfg	Indirect Boiler	Boiler Improvements	15,537	17.7%	15	\$2,839
Existing	Primary Metal Mfg	Indirect Boiler	Boiler O&M	15,537	13.5%	2	\$322
Existing	Primary Metal Mfg	Process Heat	Boiler Improvements	116,190	7.8%	15	\$4,113
Existing	Primary Metal Mfg	Process Heat	Heat Improvements	116,190	8.3%	15	\$7,569
Existing	Primary Metal Mfg	Process Heat	Heat O&M	116,190	1.6%	2	\$978
Existing	Primary Metal Mfg	Process Heat	Steam Distribution	116,190	4.2%	15	\$1,983
Existing	Printing Related Support	HVAC	HVAC Improvements	386	17.4%	15	\$31
Existing	Printing Related Support	HVAC	HVAC O&M	386	30.9%	2	\$41
Existing	Printing Related Support	Indirect Boiler	Boiler Improvements	232	12.4%	15	\$31
Existing	Printing Related Support	Indirect Boiler	Boiler O&M	232	10.3%	2	\$3
Existing	Printing Related Support	Process Heat	Boiler Improvements	463	16.3%	15	\$138
Existing	Printing Related Support	Process Heat	Heat Improvements	463	4.7%	15	\$10
Existing	Printing Related Support	Process Heat	Heat O&M	463	4.4%	2	\$13
Existing	Printing Related Support	Process Heat	Steam Distribution	463	17.3%	15	\$30
Existing	Printing Related Support	Process Other	Other O&M	26	16.6%	2	\$5
Existing	Transportation Equipment Mfg	HVAC	HVAC Improvements	11,987	7.3%	15	\$910
Existing	Transportation Equipment Mfg	HVAC	HVAC O&M	11,987	13.7%	2	\$319
Existing	Transportation Equipment Mfg	Indirect Boiler	Boiler Improvements	9,826	18.9%	15	\$1,935
Existing	Transportation Equipment Mfg	Indirect Boiler	Boiler O&M	9,826	6.2%	2	\$458
Existing	Transportation Equipment Mfg	Process Heat	Boiler Improvements	11,987	15.1%	15	\$469
Existing	Transportation Equipment Mfg	Process Heat	Heat Improvements	11,987	19.6%	15	\$792
Existing	Transportation Equipment Mfg	Process Heat	Heat O&M	11,987	3.4%	2	\$318

Construction Vintage	Customer Segment	End Use	Measure Name	Baseline decatherms (UEC or EUJ)	Savings as Percent of End Use	Measure Life	Measure Cost
Existing	Transportation Equipment Mfg	Process Heat	Steam Distribution	11,987	5.3%	15	\$5,564
Existing	Transportation Equipment Mfg	Process Other	Other O&M	786	17.4%	2	\$60
Existing	Wood Product Mfg	HVAC	HVAC Improvements	2,944	9.8%	15	\$332
Existing	Wood Product Mfg	HVAC	HVAC O&M	2,944	4.5%	2	\$24
Existing	Wood Product Mfg	Indirect Boiler	Boiler Improvements	6,308	12.1%	15	\$384
Existing	Wood Product Mfg	Indirect Boiler	Boiler O&M	6,308	3.6%	2	\$19
Existing	Wood Product Mfg	Process Heat	Boiler Improvements	11,354	11.4%	15	\$463
Existing	Wood Product Mfg	Process Heat	Heat Improvements	11,354	8.0%	15	\$2,113
Existing	Wood Product Mfg	Process Heat	Heat O&M	11,354	5.8%	2	\$77
Existing	Wood Product Mfg	Process Heat	Steam Distribution	11,354	1.5%	15	\$14
Existing	Wood Product Mfg	Process Other	Other O&M	841	6.9%	2	\$10

Appendix C.3: Detailed Results

The following pie charts show how the technical and achievable technical potential are distributed by fuel, sector, segment, and end use.

**Residential Electric
Technical Potential**

Figure 1: Residential Technical Potential in 2029 by Segment

Total: 343 aMW

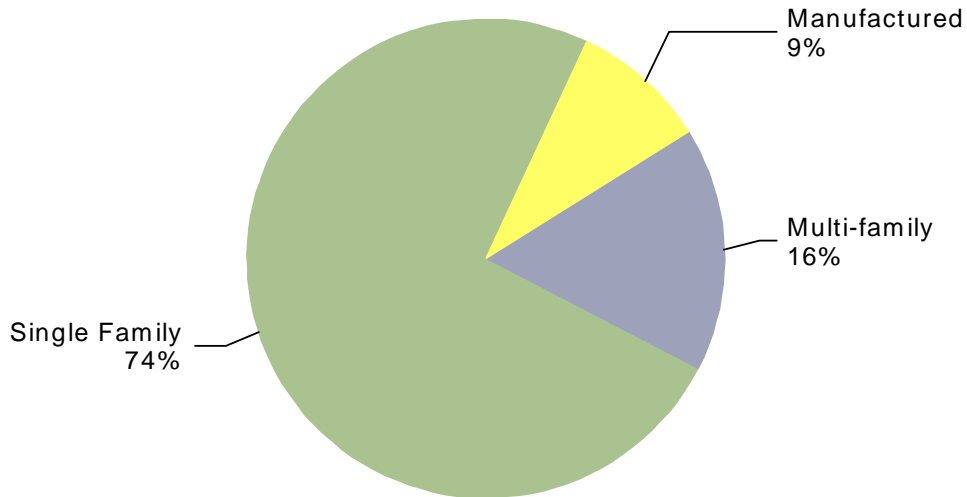


Figure 2: Residential Technical Potential in 2029 by End Use

Total: 343 aMW

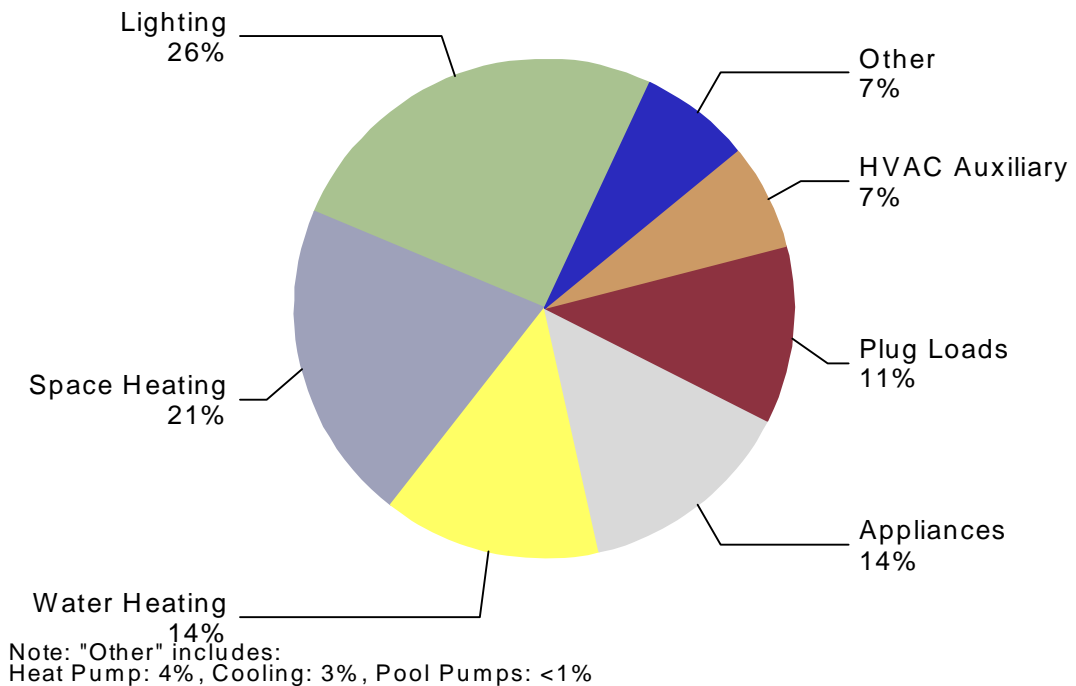


Figure 3: Residential Technical Potential in 2029 by End Use, Manufactured

Total: 343 aMW

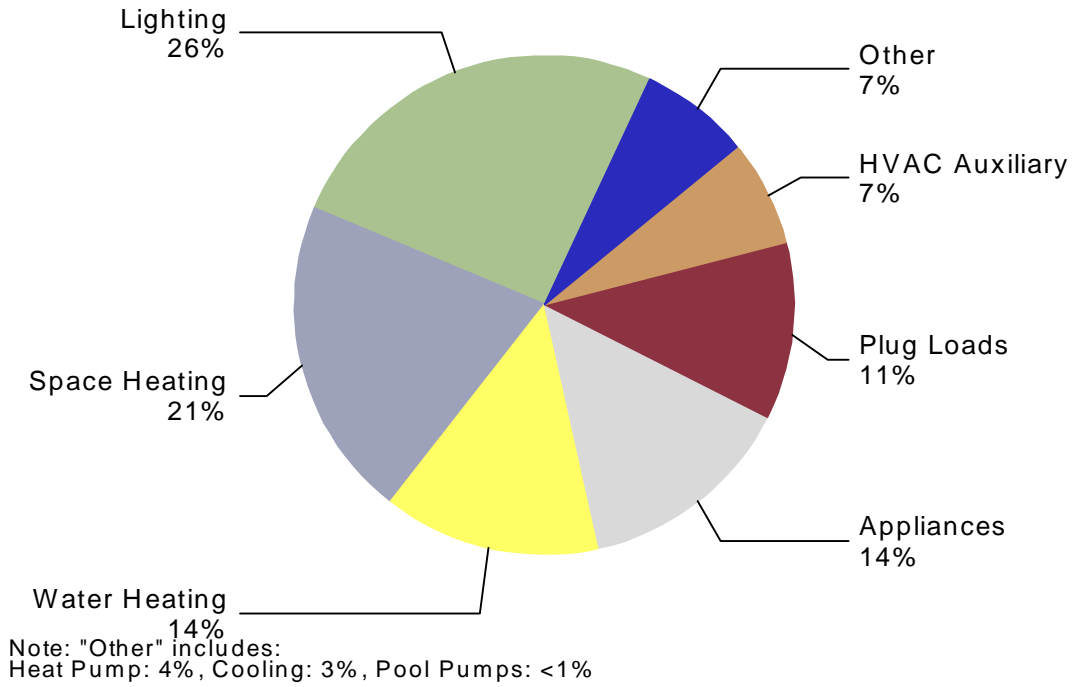


Figure 4: Residential Technical Potential in 2029 by End Use, Multifamily

Total: 57 aMW

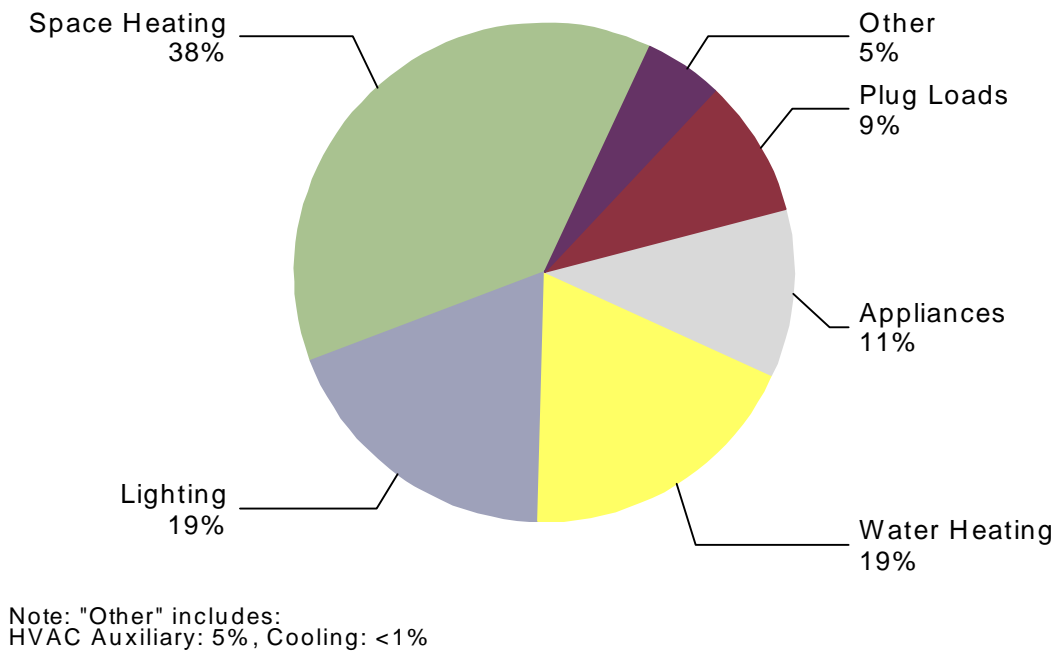
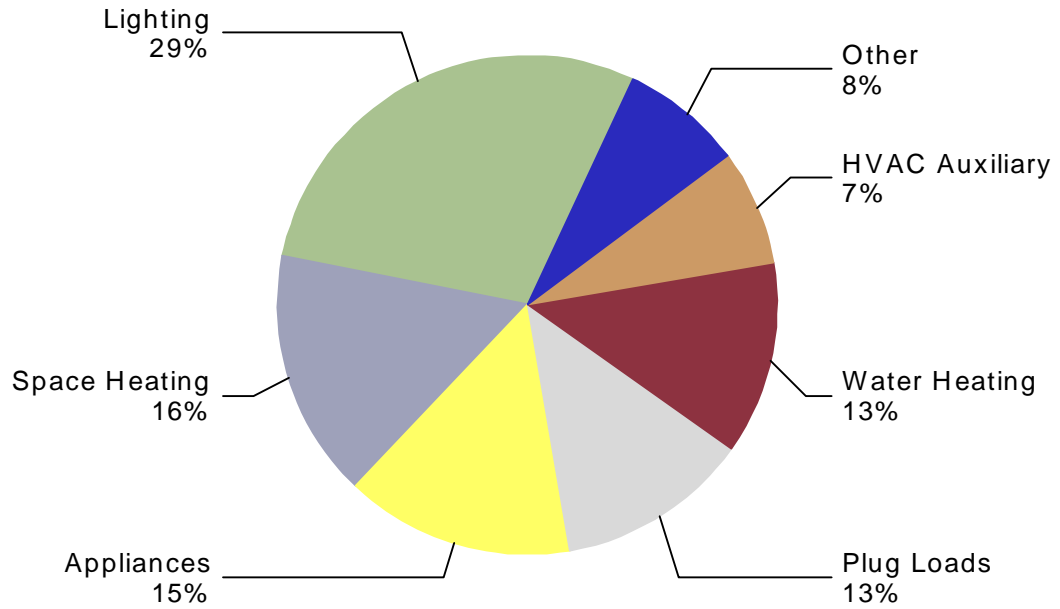


Figure 5: Residential Technical Potential in 2029 by End Use, Single Family

Total: 255 aMW



Note: "Other" includes:
Heat Pump: 4%, Cooling: 3%, Pool Pumps: <1%

Achievable Technical Potential

Figure 6: Residential Achievable Technical Potential in 2029 by Segment

Total: 273 aMW

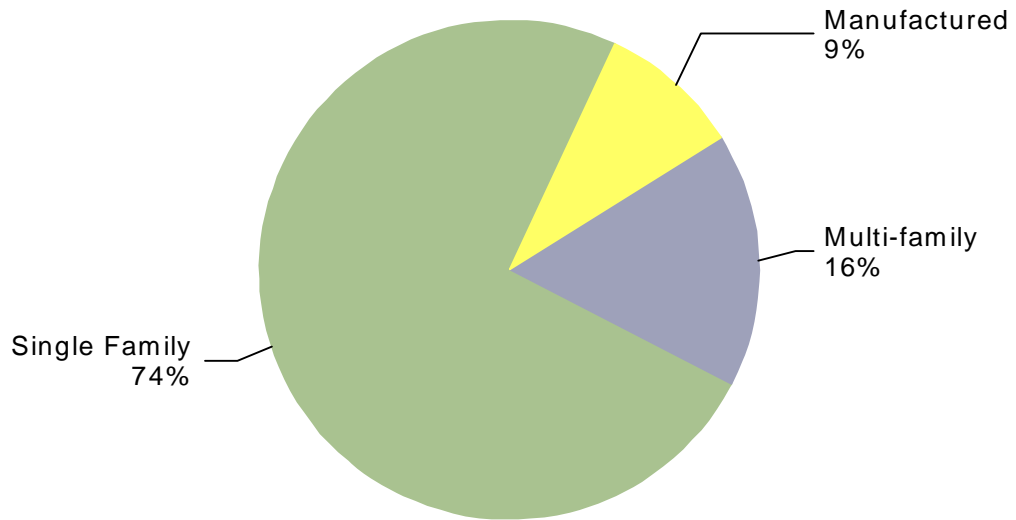


Figure 7: Residential Achievable Technical Potential in 2029 by End Use

Total: 273 aMW

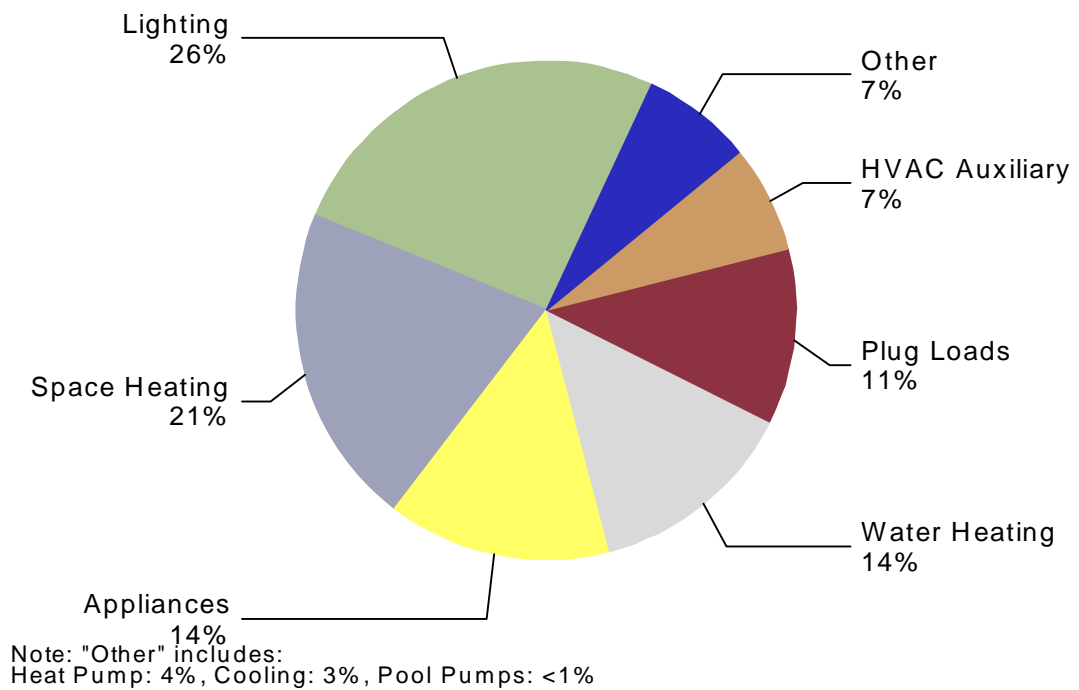


Figure 8: Residential Achievable Technical Potential in 2029 by End Use, Manufactured

Total: 273 aMW

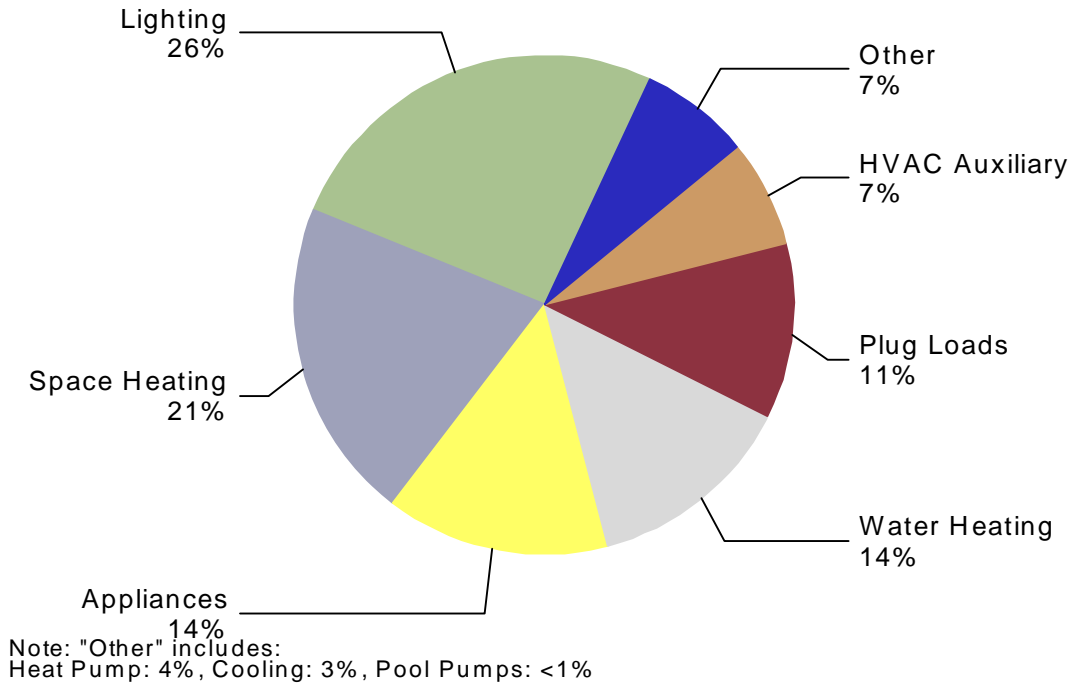


Figure 9: Residential Achievable Technical Potential in 2029 by End Use, Multifamily

Total: 45 aMW

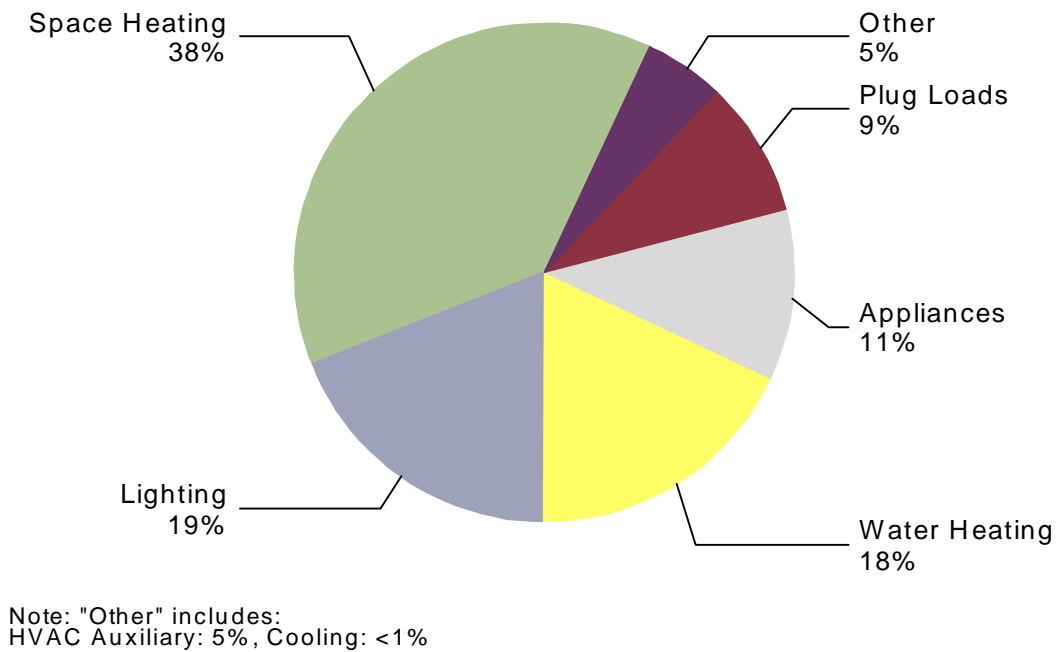
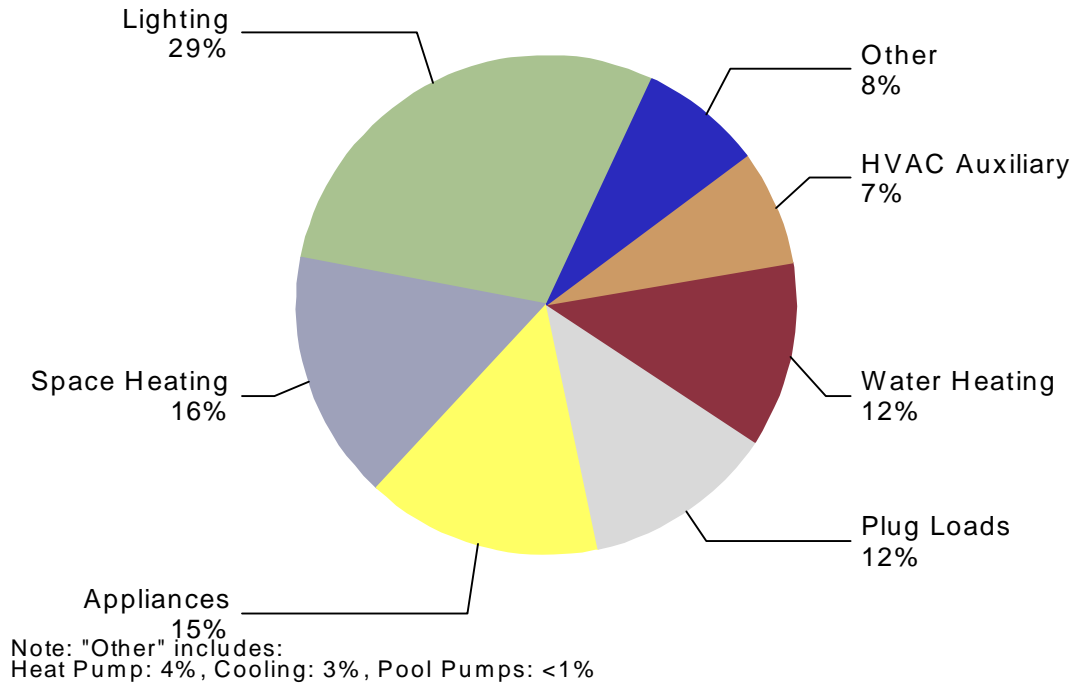


Figure 10: Residential Achievable Technical Potential in 2029 by End Use, Single Family

Total: 203 aMW

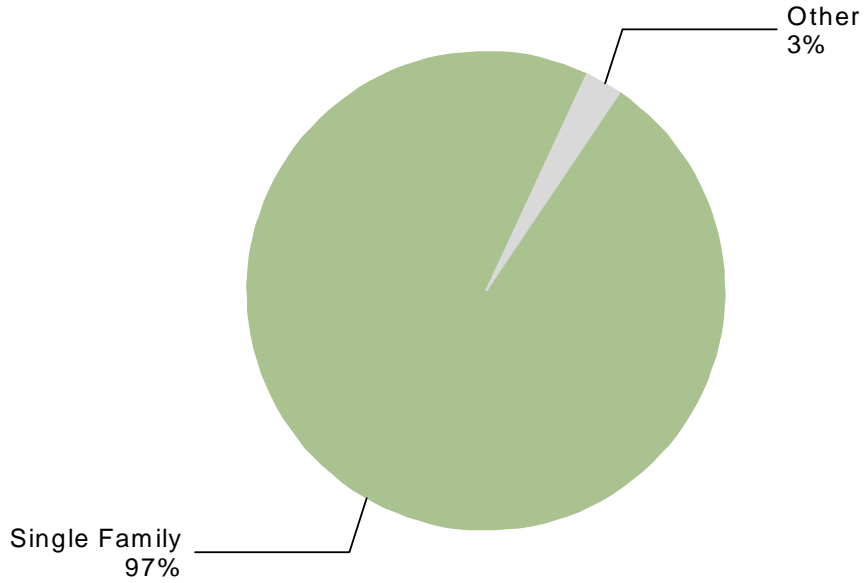


**Residential Gas
Technical Potential**

Figure 1: Residential Technical Potential in 2029 by Segment

Error! Bookmark not defined.

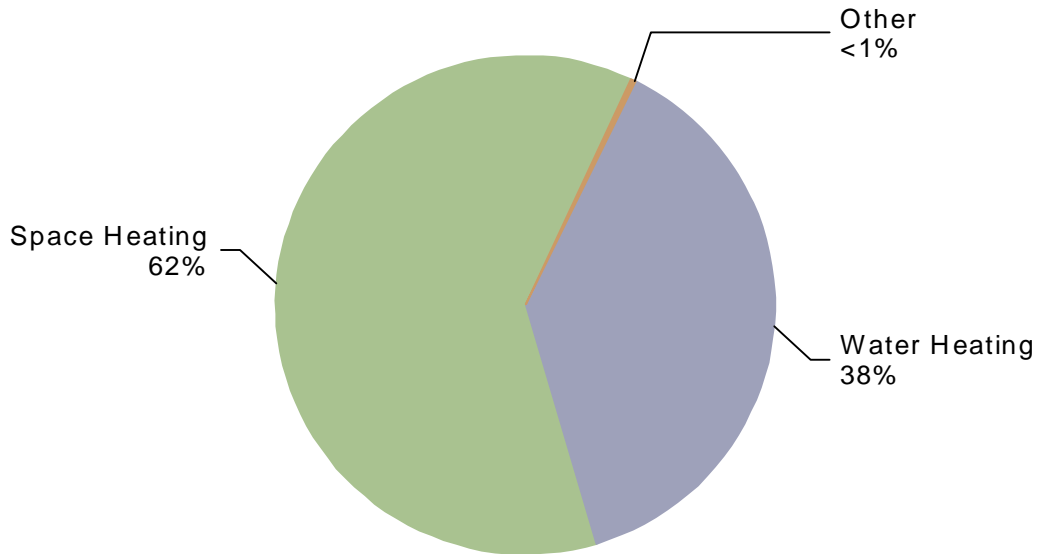
Total: 263,471,136 therms



Note: "Other" includes:
Multi-family: 2%, Manufactured: <1%

Figure 2: Residential Technical Potential in 2029 by End Use

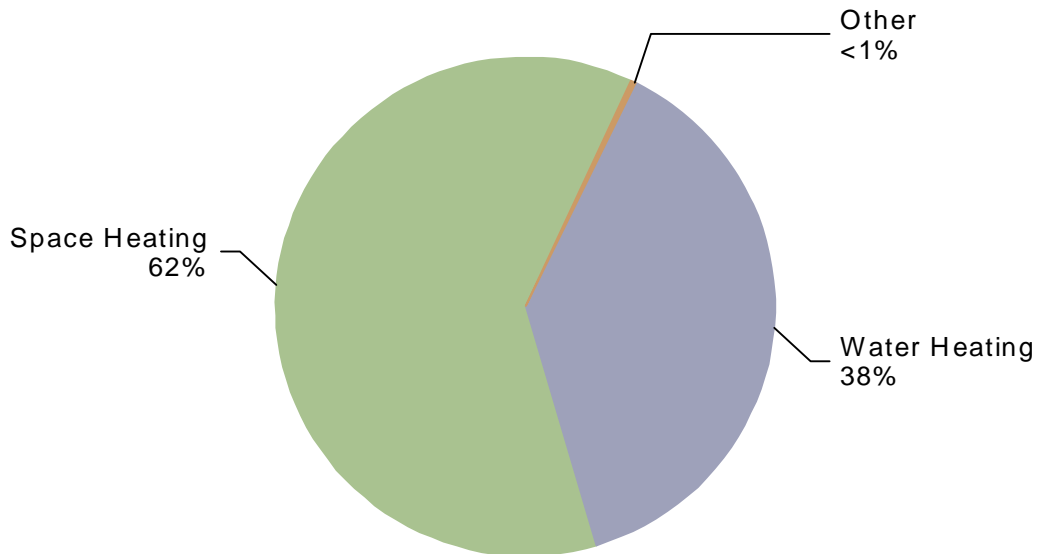
Total: 263,471,136 therms



Note: "Other" includes:
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

Figure 3: Residential Technical Potential in 2029 by End Use, Manufactured

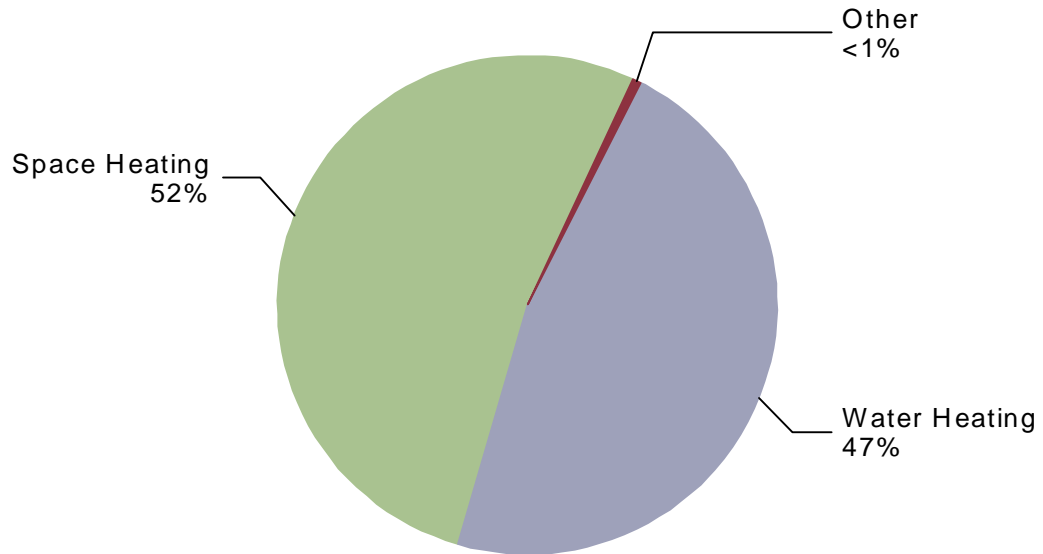
Total: 263,471,136 therms



Note: "Other" includes:
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

Figure 4: Residential Technical Potential in 2029 by End Use, Multifamily

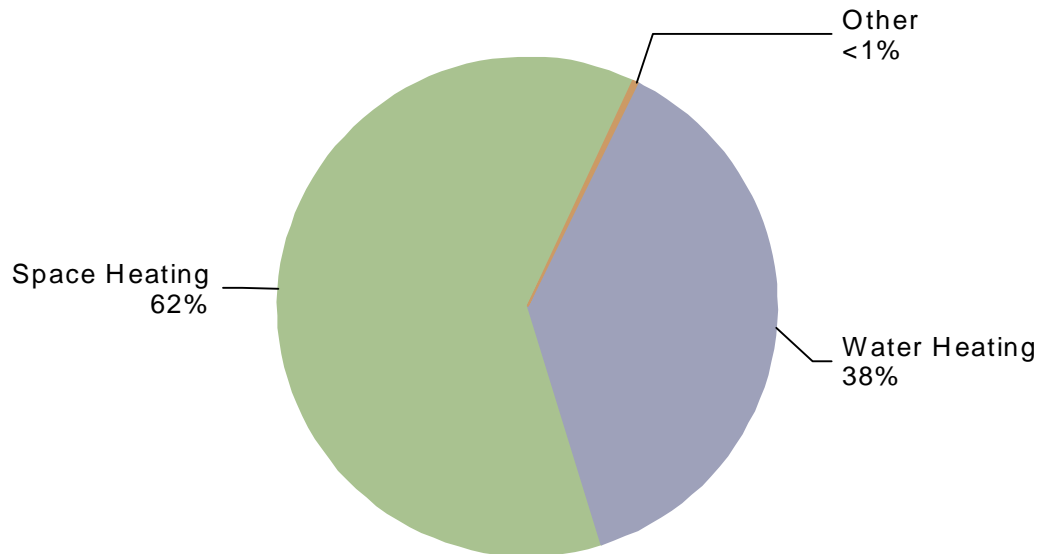
Total: 5,624,901 therms



Note: "Other" includes:
Cooking: <1%, Dryer: <1%

Figure 5: Residential Technical Potential in 2029 by End Use, Single Family

Total: 256,822,562 therms

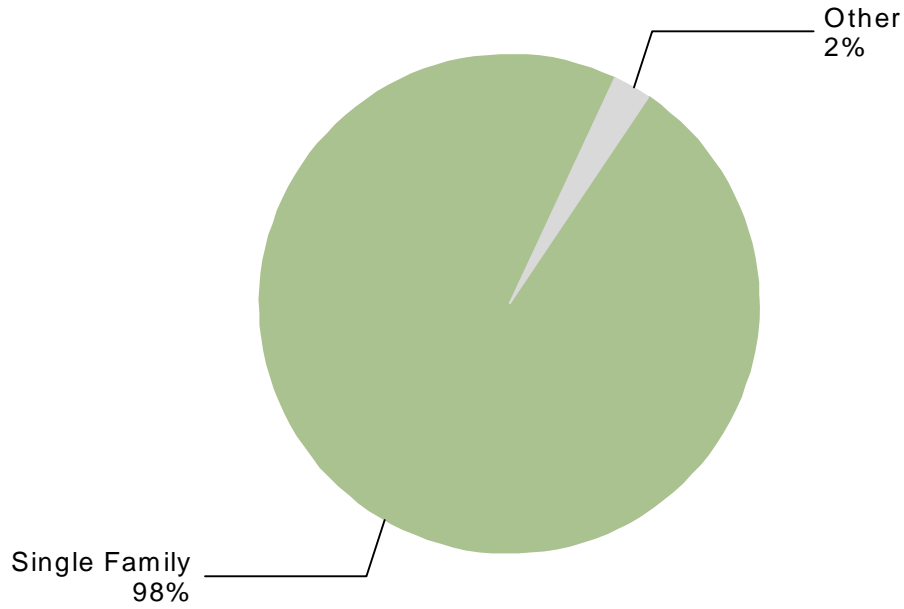


Note: "Other" includes:
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

Achievable Technical Potential

Figure 6: Residential Achievable Technical Potential in 2029 by Segment

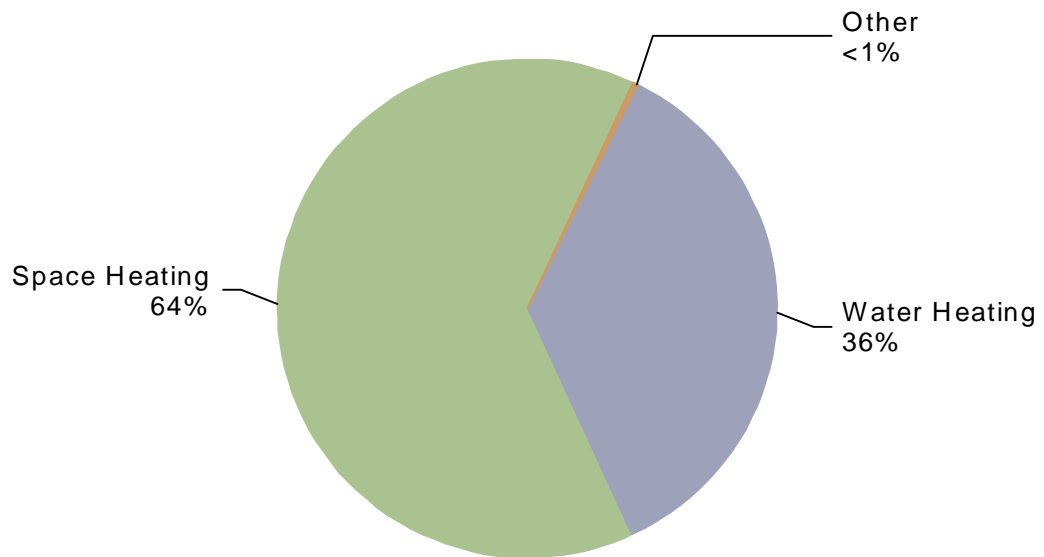
Total: 161,583,795 therms



Note: "Other" includes:
Multi-family: 2%, Manufactured: <1%

Figure 7: Residential Achievable Technical Potential in 2029 by End Use

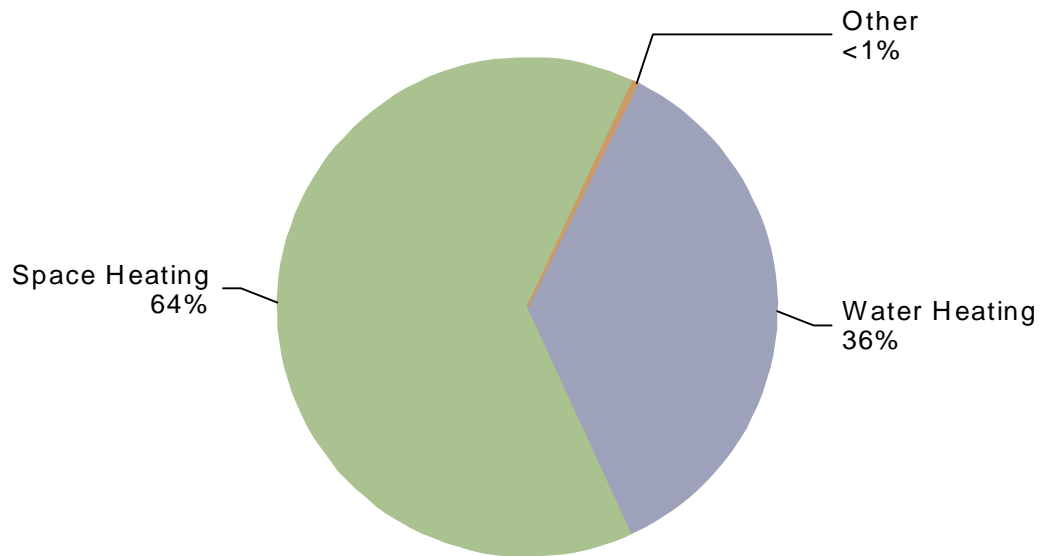
Total: 161,583,795 therms



Note: "Other" includes:
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

Figure 8: Residential Achievable Technical Potential in 2029 by End Use, Manufactured

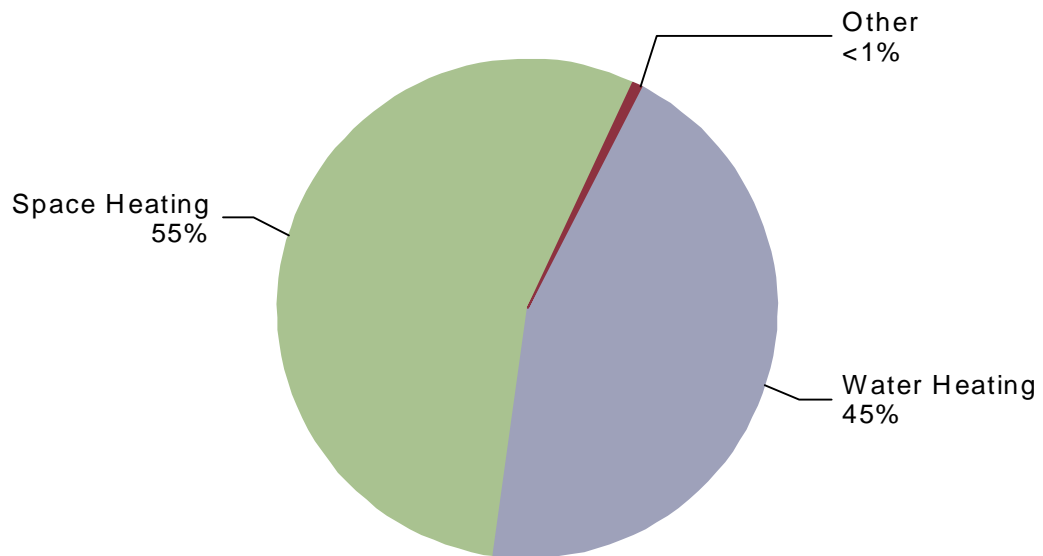
Total: 161,583,795 therms



Note: "Other" includes:
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

Figure 9: Residential Achievable Technical Potential in 2029 by End Use, Multifamily

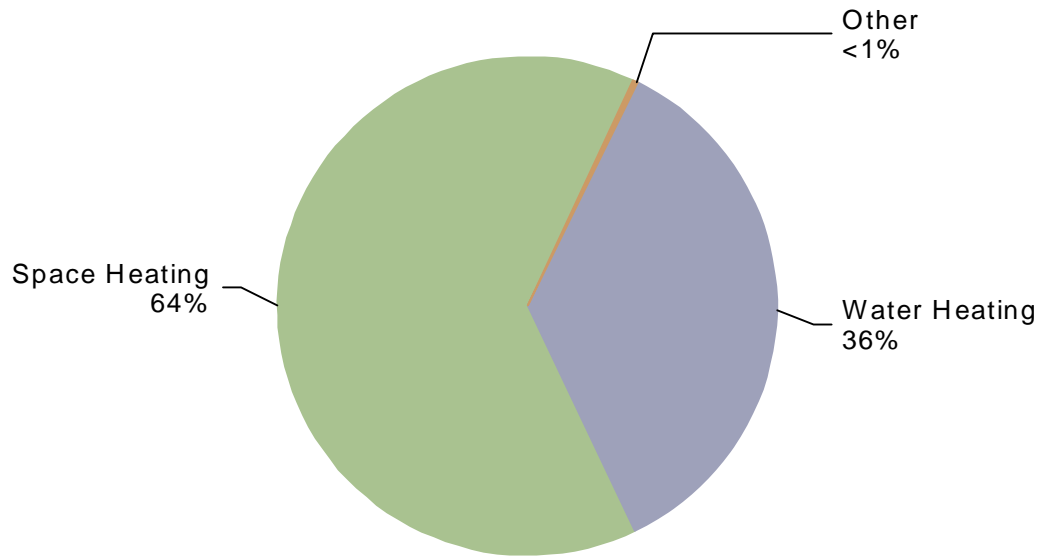
Total: 3,392,630 therms



Note: "Other" includes:
Cooking: <1%, Dryer: <1%

Figure 10: Residential Achievable Technical Potential in 2029 by End Use, Single Family

Total: 157,567,807 therms



Note: "Other" includes:
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

Commercial Electric

Technical Potential

Figure 1: Commercial Technical Potential in 2029 by Segment

Total: 378 aMW

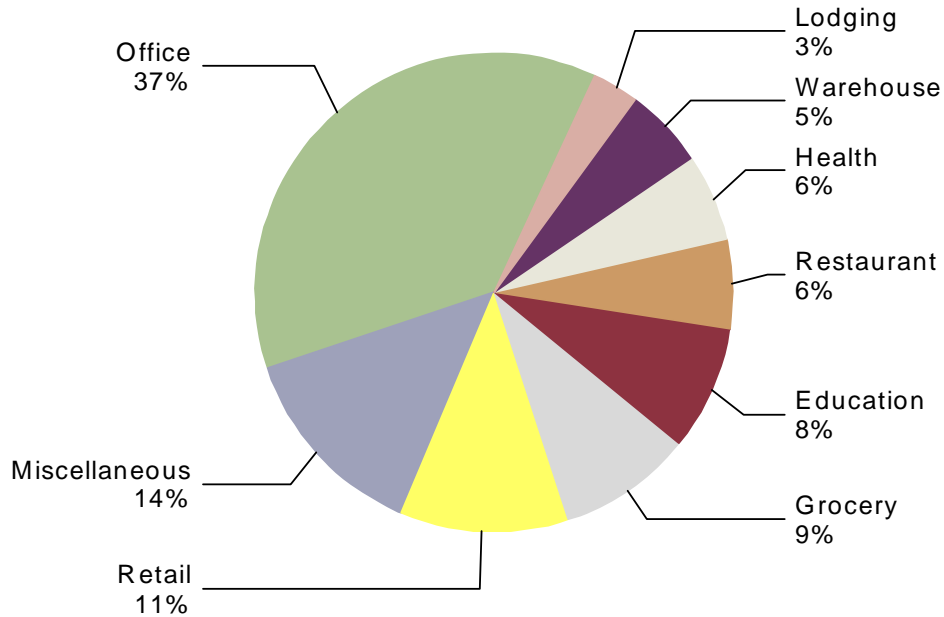


Figure 2: Commercial Technical Potential in 2029 by End Use

Total: 378 aMW

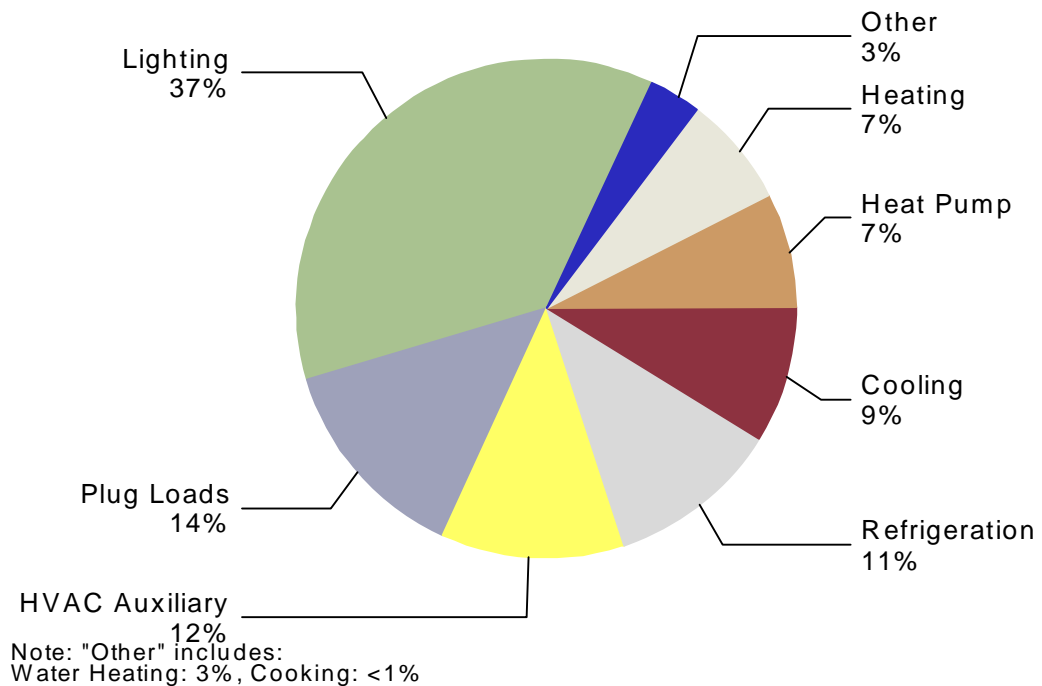


Figure 3: Commercial Technical Potential in 2029 by End Use, Education

Total: 378 aMW

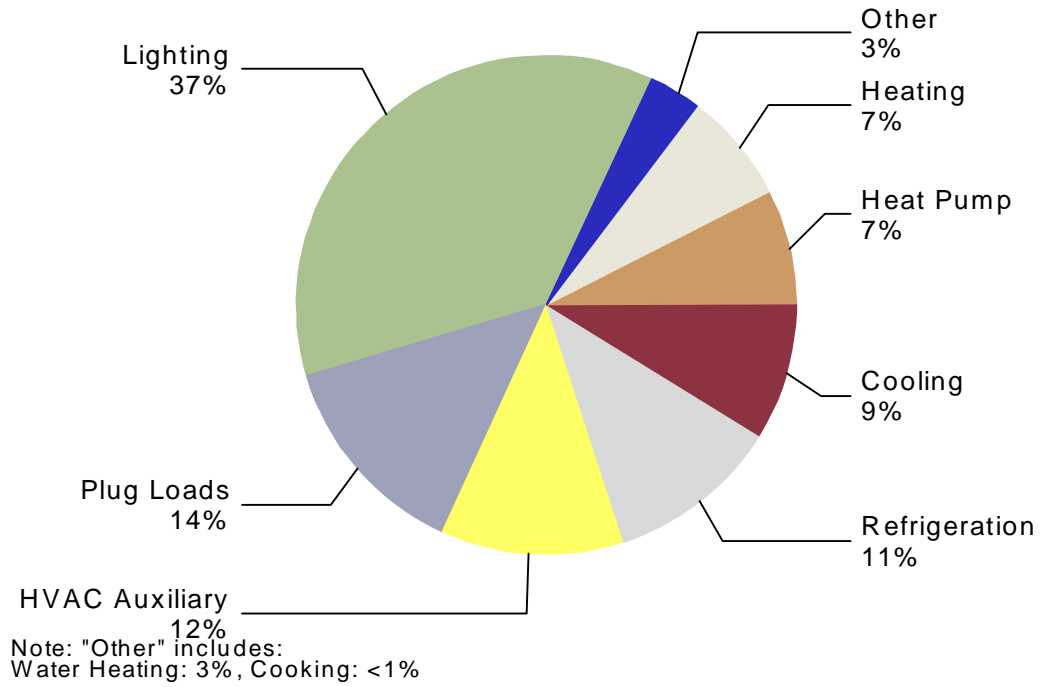
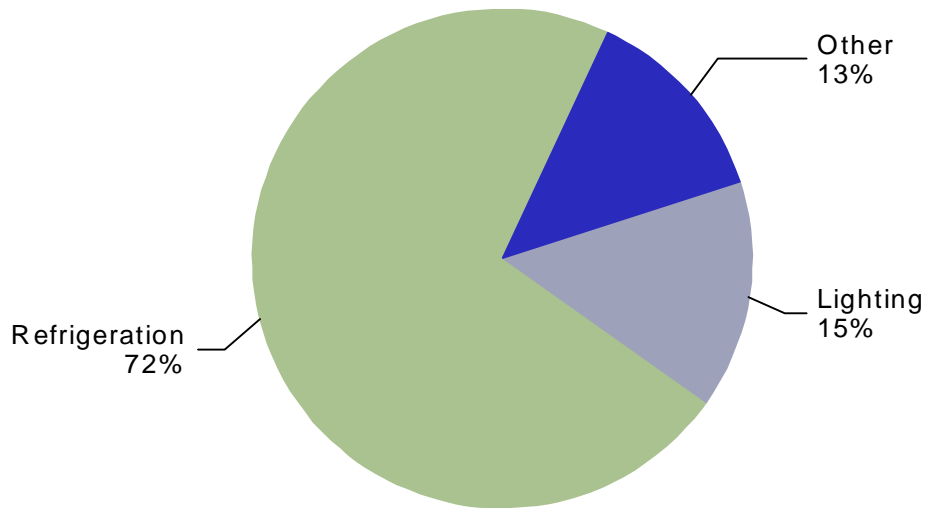


Figure 4: Commercial Technical Potential in 2029 by End Use, Grocery

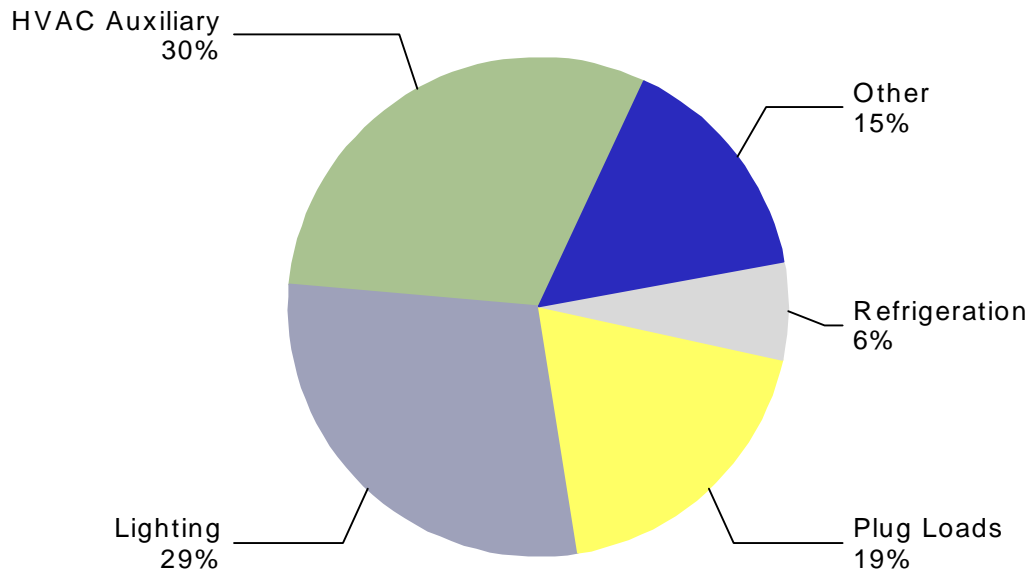
Total: 34 aMW



Note: "Other" includes:
Plug Loads: 4%, HVAC Auxiliary: 3%, Cooling: 3%, Heat Pump: 2%, Cooking: 1%, Heating: <1%, W:

Figure 5: Commercial Technical Potential in 2029 by End Use, Health

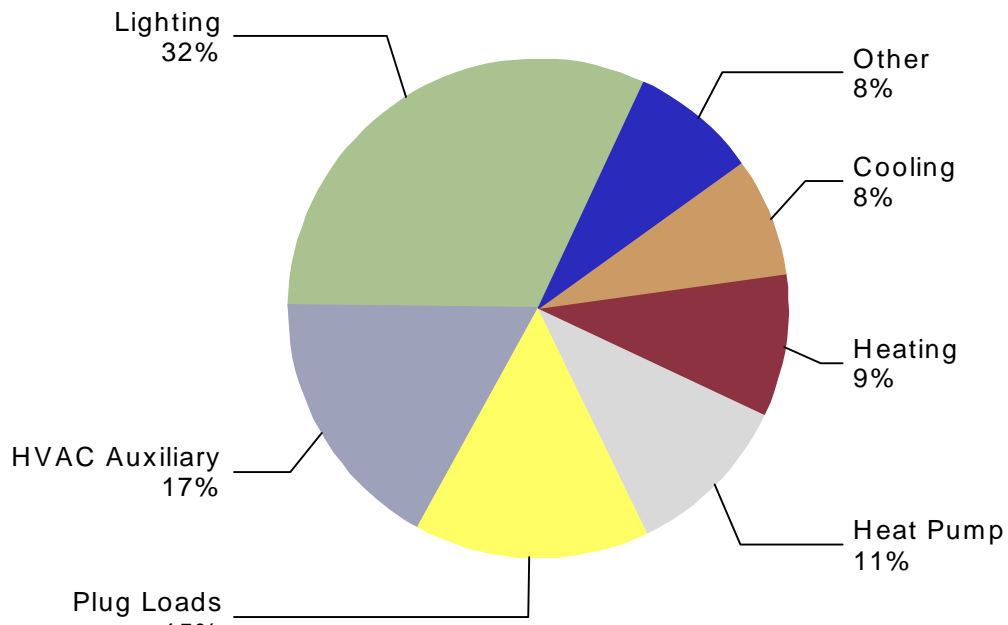
Total: 22 aMW



Note: "Other" includes: Heating: 4%, Water Heating: 4%, Cooling: 4%, Heat Pump: 2%, Cooking: <1%

Figure 6: Commercial Technical Potential in 2029 by End Use, Lodging

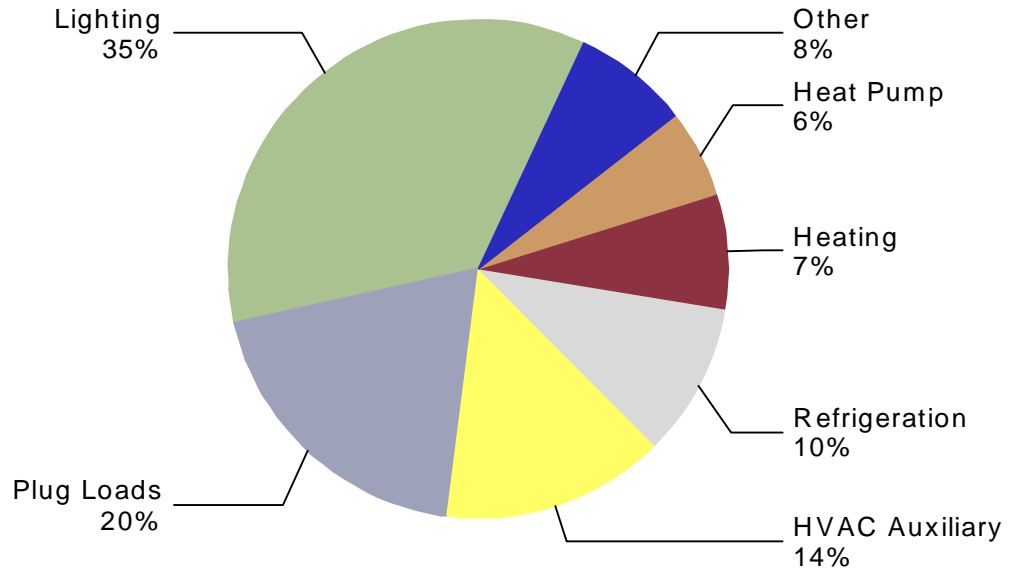
Total: 12 aMW



Note: "Other" includes: Water Heating: 5%, Refrigeration: 3%, Cooking: <1%

Figure 7: Commercial Technical Potential in 2029 by End Use, Miscellaneous

Total: 51 aMW



Note: "Other" includes:
Cooling: 4%, Water Heating: 2%, Cooking: <1%

Figure 8: Commercial Technical Potential in 2029 by End Use, Office

Total: 140 aMW

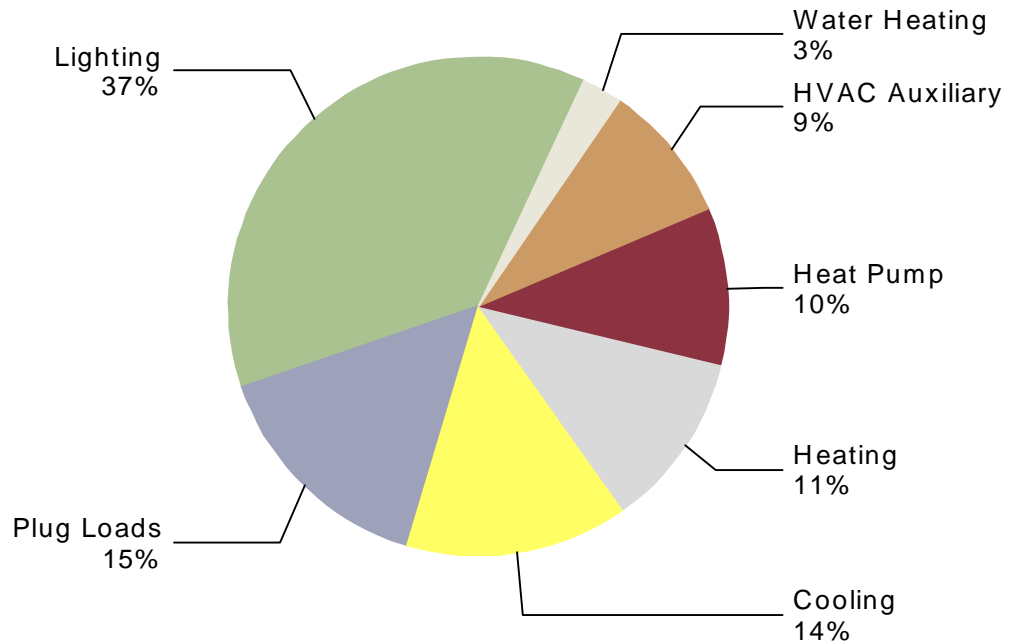
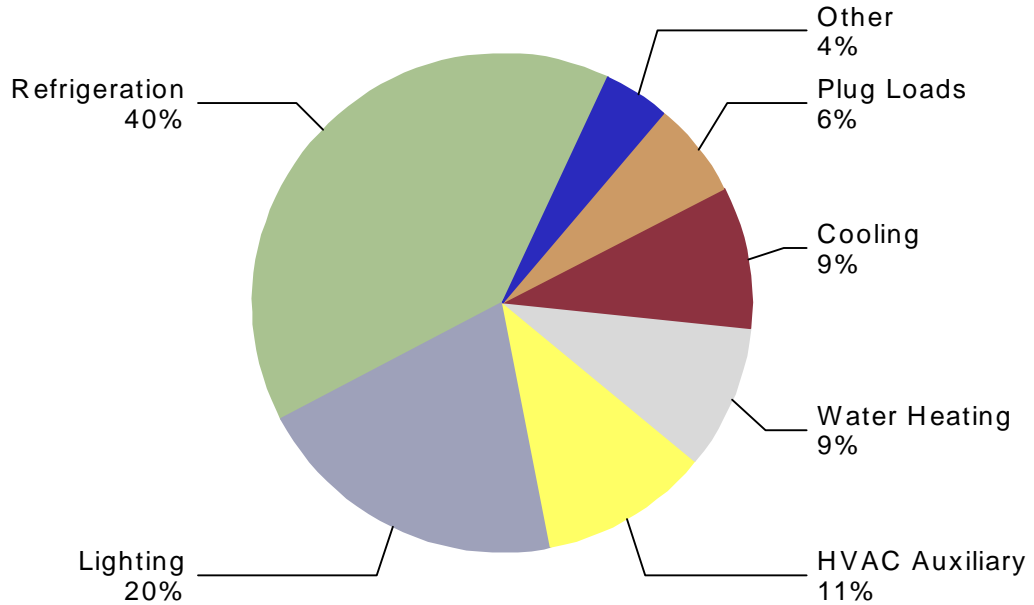


Figure 9: Commercial Technical Potential in 2029 by End Use, Restaurant

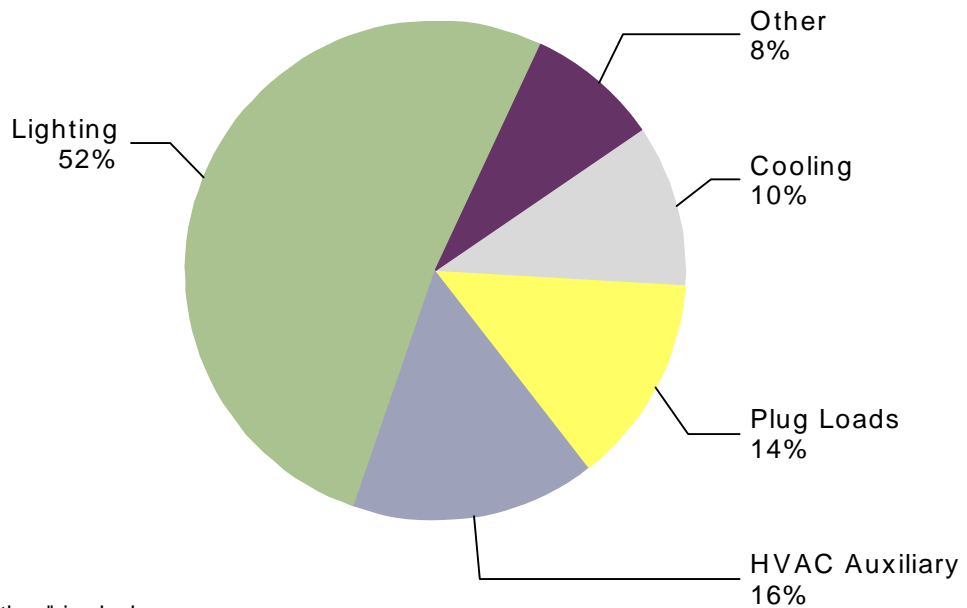
Total: 23 aMW



Note: "Other" includes:
Cooking: 2%, Heat Pump: 2%, Heating: <1%

Figure 10: Commercial Technical Potential in 2029 by End Use, Retail

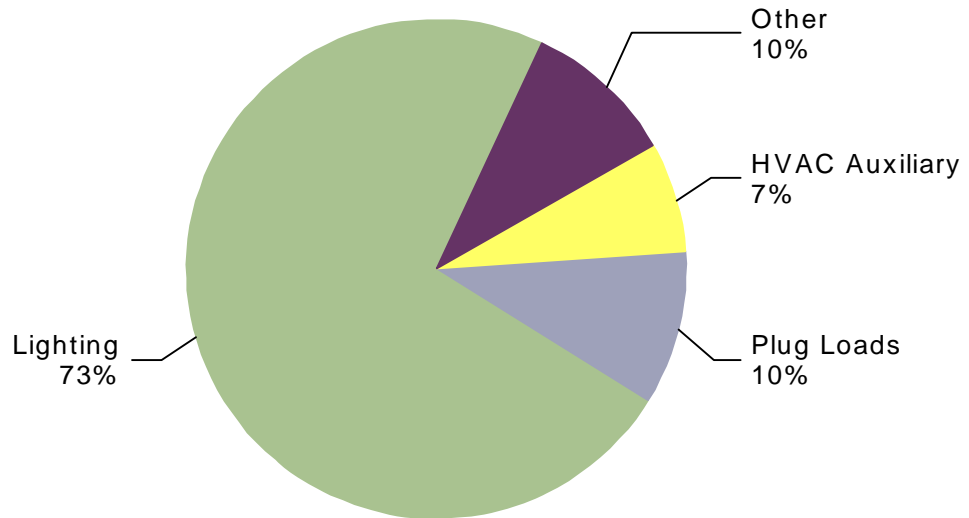
Total: 43 aMW



Note: "Other" includes:
Heat Pump: 4%, Heating: 3%, Water Heating: 2%

Figure 11: Commercial Technical Potential in 2029 by End Use, Warehouse

Total: 21 aMW



Note: "Other" includes:
Heating: 4%, Water Heating: 4%, Cooling: 1%, Heat Pump: 1%

Achievable Technical Potential

Figure 12: Commercial Achievable Technical Potential in 2029 by Segment

Total: 301 aMW

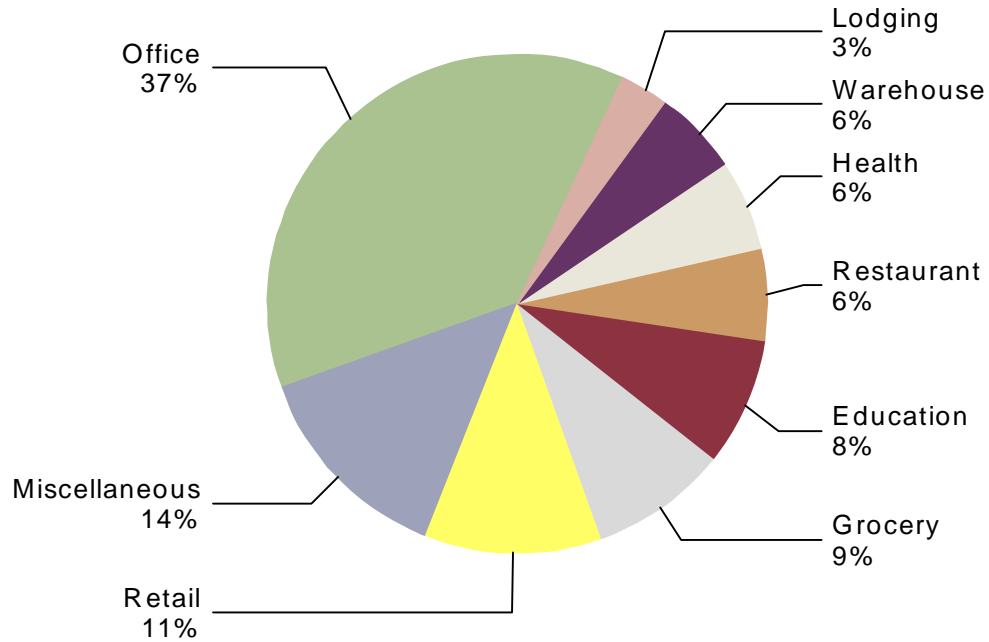


Figure 13: Commercial Achievable Technical Potential in 2029 by End Use

Total: 301 aMW

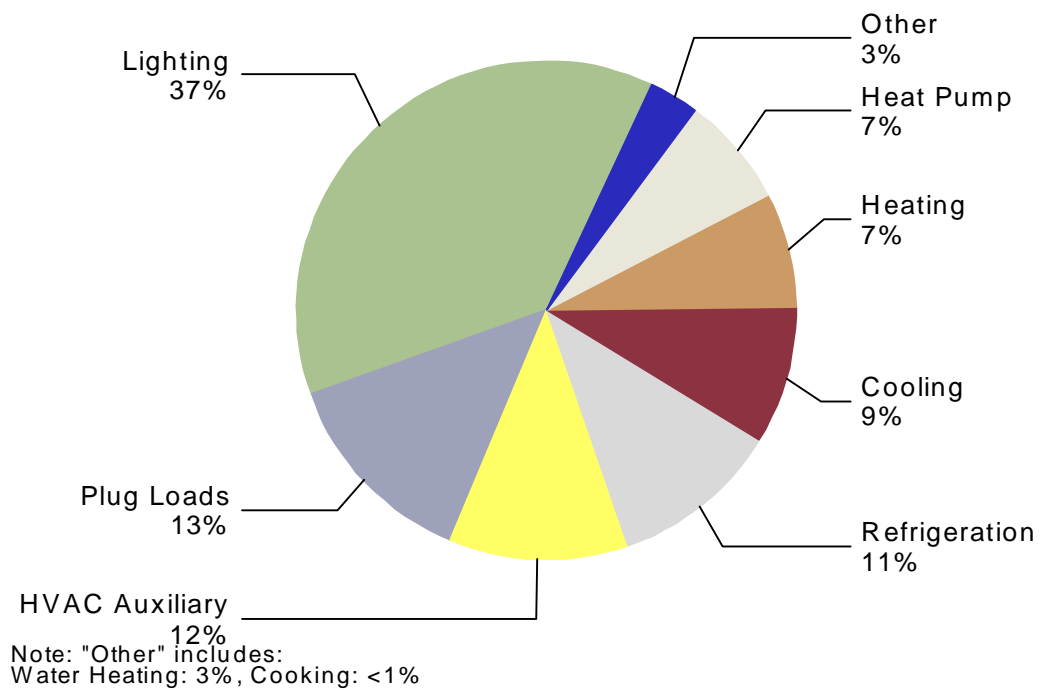


Figure 14: Commercial Achievable Technical Potential in 2029 by End Use, Education

Total: 301 aMW

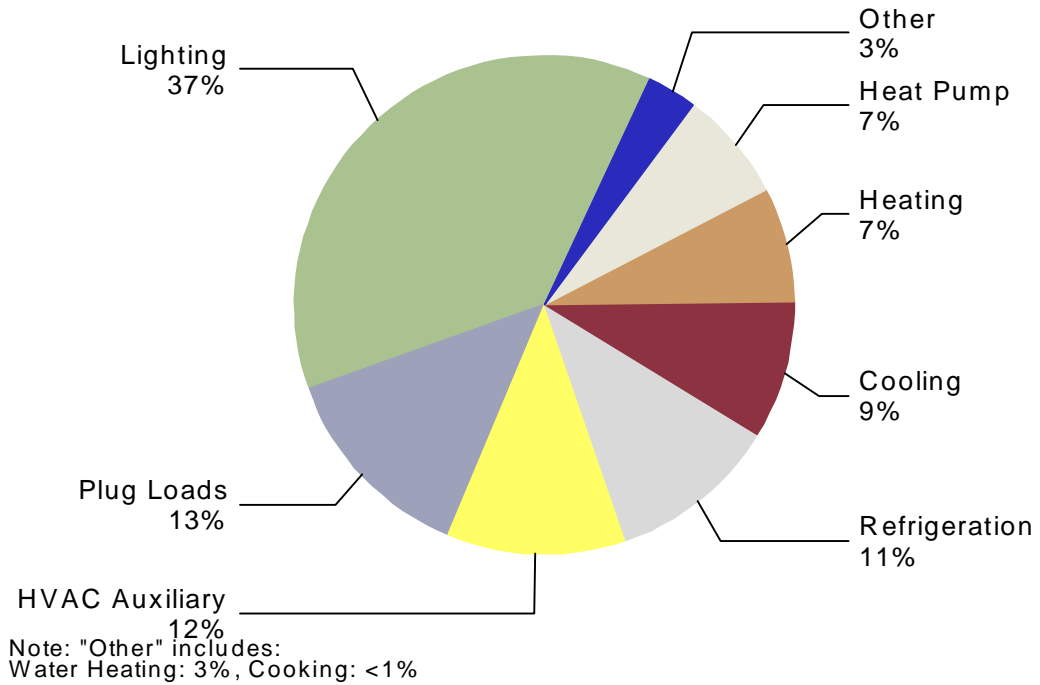
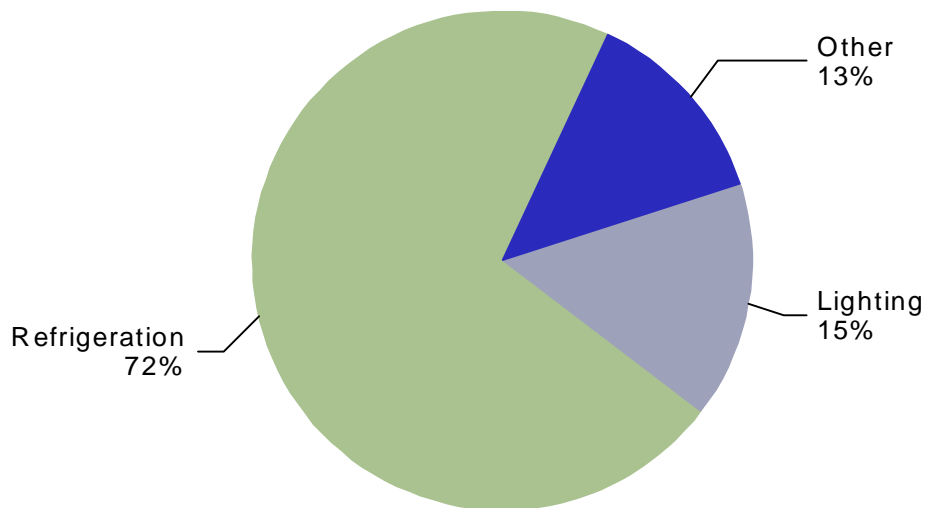


Figure 15: Commercial Achievable Technical Potential in 2029 by End Use, Grocery

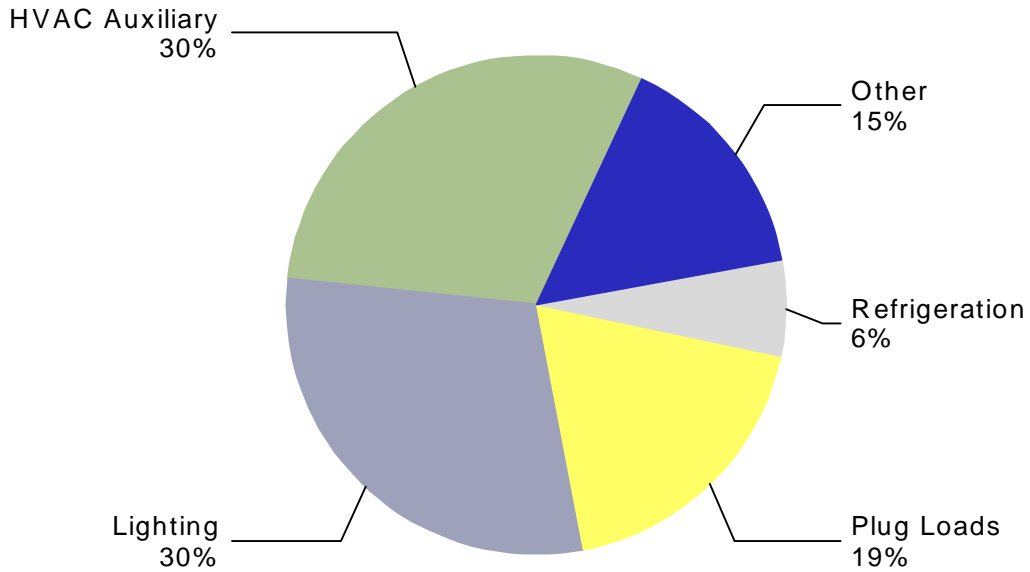
Total: 27 aMW



Note: "Other" includes:
Plug Loads: 4%, HVAC Auxiliary: 3%, Cooling: 3%, Heat Pump: 2%, Cooking: 1%, Heating: <1%, W:

Figure 16: Commercial Achievable Technical Potential in 2029 by End Use, Health

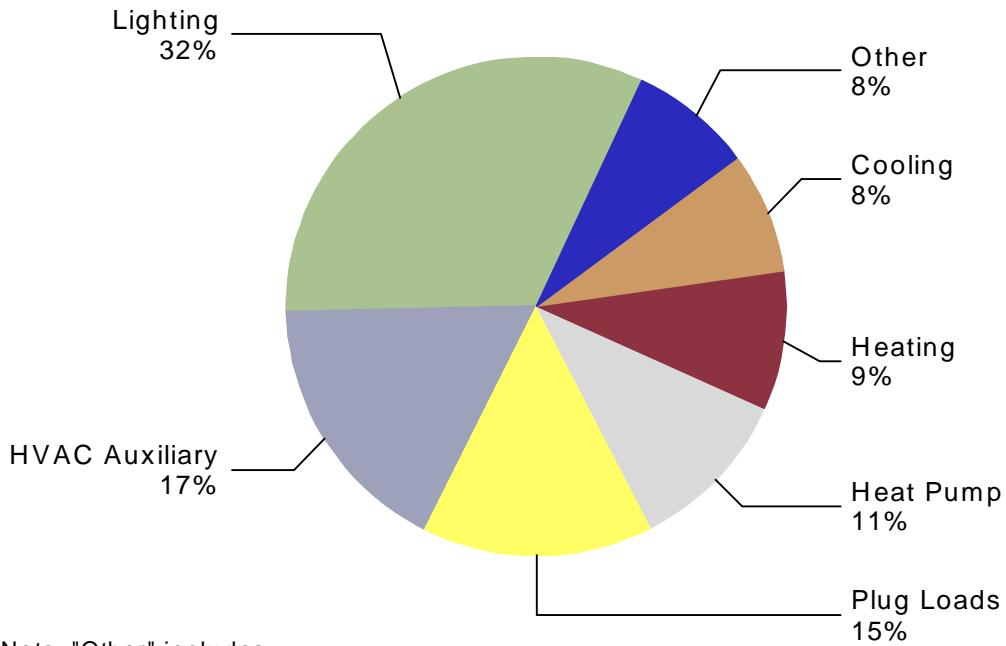
Total: 18 aMW



Note: "Other" includes: Heating: 4%, Cooling: 4%, Water Heating: 4%, Heat Pump: 2%, Cooking: <1%

Figure 17: Commercial Achievable Technical Potential in 2029 by End Use, Lodging

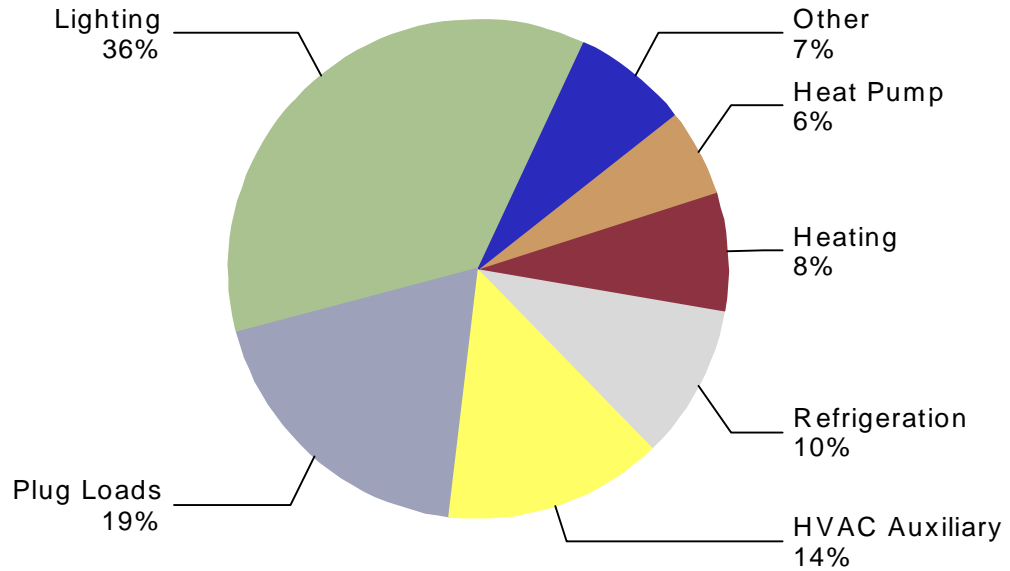
Total: 9 aMW



Note: "Other" includes: Water Heating: 4%, Refrigeration: 3%, Cooking: <1%

Figure 18: Commercial Achievable Technical Potential in 2029 by End Use, Miscellaneous

Total: 41 aMW



Note: "Other" includes:
Cooling: 4%, Water Heating: 2%, Cooking: <1%

Figure 19: Commercial Achievable Technical Potential in 2029 by End Use, Office

Total: 113 aMW

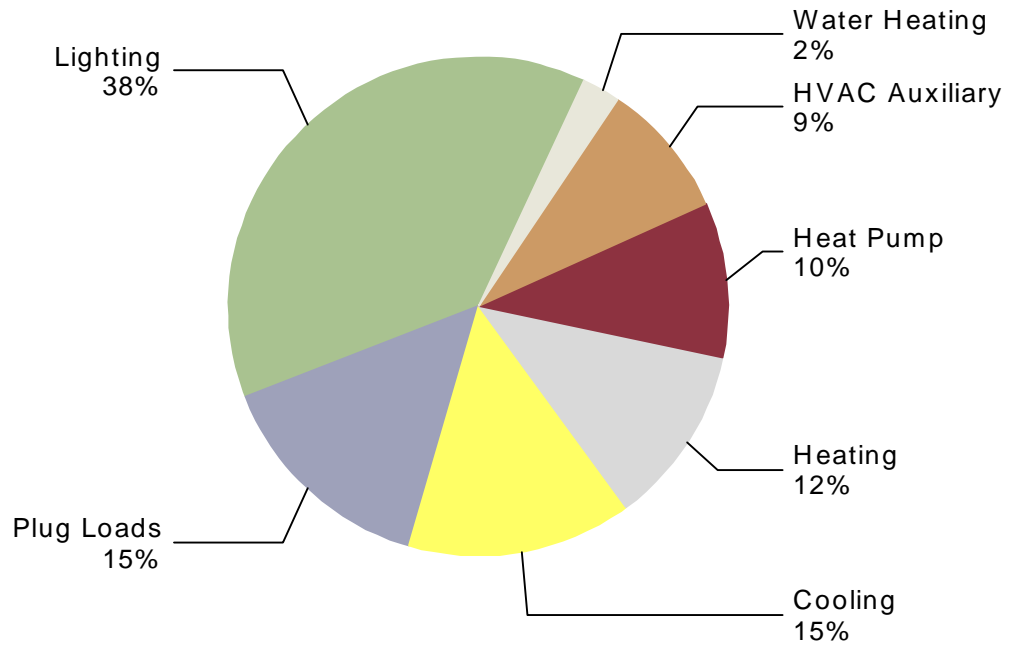
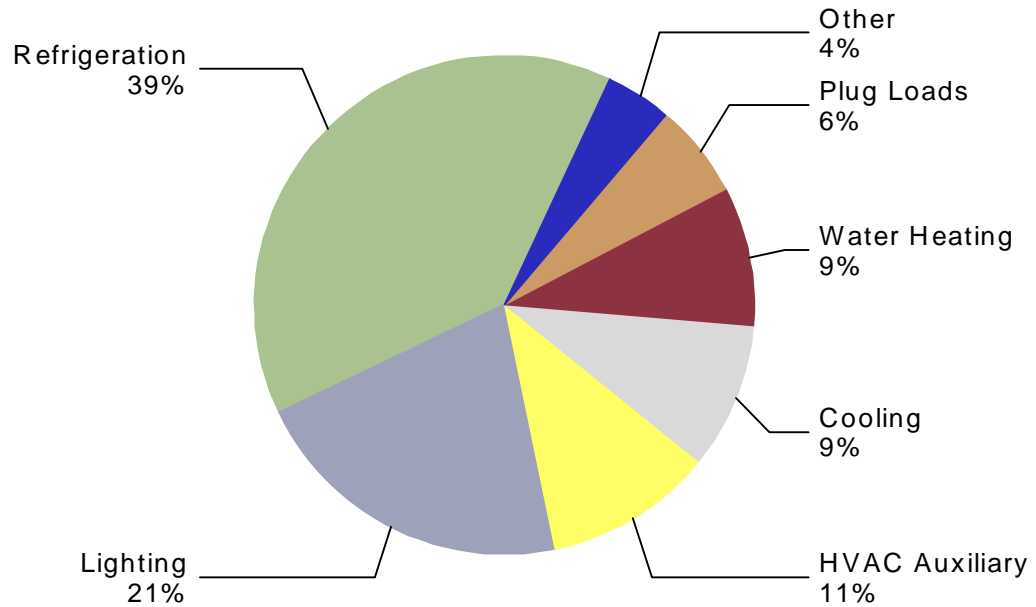


Figure 20: Commercial Achievable Technical Potential in 2029 by End Use, Restaurant

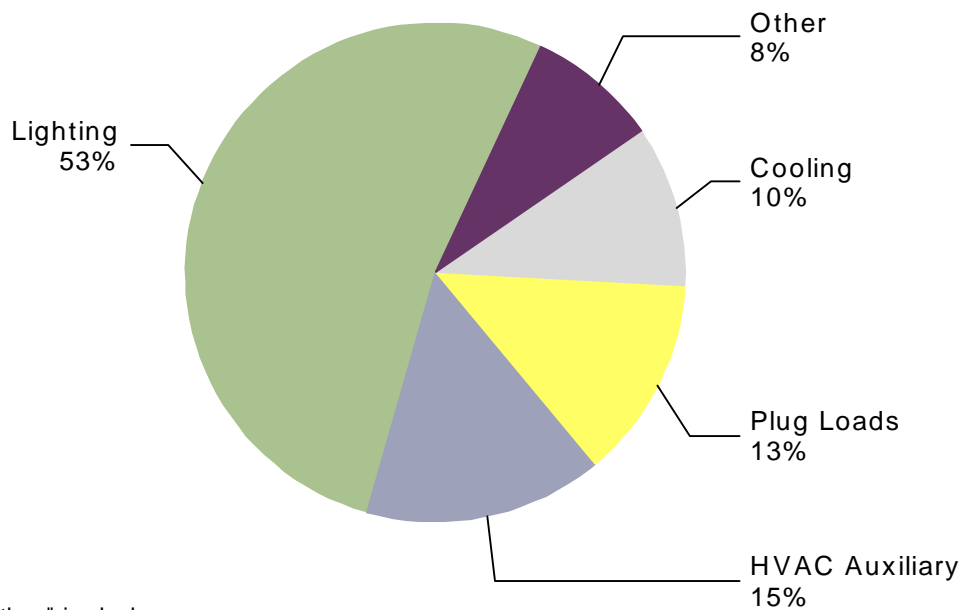
Total: 18 aMW



Note: "Other" includes:
Cooking: 2%, Heat Pump: 2%, Heating: <1%

Figure 21: Commercial Achievable Technical Potential in 2029 by End Use, Retail

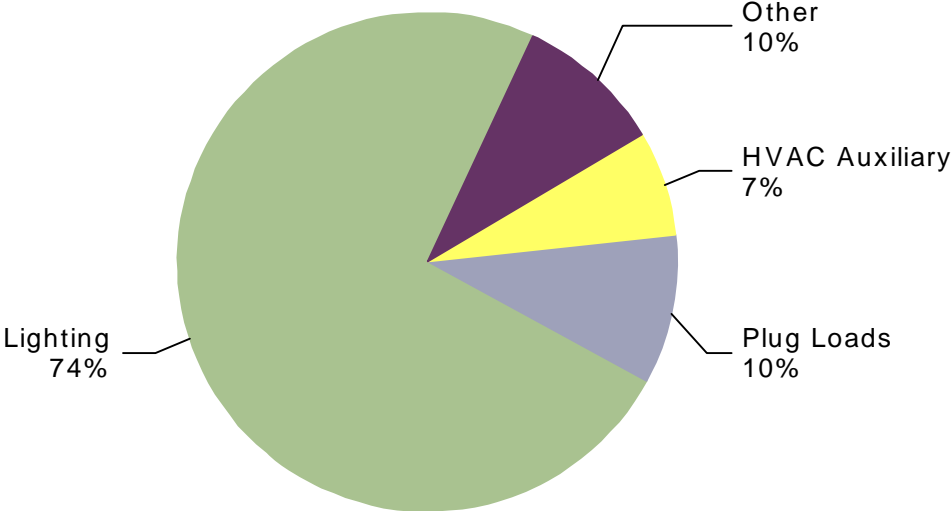
Total: 35 aMW



Note: "Other" includes:
Heat Pump: 4%, Heating: 3%, Water Heating: 2%

Figure 22: Commercial Achievable Technical Potential in 2029 by End Use, Warehouse

Total: 17 aMW



Note: "Other" includes:
Heating: 4%, Water Heating: 4%, Cooling: 1%, Heat Pump: <1%

**Commercial Gas
Technical Potential**

Com Gas Detailed Results

Figure 1: Commercial Technical Potential in 2029 by Segment

Total: 131,640,192 therms

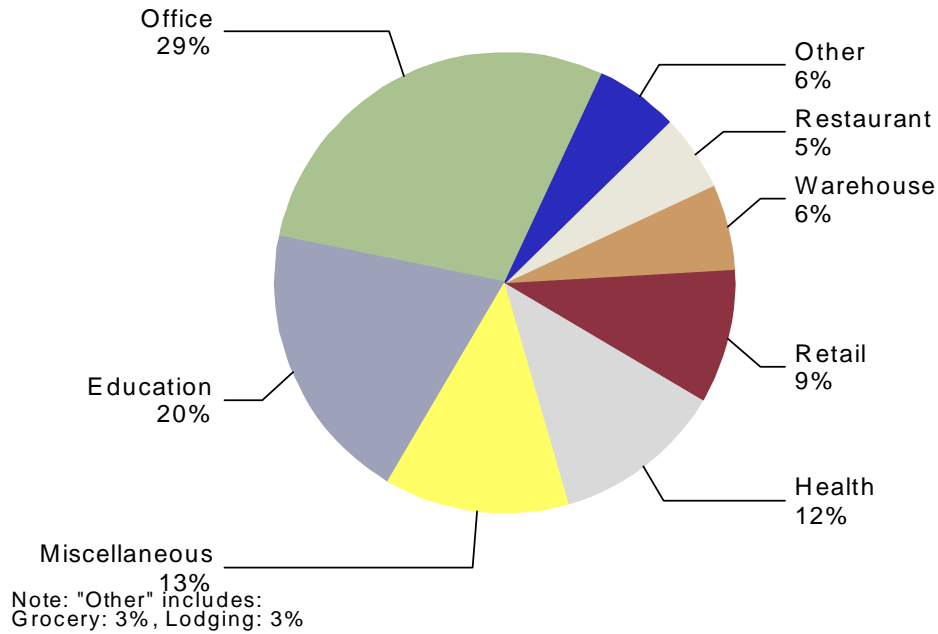
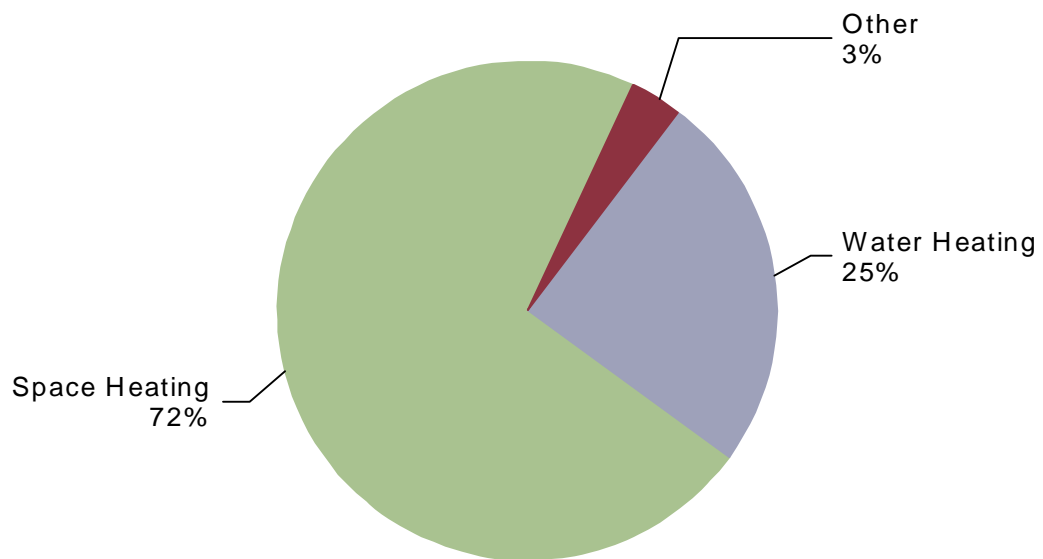


Figure 2: Commercial Technical Potential in 2029 by End Use

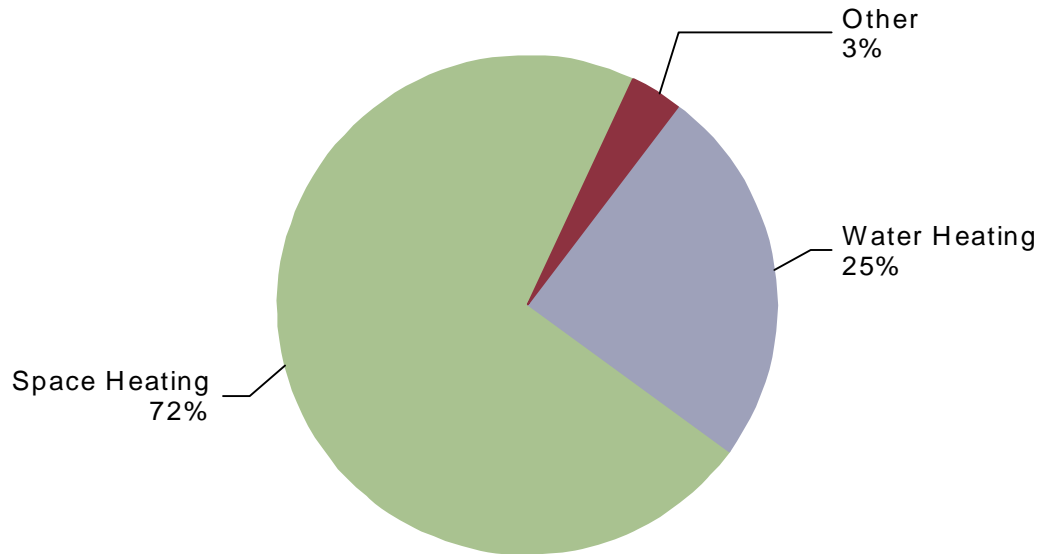
Total: 131,640,192 therms



Note: "Other" includes:
Cooking: 3%, Pool Heating: <1%

Figure 3: Commercial Technical Potential in 2029 by End Use, Education

Total: 131,640,192 therms



Note: "Other" includes:
Cooking: 3%, Pool Heating: <1%

Figure 4: Commercial Technical Potential in 2029 by End Use, Grocery

Total: 4,111,332 therms

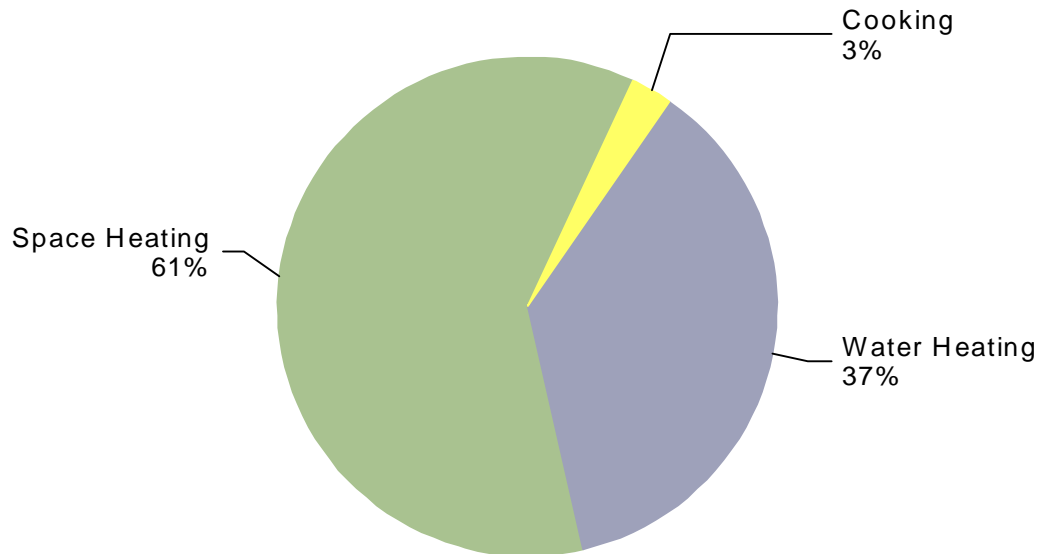


Figure 5: Commercial Technical Potential in 2029 by End Use, Health

Total: 15,753,963 therms

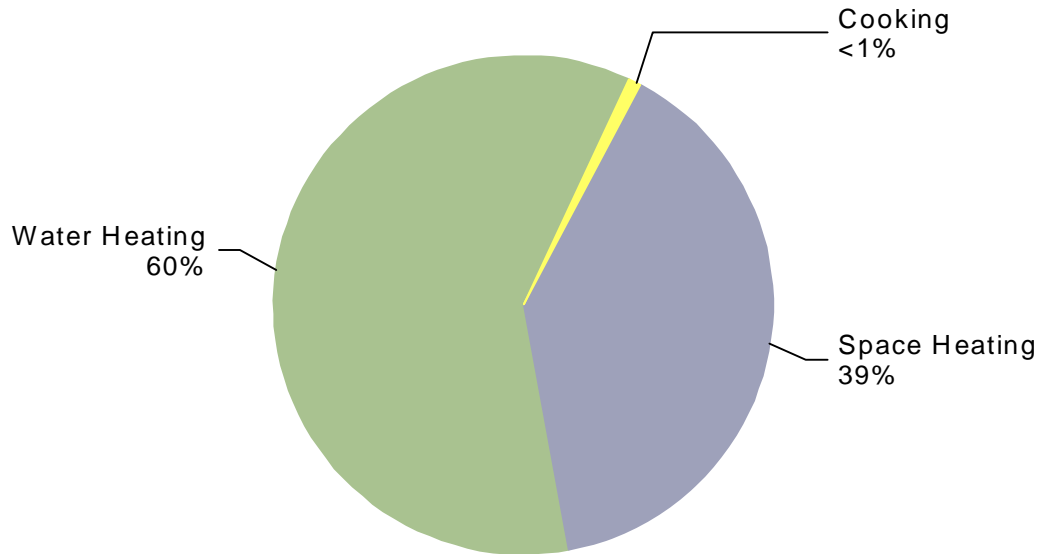
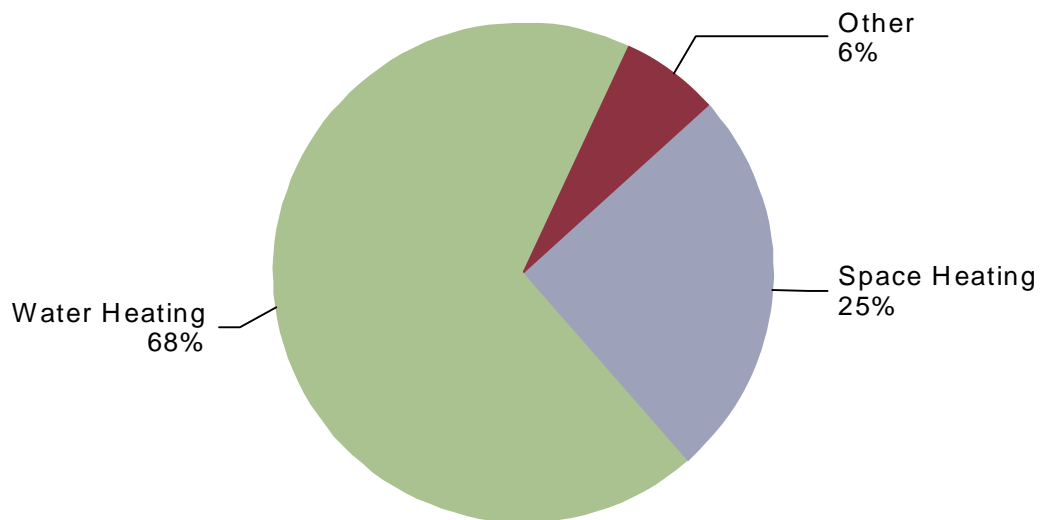


Figure 6: Commercial Technical Potential in 2029 by End Use, Lodging

Total: 3,458,562 therms



Note: "Other" includes:
Pool Heating: 4%, Cooking: 2%

Figure 7: Commercial Technical Potential in 2029 by End Use, Miscellaneous

Total: 17,112,691 therms

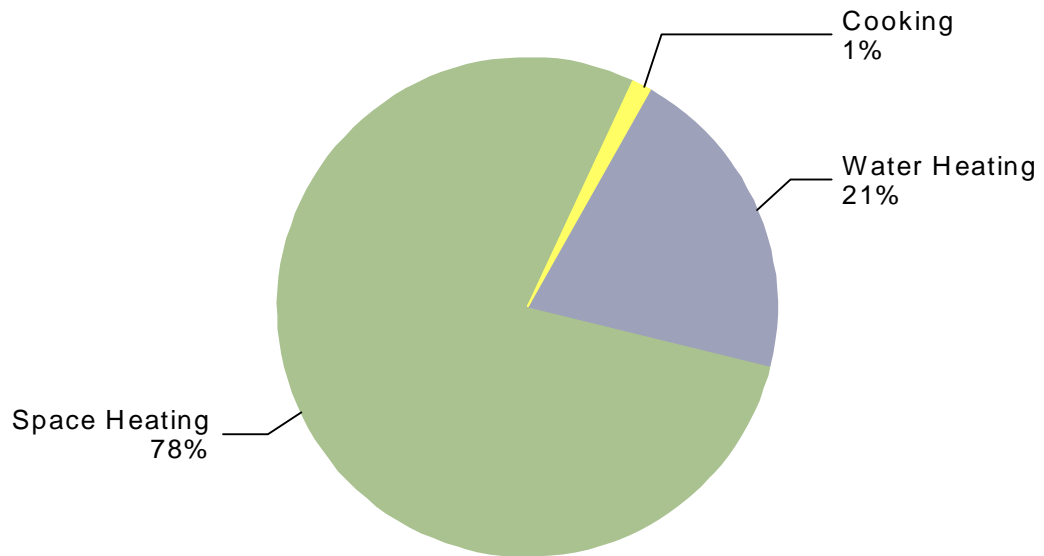


Figure 8: Commercial Technical Potential in 2029 by End Use, Office

Total: 37,780,290 therms

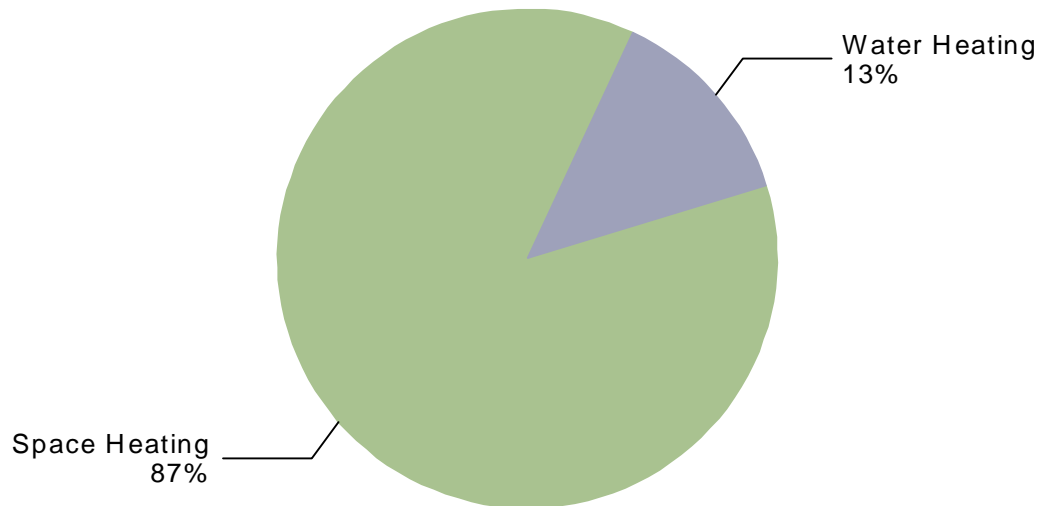


Figure 9: Commercial Technical Potential in 2029 by End Use, Restaurant

Total: 7,072,970 therms

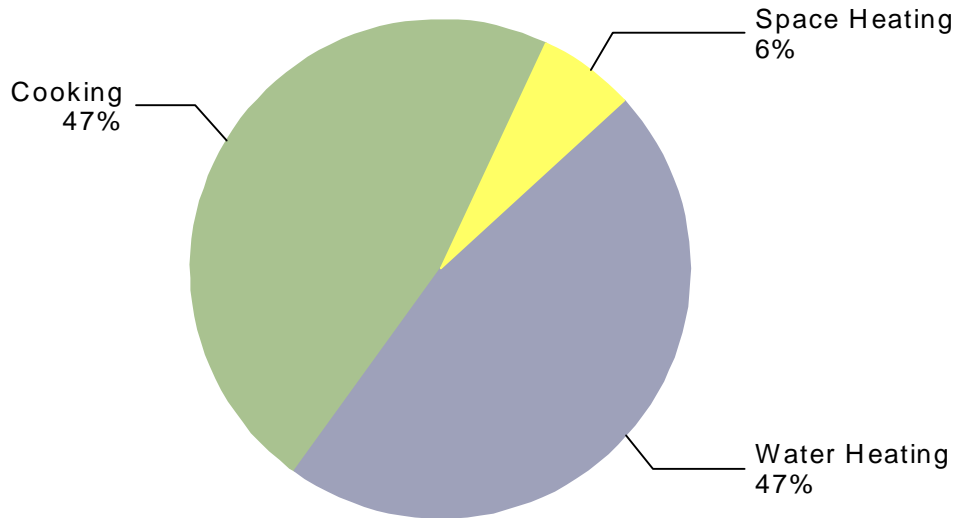


Figure 10: Commercial Technical Potential in 2029 by End Use, Retail

Total: 12,419,381 therms

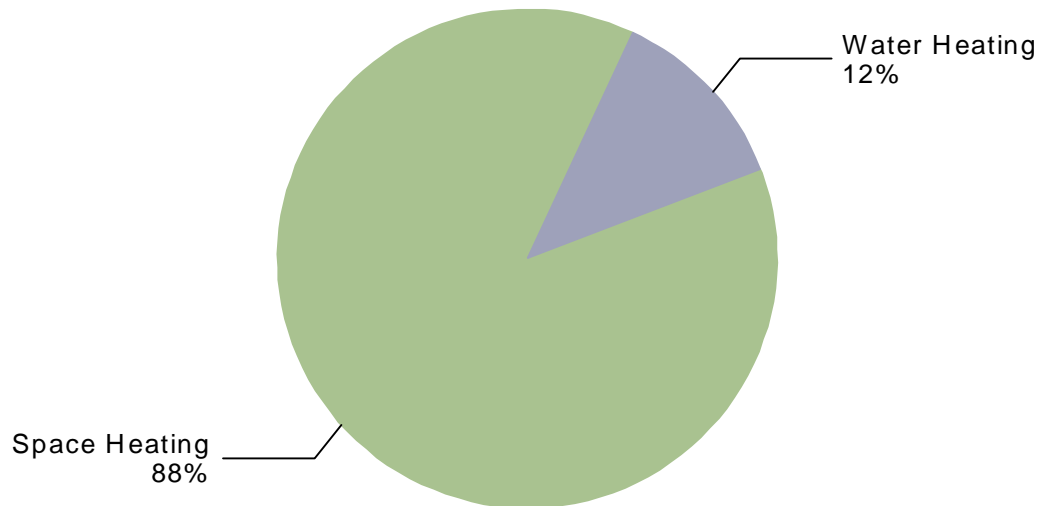
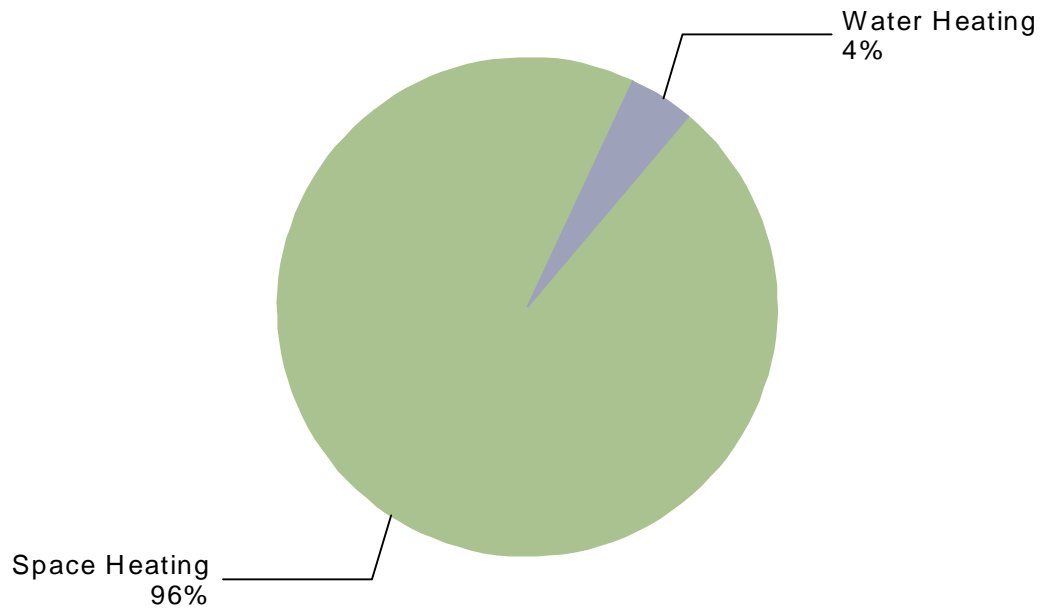


Figure 11: Commercial Technical Potential in 2029 by End Use, Warehouse

Total: 7,853,705 therms



Achievable Technical Potential

Figure 12: Commercial Achievable Technical Potential in 2029 by Segment

Total: 83,744,858 therms

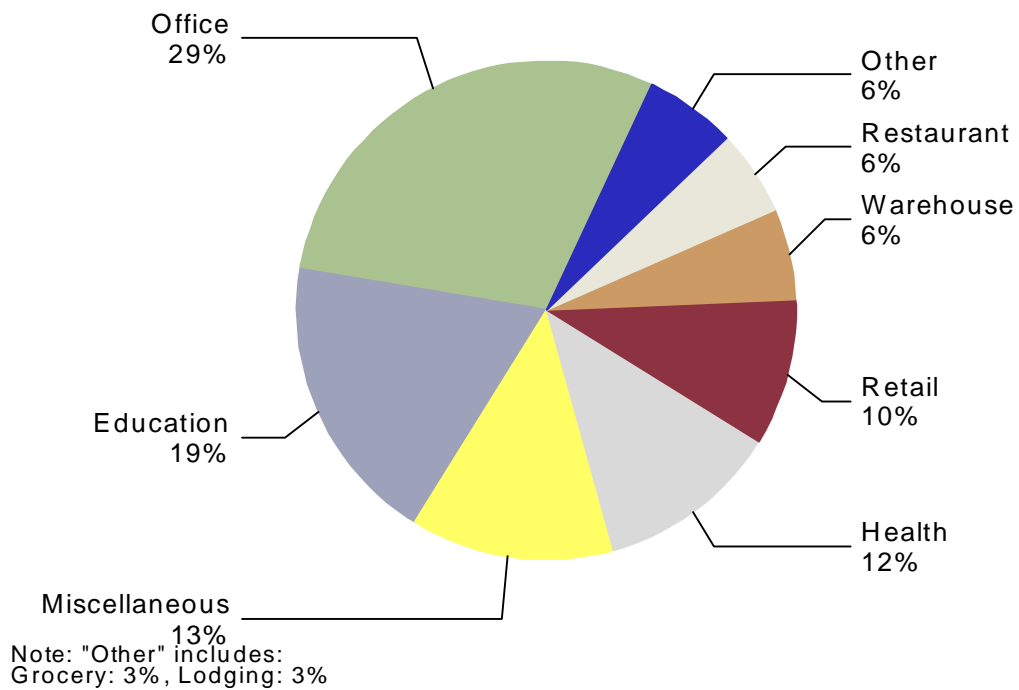
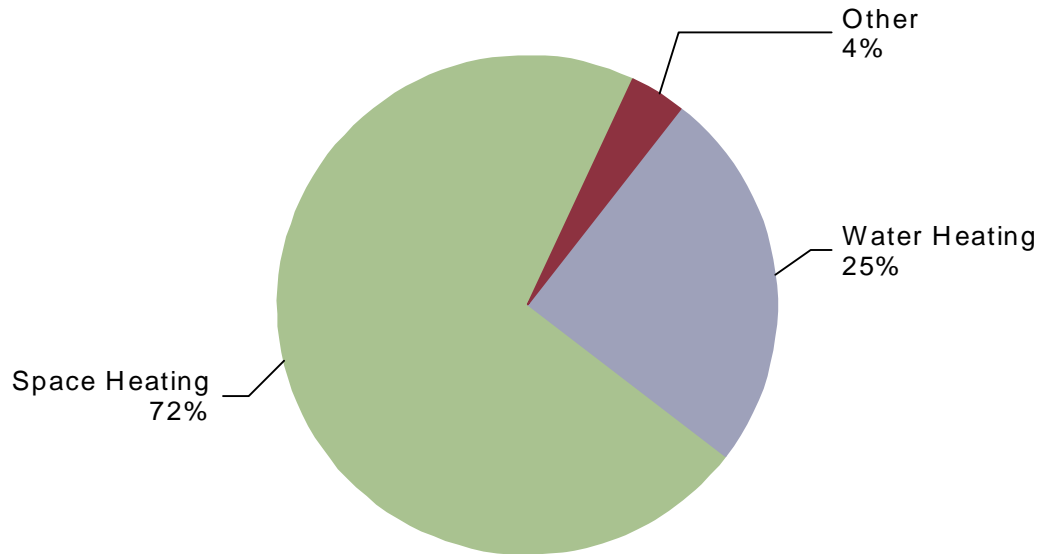


Figure 13: Commercial Achievable Technical Potential in 2029 by End Use

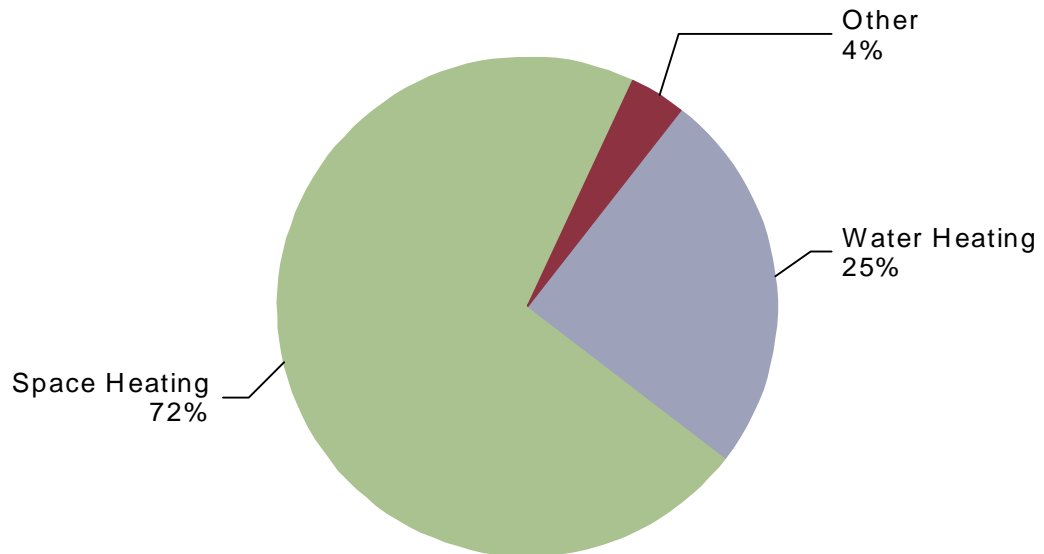
Total: 83,744,858 therms



Note: "Other" includes:
Cooking: 3%, Pool Heating: <1%

Figure 14: Commercial Achievable Technical Potential in 2029 by End Use, Education

Total: 83,744,858 therms



Note: "Other" includes:
Cooking: 3%, Pool Heating: <1%

Figure 15: Commercial Achievable Technical Potential in 2029 by End Use, Grocery

Total: 2,706,146 therms

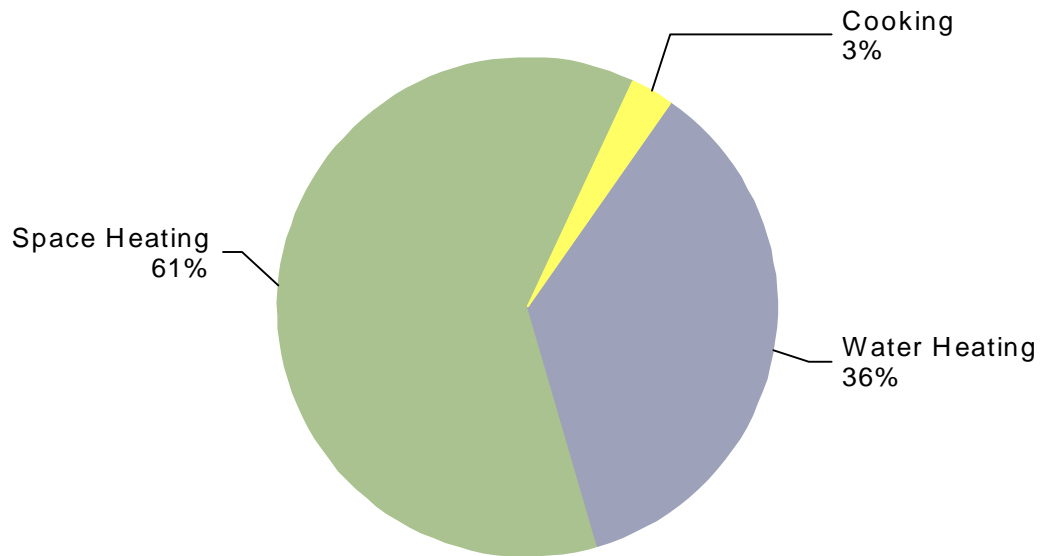


Figure 16: Commercial Achievable Technical Potential in 2029 by End Use, Health

Total: 9,932,937 therms

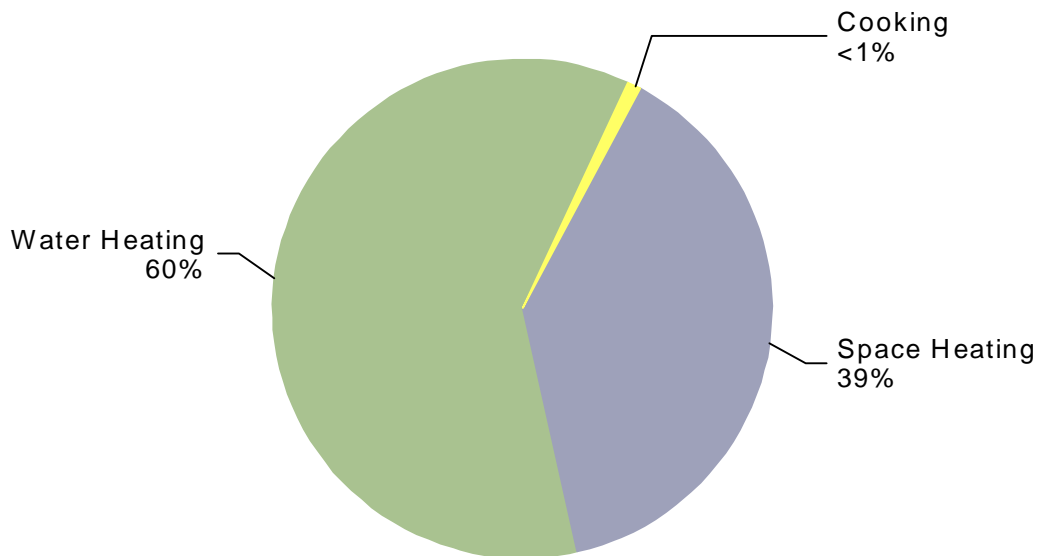
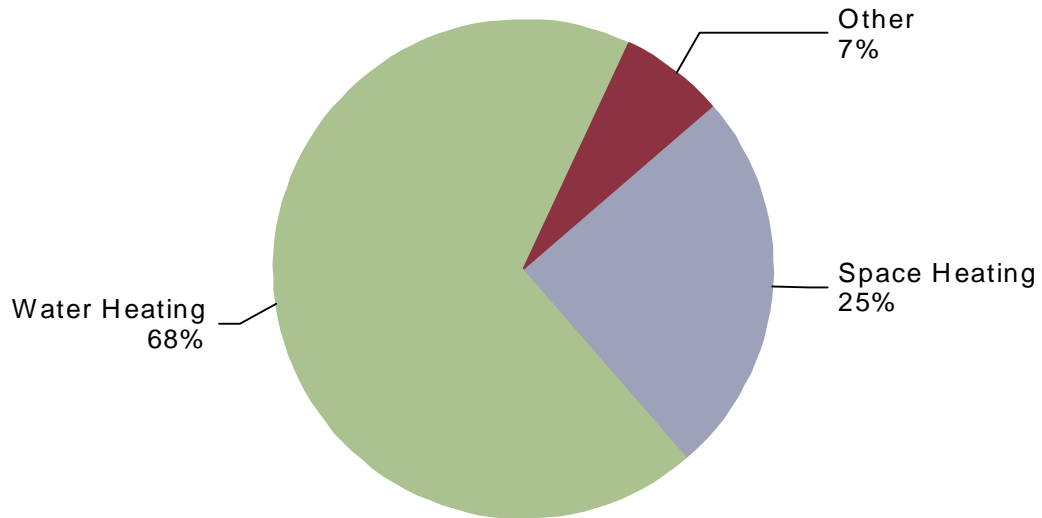


Figure 17: Commercial Achievable Technical Potential in 2029 by End Use, Lodging

Total: 2,226,227 therms



Note: "Other" includes:
Pool Heating: 4%, Cooking: 3%

Figure 18: Commercial Achievable Technical Potential in 2029 by End Use, Miscellaneous

Total: 11,038,940 therms

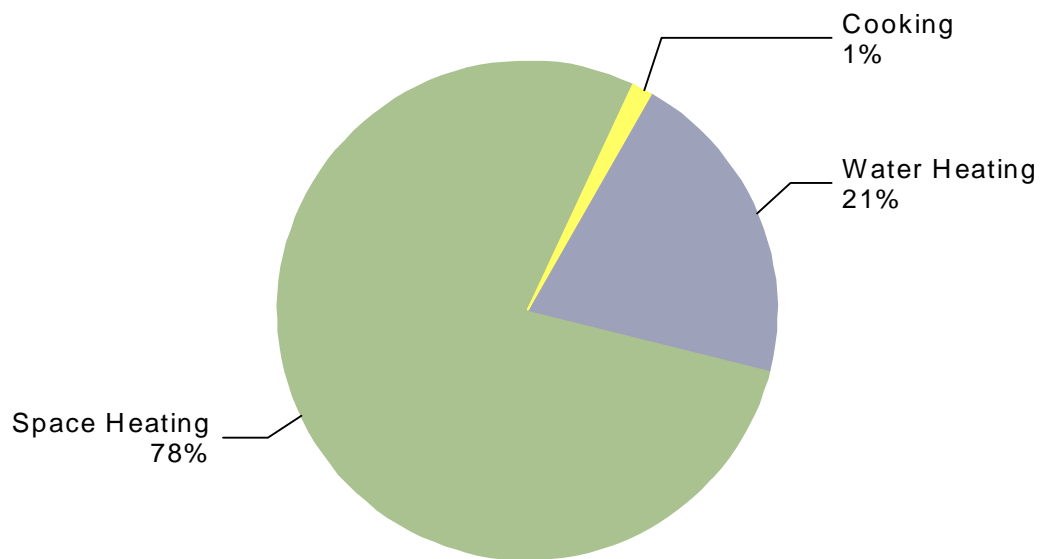


Figure 19: Commercial Achievable Technical Potential in 2029 by End Use, Office

Total: 24,512,590 therms

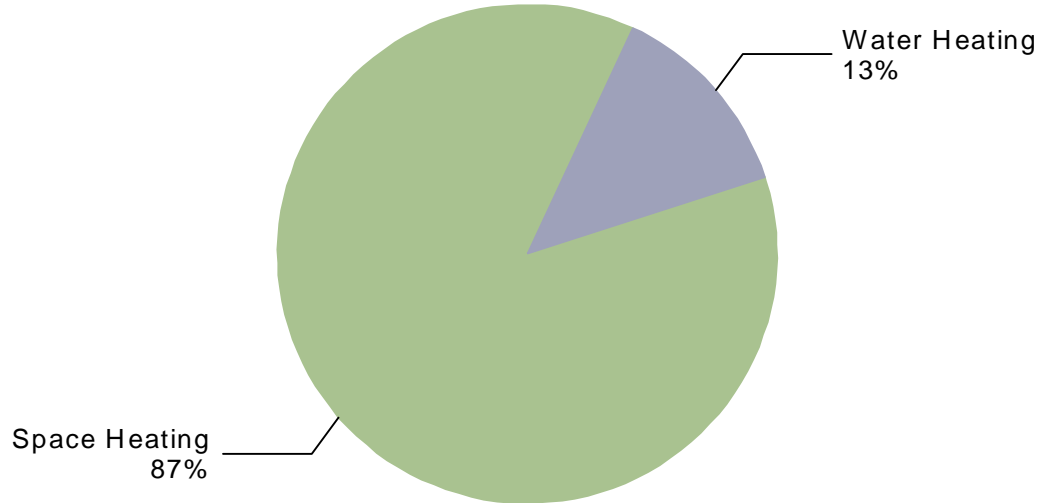


Figure 20: Commercial Achievable Technical Potential in 2029 by End Use, Restaurant

Total: 4,666,394 therms

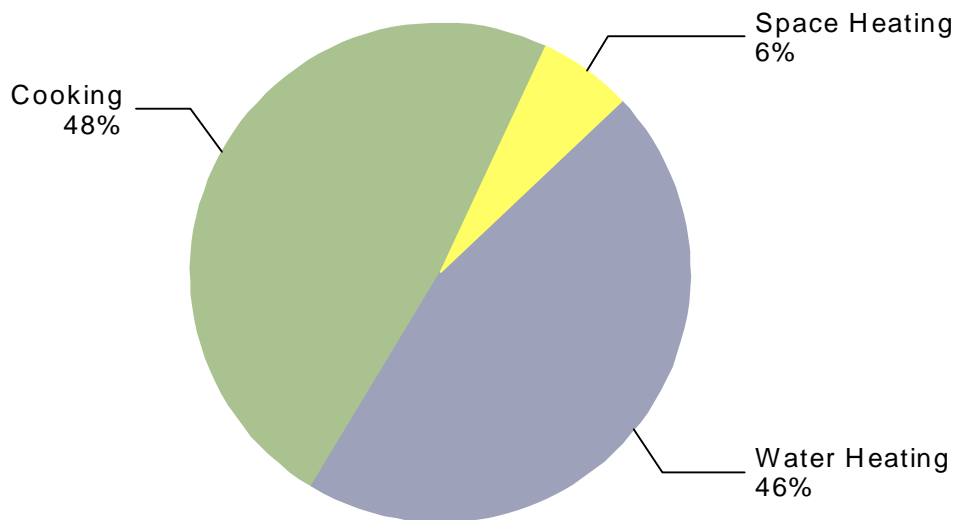


Figure 21: Commercial Achievable Technical Potential in 2029 by End Use, Retail

Total: 7,969,595 therms

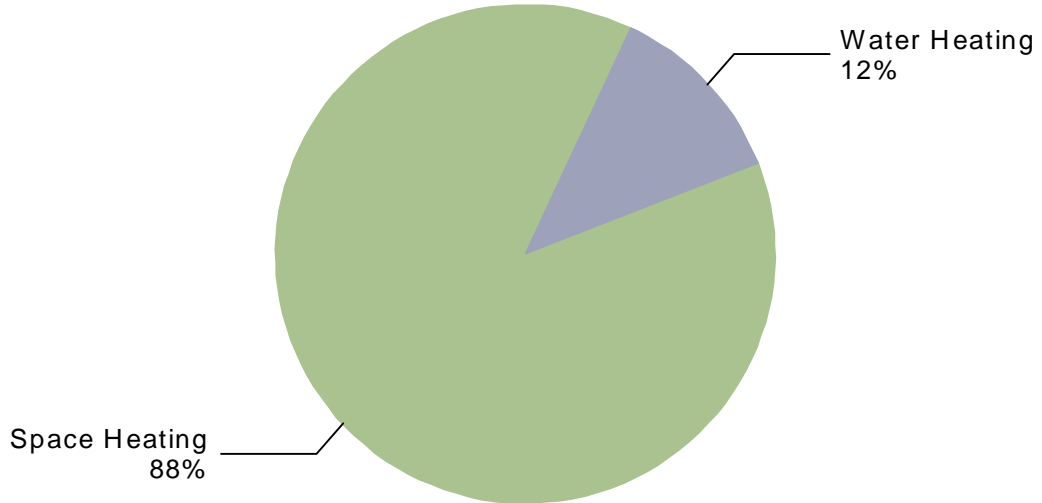
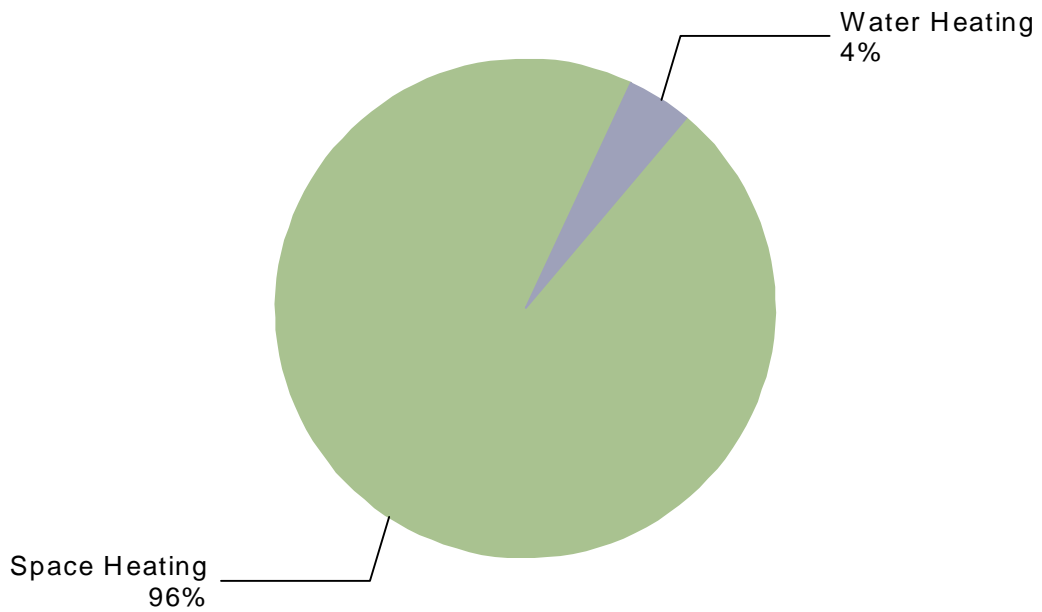


Figure 22: Commercial Achievable Technical Potential in 2029 by End Use, Warehouse

Total: 4,929,424 therms

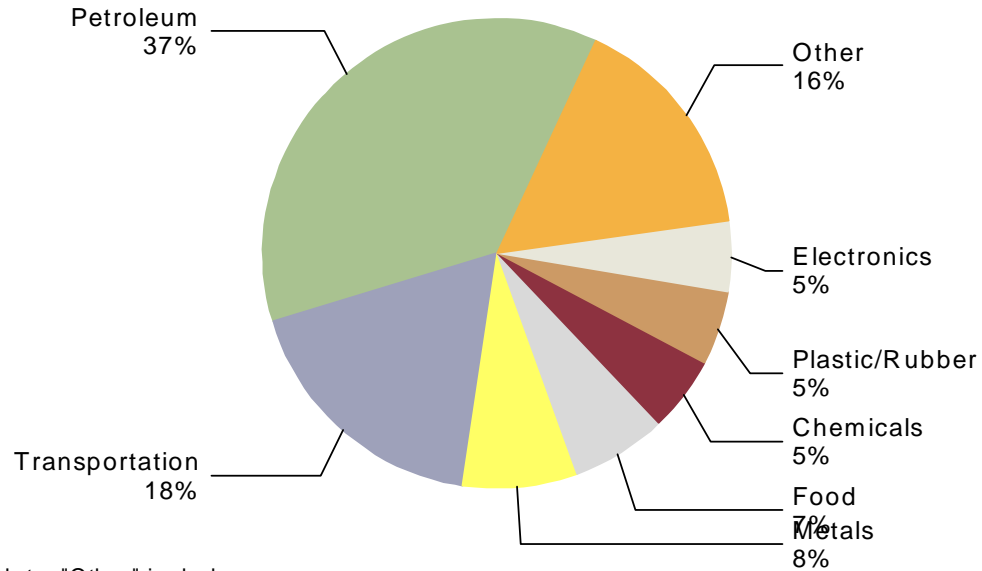


Industrial Electric

Technical Potential

Figure 1: Industrial Technical Potential in 2029 by Segment

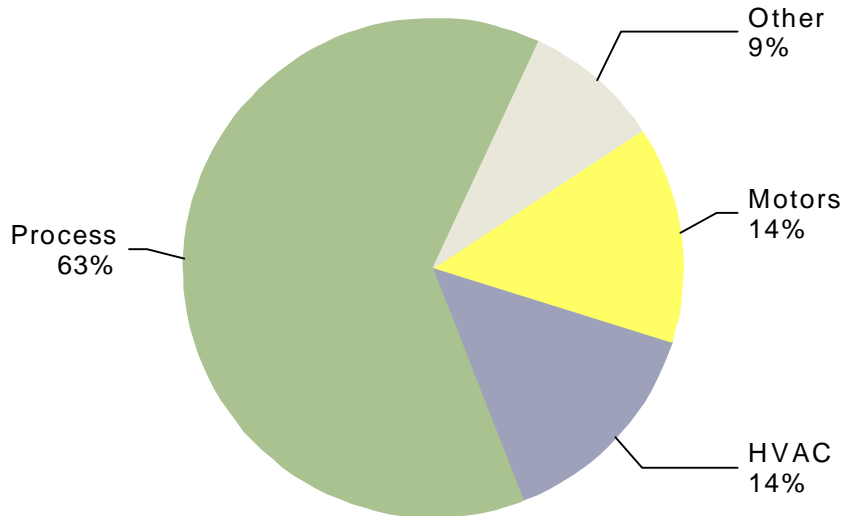
Total: 17 aMW



Note: "Other" includes: Wood: 5%, Machinery: 3%, Miscellaneous: 3%, Minerals: 2%, Paper: 2%, Printing: 1%

Figure 2: Industrial Technical Potential in 2029 by End Use

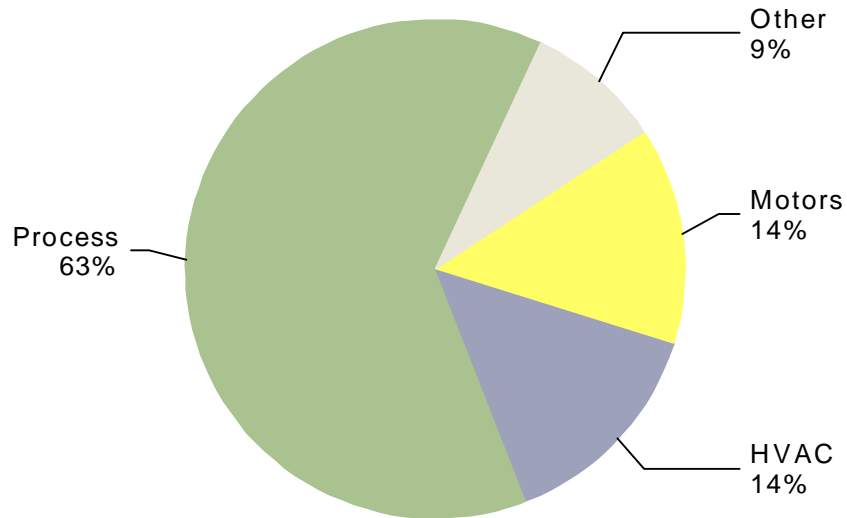
Total: 17 aMW



Note: "Other" includes: Miscellaneous: 4%, Lighting: 4%, Boiler: <1%

Figure 3: Industrial Technical Potential in 2029 by End Use, Chemicals

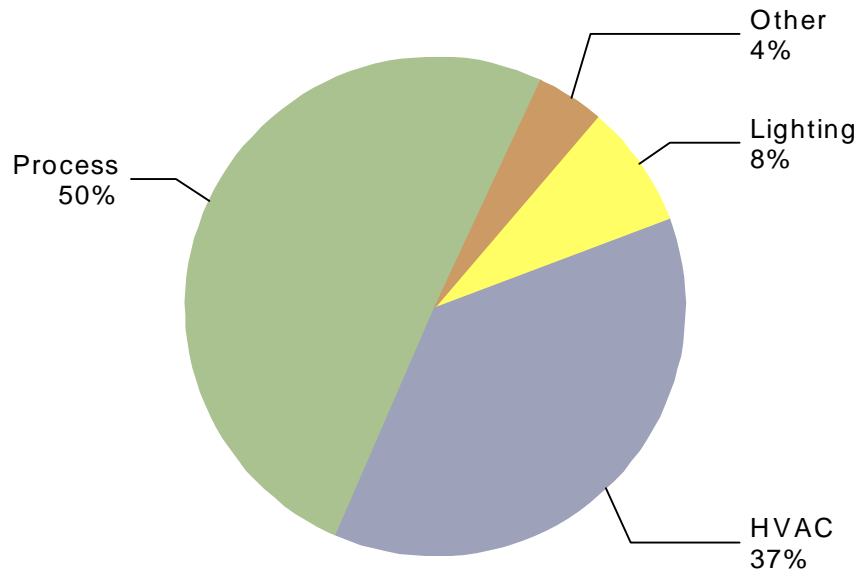
Total: 17 aMW



Note: "Other" includes:
Miscellaneous: 4%, Lighting: 4%, Boiler: <1%

Figure 4: Industrial Technical Potential in 2029 by End Use, Electronics

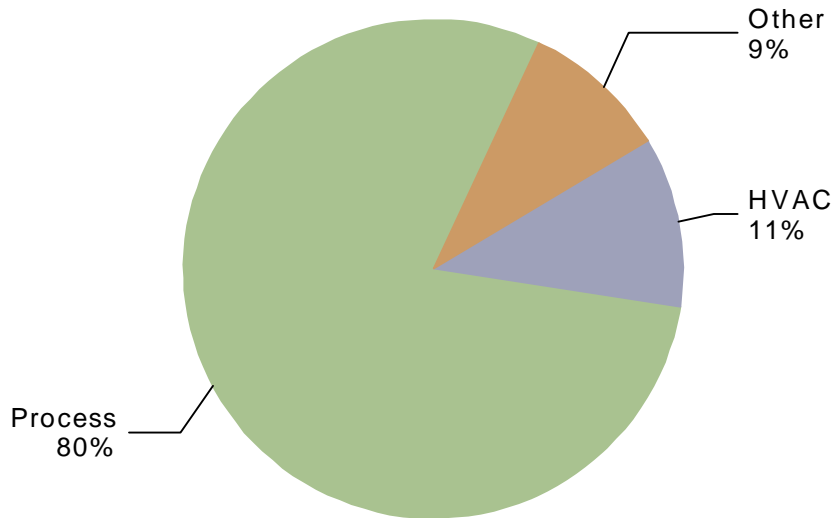
Total: 1 aMW



Note: "Other" includes:
Motors: 4%, Miscellaneous: <1%

Figure 5: Industrial Technical Potential in 2029 by End Use, Food

Total: 1 aMW



Note: "Other" includes:
Motors: 5%, Lighting: 4%, Miscellaneous: <1%

Figure 6: Industrial Technical Potential in 2029 by End Use, Machinery

Total: 0 aMW

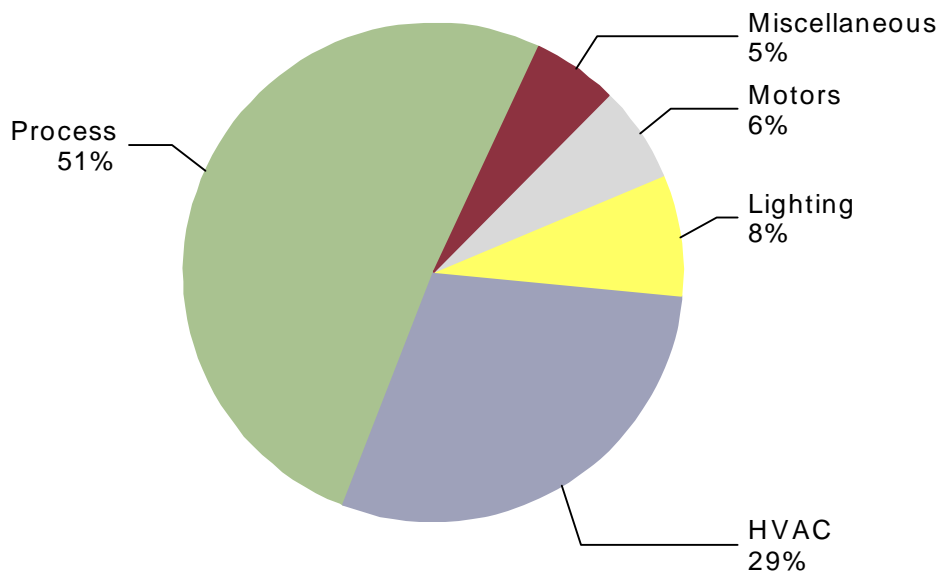
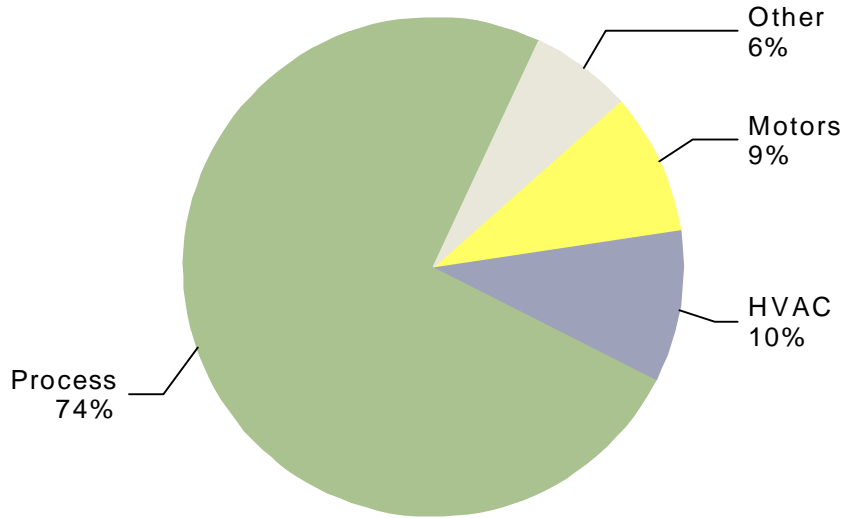


Figure 7: Industrial Technical Potential in 2029 by End Use, Metals

Total: 1 aMW



Note: "Other" includes:
Lighting: 4%, Miscellaneous: 2%, Boiler: <1%

Figure 8: Industrial Technical Potential in 2029 by End Use, Minerals

Total: 0 aMW

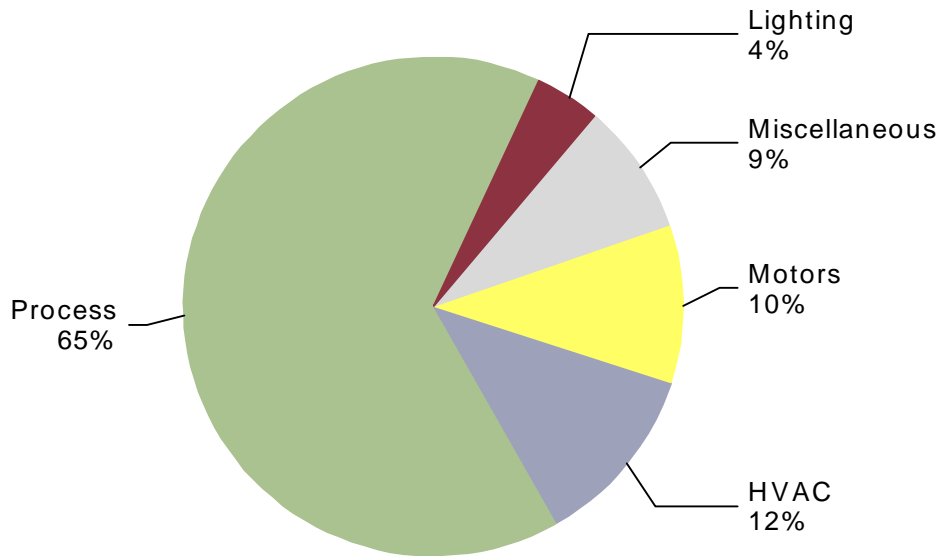
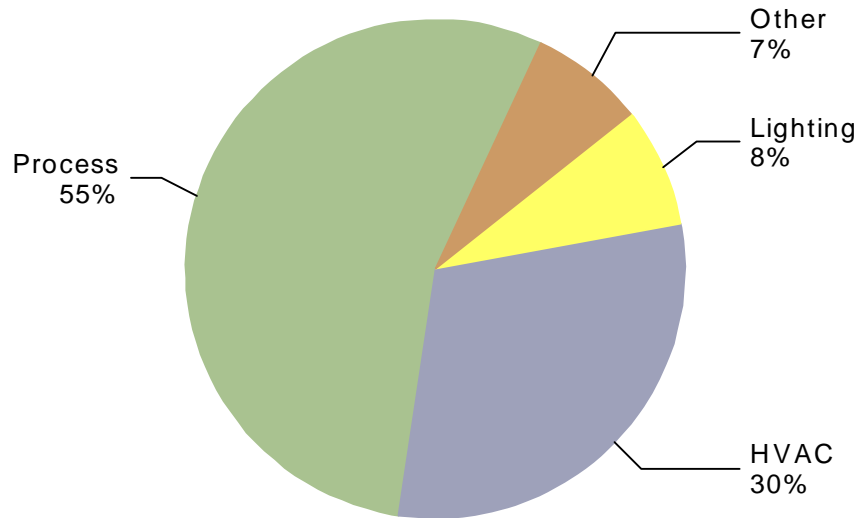


Figure 9: Industrial Technical Potential in 2029 by End Use, Miscellaneous

Total: 0 aMW



Note: "Other" includes:
Motors: 5%, Miscellaneous: 2%

Figure 10: Industrial Technical Potential in 2029 by End Use, Paper

Total: 0 aMW

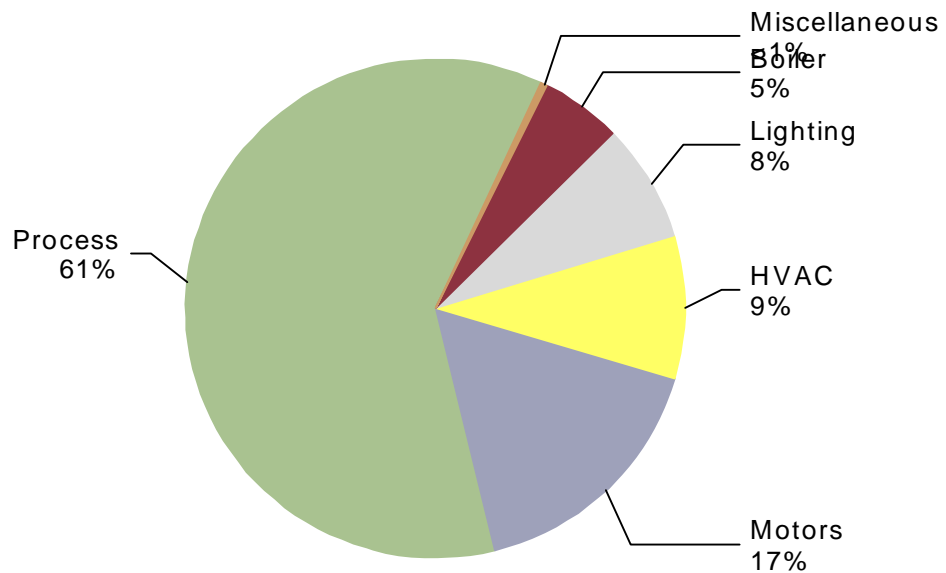


Figure 11: Industrial Technical Potential in 2029 by End Use, Petroleum

Total: 6 aMW

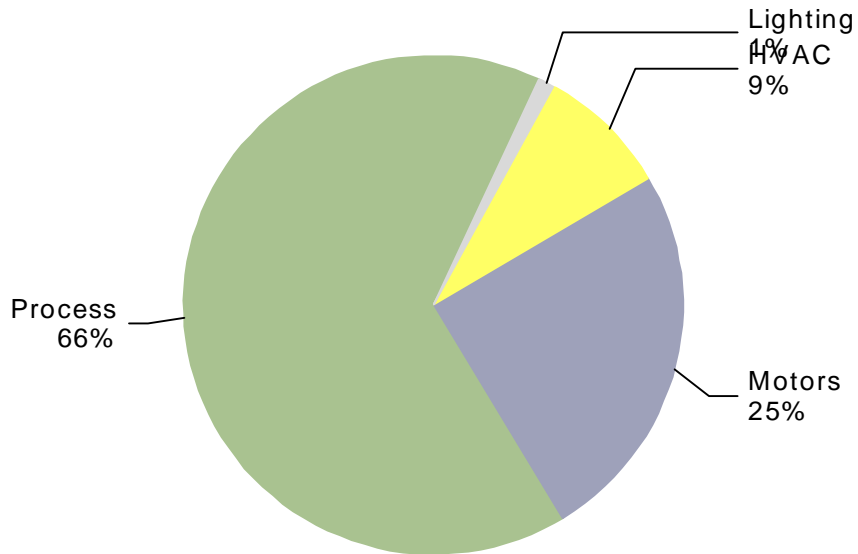


Figure 12: Industrial Technical Potential in 2029 by End Use, PlasticRubber

Total: 1 aMW

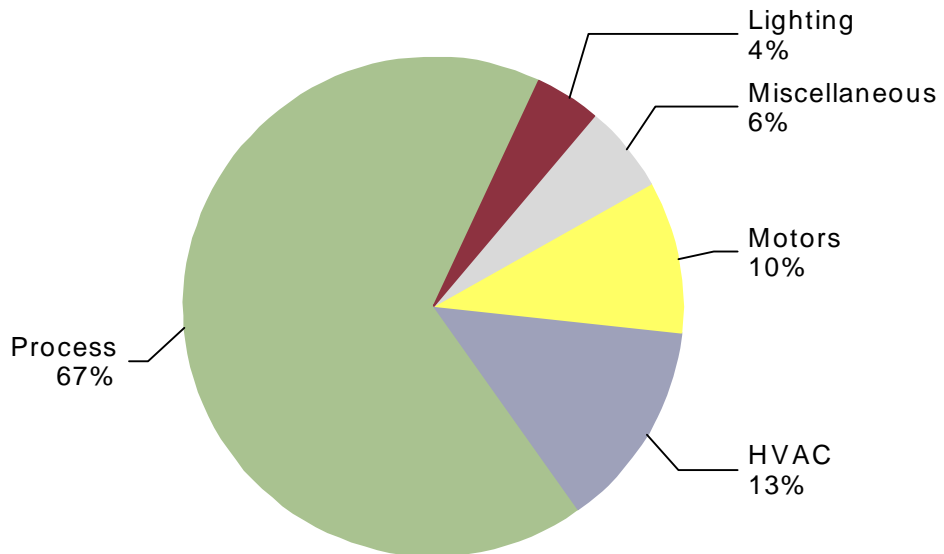
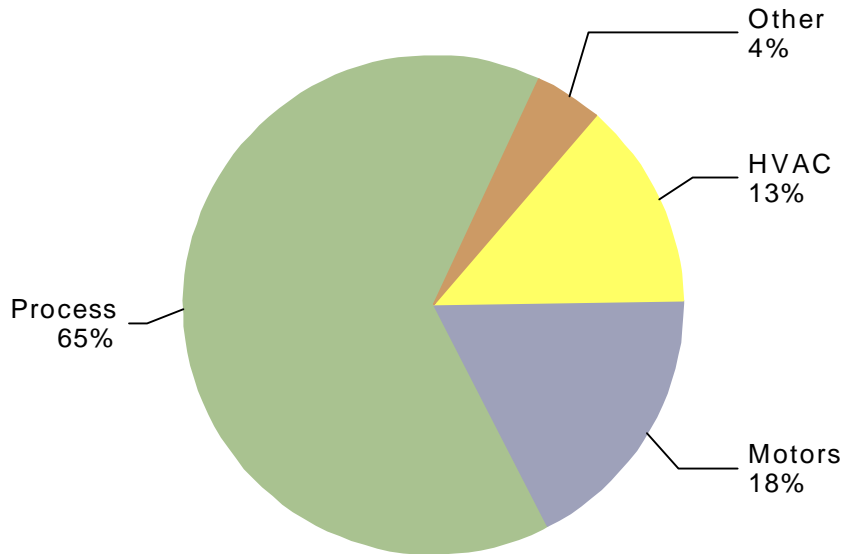


Figure 13: Industrial Technical Potential in 2029 by End Use, Printing

Total: 1 aMW



Note: "Other" includes:
Lighting: 2%, Miscellaneous: 2%

Figure 14: Industrial Technical Potential in 2029 by End Use, Transportation

Total: 0 aMW

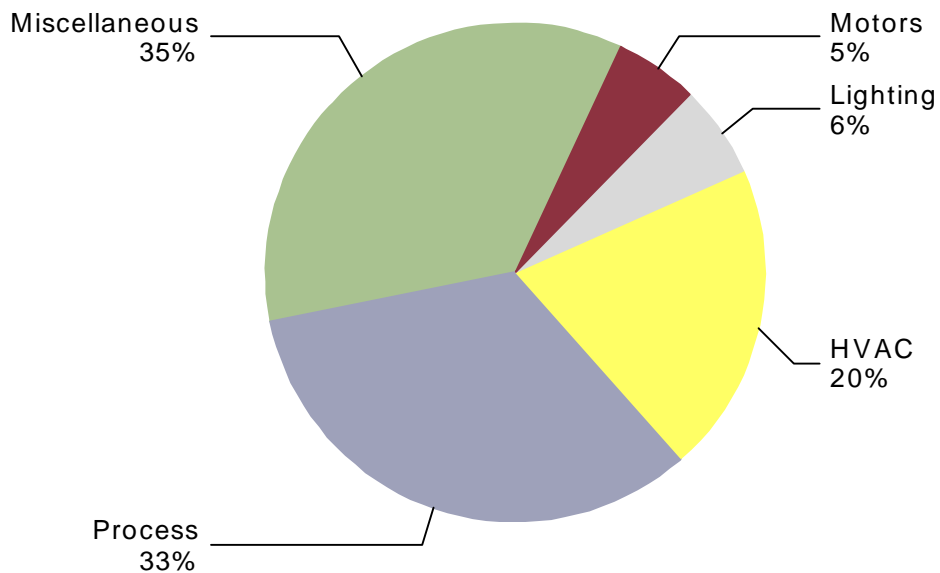
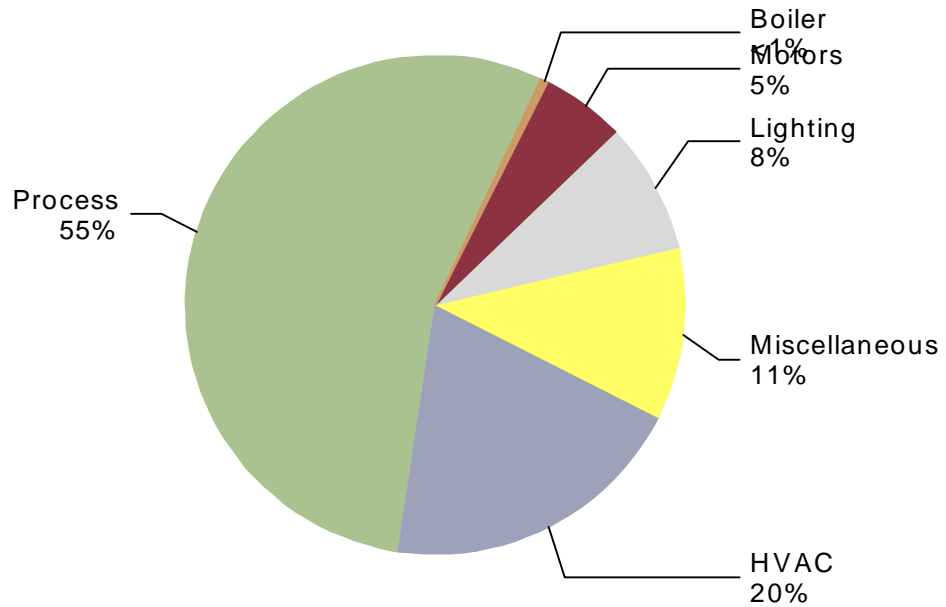


Figure 15: Industrial Technical Potential in 2029 by End Use, Wood

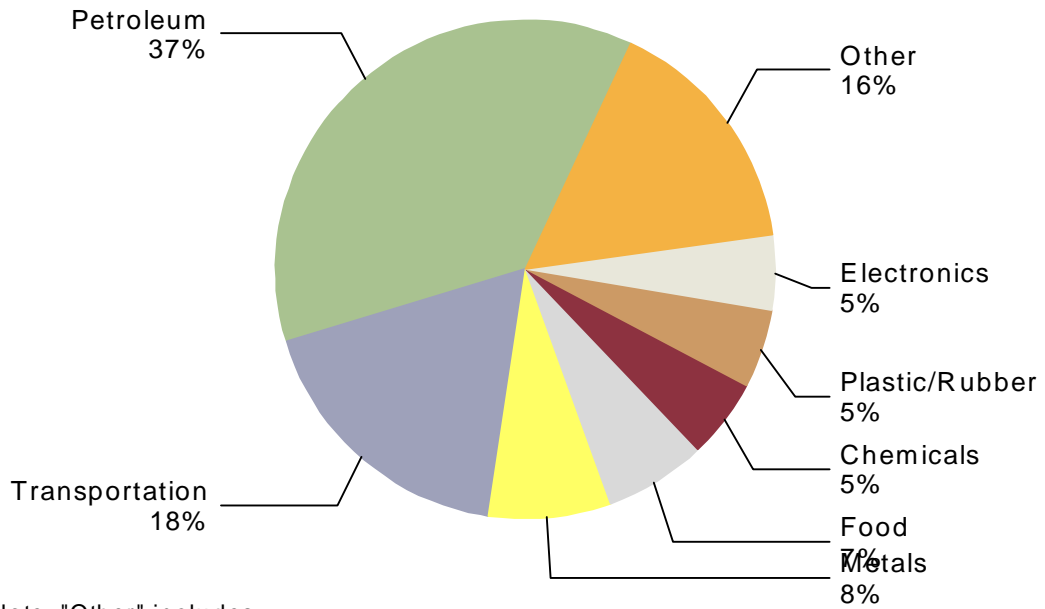
Total: 3 aMW



Achievable Technical Potential

Figure 16: Industrial Achievable Technical Potential in 2029 by Segment

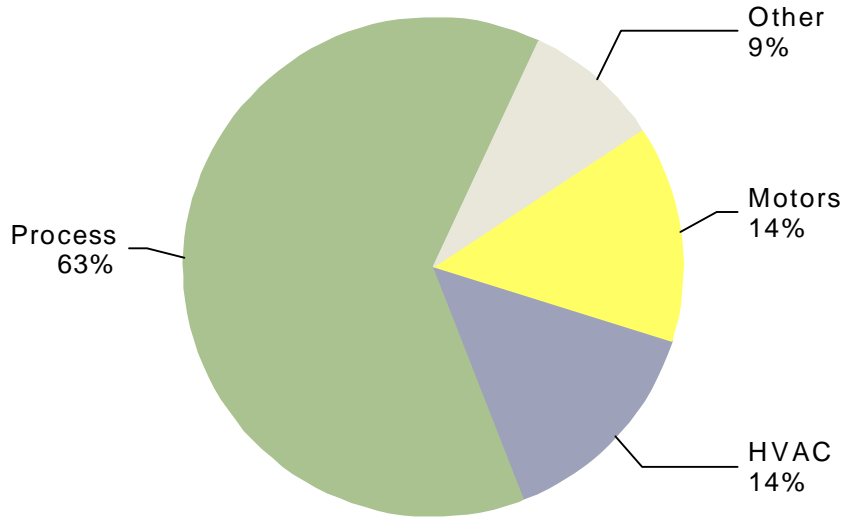
Total: 14 aMW



Note: "Other" includes: Wood: 5%, Machinery: 3%, Miscellaneous: 3%, Minerals: 2%, Paper: 2%, Printing: 1%

Figure 17: Industrial Achievable Technical Potential in 2029 by End Use

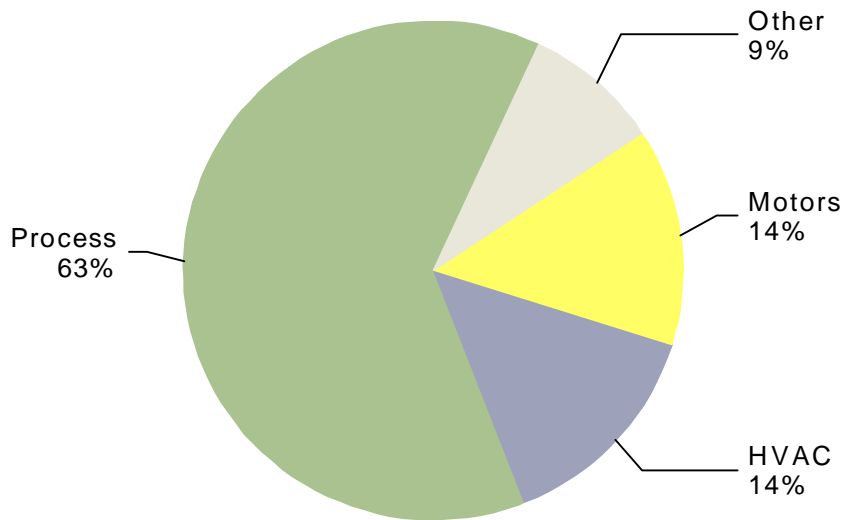
Total: 14 aMW



Note: "Other" includes:
Miscellaneous: 4%, Lighting: 4%, Boiler: <1%

Figure 18: Industrial Achievable Technical Potential in 2029 by End Use, Chemicals

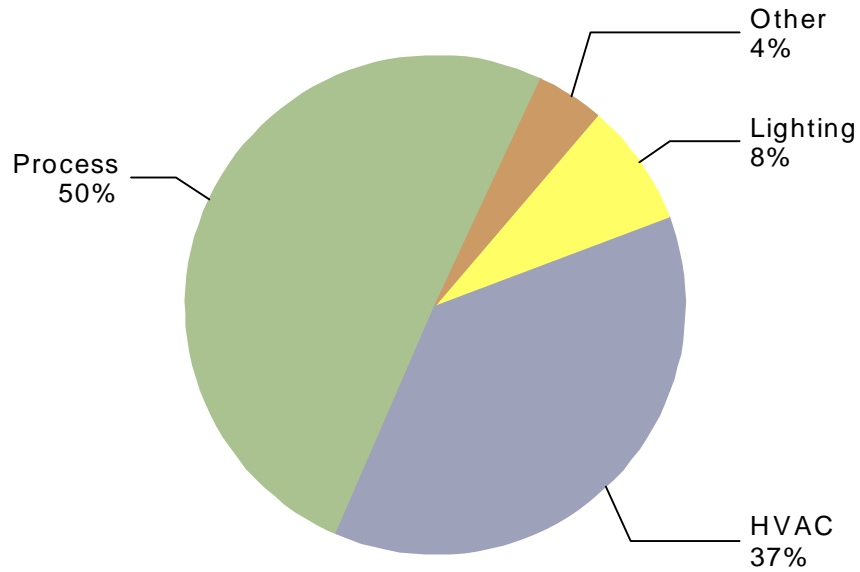
Total: 14 aMW



Note: "Other" includes:
Miscellaneous: 4%, Lighting: 4%, Boiler: <1%

Figure 19: Industrial Achievable Technical Potential in 2029 by End Use, Electronics

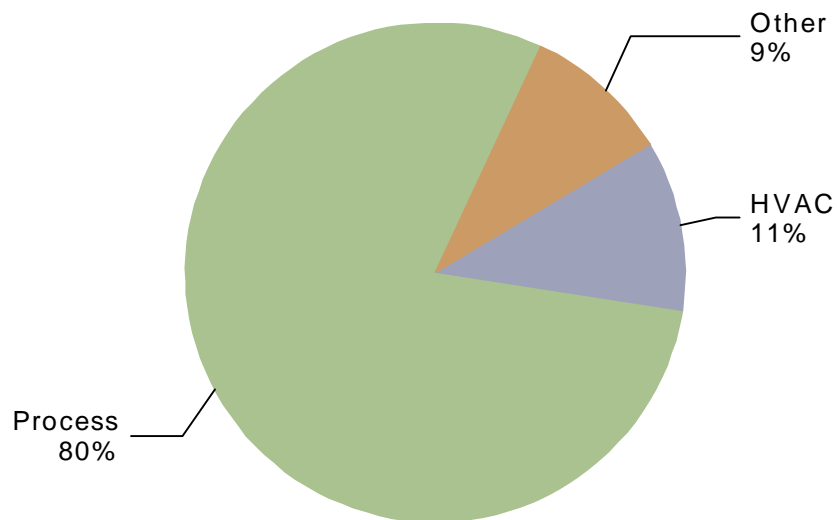
Total: 1 aMW



Note: "Other" includes:
Motors: 4%, Miscellaneous: <1%

Figure 20: Industrial Achievable Technical Potential in 2029 by End Use, Food

Total: 1 aMW



Note: "Other" includes:
Motors: 5%, Lighting: 4%, Miscellaneous: <1%

Figure 21: Industrial Achievable Technical Potential in 2029 by End Use, Machinery

Total: 0 aMW

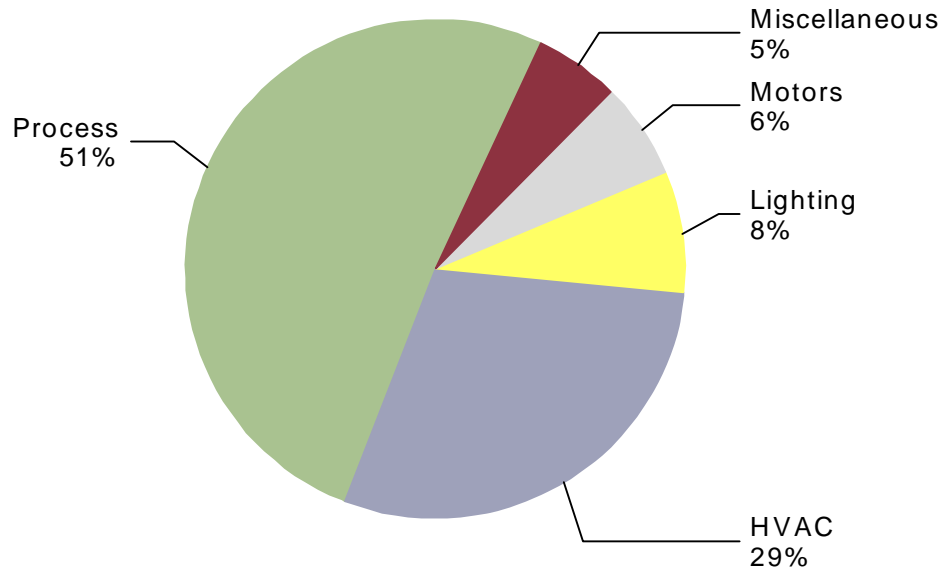
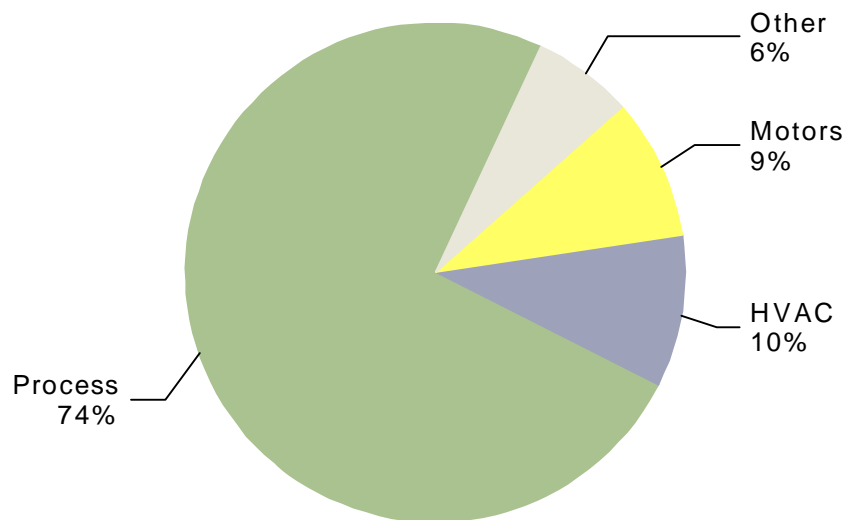


Figure 22: Industrial Achievable Technical Potential in 2029 by End Use, Metals

Total: 1 aMW



Note: "Other" includes:
Lighting: 4%, Miscellaneous: 2%, Boiler: <1%

Figure 23: Industrial Achievable Technical Potential in 2029 by End Use, Minerals

Total: 0 aMW

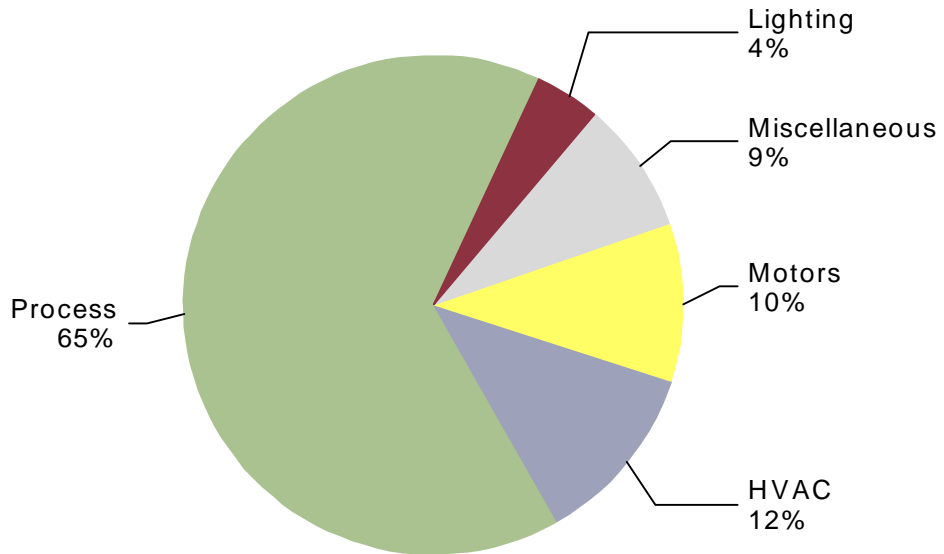
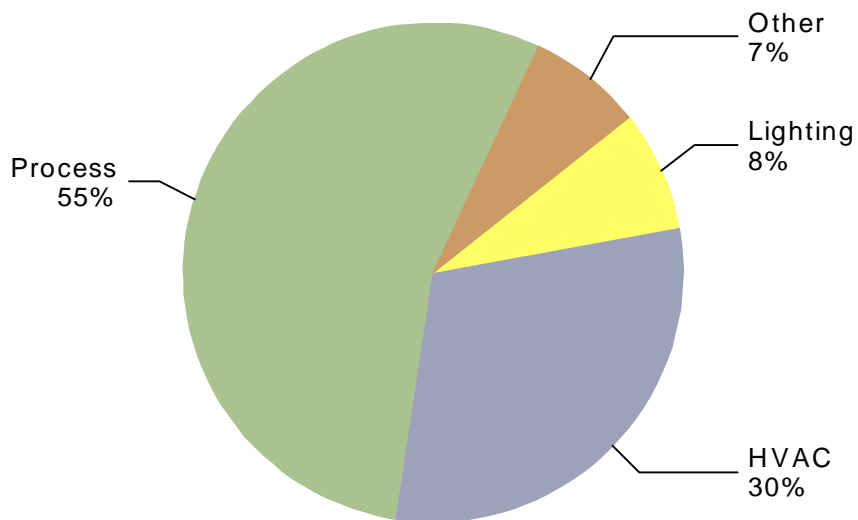


Figure 24: Industrial Achievable Technical Potential in 2029 by End Use, Miscellaneous

Total: 0 aMW



Note: "Other" includes:
Motors: 5%, Miscellaneous: 2%

Figure 25: Industrial Achievable Technical Potential in 2029 by End Use, Paper

Total: 0 aMW

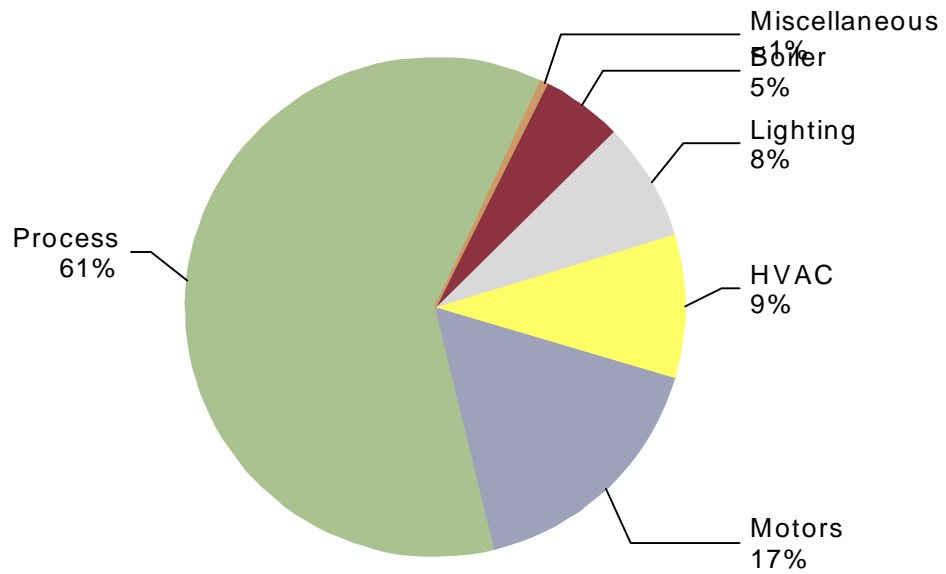


Figure 26: Industrial Achievable Technical Potential in 2029 by End Use, Petroleum

Total: 5 aMW

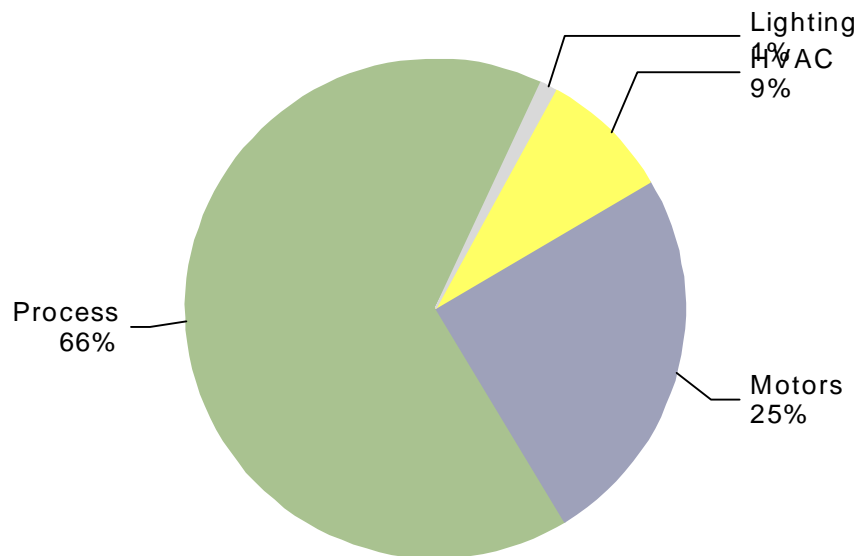


Figure 27: Industrial Achievable Technical Potential in 2029 by End Use, PlasticRubber

Total: 1 aMW

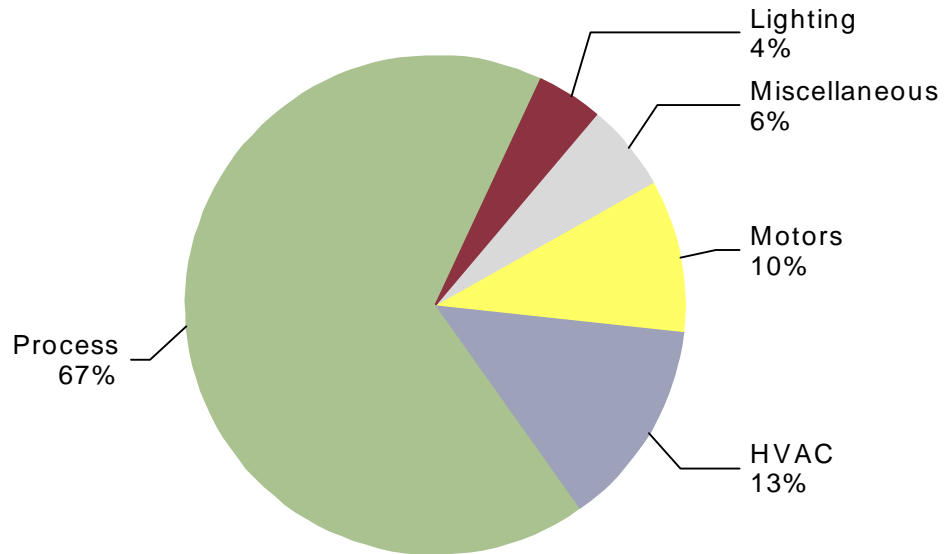
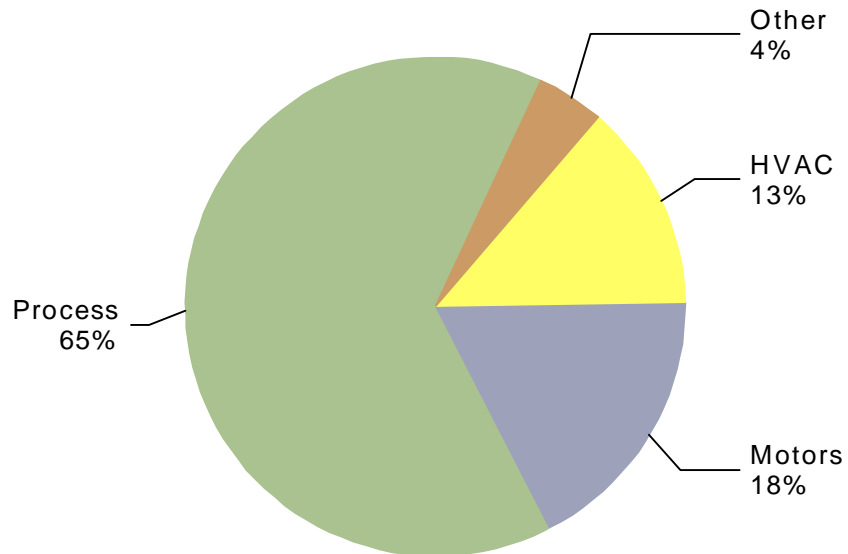


Figure 28: Industrial Achievable Technical Potential in 2029 by End Use, Printing

Total: 1 aMW



Note: "Other" includes:
Lighting: 2%, Miscellaneous: 2%

Figure 29: Industrial Achievable Technical Potential in 2029 by End Use, Transportation

Total: 0 aMW

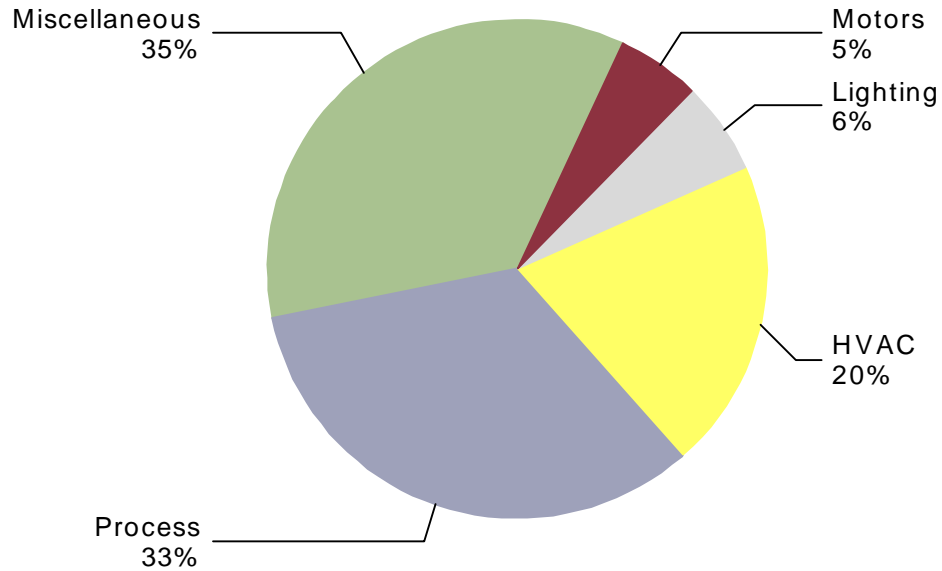
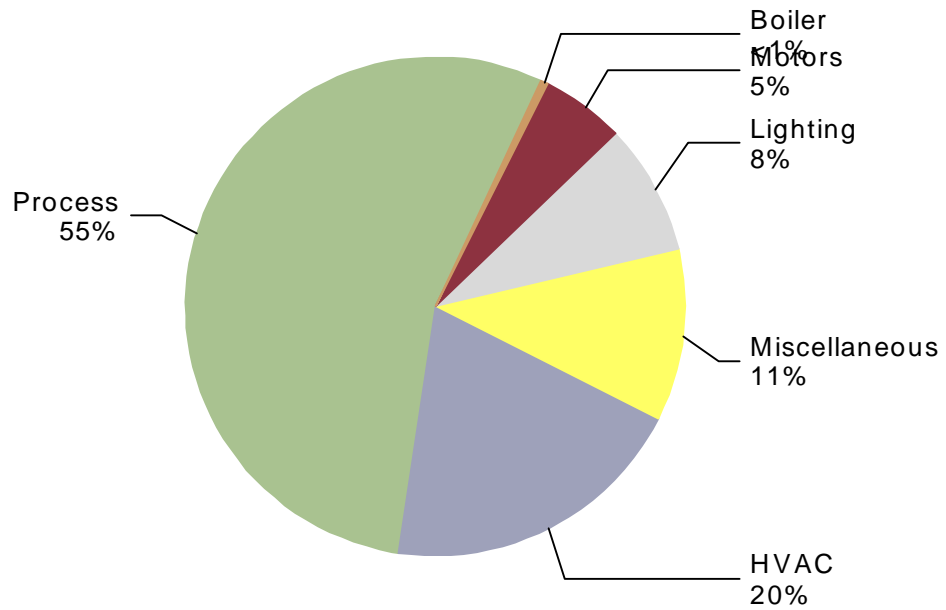


Figure 30: Industrial Achievable Technical Potential in 2029 by End Use, Wood

Total: 3 aMW



**Industrial Gas
Technical Potential**

Figure 1: Industrial Technical Potential in 2029 by Segment

Total: 11,894,716 therms

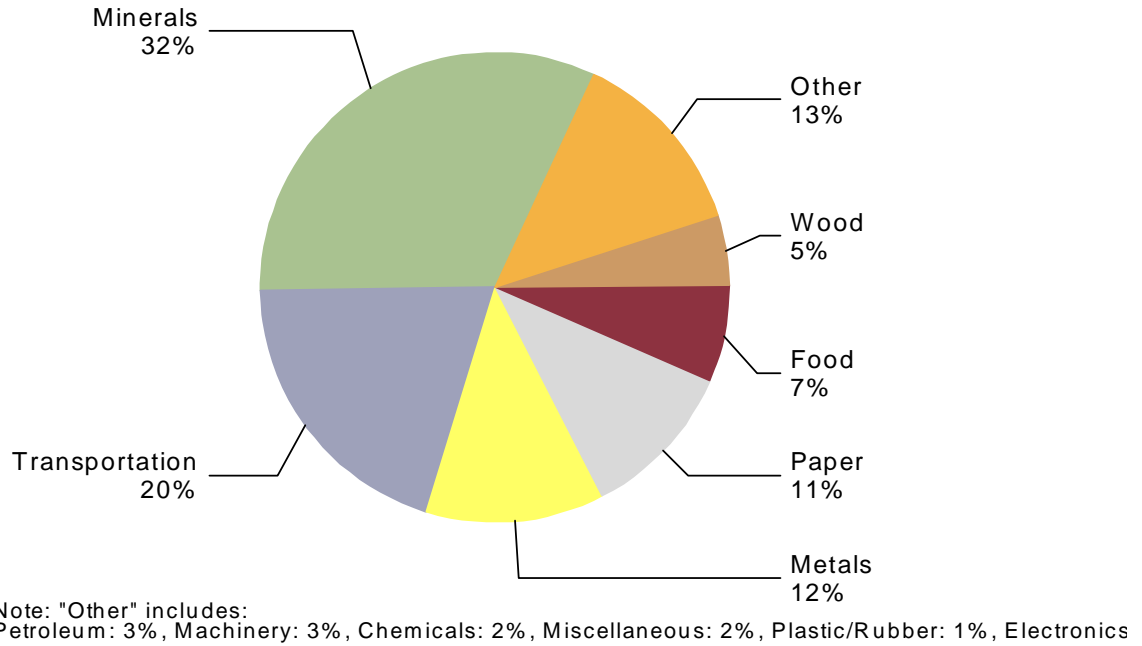


Figure 2: Industrial Technical Potential in 2029 by End Use

Total: 11,894,716 therms

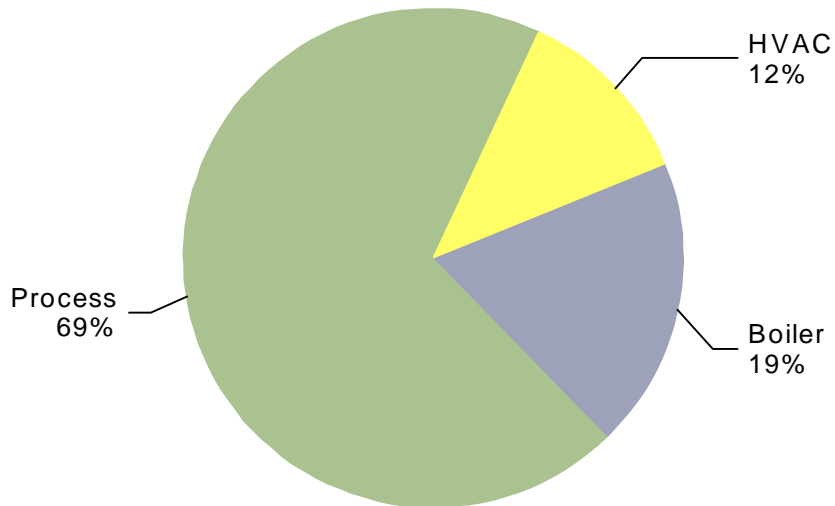


Figure 3: Industrial Technical Potential in 2029 by End Use, Chemicals

Total: 11,894,716 therms

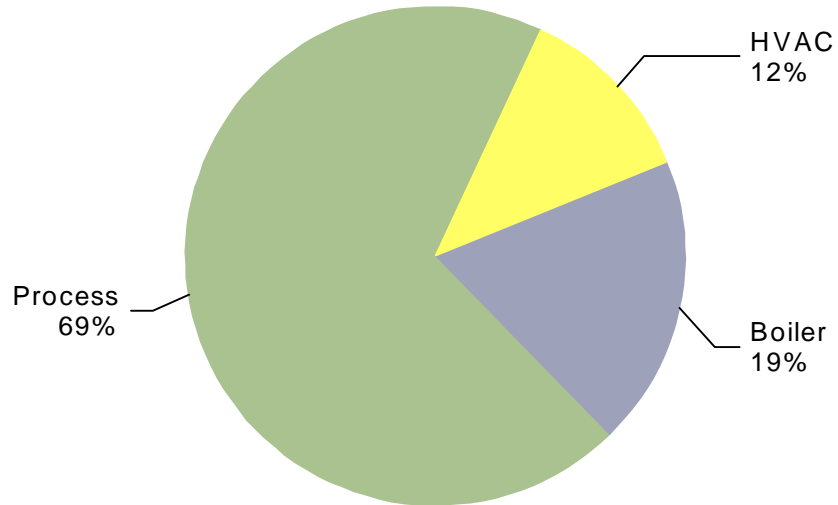


Figure 4: Industrial Technical Potential in 2029 by End Use, Electronics

Total: 119,114 therms

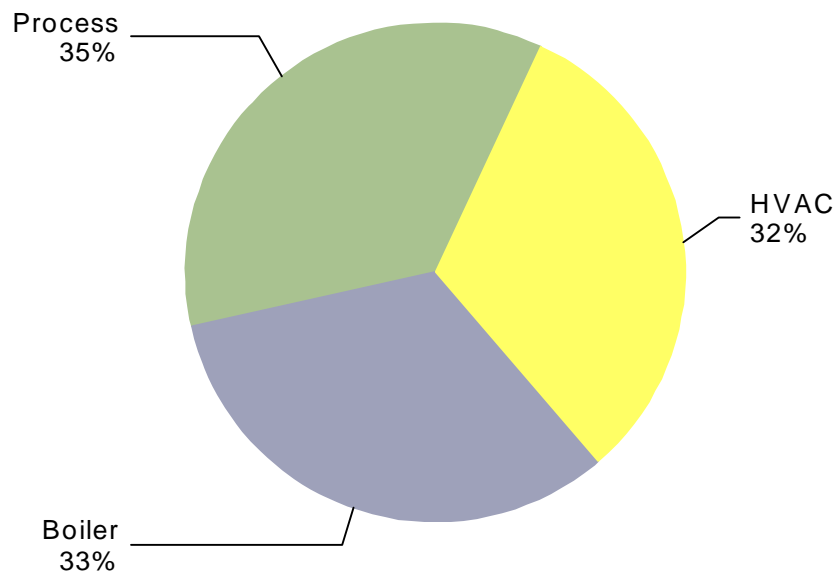


Figure 5: Industrial Technical Potential in 2029 by End Use, Food

Total: 789,692 therms

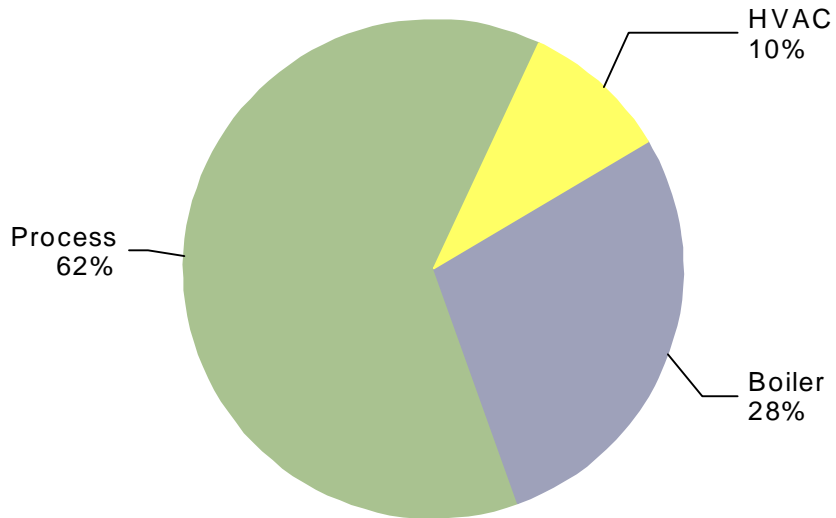


Figure 6: Industrial Technical Potential in 2029 by End Use, Machinery

Total: 302,922 therms

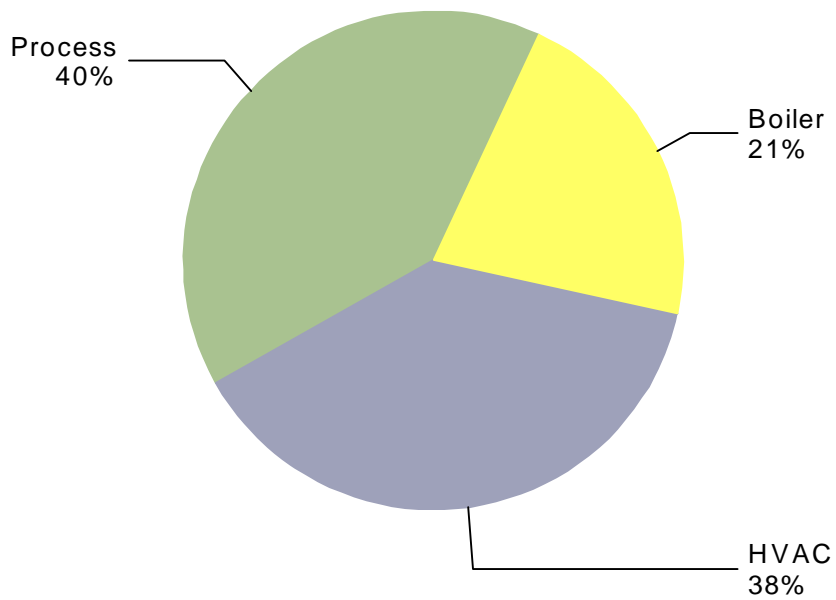


Figure 7: Industrial Technical Potential in 2029 by End Use, Metals

Total: 1,465,136 therms

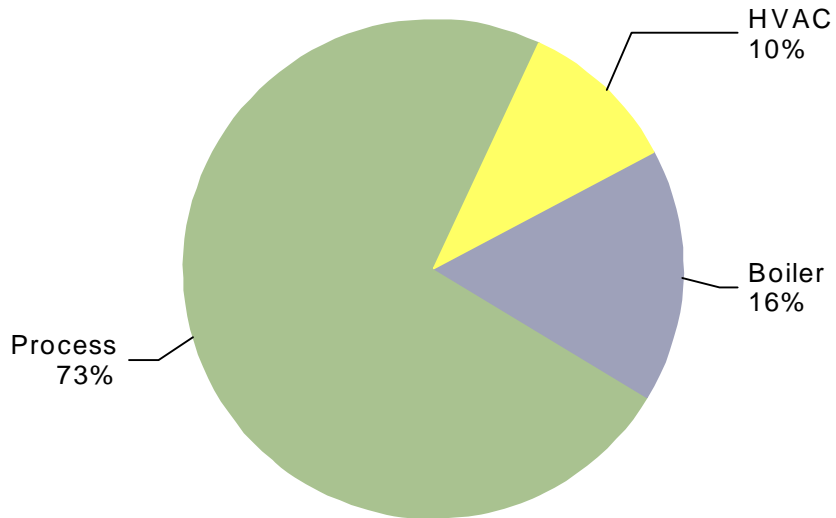
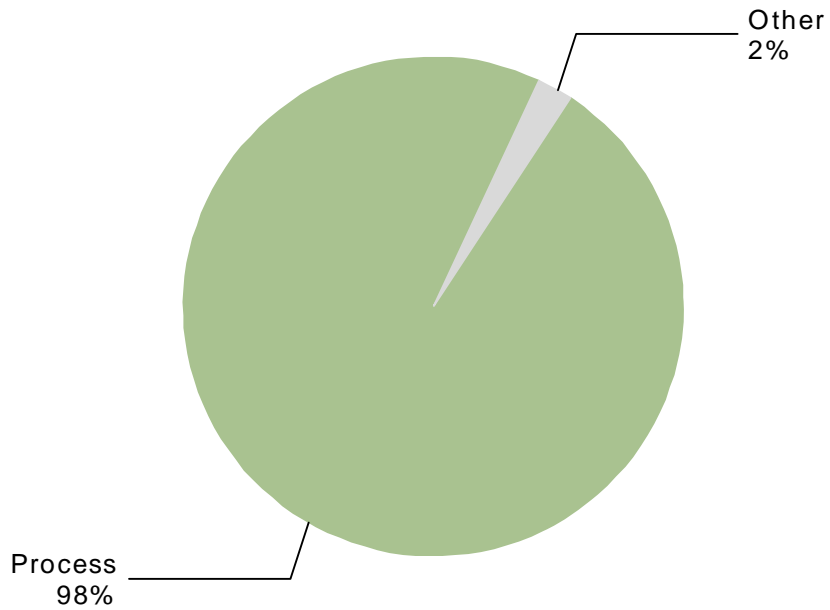


Figure 8: Industrial Technical Potential in 2029 by End Use, Minerals

Total: 3,823,347 therms



Note: "Other" includes:
HVAC: 2%, Boiler: <1%

Figure 9: Industrial Technical Potential in 2029 by End Use, Miscellaneous

Total: 202,980 therms

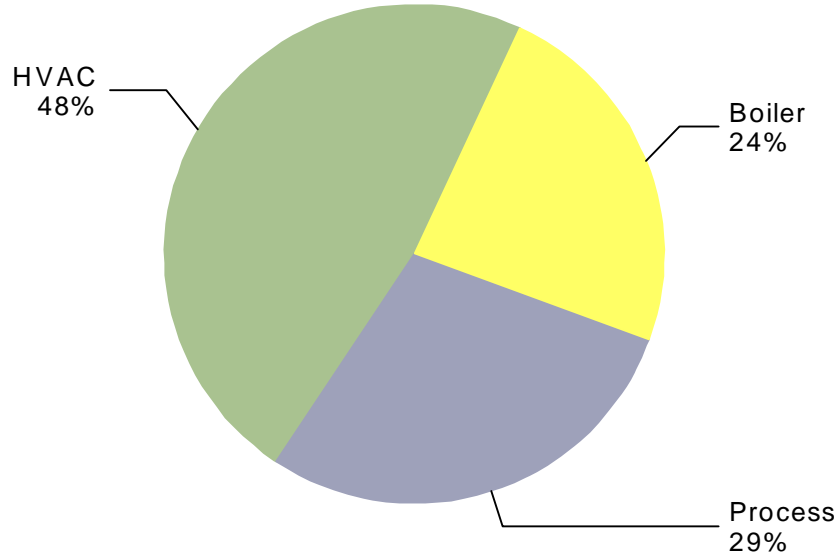


Figure 10: Industrial Technical Potential in 2029 by End Use, Paper

Total: 1,300,019 therms

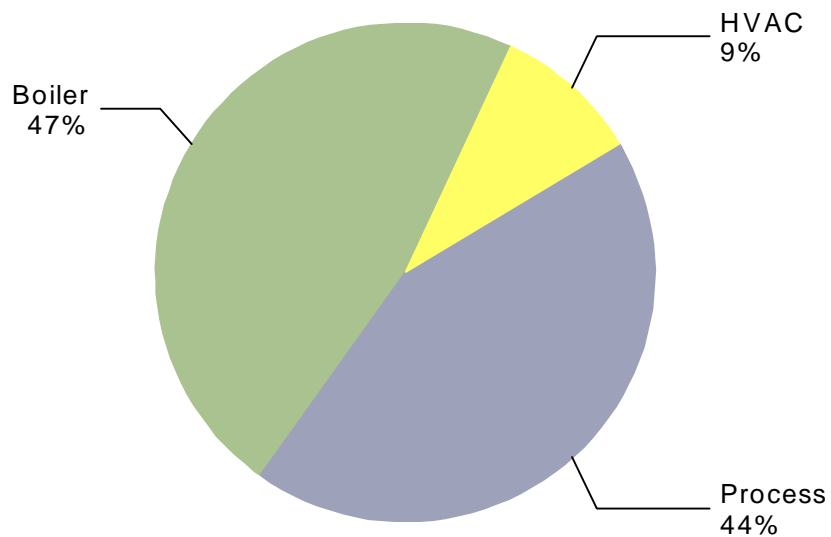


Figure 11: Industrial Technical Potential in 2029 by End Use, Petroleum

Total: 385,404 therms

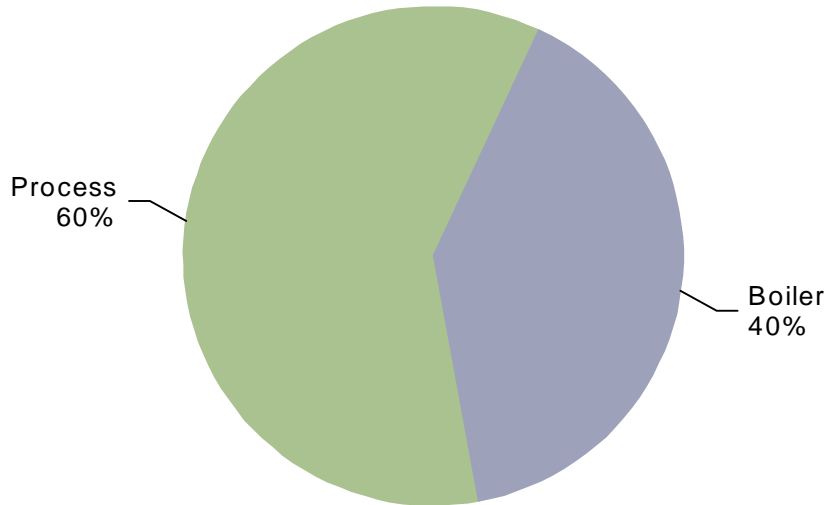


Figure 12: Industrial Technical Potential in 2029 by End Use, PlasticRubber

Total: 172,938 therms

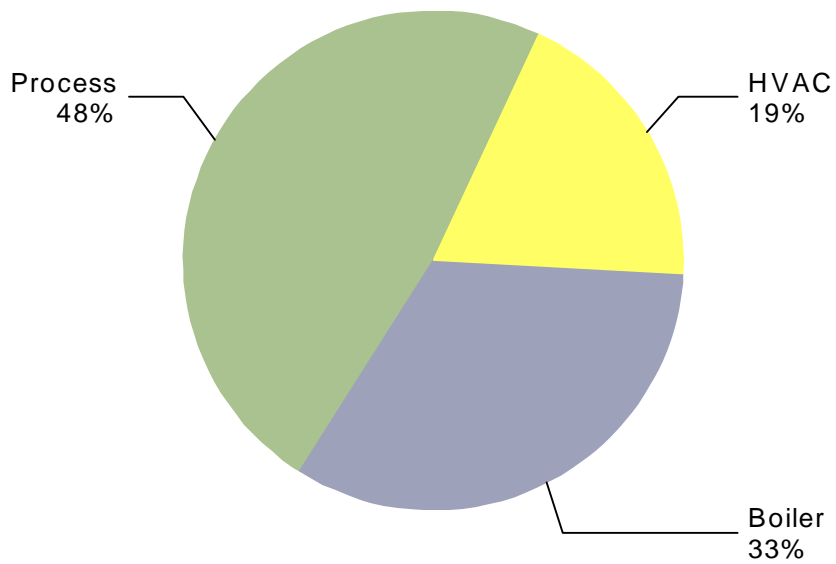


Figure 13: Industrial Technical Potential in 2029 by End Use, Printing

Total: 284,445 therms

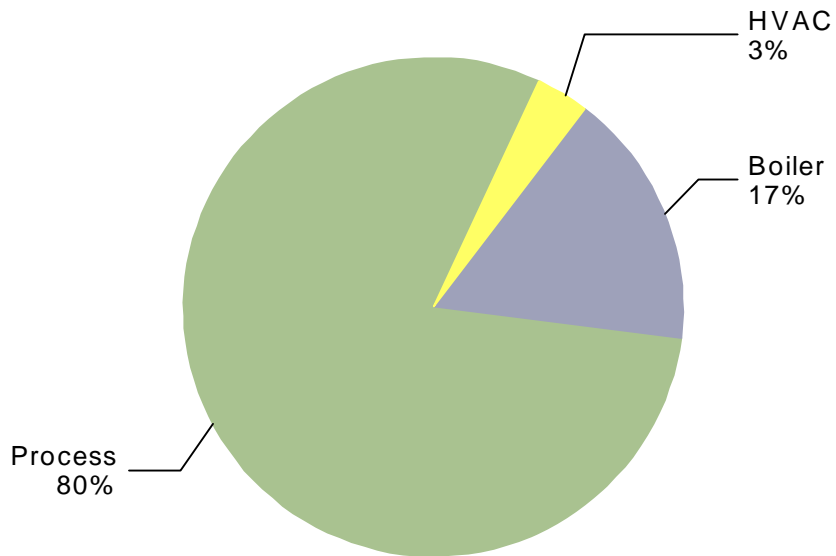


Figure 14: Industrial Technical Potential in 2029 by End Use, Transportation

Total: 89,840 therms

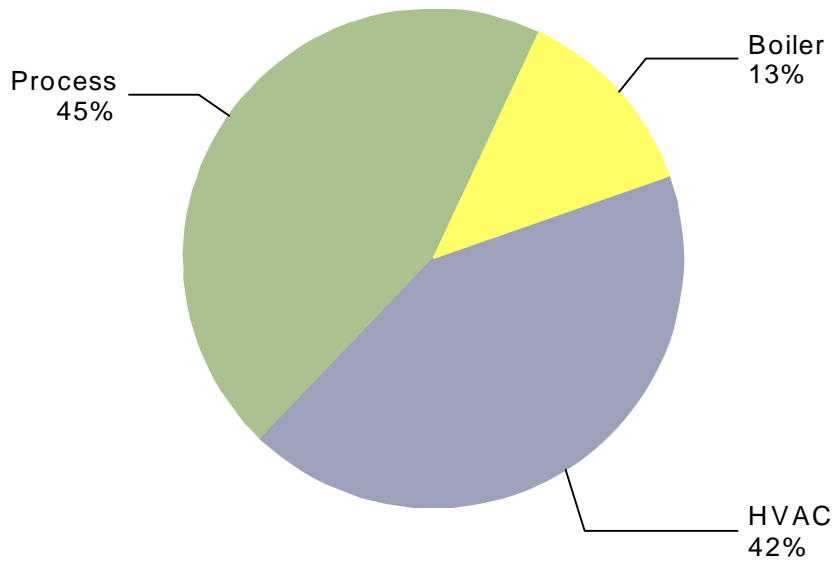
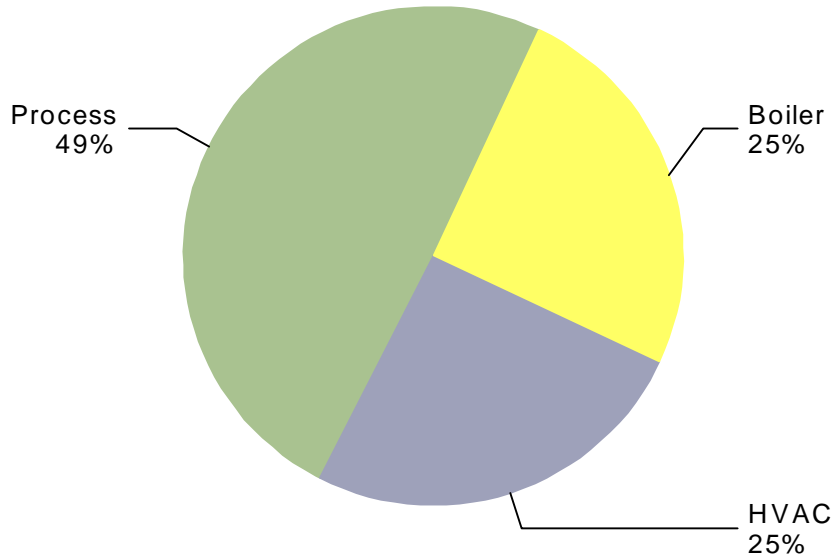


Figure 15: Industrial Technical Potential in 2029 by End Use, Wood

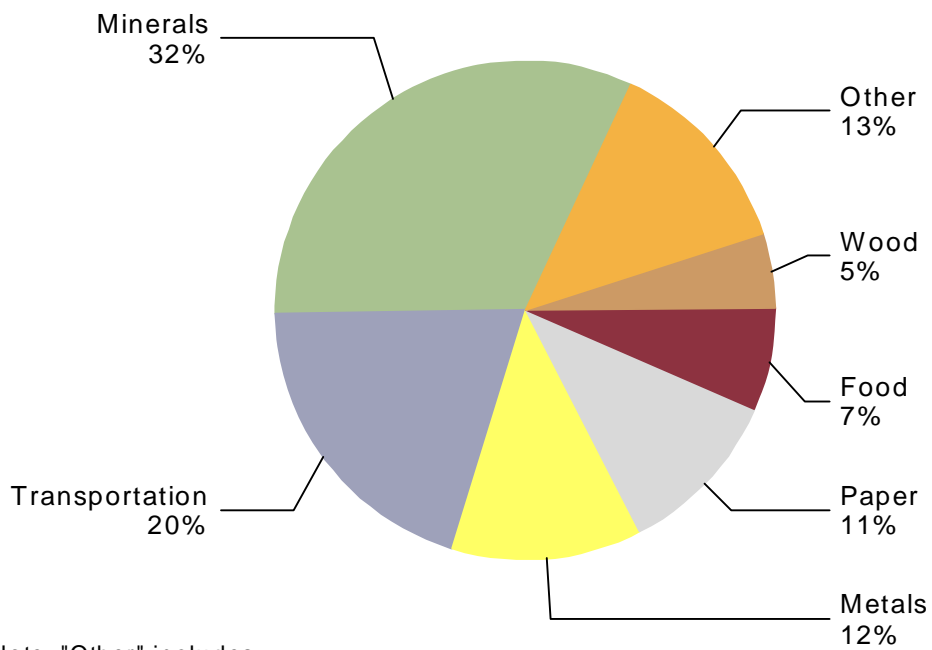
Total: 2,387,799 therms



Achievable Technical Potential

Figure 16: Industrial Achievable Technical Potential in 2029 by Segment

Total: 8,921,037 therms



Note: "Other" includes: Petroleum: 3%, Machinery: 3%, Chemicals: 2%, Miscellaneous: 2%, Plastic/Rubber: 1%, Electronics

Figure 17: Industrial Achievable Technical Potential in 2029 by End Use

Total: 8,921,037 therms

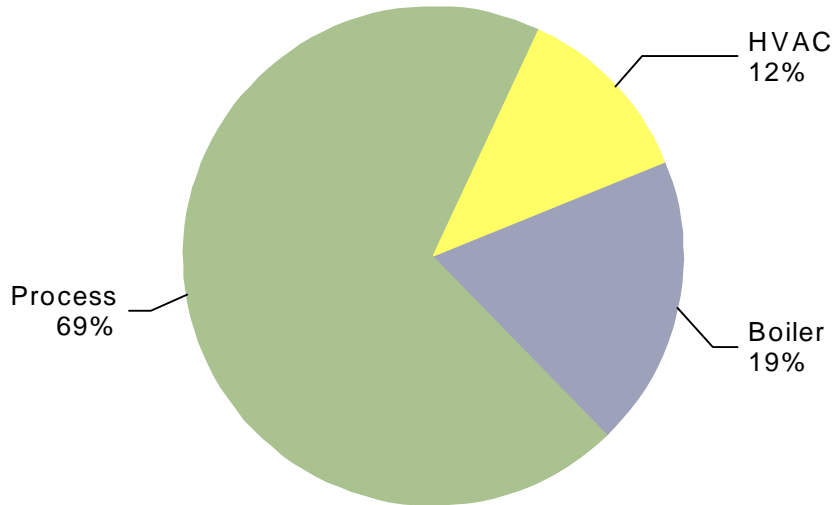


Figure 18: Industrial Achievable Technical Potential in 2029 by End Use, Chemicals

Total: 8,921,037 therms

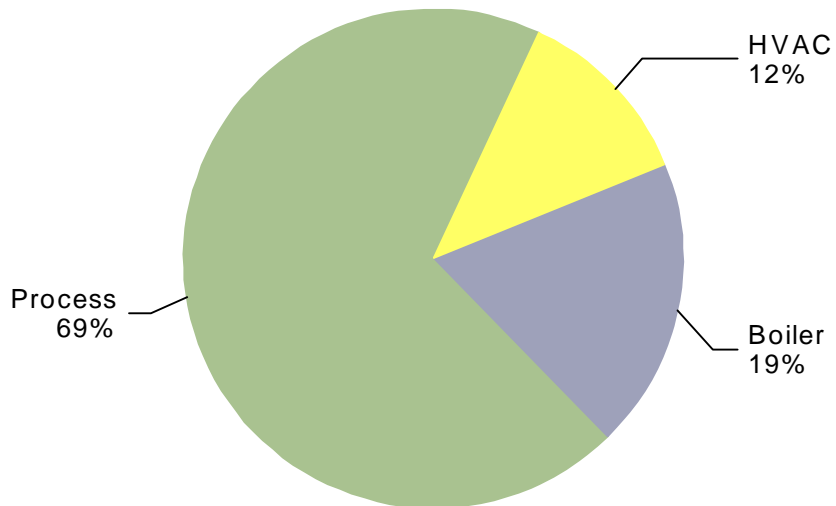


Figure 19: Industrial Achievable Technical Potential in 2029 by End Use, Electronics

Total: 89,335 therms

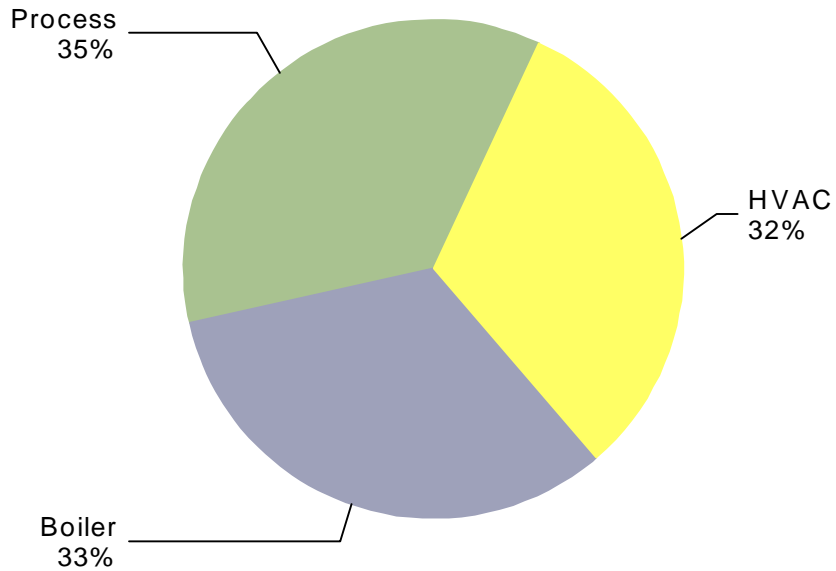


Figure 20: Industrial Achievable Technical Potential in 2029 by End Use, Food

Total: 592,269 therms

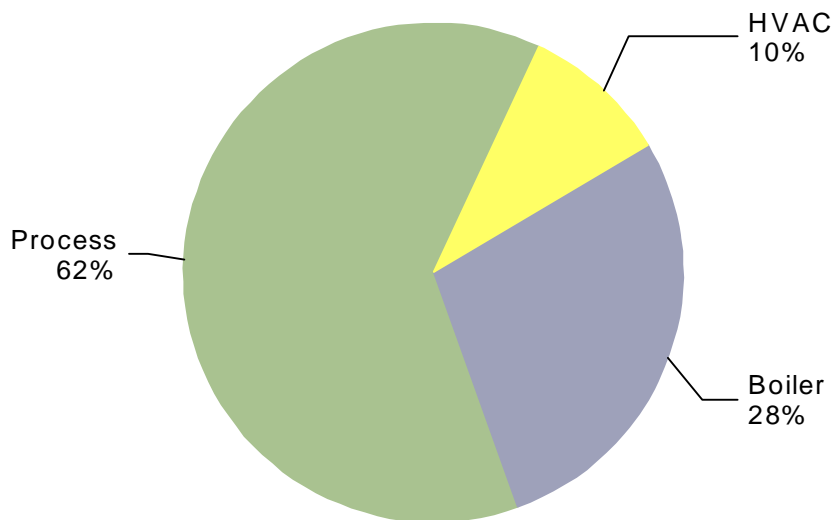


Figure 21: Industrial Achievable Technical Potential in 2029 by End Use, Machinery

Total: 227,191 therms

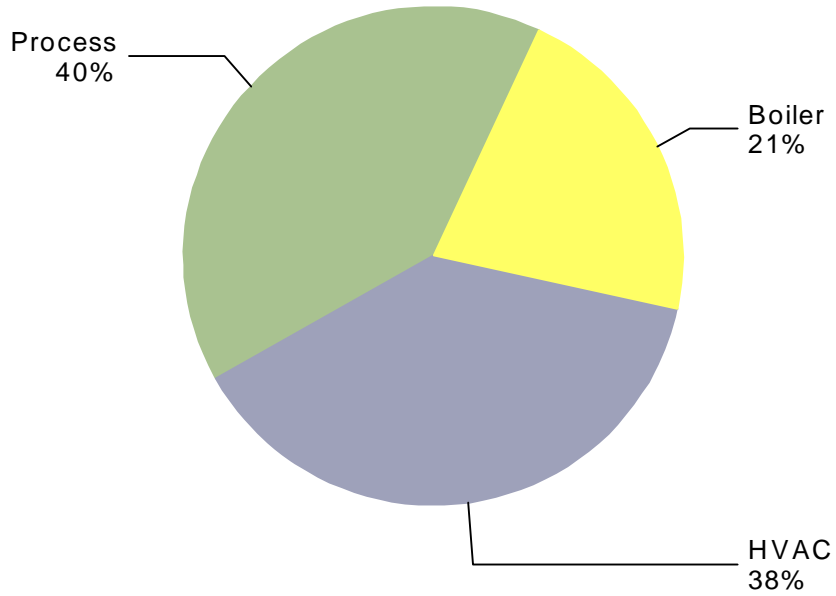


Figure 22: Industrial Achievable Technical Potential in 2029 by End Use, Metals

Total: 1,098,852 therms

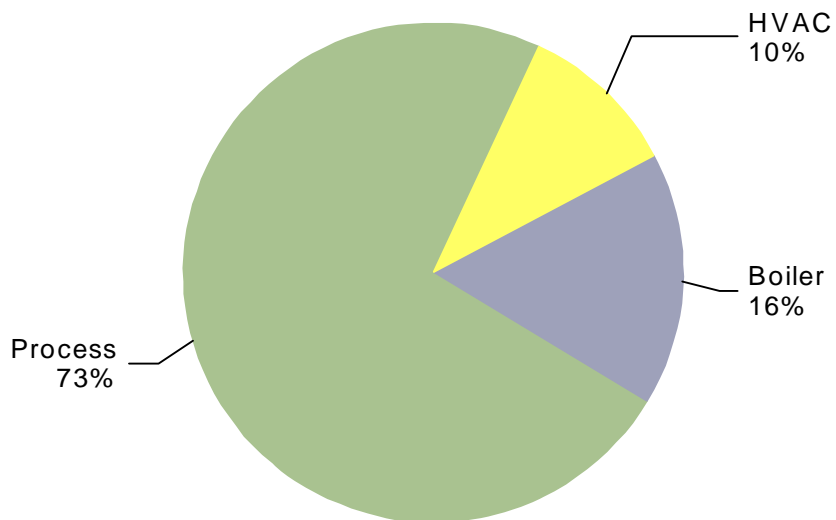
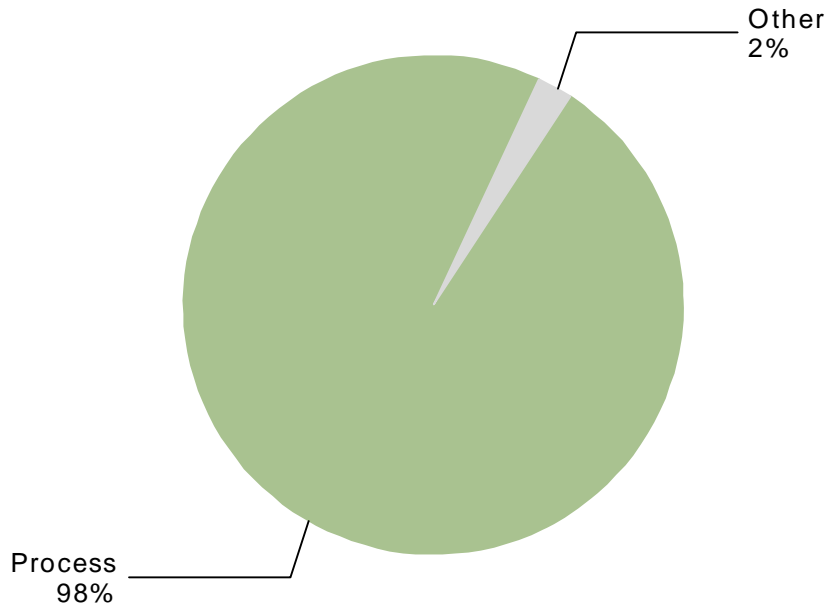


Figure 23: Industrial Achievable Technical Potential in 2029 by End Use, Minerals

Total: 2,867,510 therms



Note: "Other" includes:
HVAC: 2%, Boiler: <1%

Figure 24: Industrial Achievable Technical Potential in 2029 by End Use, Miscellaneous

Total: 152,235 therms

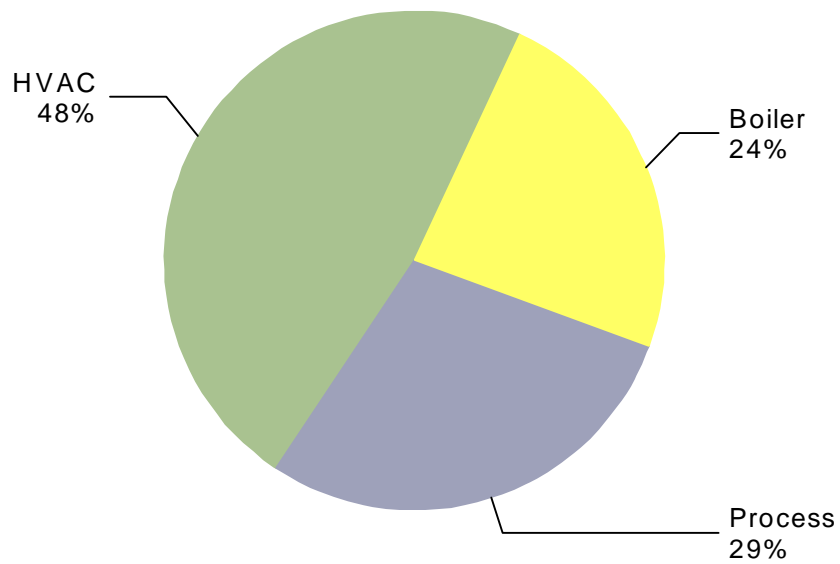


Figure 25: Industrial Achievable Technical Potential in 2029 by End Use, Paper

Total: 975,014 therms

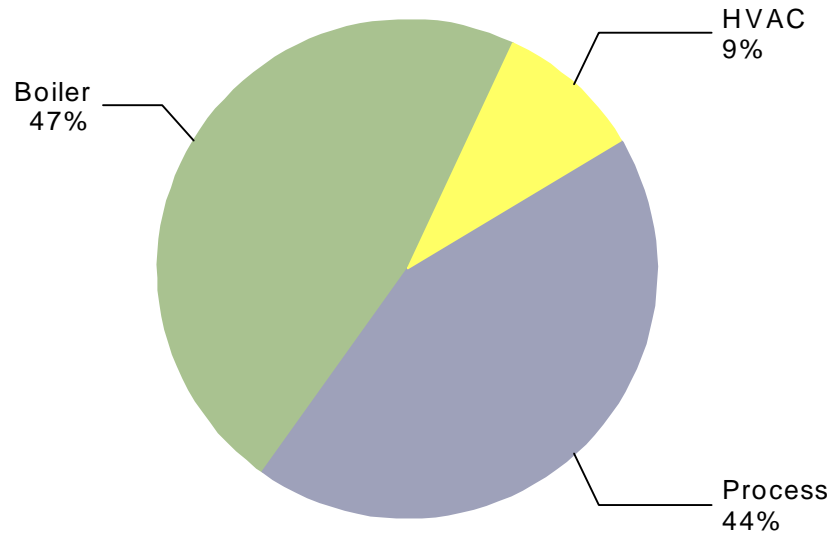


Figure 26: Industrial Achievable Technical Potential in 2029 by End Use, Petroleum

Total: 289,053 therms

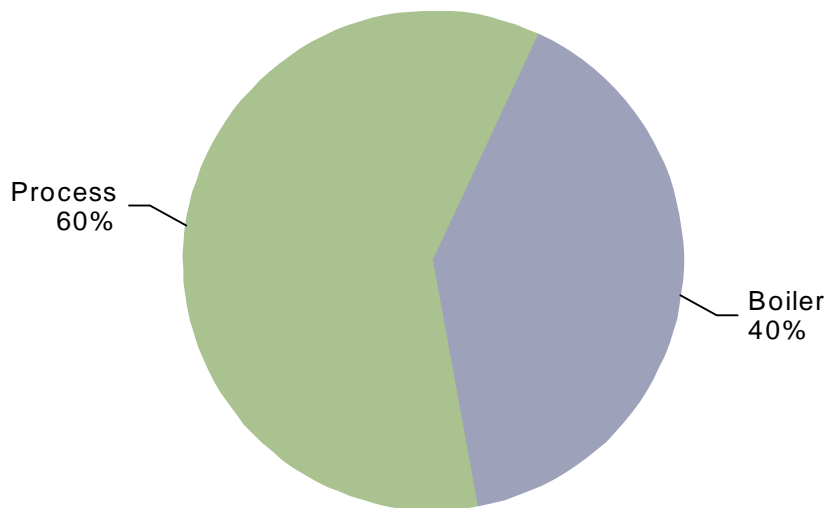


Figure 27: Industrial Achievable Technical Potential in 2029 by End Use, PlasticRubber

Total: 129,704 therms

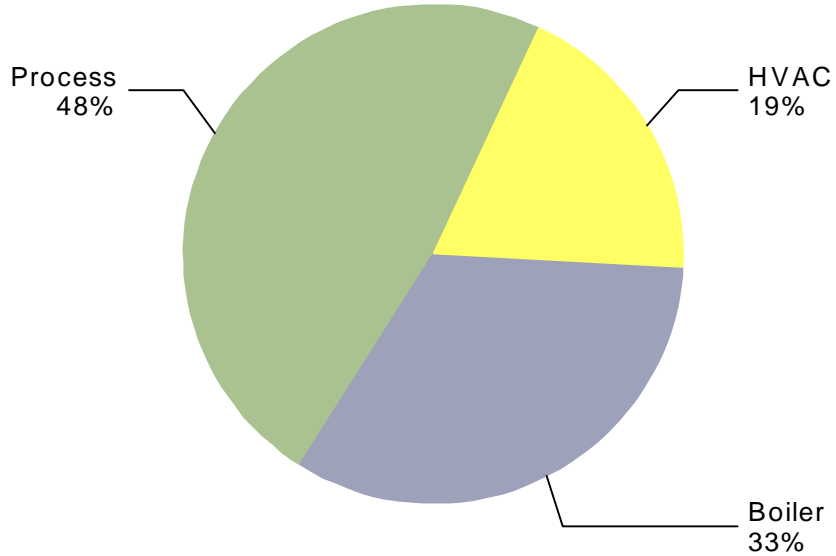


Figure 28: Industrial Achievable Technical Potential in 2029 by End Use, Printing

Total: 213,333 therms

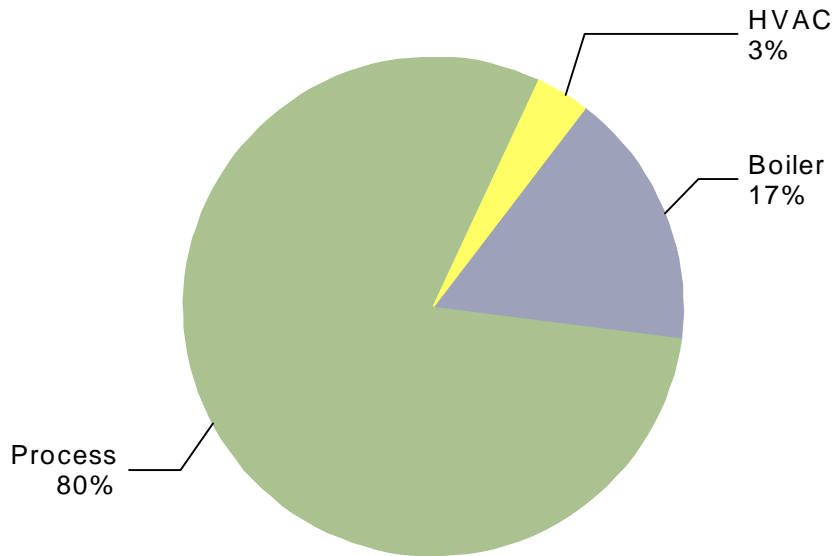


Figure 29: Industrial Achievable Technical Potential in 2029 by End Use, Transportation

Total: 67,380 therms

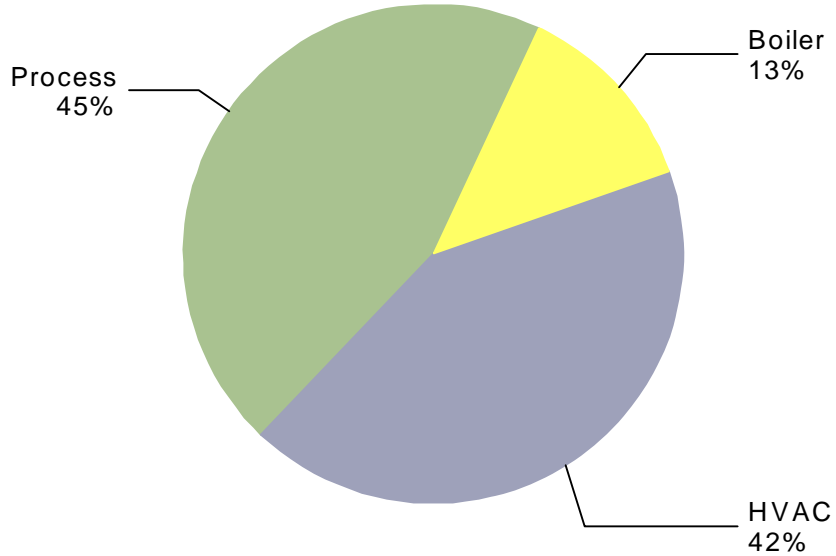
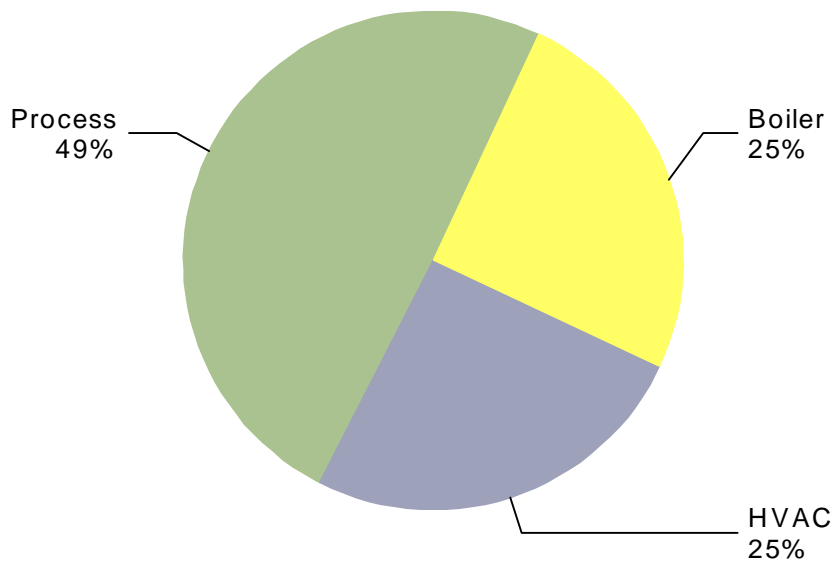


Figure 30: Industrial Achievable Technical Potential in 2029 by End Use, Wood

Total: 1,790,849 therms



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Appendix D: Supplemental Material—Fuel Conversion

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Appendix D: Supplemental Material—Fuel Conversion

Economic Assumptions

Discount Rate	8.25%
Inflation Rate	2.50%
Electric T&D Savings	6.70%
Gas T&D Savings	0.80%
Admin Adder	5.00%
Conservation Credit	10.00%
Electric: Carbon Adder	20.00%
Gas: Carbon Adder	10.00%
Main Ext - Short (ft)	50
Main Ext - Medium (ft)	300
Main Ext - Long (ft)	500
Line Cost per foot	\$40
In-House Extension	\$200
NPV Avoided Generation (\$/kW)	\$108.25
therms/kWh Conversion Factor	0.0341
Electric Dryer Energy Factor	2.67
Gas Dryer Energy Factor	3.01
Electric Range Energy Factor	0.068
Gas Range Energy Factor	0.112
Electric Retail Rate - Residential	\$0.107
Electric Retail Rate - Commercial	\$0.090
Gas Retail Rate - Residential	\$1.53
Gas Retail Rate - Commercial	\$1.39
Utility/Participant Cost Basis	Total
Rate Escalators	Yearly

Source for Electricity Use Data is 2001 Electric End Use Model;
 Labor is included for Space/Zone Heating Equipment Cost.
 One year potential assumes linear acquisition
 UECs for electric dryer/cooking; PSE gas tariff information
 UECs for space/water heating; EndUse Forecaster Model
 All calculations done for kWh/therms at GENERATION

End Use	Piping&Labor	Bundling %
Space Heating: Ducted	\$700	100%
Space Heating: Baseboard	\$500	100%
Clothes Drying	\$200	5%
Cooking	\$200	5%
Water Heating	\$200	70%
Space Heating	\$700	100%

Total Customers: Electric and/or Gas Customers/Territory

	New	Existing
Single Family	NA	883,839
Commercial	107,443	172,072
MultiFamily	200,715	NA

Distribution by Single Family Home Size

SFam - 1800 sq ft	50%
SFam - 2100 sq ft	10%
SFam - 2400 sq ft	40%

Fuel Conversion Measure Assumptions

Sector	End Use	Measure	Vintage	Baseline	kWh/yr at meter	Elec Equip Cost	Therms/yr at meter	Gas Equip Cost
SFam - 1800 sq ft	Space Heating: Ducted	90% Furnace	Existing	Electric Furnace	7,961	\$1,500	507	\$2,950
SFam - 1800 sq ft	Space Heating: Baseboard	Wall Heater 84% eff	Existing	Baseboard Heating	6,130	\$249	418	\$1,549
SFam - 2100 sq ft	Space Heating: Ducted	90% Furnace	Existing	Electric Furnace	9,287	\$1,500	591	\$2,950
SFam - 2100 sq ft	Space Heating: Baseboard	Wall Heater 84% eff	Existing	Baseboard Heating	7,151	\$299	488	\$1,549
SFam - 2400 sq ft	Space Heating: Ducted	90% Furnace	Existing	Electric Furnace	10,614	\$1,500	676	\$2,950
SFam - 2400 sq ft	Space Heating: Baseboard	Wall Heater 84% eff	Existing	Baseboard Heating	8,173	\$349	558	\$1,549
SFam - 1800 sq ft	Clothes Drying	Moisture Sensor Dryer	Existing	Electric dryer w/ moisture sens, 7.0cuft	755	\$410	32	\$479
SFam - 1800 sq ft	Cooking	Convection Cooking	Existing	Convection Electric range, 30"	339	\$719	15	\$649
SFam - 1800 sq ft	Water Heating	Tankless WH	Existing	Electric Water Heater, 50 gal.	3,348	\$239	172	\$734
SFam - 1800 sq ft	Water Heating	Condensing WH (>80% EF)	Existing	Electric Water Heater, 50 gal.	3,348	\$239	190	\$812
SFam - 2100 sq ft	Clothes Drying	Moisture Sensor Dryer	Existing	Electric dryer w/ moisture sens, 7.0cuft	755	\$410	32	\$479
SFam - 2100 sq ft	Cooking	Convection Cooking	Existing	Convection Electric range, 30"	339	\$719	15	\$649
SFam - 2100 sq ft	Water Heating	Tankless WH	Existing	Electric Water Heater, 50 gal.	3,348	\$239	172	\$734
SFam - 2100 sq ft	Water Heating	Condensing WH (>80% EF)	Existing	Electric Water Heater, 50 gal.	3,348	\$239	190	\$812
SFam - 2400 sq ft	Clothes Drying	Moisture Sensor Dryer	Existing	Electric dryer w/ moisture sens, 7.0cuft	755	\$410	32	\$479
SFam - 2400 sq ft	Cooking	Convection Cooking	Existing	Convection Electric range, 30"	339	\$719	15	\$649
SFam - 2400 sq ft	Water Heating	Tankless WH	Existing	Electric Water Heater, 50 gal.	3,348	\$239	172	\$734
SFam - 2400 sq ft	Water Heating	Condensing WH (>80% EF)	Existing	Electric Water Heater, 50 gal.	3,348	\$239	190	\$812
Commercial	Space Heating: Ducted	90% Furnace	Existing	Electric Furnace	27,124	\$6,300	2,175	\$6,034
Commercial	Water Heating	Tankless WH	Existing	Electric Water Heater, 50 gal.	8,279	\$650	748	\$1,874
Commercial	Water Heating	Condensing WH (>80% EF)	Existing	Electric Water Heater, 50 gal.	8,279	\$650	748	\$2,678
Commercial	Water Heating	Tankless WH	New	Electric Water Heater, 50 gal.	8,605	\$650	815	\$1,874
Commercial	Water Heating	Condensing WH (>80% EF)	New	Electric Water Heater, 50 gal.	8,605	\$650	815	\$2,678
Commercial	Space Heating: Ducted	90% Furnace	New	Electric Furnace	18,297	\$4,222	1,467	\$4,212
MFam Mid Rise: Renter	Space Heating: Ducted	90% Furnace	New	Electric Furnace	3,361	\$1,500	299	\$2,950
MFam Mid Rise: Renter	Space Heating: Baseboard	90% Furnace	New	Baseboard Heating	2,588	\$249	299	\$2,950
MFam Mid Rise: Renter	Clothes Drying	Moisture Sensor Dryer	New	Electric dryer w/ moisture sens, 7.0cuft	654	\$410	32	\$479
MFam Mid Rise: Renter	Cooking	Convection Cooking	New	Convection Electric range, 30"	440	\$719	19	\$649
MFam Mid Rise: Renter	Water Heating	Tankless WH	New	Electric Water Heater, 50 gal.	1,696	\$239	125	\$734
MFam Mid Rise: Renter	Water Heating	Condensing WH (>80% EF)	New	Electric Water Heater, 50 gal.	1,696	\$239	128	\$812
MFam Low Rise: Renter	Space Heating: Ducted	90% Furnace	New	Electric Furnace	3,361	\$1,500	299	\$2,950
MFam Low Rise: Renter	Space Heating: Baseboard	90% Furnace	New	Baseboard Heating	2,588	\$249	299	\$2,950
MFam Low Rise: Renter	Clothes Drying	Moisture Sensor Dryer	New	Electric dryer w/ moisture sens, 7.0cuft	654	\$410	32	\$479
MFam Low Rise: Renter	Cooking	Convection Cooking	New	Convection Electric range, 30"	440	\$719	19	\$649
MFam Low Rise: Renter	Water Heating	Tankless WH	New	Electric Water Heater, 50 gal.	1,696	\$239	125	\$734
MFam Low Rise: Renter	Water Heating	Condensing WH (>80% EF)	New	Electric Water Heater, 50 gal.	1,696	\$239	128	\$812
MFam Mid Rise: Owner	Space Heating: Ducted	90% Furnace	New	Electric Furnace	3,361	\$1,500	299	\$2,950
MFam Mid Rise: Owner	Space Heating: Baseboard	90% Furnace	New	Baseboard Heating	2,588	\$249	299	\$2,950
MFam Mid Rise: Owner	Clothes Drying	Moisture Sensor Dryer	New	Electric dryer w/ moisture sens, 7.0cuft	654	\$410	32	\$479
MFam Mid Rise: Owner	Cooking	Convection Cooking	New	Convection Electric range, 30"	440	\$719	19	\$649
MFam Mid Rise: Owner	Water Heating	Tankless WH	New	Electric Water Heater, 50 gal.	1,696	\$239	125	\$734
MFam Mid Rise: Owner	Water Heating	Condensing WH (>80% EF)	New	Electric Water Heater, 50 gal.	1,696	\$239	128	\$812
MFam Low Rise: Owner	Space Heating: Ducted	90% Furnace	New	Electric Furnace	3,361	\$1,500	299	\$2,950
MFam Low Rise: Owner	Space Heating: Baseboard	90% Furnace	New	Baseboard Heating	2,588	\$249	299	\$2,950
MFam Low Rise: Owner	Clothes Drying	Moisture Sensor Dryer	New	Electric dryer w/ moisture sens, 7.0cuft	654	\$410	32	\$479
MFam Low Rise: Owner	Cooking	Convection Cooking	New	Convection Electric range, 30"	440	\$719	19	\$649
MFam Low Rise: Owner	Water Heating	Tankless WH	New	Electric Water Heater, 50 gal.	1,696	\$239	125	\$734
MFam Low Rise: Owner	Water Heating	Condensing WH (>80% EF)	New	Electric Water Heater, 50 gal.	1,696	\$239	128	\$812

Appendix E: Supplemental Material—Demand Response

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Appendix E: Demand Response Resource Materials: Detailed Program Results – Year, Peak Season, and Market Segment

All Demand Response Programs by Year and Peak Season

Table E.1. Achievable Technical Potential, Cost, and Customers by Year and Peak Season

Year	Winter			Summer		
	kW	Cost (2008 \$)	Customers	kW	Cost (2008 \$)	Customers
2010	4,047	2,619,864	3,690	1,458	524,435	2,275
2011	9,643	1,809,046	8,796	3,472	860,198	5,424
2012	16,875	2,504,836	15,399	6,072	1,258,814	9,497
2013	31,566	4,660,706	28,819	11,351	2,467,974	17,775
2014	54,146	7,333,631	49,455	19,458	3,981,857	30,505
2015	99,963	14,056,267	91,340	35,901	7,752,845	56,347
2016	124,687	11,646,491	113,976	44,754	6,538,222	70,317
2017	142,523	11,403,136	130,330	51,127	6,466,370	80,413
2018	153,042	10,674,691	140,000	54,870	6,108,830	86,386
2019	160,634	10,571,978	146,997	57,562	6,078,360	90,711
2020	163,493	9,880,523	149,665	58,557	5,715,093	92,364
2021	166,351	10,040,346	152,332	59,551	5,810,262	94,017
2022	169,210	10,200,168	154,999	60,546	5,905,432	95,670
2023	172,069	10,359,990	157,667	61,540	6,000,601	97,322
2024	174,928	10,519,813	160,334	62,535	6,095,770	98,975
2025	177,786	10,679,635	163,001	63,529	6,190,940	100,628
2026	180,645	10,839,457	165,669	64,524	6,286,109	102,281
2027	183,504	10,999,279	168,336	65,518	6,381,278	103,934
2028	186,362	11,159,102	171,003	66,513	6,476,447	105,587
2029	189,221	11,318,924	173,670	67,507	6,571,617	107,240

Note: Costs assume no AMR installations for direct load control programs.

**Table E.2. Achievable Technical Potential (MW) by Market Segment (2029)
and Peak Season**

Market Segment	Achievable Potential - Winter	Achievable Potential - Summer
Single Family	117.99	38.10
Multifamily	35.69	6.29
Manufactured	16.26	3.76
Grocery	0.97	1.07
Health	1.44	1.69
Office	6.07	6.27
Retail	1.43	1.52
Lodging	0.25	0.21
Other Comm	1.11	1.16
Restaurant	0.50	0.54
Education	1.93	1.29
Warehouse	0.47	0.52
Food Mfg	0.26	0.36
Primary Metal Mfg	0.03	0.03
Paper Mfg	0.25	0.24
Plastics Rubber Products	0.25	0.38
Chemical Mfg	0.46	0.38
Nonmetallic Mineral Products	0.10	0.11
Industrial Machinery	0.05	0.05
Fabricated Metal Products	0.19	0.17
Printing Related Support	0.00	0.00
Transportation Equipment Mfg	0.79	0.73
Electrical Equipment Mfg	0.00	0.00
Wood Product Mfg	0.17	0.16
Miscellaneous Mfg	0.08	0.12
Petroleum Coal Products	2.36	2.21
Computer Electronic Mfg	0.12	0.13
Waste Water	0.01	0.01
Water	0.00	0.01

Summer DLC - Residential AC and Water Heat

Table E.3. Achievable Technical Potential (kW) by Year: Summer Direct Load Control – Residential Air Conditioning and Water Heat

Year	kW	Customers	Cost (2008 \$)		
			No AMR	AMR to AMI	AMI
2010	174	429	90,517	125,659	93,731
2011	414	1,023	149,975	204,067	157,638
2012	725	1,791	220,890	296,792	234,307
2013	1,357	3,352	432,377	582,988	457,489
2014	2,328	5,753	699,352	938,573	742,450
2015	4,301	10,626	1,359,101	1,831,333	1,438,709
2016	5,367	13,261	1,167,170	1,517,926	1,266,514
2017	6,138	15,165	1,164,597	1,488,967	1,278,205
2018	6,594	16,292	1,110,123	1,394,999	1,232,171
2019	6,924	17,107	1,109,330	1,383,042	1,237,488
2020	7,050	17,419	1,049,953	1,292,753	1,180,446
2021	7,176	17,731	1,067,886	1,314,645	1,200,714
2022	7,302	18,042	1,085,818	1,336,536	1,220,981
2023	7,429	18,354	1,103,751	1,358,428	1,241,249
2024	7,555	18,666	1,121,684	1,380,319	1,261,517
2025	7,681	18,977	1,139,617	1,402,211	1,281,785
2026	7,807	19,289	1,157,549	1,424,103	1,302,053
2027	7,933	19,601	1,175,482	1,445,994	1,322,320
2028	8,059	19,912	1,193,415	1,467,886	1,342,588
2029	8,186	20,224	1,211,347	1,489,777	1,362,856

Table E.4. Achievable Technical Potential (MW) by Market Segment (2029): Summer Direct Load Control- Residential Air Conditioning and Water Heat

Market Segment	Achievable Potential
Single Family	7.16
Multifamily	0.18
Manufactured	0.84

Summer Critical Peak Pricing - Residential

Table E.5. Achievable Technical Potential (kW) by Year: Summer Critical Peak Pricing - Residential

Year	kW	Customers	Cost (2008 \$)
2010	848	1,843	404,212
2011	2,021	4,394	646,643
2012	3,539	7,693	931,362
2013	6,623	14,398	1,834,455
2014	11,367	24,711	2,942,654
2015	20,996	45,643	5,759,654
2016	26,202	56,960	4,640,271
2017	29,964	65,138	4,486,987
2018	32,190	69,977	4,141,258
2019	33,801	73,480	4,077,086
2020	34,417	74,819	3,768,035
2021	35,033	76,158	3,831,341
2022	35,649	77,497	3,894,646
2023	36,265	78,835	3,957,952
2024	36,881	80,174	4,021,258
2025	37,497	81,513	4,084,563
2026	38,113	82,852	4,147,869
2027	38,729	84,191	4,211,174
2028	39,344	85,530	4,274,480
2029	39,960	86,869	4,337,786

Table E.6. Achievable Technical Potential (MW) by Market Segment (2029): Summer Critical Peak Pricing - Residential

Market Segment	Achievable Potential
Single Family	30.94
Multifamily	6.10
Manufactured	2.92

Summer Direct Load Control - Commercial

Table E.7. Achievable Technical Potential (kW) by Year: Summer Direct Load Control - Commercial

Year	kW	Customers	Cost (2008 \$)
2010	60	1	11,441
2011	145	3	21,346
2012	255	6	33,728
2013	481	12	65,364
2014	832	20	108,854
2015	1,546	37	208,817
2016	1,942	46	211,009
2017	2,234	53	226,127
2018	2,413	58	230,447
2019	2,548	61	237,695
2020	2,608	62	235,354
2021	2,668	64	240,628
2022	2,728	65	245,902
2023	2,788	67	251,175
2024	2,848	68	256,449
2025	2,908	70	261,722
2026	2,968	71	266,996
2027	3,028	72	272,270
2028	3,088	74	277,543
2029	3,148	75	282,817

Table E.8. Achievable Technical Potential (MW) by Market Segment (2029): Summer Direct Load Control – Commercial

Market Segment	Achievable Potential
Grocery	0.21
Health	0.30
Office	1.70
Retail	0.20
Lodging	0.02
Other Comm	0.14
Restaurant	0.09
Education	0.32
Warehouse	0.16

Summer Interruptible Loads - Commercial and Industrial

Table E.9. Achievable Technical Potential (kW) by Year: Summer Interruptible Loads - Commercial and Industrial

Year	kW	Customers	Cost (2008 \$)
2010	341	1	17,600
2011	807	3	40,949
2012	1,404	5	70,774
2013	2,612	9	131,850
2014	4,455	15	224,464
2015	8,182	28	412,941
2016	10,153	35	506,741
2017	11,548	40	574,538
2018	12,341	43	612,482
2019	12,893	45	639,283
2020	13,063	45	646,891
2021	13,234	46	655,318
2022	13,404	46	663,746
2023	13,574	47	672,174
2024	13,744	47	680,602
2025	13,915	48	689,030
2026	14,085	49	697,457
2027	14,255	49	705,885
2028	14,426	50	714,313
2029	14,596	50	722,741

Table E.10. Achievable Technical Potential (MW) by Market Segment (2029): Summer Interruptible Loads - Commercial and Industrial

Market Segment	Achievable Potential
Grocery	0.68
Health	1.27
Office	4.16
Retail	1.14
Lodging	0.15
Other Comm	0.92
Restaurant	0.41
Education	0.85
Warehouse	0.29
Food Mfg	0.33
Primary Metal Mfg	0.03
Paper Mfg	0.22
Plastics Rubber Products	0.35
Chemical Mfg	0.35
Nonmetallic Mineral Products	0.10
Industrial Machinery	0.04
Fabricated Metal Products	0.16
Printing Related Support	0.00
Transportation Equipment Mfg	0.68
Electrical Equipment Mfg	0.00
Wood Product Mfg	0.15
Miscellaneous Mfg	0.11
Petroleum Coal Products	2.06
Computer Electronic Mfg	0.12
Waste Water	0.01
Water	0.00

Summer Demand Bidding – Commercial and Industrial

Table E.11. Achievable Technical Potential (kW) by Year: Summer Demand Bidding - Commercial and Industrial

Year	kW	Customers	Cost (2008 \$)
2010	36	0	665
2011	85	1	1,286
2012	149	2	2,060
2013	278	4	3,928
2014	475	6	6,534
2015	876	11	12,332
2016	1,090	14	13,031
2017	1,243	16	14,122
2018	1,332	17	14,520
2019	1,396	18	14,966
2020	1,418	19	14,860
2021	1,440	19	15,089
2022	1,462	19	15,319
2023	1,484	19	15,549
2024	1,507	20	15,778
2025	1,529	20	16,008
2026	1,551	20	16,237
2027	1,573	21	16,467
2028	1,595	21	16,697
2029	1,618	21	16,926

Table E.12. Achievable Technical Potential (MW) by Market Segment (2029): Summer Demand Bidding - Commercial and Industrial

Market Segment	Achievable Potential
Grocery	0.18
Health	0.12
Office	0.40
Retail	0.18
Lodging	0.03
Other Comm	0.10
Restaurant	0.03
Education	0.12
Warehouse	0.06
Food Mfg	0.03
Primary Metal Mfg	0.00
Paper Mfg	0.02
Plastics Rubber Products	0.03
Chemical Mfg	0.03
Nonmetallic Mineral Products	0.01
Industrial Machinery	0.00
Fabricated Metal Products	0.01
Printing Related Support	0.00
Transportation Equipment Mfg	0.06
Electrical Equipment Mfg	0.00
Wood Product Mfg	0.01
Miscellaneous Mfg	0.01
Petroleum Coal Products	0.15
Computer Electronic Mfg	0.01
Waste Water	0.00
Water	0.00

Winter DLC – Residential Space Heat-Water Heat and Room Heat-Water Heat Programs

Table E.13. Achievable Technical Potential (kW) by Year: Winter Direct Load Control – Residential

Year	Space Heat-Water Heat Program					Room Heat-Water Heat Program				
	kW	Customers	Cost (2008 \$)			kW	Customers	Cost (2008 \$)		
			No AMR	AMR to AMI	AMI			No AMR	AMR to AMI	AMI
2010	1,006	992	669,340	750,909	676,801	1,150	852	313,974	404,212	267,483
2011	2,398	2,364	406,783	532,297	424,567	2,742	2,030	498,808	646,643	90,647
2012	4,197	4,138	570,660	746,732	601,790	4,800	3,554	715,116	931,362	120,225
2013	7,853	7,743	1,059,394	1,408,709	1,117,646	8,982	6,651	1,410,016	1,834,455	180,808
2014	13,476	13,287	1,676,190	2,230,903	1,776,146	15,412	11,412	2,257,649	2,942,654	272,635
2015	24,887	24,537	3,200,301	4,295,166	3,384,898	28,463	21,076	4,424,456	5,759,654	459,528
2016	31,051	30,616	2,756,486	3,569,399	2,986,811	35,513	26,297	3,517,113	4,640,271	552,282
2017	35,504	35,006	2,750,177	3,501,732	3,013,527	40,606	30,068	3,377,070	4,486,987	619,327
2018	38,135	37,600	2,624,023	3,283,885	2,906,891	43,615	32,296	3,093,554	4,141,258	656,780
2019	40,038	39,476	2,621,857	3,255,735	2,918,840	45,791	33,908	3,034,570	4,077,086	683,211
2020	40,762	40,190	2,484,449	3,046,607	2,786,799	46,619	34,520	2,788,178	3,768,035	690,621
2021	41,485	40,903	2,525,537	3,096,793	2,833,253	47,446	35,133	2,834,478	3,831,341	698,869
2022	42,208	41,616	2,566,625	3,146,979	2,879,708	48,274	35,746	2,880,779	3,894,646	707,117
2023	42,932	42,330	2,607,713	3,197,164	2,926,162	49,101	36,358	2,927,079	3,957,952	715,366
2024	43,655	43,043	2,648,801	3,247,350	2,972,616	49,928	36,971	2,973,380	4,021,258	723,614
2025	44,379	43,756	2,689,889	3,297,536	3,019,071	50,756	37,584	3,019,680	4,084,563	731,862
2026	45,102	44,470	2,730,977	3,347,722	3,065,525	51,583	38,197	3,065,981	4,147,869	740,110
2027	45,826	45,183	2,772,065	3,397,908	3,111,980	52,411	38,809	3,112,281	4,211,174	748,359
2028	46,549	45,896	2,813,153	3,448,093	3,158,434	53,238	39,422	3,158,582	4,274,480	756,607
2029	47,273	46,610	2,854,241	3,498,279	3,204,888	54,066	40,035	3,204,882	4,337,786	764,855

Table E.14. Achievable Technical Potential (MW) by Market Segment (2029): Winter Direct Load Control - Residential Space Heat-Water Heat and Room Heat-Water Heat Programs

Market Segment	Space Heat and Water Heat	Room Heat and Water Heat
Single Family	35.24	32.63
Multifamily	2.74	19.59
Manufactured	9.29	1.85

Winter Critical Peak Pricing - Residential

Table E.15. Achievable Technical Potential (kW) by Year: Winter Critical Peak Pricing - Residential

Year	kW	Customers	Cost (2008 \$)
2010	1,455	1,843	864,211
2011	3,470	4,394	706,643
2012	6,076	7,693	991,362
2013	11,371	14,398	1,894,455
2014	19,516	24,711	3,002,654
2015	36,048	45,643	5,819,654
2016	44,986	56,960	4,700,271
2017	51,445	65,138	4,546,987
2018	55,266	69,977	4,201,258
2019	58,033	73,480	4,137,086
2020	59,090	74,819	3,828,035
2021	60,148	76,158	3,891,341
2022	61,205	77,497	3,954,646
2023	62,263	78,835	4,017,952
2024	63,320	80,174	4,081,258
2025	64,377	81,513	4,144,563
2026	65,435	82,852	4,207,869
2027	66,492	84,191	4,271,174
2028	67,550	85,530	4,334,480
2029	68,607	86,869	4,397,786

Table E.16. Achievable Technical Potential by Market Segment (2029): Winter Critical Peak Pricing - Residential

Market Segment	Achievable Potential
Single Family	50.12
Multifamily	13.36
Manufactured	5.12

Winter Direct Load Control - Commercial

Table E.17. Achievable Technical Potential (kW) by Year: Winter Direct Load Control - Commercial

Year	kW	Customers	Cost (2008 \$)
2010	62	1	260,310
2011	150	3	69,730
2012	264	5	81,581
2013	498	10	110,998
2014	861	18	152,042
2015	1,600	33	244,998
2016	2,009	42	252,829
2017	2,311	48	269,693
2018	2,497	52	275,979
2019	2,636	55	283,982
2020	2,698	56	282,976
2021	2,760	57	288,220
2022	2,822	59	293,464
2023	2,885	60	298,708
2024	2,947	61	303,952
2025	3,009	63	309,196
2026	3,071	64	314,440
2027	3,133	65	319,684
2028	3,195	66	324,929
2029	3,257	68	330,173

Table E.18. Achievable Technical Potential by Market Segment (2029): Winter Direct Load Control – Commercial

Market Segment	Achievable Potential
Grocery	0.18
Health	0.25
Office	1.70
Retail	0.19
Lodging	0.03
Other Comm	0.15
Restaurant	0.08
Education	0.54
Warehouse	0.14

Winter Interruptible Loads – Commercial and Industrial

Table E.19. Achievable Technical Potential (kW) by Year: Winter Interruptible Loads - Commercial and Industrial

Year	kW	Customers	Cost (2008 \$)
2010	338	1	267,483
2011	800	3	90,647
2012	1,391	5	120,225
2013	2,587	9	180,808
2014	4,412	15	272,635
2015	8,101	28	459,528
2016	10,051	35	552,282
2017	11,430	40	619,327
2018	12,213	43	656,780
2019	12,757	44	683,211
2020	12,923	45	690,621
2021	13,090	46	698,869
2022	13,256	46	707,117
2023	13,423	47	715,366
2024	13,589	47	723,614
2025	13,756	48	731,862
2026	13,922	49	740,110
2027	14,089	49	748,359
2028	14,255	50	756,607
2029	14,422	50	764,855

Table E.20. Achievable Technical Potential by Market Segment (2029): Winter Interruptible Loads - Commercial and Industrial

Market Segment	Achievable Potential
Grocery	0.62
Health	1.09
Office	3.98
Retail	1.07
Lodging	0.18
Other Comm	0.87
Restaurant	0.39
Education	1.22
Warehouse	0.27
Food Mfg	0.24
Primary Metal Mfg	0.03
Paper Mfg	0.23
Plastics Rubber Products	0.23
Chemical Mfg	0.43
Nonmetallic Mineral Products	0.10
Industrial Machinery	0.05
Fabricated Metal Products	0.17
Printing Related Support	0.00
Transportation Equipment Mfg	0.73
Electrical Equipment Mfg	0.00
Wood Product Mfg	0.16
Miscellaneous Mfg	0.07
Petroleum Coal Products	2.20
Computer Electronic Mfg	0.11
Waste Water	0.00
Water	0.00

Winter Demand Bidding – Commercial and Industrial

Table E.21. Achievable Technical Potential (kW) by Year: Winter Commercial and Industrial Demand Bidding

Year	kW	Customers	Cost (2008 \$)
2010	35	1	250,939
2011	84	2	51,671
2012	147	4	52,563
2013	274	7	54,943
2014	470	12	58,099
2015	865	21	65,484
2016	1,077	27	64,841
2017	1,228	30	65,508
2018	1,316	33	65,445
2019	1,379	34	65,713
2020	1,400	35	65,303
2021	1,422	35	65,537
2022	1,444	36	65,770
2023	1,466	36	66,003
2024	1,488	37	66,237
2025	1,510	37	66,470
2026	1,531	38	66,703
2027	1,553	39	66,937
2028	1,575	39	67,170
2029	1,597	40	67,404

Table E.22. Achievable Technical Potential by Market Segment (2029): Winter Demand Bidding - Commercial and Industrial

Market Segment	Achievable Potential
Grocery	0.17
Health	0.10
Office	0.39
Retail	0.17
Lodging	0.04
Other Comm	0.10
Restaurant	0.03
Education	0.17
Warehouse	0.06
Food Mfg	0.02
Primary Metal Mfg	0.00
Paper Mfg	0.02
Plastics Rubber Products	0.02
Chemical Mfg	0.03
Nonmetallic Mineral Products	0.01
Industrial Machinery	0.00
Fabricated Metal Products	0.01
Printing Related Support	0.00
Transportation Equipment Mfg	0.06
Electrical Equipment Mfg	0.00
Wood Product Mfg	0.01
Miscellaneous Mfg	0.01
Petroleum Coal Products	0.16
Computer Electronic Mfg	0.01
Waste Water	0.00
Water	0.00

Appendix F: Supplemental Material—Distributed Generation

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CHP Background Data

The primary data source for installed cost of CHP technologies is the California’s Self-Generation Incentive Program (SGIP).¹ This program, funded by the major investor-owned utilities of California, provides varying levels of incentives for individual customers to install various distributed generation technologies, including CHP, with a maximum capacity of 5 MW. This program has been in effect since 2001, although as of Jan 1, 2008, the program only offers incentives for wind and fuel cells. As such, only data through 2007 is considered in this analysis. The program has a publicly-available database of all installations, including generation technology, capacity, fuel, and total cost.

For the CHP assessment, nameplate capacity is based on the weighted average of the units installed through California’s SGIP for both non-renewable generation and anaerobic digesters. Typical nameplate capacities for industrial biomass vary widely; a 4,800 kW unit is used as a proxy based on a study for the Energy Trust of Oregon.² It should be realized that these are just proxy values, and larger or smaller units can be installed. These values are summarized in Table 1. Also shown in the table is the net fuel heat rate, measure life and capacity factors for the different generators. Heat rates are from literature values,³ based on a weighted average of CHP units from the SGIP data. The measure life and capacity factors were also obtained from the literature.³ Note that these values are assumed equivalent across PSE territory.

Table 1. CHP Prototypical Generating Units

Technology	Nameplate Capacity (kW)	Fuel Heat Rate (MMBTU/MWh)	Measure Life (years)	Capacity Factor
CHP: Non-Renewable				
Reciprocating Engine	644	5.0	20	0.9
Microturbine	140	7.4	15	0.9
Fuel Cell	531	5.8	10	0.95
Gas Turbine	3,174	6.6	20	0.9
CHP: Renewable				
Small Anaerobic Digesters	525	N/A	15	0.8
Large Anaerobic Digesters	1,929	N/A	15	0.8
Industrial Biomass	4,800	N/A	20	0.9

Note: no heat rate is given for the renewable generation technologies; since the fuel is produced on-site the heat rate is not relevant.

With these prototypical generating units, the associated costs are determined from the SGIP database or, for industrial biomass, literature values.³ The installed costs include: planning and feasibility, engineering and design, permitting, generator equipment costs, waste heat recovery costs, construction and installation, interconnection, service contracts. The SGIP database costs

¹ http://www.cpuc.ca.gov/static/energy/electric/051005_sgip.htm

² “Sizing and Characterizing the Market for Oregon Biopower Projects,” prepared for Energy Trust of Oregon, by CH2MHill, 2005.

³ “Gas-Fired Distributed Energy Resource Technology Characterization,” National Renewable Energy Laboratory, NREL-TP-620-34783, 2003.

were reduced by 17% to remove the included sales tax (7%) as well a 10% reduction based on higher costs typical of the California market.⁴

It should be noted that, for generators used with anaerobic digesters, any of the three CHP technologies could be used; thus, the costs can vary widely. In this analysis, two size ranges are used and a weighted average cost of the technologies, based on adoption proportions in California, is assumed. The small digesters are coupled with a microturbine, fuel cell, or reciprocating engine, while the large digesters could be coupled with a reciprocating engine or gas turbine. These costs are reported in Table 2. It is assumed the installed cost will negate the effects of inflation (annual increase of 2.5%). Administration costs of 10% of the capital expense are included in total cost and increase with inflation. Fuel costs are calculated from the heat rates using 2010 expected natural gas prices, based on the 2007 projected gas retail rates. Together, these data allow a full life-cycle cost analysis of the resource.

Table 2. Costs for Assessed Technologies (2007\$)

Technology	Installed Cost (\$/kW)	Annual O&M Costs (\$/kW)	Annual Fuel Cost (\$/kW)
Reciprocating Engine (RE)	2,314	80	316
Microturbine (MT)	2,623	73	468
Fuel Cell (FC)	5,866	15	385
Gas Turbine (GT)	1,644	49	438
Small Anaerobic Digesters	4,239	58	0
Large Anaerobic Digesters	2,281	64	0
Industrial Biomass	1,800	39	0

For cooling applications, the cost of an absorption chiller is added to the cost of the generator. In addition, the net heat rate is adjusted to account for savings offsetting cooling rather than heating requirements. Cost and technical specifications for the prototypical cooling units are given in Table 3.

Table 3. Cooling CHP Specifications

Size (tons)	Generator	Cost (\$/ton)	Net Heat Rate
10	Microturbine	\$2,632	11.4
100	Fuel Cell	\$1,650	2.9
500	Reciprocating Engine	\$580	4.1
800	Gas Turbine	\$900	7.0

⁴ RS Means, 2007

Table 4. Total Number of Dairy and Swine Farms by Zip Code

		Milk cow inventory, total farms	Hogs and pigs inventory, total farms	Cows		Swine			cows	500-999 head	15.5%
				500-999	1000+	2000-4999	5000+				
TOTAL IN PSE TERRITORY		634	282	98	279	120	415			1000+	44%
County	Zip										
KING	98001			0	0	0	0				
KING	98002			0	0	0	0				
KING	98003			0	0	0	0	swine		2000-4999	19%
KING	98004			0	0	0	0			5000+	65.5%
KING	98005			0	0	0	0				
KING	98006			0	0	0	0				
KING	98007			0	0	0	0				
KING	98008			0	0	0	0				
KING	98010		*	0	0	0	0				
KING	98011	*		0	0	0	0				
KING	98013			0	0	0	0				
KING	98014	*	*	0	0	0	0				
KING	98019	10	7	2	4	2	7				
KING	98022	43	20	7	19	8	28				
PIERCE	98022	43	20	7	19	8	28				
KING	98023			0	0	0	0				
KING	98024	*	*	0	0	0	0				
KING	98025			0	0	0	0				
KING	98027			0	0	0	0				
KING	98028			0	0	0	0				
KING	98029			0	0	0	0				
KING	98030			0	0	0	0				
KING	98031			0	0	0	0				
KING	98032		*	0	0	0	0				
KING	98033			0	0	0	0				
KING	98034			0	0	0	0				
KING	98038			0	0	0	0				
KING	98039			0	0	0	0				
KING	98040			0	0	0	0				
KING	98042		*	0	0	0	0				
KING	98045	*		0	0	0	0				
KING	98047		*	0	0	0	0				

PIERCE	98047		*	0	0	0	0				
KING	98050			0	0	0	0				
KING	98051		*	0	0	0	0				
KING	98052			0	0	0	0				
KING	98053		*	0	0	0	0				
KING	98055			0	0	0	0				
KING	98056			0	0	0	0				
KING	98057			0	0	0	0				
KING	98058			0	0	0	0				
KING	98059			0	0	0	0				
KING	98065			0	0	0	0				
KING	98068			0	0	0	0				
KITTITAS	98068			0	0	0	0				
KING	98070		*	0	0	0	0				
KING	98072			0	0	0	0				
SNOHOMISH	98072			0	0	0	0				
KING	98077			0	0	0	0				
SNOHOMISH	98077			0	0	0	0				
KING	98092	5	7	1	2	1	3				
KITSAP	98110			0	0	0	0				
KING	98133			0	0	0	0				
KING	98148			0	0	0	0				
KING	98155			0	0	0	0				
KING	98166			0	0	0	0				
KING	98168			0	0	0	0				
KING	98188			0	0	0	0				
KING	98198			0	0	0	0				
WHATCOM	98220	*	*	0	0	0	0				
SKAGIT	98221		*	0	0	0	0				
KING	98224	26	15	4	11	5	17				
WHATCOM	98225			0	0	0	0				
SKAGIT	98226	15	7	2	7	3	10				
WHATCOM	98226	15	7	2	7	3	10				
WHATCOM	98229	*		0	0	0	0				
WHATCOM	98230	*	*	0	0	0	0				
SKAGIT	98232	9	*	1	4	2	6				
SKAGIT	98233	6	*	1	3	1	4				
SKAGIT	98235			0	0	0	0				
ISLAND	98236	*		0	0	0	0				
SKAGIT	98237		*	0	0	0	0				

SKAGIT	98238			0	0	0	0				
ISLAND	98239	*	*	0	0	0	0				
WHATCOM	98240	14		2	6	3	9				
WHATCOM	98244	11		2	5	2	7				
WHATCOM	98247	58	5	9	26	11	38				
WHATCOM	98248	21	10	3	9	4	14				
ISLAND	98249		*	0	0	0	0				
ISLAND	98253		*	0	0	0	0				
SKAGIT	98255			0	0	0	0				
SKAGIT	98257			0	0	0	0				
ISLAND	98260			0	0	0	0				
WHATCOM	98262			0	0	0	0				
SKAGIT	98263			0	0	0	0				
WHATCOM	98264	99	*	15	44	19	65				
WHATCOM	98266			0	0	0	0				
SKAGIT	98267			0	0	0	0				
SNOHOMISH	98272	8	*	1	4	2	5				
SKAGIT	98273	27	*	4	12	5	18				
SKAGIT	98274	6		1	3	1	4				
WHATCOM	98276			0	0	0	0				
ISLAND	98277	11	*	2	5	2	7				
WHATCOM	98281			0	0	0	0				
SKAGIT	98283	*	*	0	0	0	0				
SKAGIT	98284	26	5	4	11	5	17				
WHATCOM	98284	26	5	4	11	5	17				
KING	98288			0	0	0	0				
SKAGIT	98292	28	25	4	12	5	18				
WHATCOM	98295	25	*	4	11	5	16				
KITSAP	98310			0	0	0	0				
KITSAP	98311			0	0	0	0				
KITSAP	98312		*	0	0	0	0				
PIERCE	98321	7	8	1	3	1	5				
PIERCE	98323			0	0	0	0				
JEFFERSON	98325	12		2	5	2	8				
PIERCE	98327			0	0	0	0				
PIERCE	98328	*	9	0	0	0	0				
PIERCE	98329		*	0	0	0	0				
PIERCE	98332			0	0	0	0				
JEFFERSON	98334			0	0	0	0				
KITSAP	98337	*	*	0	0	0	0				

PIERCE	98338	*		6	0	0	0	0			
JEFFERSON	98339	*		6	0	0	0	0			
KITSAP	98340	*			0	0	0	0			
KITSAP	98342				0	0	0	0			
PIERCE	98344				0	0	0	0			
KITSAP	98345				0	0	0	0			
KITSAP	98346	*	*		0	0	0	0			
KITSAP	98353				0	0	0	0			
PIERCE	98354				0	0	0	0			
JEFFERSON	98358				0	0	0	0			
KITSAP	98359	*			0	0	0	0			
PIERCE	98360	*	*		0	0	0	0			
KITSAP	98364				0	0	0	0			
JEFFERSON	98365				0	0	0	0			
KITSAP	98366	*		8	0	0	0	0			
KITSAP	98367		8	9	1	4	2	5			
JEFFERSON	98368				0	0	0	0			
KITSAP	98370		10	8	2	4	2	7			
PIERCE	98371	*	*		0	0	0	0			
PIERCE	98372				0	0	0	0			
PIERCE	98373				0	0	0	0			
PIERCE	98374				0	0	0	0			
PIERCE	98375	*			0	0	0	0			
JEFFERSON	98376				0	0	0	0			
KITSAP	98380		*		0	0	0	0			
JEFFERSON	98382		14	*	2	6	3	9			
KITSAP	98383		*		0	0	0	0			
PIERCE	98385	*			0	0	0	0			
KITSAP	98386	*			0	0	0	0			
PIERCE	98387			9	0	0	0	0			
PIERCE	98388				0	0	0	0			
PIERCE	98390	*	*		0	0	0	0			
PIERCE	98391	*	*		0	0	0	0			
KITSAP	98392				0	0	0	0			
KITSAP	98393				0	0	0	0			
PIERCE	98396				0	0	0	0			
PIERCE	98422				0	0	0	0			
PIERCE	98424				0	0	0	0			
PIERCE	98439				0	0	0	0			
PIERCE	98445		*		0	0	0	0			

PIERCE	98446	*		5	0	0	0	0				
PIERCE	98498				0	0	0	0				
PIERCE	98499				0	0	0	0				
THURSTON	98501	*	*		0	0	0	0				
THURSTON	98502				0	0	0	0				
THURSTON	98503				0	0	0	0				
THURSTON	98506	*		8	0	0	0	0				
THURSTON	98512	*	*		0	0	0	0				
PIERCE	98513	*	*		0	0	0	0				
THURSTON	98513	*	*		0	0	0	0				
THURSTON	98516				0	0	0	0				
THURSTON	98530				0	0	0	0				
THURSTON	98531		5	12	1	2	1	3				
PIERCE	98558				0	0	0	0				
THURSTON	98568		8	*	1	4	2	5				
THURSTON	98576	*		7	0	0	0	0				
THURSTON	98579		13	12	2	6	2	9				
PIERCE	98580		5	12	1	2	1	3				
THURSTON	98589	*	*		0	0	0	0				
THURSTON	98597		9	9	1	4	2	6				
KITTITAS	98922	*	*		0	0	0	0				
KITTITAS	98925				0	0	0	0				
KITTITAS	98926		11	21	2	5	2	7				
KITTITAS	98934				0	0	0	0				
KITTITAS	98940				0	0	0	0				
KITTITAS	98941				0	0	0	0				
KITTITAS	98943				0	0	0	0				
KITTITAS	98946				0	0	0	0				
* - Data withheld for categories with one to four farms. Farm counts for these zip codes are included in the 'State Total' category.												
Source:	USDA Farms, Land in Farms & Livestock, 2/07											
	http://www.nass.usda.gov/Census_of_Agriculture/index.asp											

Table 5. Existing Landfills in PSE Territory

Project ID #	Landfill ID #	Expansion ID #	LMOP Territory	Landfill Name	Landfill City	Landfill County	State	Waste In Place (tons)	Year Landfill Opened	Landfill Closure Year	Landfill Owner Organization	Project Status	Project Start Date	Project Shutdown Date	Project Developer Organization	LFGE Utilization Type (Direct-Use vs Electricity)	LFGE Project Type	MW Capacity	LFG Flow to Project (mmscfd)	Emission Reductions (MMTCO ₂ E/yr)
1695	1616	0	3	Hidden Valley LF	Puyallup	Pierce	WA	17,425,280	1959	1999	Land Recovery, Inc.	Operational	1/1/1999			Electricity	Reciprocating Engine	1.9		0.082
1701	1622	0	3	Olympic View LF	Port Orchard	Kitsap	WA	7,004,248	1960	2012	Kitsap County	Operational	1/1/1998		Shaw Environmental, Inc.	Direct	Leachate Evaporation			
1685	1606	0	3	Cedar Hills LF	Maple Valley	King	WA	24,135,629	1962	2012	King County, WA	Construction	6/1/2008		Energy Developments	Electricity	Gas Turbine	17.0		0.729
1692	1613	0	3	Fort Lewis LF #5	Fort Lewis	Pierce	WA	1,198,910	1969	2004	Fort Lewis-PW / ENRD	Candidate								
1736	1656	0	3	Kent Highlands LF	Kent	King	WA	8,000,000	1968	1986	City of Seattle, WA	Candidate								
1694	1615	0	3	Thurston County Waste and Recovery Center	Olympia	Thurston	WA	750,000	1970	2001	Thurston County	Candidate								
1722	1643	0	3	Carnation LF		King	WA			1989		Potential								
1713	1634	0	3	Cedarville LF		Whatcom	WA	250,000	1981	1990		Potential								
1715	1636	0	3	Enumclaw LF		King	WA		1958	1993	Landfill Owner	Potential								
1723	1644	0	3	Gibraltar LF		Skagit	WA			1989		Potential								
1716	1637	0	3	Hansville LF		Kitsap	WA	599,880	1962	1989		Potential								
1717	1638	0	3	Hobart LF		King	WA	413,697	1958	1994	Landfill Owner	Potential								
1718	1639	0	3	Inman LF		Skagit	WA				Landfill Owner	Potential								
1727	1648	0	3	Olalla LF		Kitsap	WA			1989		Potential								
1729	1650	0	3	Point Roberts LF		Whatcom	WA			1991		Potential								
1709	1630	0	3	Vashon LF	Vashon Island	King	WA	281,554	1963		Landfill Owner	Potential								

Source: <http://www.epa.gov/lmop/proj/index.htm#1>

Table 6. Wastewater Treatment Facilities in PSE Territory

County Name +	Authority Name	Facility Name	Watershed Name	Congressional District	Existing Municipal Flow (Mgd)	Present Municipal Flow (Mgd)	Future Municipal Flow (Mgd)	Total Existing Flow (Mgd)	Present Design Flow (Mgd)	Future Design Flow (Mgd)
ISLAND	COUPEVILLE, TOWN OF	COUPEVILLE STP	Puget Sound.	2	0.18	0.21	0.3	0.18	0.21	0.3
ISLAND	LANGLEY WATER AND SEWER DISTRICT	LANGLEY S/T FACILITY	Puget Sound.	2	0.09	0.128	0.128	0.09	0.128	0.128
ISLAND	OAK HARBOR, CITY OF	OAK HARBOR STP	Puget Sound.	2	0.57	0.595	0.595	0.57	0.595	0.595
ISLAND	PENN COVE SEWER DISTRICT	PENN COVE S.D. STP	Puget Sound.	2	0.04	0.051	0.051	0.04	0.051	0.051
JEFFERSON	PORT TOWNSEND, CITY OF	PORT TOWNSEND STP	Puget Sound., Dungeness-Elwha.	6	0.81	0.81	0.81	0.81	0.81	0.81
KING	DES MOINES SEWER DISTRICT	DES MOINES STP	Puget Sound.	7	4.5	7.65	7.65	4.5	7.65	7.65
KING	DUVALL TOWN OF	DUVALL WW TREAT FAC	Snoqualmie.	8	0.636	0.9	0.9	0.636	0.9	0.9
KING	ENUMCLAW, CITY OF	ENUMCLAW STP	Puyallup.	8	1.8	2.4	3.7	1.83	2.43	3.73
KING	FEDERAL WAY SEWER DIST.	LAKOTA STP	Puget Sound.	9	4	10	10	4	10	10
KING	FEDERAL WAY WATER & SEWER KING CO.	REDONDO STP	Puget Sound.	9	2.4	4.32	4.32	2.4	4.32	4.32
KING	SEWER DISTRICT MUN OF METRO SEATTLE	SPRING BEACH	Puget Sound.	7			0.005			0.005
KING	MUN OF SEATTLE	RENTON WWTP	Duwamish., Puget Sound.	9	70	122	122	70	122	122
KING	MUN OF SEATTLE	WEST POINT WWTP	Puget Sound.	7	100	133	133	100	133	133
KING	NORTH BEND, CITY OF	NORTH BEND TREATMENT PLAN	Snoqualmie., Hood Canal.	8	0.636	1.06	2.503	0.636	1.06	2.503
KING	SNOQUALMIE TOWN OF	SNOQUALMIE LAGOONS	Snoqualmie.	8	0.34	0.72	0.72	0.34	0.72	0.72
KING	SOUTHWEST	MILLER	Puget Sound.	7	3.3	5.2	7	3.3	5.2	7



	SUBURBAN SEWER SW	CREEK STP								
KING	SUBURBAN SEWER DISTRICT VASHON	SALMON CREEK STP #1	Puget Sound.	7	2.4	6.88	6.88	2.4	6.88	6.88
KING	DISTRICT BAINBRIDGE ISLAND CITY	VASHON STP	Puget Sound.	7	0.175	0.264	0.264	0.175	0.264	0.264
KITSAP	OF BREMERTON ,CITYOF KITSAP CO.	WINSLOW S/T FACILITY BREMERTON STP	Puget Sound.	1	0.39	0.5	0.5	0.39	0.5	0.5
KITSAP	COMMISSIONERS KITSAP CO. PUBLIC WORKS KITSAP CO. S.D. #3 KITSAP COUNTY SD	CENT. KITSAP REG. STP	Puget Sound.	1	3.3	5.1	8.79	3.3	5.1	8.79
KITSAP	WORKS KITSAP CO. S.D. #3 KITSAP COUNTY SD	KINGSTON STP	Puget Sound.	6	0.14	0.15	0.29	0.14	0.15	0.29
KITSAP	WORKS KITSAP CO. S.D. #3 KITSAP COUNTY SD	MANCHESTER STP	Puget Sound.	6	0.17	0.23	0.23	0.17	0.23	0.23
KITSAP	WORKS KITSAP CO. S.D. #3 KITSAP COUNTY SD	FORT WARD SUQUAMISH STP	Puget Sound.	6	0.1	0.142	0.142	0.1	0.142	0.142
KITSAP	WORKS KITSAP CO. S.D. #3 KITSAP COUNTY SD	FORT WARD SUQUAMISH STP	Puget Sound.	6	0.1	0.2	0.2	0.1	0.2	0.2
KITSAP	ORCHARD PUBLIC WORKS CLE ELUM, CITY OF ELLENSBURG ,CITYOF	RETSIL TREATMENT PLANT CLE ELUM S/T FACILITY ELLENSBURG STP	Puget Sound.	6	1.8	2.38	4.8	1.8	2.38	4.8
KITTITAS	CITY OF ELLENSBURG ,CITYOF	RETSIL TREATMENT PLANT CLE ELUM S/T FACILITY ELLENSBURG STP	Upper Yakima.	4	0.605	0.643	1.45	0.605	0.643	1.45
KITTITAS	,CITYOF	RETSIL TREATMENT PLANT CLE ELUM S/T FACILITY ELLENSBURG STP	Upper Yakima.	4	3.11	8	8	3.11	8	8
KITTITAS	KITTITAS CO. W.D. #6 KITTITAS, CITY OF ROSLYN, CITY OF SNOQUALMIE PASS S.D. BUCKLEY, CITY OF	KITTITAS CO #6 STP	Upper Columbia-Entiat.	4	0.01	0.015	0.09	0.01	0.015	0.09
KITTITAS	KITTITAS CO. W.D. #6 KITTITAS, CITY OF ROSLYN, CITY OF SNOQUALMIE PASS S.D. BUCKLEY, CITY OF	KITTITAS STP ROSLYN S/T FACILITY	Upper Yakima.	4	0.16	0.28	0.29	0.16	0.28	0.29
KITTITAS	KITTITAS CO. W.D. #6 KITTITAS, CITY OF ROSLYN, CITY OF SNOQUALMIE PASS S.D. BUCKLEY, CITY OF	KITTITAS STP ROSLYN S/T FACILITY	Upper Yakima.	4	0.136	0.22	0.22	0.136	0.22	0.22
KITTITAS	KITTITAS CO. W.D. #6 KITTITAS, CITY OF ROSLYN, CITY OF SNOQUALMIE PASS S.D. BUCKLEY, CITY OF	SNOQUALMIE PASS S/T FAC.	Upper Yakima.	4	0.1	0.368	0.368	0.1	0.368	0.368
PIERCE	KITTITAS CO. W.D. #6 KITTITAS, CITY OF ROSLYN, CITY OF SNOQUALMIE PASS S.D. BUCKLEY, CITY OF	BUCKLEY STP	Puyallup.	8	0.29	0.44	0.44	0.29	0.44	0.44

PIERCE	CARBONADO, CITY OF	CARBONADO S/T FAC.	Puyallup.	8	0.03	0.1	0.1	0.03	0.1	0.1
PIERCE	EATONVILLE, TOWN OF	EATONVILLE STP	Nisqually.	8	0.08	0.13	0.13	0.08	0.13	0.13
PIERCE	EATONVILLE STP	EATONVILLE WWTP	Nisqually.	8	0.453	0.453	0.534	0.453	0.453	0.534
PIERCE	ELBE, TOWN OF	ELBE COMM. SEPTIC	Nisqually.	8	0.08	0.01	0.01	0.08	0.01	0.01
PIERCE	ORTING, TOWN OF	ORTING S/T FACILITY	Puyallup.	8	1.2	1.2	1.2	1.2	1.2	1.2
PIERCE	PIERCE COUNTY	CREEK	Puget Sound.	6	14.3	18	18	14.3	18	18
PIERCE	PIERCE COUNTY	GIG HARBOR STP	Puget Sound.	6	0.886	1.36	3.5	0.886	1.36	3.5
PIERCE	PUYALLUP, CITY OF	PUYALLUP STP	Puyallup.	9	4.78	4.78	4.78	4.78	4.78	4.78
PIERCE	SOUTH PRAIRIE, TOWN OF	SOUTH PRAIRIE AREA	Puyallup.	8	0.038	0.038	0.048	0.038	0.038	0.048
PIERCE	SUMNER, CITY OF	SUMNER STP	Puyallup.	8	1.5	2.62	3.42	1.5	2.62	3.42
PIERCE	TACOMA, CITY OF	TACOMA CENTRAL STP #1	Puyallup., Puget Sound.	6	22.8	38	50	22.8	38	50
PIERCE	TACOMA, CITY OF	TACOMA #3 STP NORTH	Puget Sound.	6	4.4	7	7	4.5	7.1	7.1
PIERCE	WILKESON, TOWN OF	WILKESON STP	Puyallup.	8	0.03	0.03	0.03	0.03	0.03	0.03
SKAGIT	ANACORTES, CITY OF, DEPT PW	ANACORTES STP	Strait Of Georgia.	2	1.59	3.2	3.2	1.59	3.2	3.2
SKAGIT	BURLINGTON, CITY OF	BURLINGTON S/T FAC.	Lower Skagit.	2	0.8	1.2	1.2	0.8	1.2	1.2
SKAGIT	CONCRETE, TOWN OF	CONCRETE S/T FACILITY	Upper Skagit., Lower Skagit.	2	0.038	0.038	0.038	0.038	0.038	0.038
SKAGIT	LA CONNER, TOWN OF	LA CONNER S/T FACILITY	Puget Sound.	2	0.15	0.23	0.23	0.15	0.23	0.23
SKAGIT	MOUNT VERNON, CITY OF	MOUNT VERNON S/T FAC.	Lower Skagit.	2	3	4	4	3.3	4.36	4.36
SKAGIT	SEDRO WOOLLEY, CITY OF	SEDRO WOOLLEY STP	Lower Skagit.	2	0.65	1.759	1.759	0.65	1.759	1.759
SKAGIT	SKAGIT COUNTY SD # 1	SNEE OOSH BEACH STP	Puget Sound.	2	0.01	0.04	0.04	0.01	0.04	0.04

SKAGIT	SKAGIT COUNTY SD #2	SKAGIT CO. SD # 2 STP	Lower Skagit.	2	0.09	0.17	0.4	0.09	0.17	0.4
THURSTON	CARLYON BEACH WWTP	CARLYON BEACH WWTP	Puget Sound.	3	0.02	0.038	0.038	0.02	0.038	0.038
THURSTON	OLYMPIA, CITY OF	OLYMPIA STP	Puget Sound.	3	17	17	17	17.9	20.6	20.6
THURSTON	THURSTON COUNTY	BOSTON HARBOR WWTF	Puget Sound.	3	0.045	0.045	0.045	0.045	0.045	0.045
THURSTON	THURSTON COUNTY PWD	TAMOSHAN DEVELOPMENT	Puget Sound.	3	0.01	0.05	0.05	0.01	0.05	0.05
THURSTON	YELM, CITY OF	YELM S/T FACILITY	Nisqually Strait Of	3	1	1	1	1	1	1
WHATCOM	BELLINGHAM SEWER DEPT	BELLINGHAM POST POINT TP	Georgia., Nooksack.	2	20	30	30	20	30	30
WHATCOM	BIRCH BAY WATER DISTRICT #8	BIRCH BAY STP	Strait Of Georgia.	2	0.6	0.85	0.85	0.6	0.85	0.85
WHATCOM	BLAINE, CITY OF, WAT & SE	BLAINE STP	Strait Of Georgia.	2	0.483	0.68	0.68	0.483	0.68	0.68
WHATCOM	EVERSON, TOWN OF	EVERSON S/T FACILITY	Nooksack.	2	0.12	0.18	0.18	0.12	0.18	0.18
WHATCOM	FERNDALE ,TOWNOF	FERNDALE STP	Nooksack.	2	1.1	2.7	2.7	1.1	2.7	2.7
WHATCOM	LYNDEN ,CITYOF	LYNDEN SEWAGE TREATMENT P	Nooksack.	2	0.31	0.41	0.41	0.31	0.41	0.41

Source: <http://www.epa.gov/lmop/proj/index.htm>

Table 7. Installed CHP facilities in PSE Territory

State	City	Organization Name	Facility Name	Application	SIC4	NAICS	Op Year	Prime Mover	Capacity (kw)	Fuel Type
WA	Bremerton	Bremerton Wastewater	Bremerton Wastewater	Wastewater Treatment	4952	22132	.	ERENG	152	BIOMASS
WA	Lynden	Vander Haak Dairy	Vander Haak Dairy	Agriculture	241	11212	2004	ERENG	450	BIOMASS
WA	Ferndale	Whatcom Co. MSW	Whatcom Co. MSW	Solid Waste Facilities	4953	562212	1986	B/ST	2000	WAST
WA	Darrington	Hampton Timber Mill	Hampton Timber Mill	Wood Products	2421	321113	2006	B/ST	7200	WOOD
WA	Renton	King County Wastewater Treatment Div.	South Treatment Plant	Wastewater Treatment	4952	562111	2004	CT	9500	BIOMASS
WA	Port Townsend	Port Townsend Paper Company	Port Townsend Paper Company	Pulp and Paper	2621	322121	1990	B/ST	14500	WAST
WA	Burlington	Sierra Pacific - Skagit County	Sierra Pacific	Wood Products	2421	321113	2007	B/ST	26000	WOOD

Prime Mover Code	Description	Sites	Capacity (kW)	Fuel Code	Description
Total		7	59,802	BIOMASS	Biomass, landfill gas, digester gas, bagasse
B/ST	Boiler/Steam Turbine	4	-	WAST	Waste, MSW, black liquor, blast furnace gas, petroleum coke, process gas
CC	Combined Cycle	0	49,700	WOOD	Wood, wood waste
CT	Combustion Turbine	1	9,500		
FCEL	Fuel Cell	0	-		
MT	Microturbine	0	-		
OTR	Other	0	-		
ERENG	Reciprocating Engine	2	602		

Source: <http://www.eea-inc.com/chpdata/States/WA.html>

Table 8. Number of Facilities by Segment and Average Annual Usage

State	Sector	Segment	Average annual usage bins						
			< 30 kW	30-99 kW	100-199 kW	200-499 kW	500-999 kW	1 - 4.9 MW	5 MW+
WA	IND	Chemical_Mfg	152	10	3	4	1	3	3
WA	IND	Computer_Electronic_Mfg	390	37	16	10	5	2	0
WA	COM	Dry Goods Retail	10086	686	106	94	29	3	0
WA	IND	Electrical_Equipment_Mfg	114	11	1	2	0	0	0
WA	IND	Fabricated_Metal_Products	463	31	7	6	2	4	0
WA	IND	Food_Mfg	473	39	9	15	12	5	0
WA	COM	Grocery	1387	134	72	87	4	3	0
WA	COM	Hospital	5779	278	79	33	11	10	0
WA	COM	Hotel Motel	1488	163	31	24	5	0	0
WA	IND	Industrial_Machinery	640	55	11	5	3	1	0
WA	IND	Miscellaneous_Mfg	1270	75	29	15	1	3	0
WA	IND	Nonmetallic_Mineral_Products	261	26	8	4	2	2	0
WA	COM	Office	38634	1009	282	152	47	31	7
WA	COM	Other_Comm	35669	666	137	76	19	11	1
WA	IND	Paper_Mfg	50	15	4	4	8	1	1
WA	IND	Petroleum_Coal_Products	27	7	2	0	0	0	2
WA	IND	Plastics_Rubber_Products	182	18	9	4	5	2	1
WA	IND	Primary_Metal_Mfg	75	2	2	0	0	1	0
WA	IND	Printing_Related_Support	433	20	7	1	0	0	0
WA	COM	Restaurant	4080	508	15	4	3	3	0
WA	COM	School	1312	516	137	53	1	0	0
WA	IND	Transportation_Equipment_Mfg	422	55	25	12	4	3	3
WA	COM	University	634	38	10	7	8	5	0
WA	COM	Warehouse	4475	279	46	46	10	0	0
WA	IND	Wood_Product_Mfg	356	24	9	6	3	5	0
WA	COM	Swine Farms	0	54	185	0	0	0	0
WA	COM	Dairy Farms	0	0	98	279	0	0	0
WA	COM	Landfills (kW)	0	0	1205	4520	2	28.7	0
WA	COM	Wastewater (kW)	0	0	598	618	0.6	0	0

Clean Energy Background Data

The installed costs and operation and maintenance costs (O&M) for the three clean energy technologies are shown in Table 9. Also included are expected measure life and capacity factors. Capacity factors are an indication of the percentage of the year energy will be produced. Further details for each technology are given below.

Table 9. Costs, Measure Life, and Capacity Factor for Clean Energy Resources

Technology	Average Installed Cost (\$/kW)	O&M Cost (\$/kW/yr)	Measure Life	Capacity Factor
Building PV ⁵	\$8,642	\$100	25	0.12
Small Hydro ⁶	\$5,688	\$535	40	0.80
Small Wind ⁷	\$8,197	\$20	25	0.06

Building PV

On-site PVs consist of solar electricity-generation from building-mounted photovoltaic panels. PV systems are weather-dependent and rely on the sun to generate electricity. This study focuses on renewable-electricity generation potential from rooftop residential and commercial buildings. PV systems include an array of solar electric modules, an inverter (DC to AC), and a balance of systems. These systems do not have battery back-up equipment and are completely connected to the utility (grid-tied). PV generation is a whole-building electricity generation resource and typically only offsets a portion of baseline loads. In most cases, PV is considered a secondary source of a building's energy needs. When excess PV electricity is generated (more than the building's loads), it is fed back into the grid. This depends heavily on the PV system size and current weather and, for residential and commercial customers, generally occurs when the building is not occupied.

Three primary PV technologies considered are: (1) mono-crystalline (single crystalline cell); (2) poly-crystalline (multi-crystalline cell); and (3) amorphous thin-film. These three technologies currently dominate the solar market.⁸ Efficiencies of these technologies are improving annually and are accounted for in this study. This study does not include large PV generation facilities that operate to sell the majority (or all) of their power to the grid and emerging PV technologies.

The PV Watts performance calculator, developed by the National Renewable Energy Laboratory, is used to determine the capacity factor.⁹ The amount of solar insolation (i.e., the measure of solar energy received on a given surface area in a given time), based on weather stations, determines the performance potential for the region. To maximize roof area coverage for calculation of technical potential, commercial and multifamily buildings are fixed with 0.0° array tilt (flat roof), while single-family and manufactured homes are fixed at 18.5° tilt (4/12 pitch).

⁵ First year cost.

⁶ Average cost.

⁷ Average cost and capacity factor.

⁸ EIA, based on photovoltaic cell and module shipments by type, 2006.

⁹ http://redc.nrel.gov/solar/codes_algs/PVWATTS/

However, for actual installations (used in achievable technical potential), the PV arrays are generally fixed at an angle to maximize solar exposure with coverage. This translates to an optimal array tilt of 33.5° for commercial buildings and 22.5° for residential buildings. With this variance in array tilt, there is a slight difference in the capacity factor; however, for PSE territory, the difference is minimal and the capacity factor for both sectors is 0.12.

PV Energy Costs. The primary and secondary resources for PV installed costs are from the California Energy Commission (CEC), the Energy Trust of Oregon (ETO), the U.S. Department of Energy (DOE), and other on-line sources. Cost analysis for PV installation of other programs results in an average installation cost in 2006 of \$9/W¹⁰; a cost of \$8.64/W in 2010 is assumed for this analysis. Given expected technological improvements, the installed cost of PV is assumed to nearly halve by 2029 to \$4.73/W.^{11, 12, 13, 14, 15} Other technical data have been acquired from multiple primary and secondary resources to determine measure life (25 years¹⁶), and O&M costs. O&M costs of \$100/kW/yr include inverter replacement every ten years and seasonal module washing.¹⁷

¹⁰ “Solar Trends: California Energy Commission” by SunPower Consulting LLC provided cost analysis, August 2006, ETO, and DOE.

¹¹ NREL, “Solar Electric Power: The US Photovoltaic Industry Roadmap”, 2001

¹² EERE, “Solar Energy Technologies Multi-Year Technical Plan 2003-2007”, 2004

¹³ DOE/EIA, “Annual Energy Outlook 2008”, 2008

¹⁴ Prometheus Institute, “PV Technology, Performance, and Cost”, 2007

¹⁵ PSE PV cost projections and PV costs include installed labor, contractor profit and overhead

¹⁶ Data was averaged from the following sources: NREL, NW Power, and Conservation Council, and typical warranty periods.

¹⁷ NREL, “A Review of PV Inverter Technology Cost and Performance Projections”, 2006.

Table 10. Summary Market Potential

Market Scenario	Market Potential 2029 (MW)	Market Potential 2029 (aMW)	Market Potential (Percent of Technical) in 2029	Levelized Cost w/out Subsidy	Levelized Cost w/ Subsidy	Cost per kW in 2010	Cost per kW in 2029	Annual O&M Cost per kW
PV Market	172	21	0.79%	\$0.69	\$0.61	\$8.642	\$4.733	\$1.00

172 MW		PV Growth		2009		2010		2011		2012		2013		2014	
		Commercial	Tech MW	7,429	7,766	8,118	8,487	8,872	9,275						
		Residential	Tech aMW	732	765	792	820	881							
		Combined	Tech MW	1,759	1,831	1,906	1,983	2,062	2,145						
		Combined	Tech aMW	188	195	201	208	214							
		Commercial	Tech MW	9,188	9,597	10,024	10,470	10,935	11,420						
		Residential	Tech aMW	919	960	993	1,028	1,064	1,101						
		Combined	Market Potential (Percent of Technical)	0.039%	0.79%	0.79%	0.79%	0.79%	0.79%						
		Combined	Market Curve Cumulative Commercial	DSM	3%	1%	3%	5%	7%						
		Commercial	Market Curve Cumulative Residential	DSM	3%	6%	13%	19%	28%						
		Commercial	Market MW	(1.75)	0.76	1.99	3.13	4.90	7.69						
		Residential	Market aMW	(0.21)	0.09	0.24	0.38	0.60	0.94						
		Combined	Market MW	(0.41)	0.79	1.87	2.92	4.56	7.11						
Assumptions		Residential	Market aMW	(0.19)	0.10	0.23	0.35	0.55	0.86						
		Combined	Market MW	(2.17)	1.55	3.87	6.05	9.46	14.80						
		Combined	Market aMW	(0.41)	0.19	0.47	0.73	1.15	1.80						
		Combined	Market aMW												

Without State and Federal Incentives

Commercial		Cost per kW (\$)	
At Customer	a MW		
At Generation	MW_w/adders		
Line Loss:	a MW_w/adders	6.7%	
Lev Cost:	Inst costs (\$)	\$0.68 \$/kWh	
Lev Cost w/adders:	O & M (\$)	\$0.63 \$/kWh	
NPV:	Lump sum (\$)	\$434,848 (\$000)	
Residential		Cost per kW (\$)	
At Customer	a MW		
At Generation	MW_w/adders		
Line Loss:	a MW_w/adders	6.7%	
Lev Cost:	Inst costs (\$)	\$0.75 \$/kWh	
Lev Cost w/adders:	O & M (\$)	\$0.71 \$/kWh	
NPV:	Lump sum (\$)	\$123,764 (\$000)	
Combined Commercial and Residential PV			
At Customer	MW		
At Generation	a MW		
Line Loss:	MW_w/adders	6.7%	
Lev Cost:	Inst costs (\$)	\$0.69 \$/kWh	
Lev Cost w/adders:	O & M (\$)	\$0.65 \$/kWh	
NPV:	Lump sum (\$)	\$558,612 (\$000)	

With State and Federal Incentives

No Subsidy		Federal Tax Credit (ITC)		State Tax Credit (BETC)		Production Subsidy		Federal Tax Credit (ITC) and State Tax Credit (BETC)		Federal Tax Credit (ITC), State Tax Credit (BETC) and Production Subsidy	
Lev Cost:	Com	\$/kWh	\$0.68	Lev Cost:	Com	\$/kWh	\$0.67	Lev Cost:	Com	\$/kWh	\$0.59
Lev Cost:	Res	\$/kWh	\$0.75	Lev Cost:	Res	\$/kWh	\$0.74	Lev Cost:	Res	\$/kWh	\$0.64
Lev Cost w/added Com		\$/kWh	\$0.63	Lev Cost w/added Com		\$/kWh	\$0.63	Lev Cost w/added Com		\$/kWh	\$0.55
Lev Cost w/added Res		\$/kWh	\$0.71	Lev Cost w/added Res		\$/kWh	\$0.69	Lev Cost w/added Res		\$/kWh	\$0.60

Assumptions

Optimal Capacity	Com	CF	0.12
Optimal Capacity	Res	CF	0.12
Output (kW h/kW Com)			1071
Output (kW h/kW Res)			1055

Subsidy

Federal Tax Credit	Com	%	30%
Federal Tax Credit	Res	%	30%
State Tax Credit	Com	%	0%
State Tax Credit	Res	%	0%
Production Subsidy	Com	\$/kWh	\$0.15
Production Subsidy	Res	\$/kWh	\$0.15
Production Subsidy	Com	Term	END
Production Subsidy	Res	Term	END



Table 11. PSE DG: PV Technical Potential

		Capacity	2010	2029	2010	2029	2010	2029
Building Type		Factor	kW	kW	kWh*	kWh*	aMW*	aMW*
Commercial Sector	Dry_Goods_Retail	0.10	527,704	1,225,104	5,358,119	10,876,686	52	106
	Grocery	0.10	108,686	252,322	1,103,557	2,240,159	11	22
	Hospital	0.10	341,608	793,068	3,468,566	7,040,998	34	68
	Hotel_Motel	0.10	40,762	94,631	413,880	840,154	4	8
	Office	0.10	2,855,720	6,629,761	28,995,952	58,860,181	281	571
	Other	0.10	2,922,078	6,783,817	29,669,729	60,227,912	288	584
	Restaurant	0.10	161,742	375,496	1,642,272	3,333,721	16	32
	School	0.10	167,520	388,909	1,700,936	3,452,806	16	33
	University	0.10	84,933	197,178	862,379	1,750,582	8	17
	Warehouse	0.10	556,875	1,292,826	5,654,309	11,477,935	55	111
	Total Commercial (MW/MWh)	0.10	7,768	18,033	78,870	160,101	765	1,553
Residential Sector	Multi_Family	0.10	490,913	1,028,038	4,984,552	9,059,404	48	88
	Manufactured	0.11	196,790	412,105	1,768,841	3,214,862	22	40
	Single_Family	0.11	1,143,905	2,395,492	10,281,958	18,687,418	127	231
	Total Residential (MW/MWh)	0.11	1,832	3,836	17,035	30,962	198	359
Total Technical Potential (MW/MWh)		0.10	9,599	21,869	95,905	191,063	963	1,912

Table 12. Module, Inverter and Total System Costs, System Prices

Assumptions
 2008 \$
 Inflation rate 2.00%

MARKET CASE										2008 \$	
	Sector	Distributor Module Cost per Watt	Distributor Inverter Cost per Watt	Labor Installed Costs per Watt	Install Costs per Watt	Bulk Quantity Discount	Customers % Receiving Bulk Discount	TOTAL Install Cost per Watt	Source		
2008 Costs	Commercial	\$ 4.82	\$ 0.72	\$ 3.61	\$ 9.15	5%	40%	\$ 8.96	SolarBuzz.co		
	Com %	53%	8%	39%	100%						
	Residential	\$ 4.82	\$ 0.72	\$ 3.61	\$ 9.15	0%	0%	\$ 9.15	SolarBuzz.co		
	Res %	53%	8%	39%	100%						
	Commercial	\$ 4.40	\$ 0.66	\$ 3.29	\$ 8.35	8%	40%	\$ 8.10	Prometheus		
	Com %	53%	8%	39%	100%						
	Residential	\$ 4.49	\$ 0.67	\$ 3.36	\$ 8.52	0%	0%	\$ 8.52	Prometheus		
	Res %	53%	8%	39%	100%						
	Commercial	\$ 3.97	\$ 0.59	\$ 2.97	\$ 7.54	10%	40%	\$ 7.24	Prometheus		
	Com %	53%	8%	39%	100%						
	Residential	\$ 4.05	\$ 0.61	\$ 3.03	\$ 7.69	0%	0%	\$ 7.69	Prometheus		
	Res %	53%	8%	39%	100%						
2015 Costs	Commercial	\$ 3.43	\$ 0.51	\$ 2.57	\$ 6.52	10%	40%	\$ 6.26	DOE/NREL		
	Com %	53%	8%	39%	100%						
	Residential	\$ 3.50	\$ 0.52	\$ 2.62	\$ 6.65	0%	0%	\$ 6.65	DOE/NREL		
	Res %	53%	8%	39%	100%						
	Commercial	\$ 1.84	\$ 0.54	\$ 2.31	\$ 4.68	10%	40%	\$ 4.50	DOE/NREL		
	Com %	39%	11%	49%	100%						
2020 Costs	Residential	\$ 1.68	\$ 0.55	\$ 2.35	\$ 4.78	0%	0%	\$ 4.78	DOE/NREL		
	Res %	39%	11%	49%	100%						

Sector	PV Cost	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commercial	Market Case	\$ 8.96	\$ 8.76	\$ 8.55	\$ 8.35	\$ 8.15	\$ 7.94	\$ 7.74	\$ 7.54	\$ 7.33	\$ 7.13	\$ 6.93	\$ 6.72	\$ 6.52
Residential	Market Case	\$ 9.15	\$ 8.94	\$ 8.73	\$ 8.52	\$ 8.31	\$ 8.11	\$ 7.90	\$ 7.69	\$ 7.48	\$ 7.27	\$ 7.07	\$ 6.86	\$ 6.65
Commercial	Base Case	\$ 8.96	\$ 8.53	\$ 8.10	\$ 7.93	\$ 7.75	\$ 7.58	\$ 7.41	\$ 7.24	\$ 7.04	\$ 6.84	\$ 6.65	\$ 6.45	\$ 6.26
Residential	Base Case	\$ 9.15	\$ 8.83	\$ 8.52	\$ 8.36	\$ 8.19	\$ 8.02	\$ 7.86	\$ 7.69	\$ 7.48	\$ 7.27	\$ 7.07	\$ 6.86	\$ 6.65
Commercial	High Case	\$ 5.87	\$ 5.42	\$ 5.40	\$ 5.18	\$ 4.95	\$ 4.26	\$ 4.51	\$ 3.67	\$ 4.10	\$ 3.93	\$ 3.78	\$ 3.63	\$ 3.61
Residential	High Case	\$ 6.16	\$ 5.69	\$ 5.67	\$ 5.43	\$ 5.20	\$ 4.47	\$ 4.73	\$ 3.85	\$ 4.30	\$ 4.13	\$ 3.97	\$ 3.81	\$ 3.79

Market Case = Assume PV costs decrease based on market data by 50% in 2029 based on DOE/NREL while install costs remain high
 Base Case = Assume PV costs decrease based on market data by 66% in 2029 based on DOE/NREL
 High Case = Assume PV costs decrease based on aggressive market data - assume cost data from sources (average)

Sources

1 SOLARBUZZ

Lowest Prices (\$/Wp)

The tracking of the lowest price band in the survey is measured against the number of prices below \$4.75 per watt (previously analyzed to below \$4.50 per watt). As of July 2008, there are currently 188 solar module prices below \$4.75 per watt (€2.99 per watt) or 13.0% of the total sample. This compares with 201 prices below \$4.75 per watt in June. The lowest retail price for a multicrystalline solar module is \$4.17 per watt (€2.63 per watt) from a US retailer. The lowest retail price for a monocrystalline module is \$4.35 per watt (€2.74 per watt), also from a US retailer. The module cost represents around 50 - 60% of the total installed cost of a Solar Energy System.

Year	Distributor Module	Distributor Invert	Module % of Total	Total Installed Cost \$/Watt
2005	\$ 4.57		53%	\$ 8.67
2006	\$ 4.82	\$ 0.71	53%	\$ 9.14
2007	\$ 4.85	\$ 0.71	53%	\$ 9.21
2008	\$ 4.82	\$ 0.72	53%	\$ 9.15
Averaged:	\$ 4.76	\$ 0.71	\$ 0.53	\$ 9.04

2 NREL

According to NREL's U.S. Photovoltaics Industry Roadmap, in 2027 the estimated installed cost for PV will be: estimated: \$ 3.25 \$/Watt

3 California Energy Commission (CEC)

<http://www.renewableenergyaccess.com/rea/news/info.cu.s/story?id=46191>
<http://www.renewableenergyaccess.com/assets/images/story/2006/10/11/ta1e1.gif>
 Average installed costs in CA for less than 30kW over the last 5 years

2002	\$ 9.97
2003	\$ 9.00
2004	\$ 8.63
2005	\$ 8.71
2006	\$ 9.14
Averaged:	\$ 9.09

Table 13. Module Power Density Assumptions

* Power Density

Technology	% shares in x-Si	Module power density (Wp/sq. ft.)	System power density (Wp/sq. ft.)		
			2010	2015	2029
Mono crystalline	25%	15.9	10.18	11.28	15.07
Poly-crystalline/Ribbon	44%	14.7			
Amorphous silicon (thin film)	30%	7.1			
Weighted average		12.7			

Module power density (w/sq.ft.)

System power density (w/sq.ft)

= 1.25 / Module power density (this accounts for the additional space required for installation such as space between modules, racking, wiring, etc)

U.S. National Photovoltaics Program Goals - 2000-2005

	1995	2000	2005	2020-2030	
Module Efficiency (percent)	7-17	8-18	10-20	15-25	*assume average
average eff percent	12	13	15	20	
Increase per yr	-	0.20	0.40	0.25	
Change in %		1.6%	3.0%	1.6%	
		average	2.09%		

Source: U.S. Department of Energy, *Photovoltaics - Energy for the New Millennium: The National Photovoltaics Program Plan 2000-2004*, DOE/GO-10099-940 (Washington DC, January 2000), p. 9.

Note: Table shows range of module efficiencies for commercial flat-plate and concentrator modules

Sources:

Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey." Link: <http://www.eia.doe.gov/cneaf/solar/renewables/page/solarreport/solar.html>

IEA 2002: <http://iea-pvps.org/pv/materials.htm>

NREL: 2007 R&D Future - PROJECTIONS OF FUTURE PERFORMANCE Graph

NREL: 2005 <http://www.nrel.gov/docs/fy05osti/37353.pdf>

Comparable Sources:

Technology	% share in x-Si Production	Module power density (Wp/sq. ft.)	System power density (Wp/sq. ft.)		
			2003	2010	2025
Mono crystalline	41%	12.2	8.70	10.20	12.30
Poly-crystalline	59%	9.9			
Weighted average		10.80			

Based on 2.4% increase per yr

Energy Foundation PV: <http://www.ef.org/documents/EF-Final-Final2.pdf>

Table 14. PSE Building Assumptions

RESIDENTIAL													
Residential Assumptions													
Building Type	Roof Pitch			Usable roof orientation by % (max 25%)				Usable Sq. Ft. Factors				Total Usable Sq. Ft.	
	Roof Pitch	Pitch in Degrees	% Increase in Area	N	E	S	W	% sq. ft. roof usable	% sq. ft. available	Tree or building	Total Usable		
Multi-Family*	0/12 pitch		0	1	25%	25%	25%	25%	100%	100%	70%	50%	35.0%
Manufactured	4/12 pitch		18.43	1.05	0%	25%	25%	25%	50%	38%	85%	50%	16.8%
Single-Family	4/12 pitch		18.43	1.05	0%	25%	25%	25%	50%	38%	85%	50%	16.8%

Manufactured Homes and Single-Family assumes 15% loss due to obstructions

Multi-Family assume 30% loss due to obstructions

All residential building types assume 50% loss due to shading (by trees and other buildings) and technical feasibility

* All multi-family units are considered flat roof and use the same commercial times 50% of useable area factor

Assumptions based in part on Cadmus Solar experience and with reasonable limits based on Energy Foundation PV report: <http://www.ef.org/documents/EF-Final-Final2.pdf>

COMMERCIAL
Comparison of sources determine of a available roof sq.ft.

Source	% sq. ft. area un-available	Factor (placement)	Total Sq. ft. un-	Total Usable	Source Links
Energy Foundation**	5%	7	35%	65%	Energy Foundation PV: http://www.ef.org/documents/EF-Final-Final2.pdf
San Diego Gas & Electric	20%	1	20%	80%	TECHNICAL POTENTIAL FOR ROOFTOP PHOTOVOLTAICS IN THE SAN DIEGO REGION: http://www.sandiego.edu/epic

**An estimated 5% of commercial building roofing space is occupied by HVAC and other structures. Small obstructions create problems with mechanical array placement while large obstructions share areas up to 7x that of the footprint. Hence, around 35% of roof area is considered to be unavailable due to shading. In some commercial buildings such as shopping center, rooftops tend to be geometrically more complex than in other buildings and the percentage of a available space may be slightly higher.

Commercial Assumptions

All commercial building types are assumed flat: roof pitch 0

Building Type	Obstructions and Equipment	Parapet access (2)	Equipment Shad	Building Shad	Total % loss	Total Usable sq. ft.
Dry Goods Retail	10%	5%	5%	15%	35%	65%
Grocery	10%	5%	5%	15%	35%	65%
Hospital	10%	5%	5%	15%	35%	65%
Hotel Motel	10%	5%	5%	15%	35%	65%
Office	10%	5%	5%	15%	35%	65%
Other	10%	5%	5%	15%	35%	65%
Restaurant	10%	5%	5%	15%	35%	65%
School	10%	5%	5%	15%	35%	65%
University	10%	5%	5%	15%	35%	65%
Warehouse	10%	5%	5%	15%	35%	65%

1) The obstructions and equipment are assumed to 10% of the building roof and is assumed there is additional shading of 50% by that equipment

2) Parapet access is required by code / OSHA, assume 5% loss in sq. ft.

3) Building shading accounts for the surrounding building and other technical restrictions, it is assumed that more shading occurs in an urban setting due to the surrounding buildings

General Building Assumptions

Bldg ID	Building Type	Building Sq. Ft.	Estimated Floors
RT0	Dry Goods Retail	6,421	1
GR0	Grocery	8,637	1
HEH	Hospital	14,803	2
LGO	Hotel Motel	12,772	4
OFF0	Office	9,525	1
OCM	Other	10,699	1
RS0	Restaurant	4,699	1
EDS	School	22,241	2
EDU	University	32,392	2
WA0	Warehouse	15,284	1
TCOM	Total Commercial	137,473	2
MF0	Multi-Family	1,300	2
MNO	Manufactured	1,570	1
SFO	Single-Family	1,921	2
TRES	Total Residential	4,791	2

Table 15. PV WATTS Assumptions

Overall DC to AC Derate Factor	Component	Range of
Component Derate Factors	Derate Values	Acceptable Values
PV module nameplate DC rating	0.95	0.80 - 1.05
Inverter and Transformer	0.92	0.88 - 0.96
Mismatch	0.98	0.97 - 0.995
Diodes and connections	0.995	0.99 - 0.997
DC wiring	0.98	0.97 - 0.99
AC wiring	0.99	0.98 - 0.993
Soiling	0.95	0.30 - 0.995
System availability	0.98	0.00 - 0.995
Shading	1	0.00 - 1.00
Sun-tracking	1	0.95 - 1.00
Age	1	0.70 - 1.00
Overall DC to AC derate factor	77%	PVWATTS Default

Residential Assumptions

PVWATTS: Hourly PV Performance Data	
City:	SEATTLE
State:	WA
Lat (deg N):	47.45
Long (deg W):	122.3
Elev (m):	122
Array Type:	"Fixed Tilt"
Array Tilt (deg):	18.5
Array Azimuth (deg):	180
DC Rating (kW):	1000
DC to AC Derate Factor:	0.77
AC Rating (kW):	770

Commercial Assumptions

PVWATTS: Hourly PV Performance Data	
City:	
State:	
Lat (deg N):	
Long (deg W):	
Elev (m):	
Array Type:	
Array Tilt (deg):	
Array Azimuth (deg):	
DC Rating (kW):	
DC to AC Derate Factor:	
AC Rating (kW):	

Source:

PVWATTS: http://rredc.nrel.gov/solar/codes_algs/PVWATTS/

See link for more information: http://rredc.nrel.gov/solar/codes_algs/PVWATTS/version1/derate.cgi

Small Hydro

Hydraulic power can be captured wherever a flow of water falls from a higher level to a lower level, which usually occurs where a stream runs down a hillside, a river passes over a waterfall or man-made weir, or where a reservoir discharges water back into the main river. The vertical fall of the water is known as the “head,” and this, along with the flow rate, determines the power output. The primary resource used in this study to evaluate potential sites for hydro development was the Virtual Hydropower Prospector (VHP), which is available through the Idaho National Laboratory.¹⁸ The VHP is a GIS-based tool that allows users to identify existing and potential small hydro sites (≥ 10 kWa).

The most small or micro hydro systems are run-of-river structures and do not require dams. The water flowing in the stream is channeled into pipes (or a penstock) and then into a turbine, which generates electricity. The water is then returned to the stream downstream from the turbine. The environmental footprints of run-of-river facilities are much smaller than those of larger hydro plants, which require large storage reservoirs. No land is flooded to create a reservoir for the plant, but a small weir may be installed to help regulate flow.

The benefits of small hydro are many and include:

- High efficiency (70% – 90%).
- A high capacity factor.
- A high level of predictability, varying with annual rainfall patterns.
- Slow rate of change for output power, which varies only gradually from day to day (not from minute to minute).
- A long-lasting and robust technology; systems can be engineered to last for 40 years or more.
- Low environmental impact; fish and other wildlife are generally not affected by the installation.

Hydro Energy Costs

Costs vary considerably according to the size of the system installed, with the cost per kW going down as the system size increases. For this study, costs were taken from a study prepared for BC Hydro¹⁹ and include the following installation related costs: penstock, intake, powerhouse, generating equipment, access road, switchyard, and transmission line. A percentage of the equipment costs are added to the total cost to account for engineering costs (20%) and contingency costs (30%).

Cadmus used cost data from sites with less than one mile of transmission required for installation; these sites ranged from 100 to 3700 kW. Estimated installed costs were \$5,688/kW, with additional O&M costs of \$535/kW per year (calculated as 9.4% of installed cost).

¹⁸ <http://hydropower.inl.gov/prospector>

¹⁹ *Green Energy Study for British Columbia Phase 2: Mainland*; Small Hydro, October 2002, Prepared for BC Hydro by Sigma Engineering Ltd.

Table 16. Cost Estimation

Stream	Name	F3	Lat_Long	Region	Flow (m/s)	Head (m)	Penstock Length (m)	Penstock Diameter (m)	Power (kW)	Cost (\$1000)	Transmission Dist (km)	Capacity Factor
11	DAVIS	CR	5008/11657	1	0.8	122	500	0.52	800	1578	0.5	0.47
16	FALL	CR	5036/11853	1	0.45	500	1000	0.41	1800	2347	1.5	0.45
18	FERRY	CR	5015/11839	1	1.1	150	3100	0.78	1300	4060	1	0.51
23	HOLSTEIN	CR	5018/11835	1	0.29	150	1200	0.41	300	1605	1	0.45
30	LEGERWOOD	CR	5058/11846	1	0.53	250	1300	0.47	1000	2594	1.5	0.45
33	LOFTUS	CR	5056/11849	1	0.75	250	1000	0.51	1500	2378	0.5	0.45
34	LOST	LEDGE	5006/11656	1	0.28	430	1700	0.36	900	1639	0.5	0.47
46	SCHROEDER	CR	5002/11653	1	0.64	300	2300	0.53	1500	3502	0.5	0.47
63	UNNAMED	CR	5055/11807	1	0.85	250	1150	0.54	1700	2755	1	0.45
69	BLURTON	CR	5041/111902	2	0.48	400	1600	0.44	1500	2383	1	0.45
72	CADWALLADER	CR	5046/12248	2	4.8	50	600	1.2	1900	4284	0.5	0.52
73	CHASE	CR	5049/11941	2	0.99	100	500	0.58	800	1591	0	0.45
75	CORNING	CR	5054/11932	2	0.52	100	700	0.49	400	1251	0	0.45
76	CYPRESS	CR	4920/12314	2	1.3	105	825	0.7	1100	1782	0	0.55
82	HUMMING	BIRD	5046/11900	2	0.3	250	750	0.36	600	1103	1	0.45
87	MARA	CR	5046/11900	2	0.46	250	1000	0.44	900	1389	1	0.45
90	PAUL	CR	4915/12001	2	0.67	120	400	0.47	600	2190	1	0.4
91	PAVILION	CR	5054/12146	2	0.15	350	2350	0.36	400	1686	0	0.5
94	POTLATCH	CR	4935/12319	2	0.43	150	1300	0.47	500	2061	1	0.55
101	TRETHEWAY	CR	4942/12205	2	7.5	30	150	1.3	1800	4228	0	0.55
104	UNNAMED	CR	4918/12004	2	0.08	600	1300	0.2	400	1380	1	0.4
105	UNNAMED	CR	4941/12335	2	0.18	793	1800	0.31	1100	2585	0	0.57
106	UNNAMED	CR	4940/12335	2	0.15	1037	2400	0.25	1200	3276	0	0.6
113	WHITE	CR	5051/11919	2	0.6	50	300	0.5	200	1005	0	0.6
114	WHITECAP	CR	5043/12218	2	0.73	200	950	0.52	1100	2415	1	0.52
118	ADRIAN	CR	4948/12527	3	1.8	50	625	0.87	700	2352	0	0.65
119	AHAMINGUS	CR	4941/112607	3	0.99	40	100	0.52	300	1155	0.5	0.65
126	BIG	TREE	5015/12545	3	1.7	100	1900	0.92	1300	3889	1.5	0.67
130	CANTON	CR	4949/12628	3	3.1	30	800	1.2	700	3447	1.5	0.65
144	HEADQUARTERS	CR	4942/12507	3	1.5	50	250	0.68	600	1668	1.4	0.65
174	OKTWANCH	R	4947/12615	3	1.6	30	400	0.83	400	2072	0.9	0.65
185	SOMBRIO	R	4831/12417	3	0.87	50	380	0.6	300	1365	0.5	0.51
192	TLOOLS	CR	4952/12545	3	3	50	625	1.1	1200	2971	1	0.65
205	UNNAMED	CR	4948/12625	3	1.2	30	200	0.65	300	1310	0.5	0.65
211	UNNAMED	CR	4948/12617	3	2	30	400	0.9	500	2061	1.5	0.65
216	UNNAMED	CR	5030/12654	3	1.4	60	500	0.73	700	2032	1.6	0.68
220	UNNAMED	CR	5005/12625	3	2	60	1250	0.99	900	3051	0.8	0.64
224	UNNAMED	CR	5005/12628	3	1.5	90	1320	0.83	1100	3038	1.2	0.64
232	UPANA	CR	4948/12605	3	5.8	30	800	1.5	1400	4587	0.1	0.65
236	WARD	CR	4947/12604	3	0.86	30	200	0.58	200	1122	0.4	0.65
255	SWIFT	CR	5251/11916	4	3.7	61	1425	1.3	1800	5154	0.9	0.5
265	MCLEESE	CR	5220/12217	5	0.3	150	1300	0.45	400	1424	0	0.45
268	UNNAMED	CR	5155/12444	5	0.5	61	750	0.53	200	1487	1	0.4
269	UNNAMED	CR	5144/12427	5	0.4	425	3700	0.47	1300	4129	1	0.45
274	NOOMST	CR	5226/12613	6	3.4	61	550	1	1600	3712	1	0.65
275	NOOSGULCH	CR	5226/12623	6	8.4	30	700	1.7	2000	5904	1	0.65
276	TASTSQUAN	CR	5222/12645	6	1.9	91	250	0.67	1400	2240	0.5	0.65
288	ALICE	CR	5440/12847	8	1.9	92	1200	0.89	1400	3388	1	0.6
299	HANKIN	CR	5435/12826	8	1	91	950	0.67	700	3406	1	0.6
310	TROUT	CR	5451/12719	8	1.6	50	500	0.79	600	1753	0	0.6
325	UNNAMED	CR	5410/12956	9	0.1	650	2000	0.23	500	2342	0.5	0.7
353	TELEGRAPH	CR	5754/13110	13	0.56	152	1200	0.51	700	2048	0	0.45

Source: BC Hydro, Microhydro/small hydro potential, INVENTORY OF UNDEVELOPED OPPORTUNITIES AT POTENTIAL MICROHYDRO SITES IN BRITISH COLUMBIA, March 2000

Size (kW)	Cost/KW (power curve)	Cost/KW (linear model)
20	\$ 15,386	\$ 4,685
30	\$ 12,799	\$ 4,668
40	\$ 11,232	\$ 4,652
60	\$ 9,344	\$ 4,618
80	\$ 8,200	\$ 4,585
100	\$ 7,410	\$ 4,551
300	\$ 4,500	\$ 4,215
500	\$ 3,568	\$ 3,880
1000	\$ 2,605	\$ 3,041

**Table 17. Summed Average Stream Flow for all Available Stream Data in the Specified County
(Average Taken over a Five Year Period)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	# streams (n)
Whatcom	26,812	17,526	18,798	18,047	19,782	21,939	16,907	10,357	9,792	17,213	29,304	21,953	20
Skagit	68,642	50,266	49,824	46,188	52,094	64,099	48,141	29,870	28,863	46,460	80,168	57,785	8
Jefferson	15,641	7,578	11,045	6,692	4,872	4,361	3,427	1,937	2,064	7,550	14,328	12,563	4
King	36,237	24,457	26,522	23,221	24,109	20,538	10,089	6,996	8,385	13,950	34,339	27,140	44
Pierce	14,874	9,962	10,456	10,838	11,903	12,113	8,674	6,562	5,608	6,961	11,622	12,738	20
Thurston	13,708	8,422	8,669	5,880	3,509	2,594	1,784	1,547	1,692	2,658	9,380	11,019	8
Kitsap	165	71	86	49	29	18	15	13	13	38	81	131	3
Kittitas	1,557	1,733	2,313	2,431	2,662	2,922	3,752	3,681	1,537	1,019	1,332	1,142	1
Island	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	177,636	120,015	127,713	113,347	118,962	128,584	92,788	60,962	57,954	95,849	180,555	144,471	
% of max	98%	66%	71%	63%	66%	71%	51%	34%	32%	53%	100%	80%	

Small Wind

Wind energy is converted to mechanical or electrical energy through the use of a wind turbine. Wind energy is an intermittent resource, meaning that the energy output varies and is unpredictable. Despite the intermittency of the wind, the wind energy industry is growing; small wind saw an average growth of 14 percent. The total installed capacity of small wind (<100 kW) in the U.S. is estimated to be between 55-60 MW as of 2007.²⁰

Small wind turbines are generally defined as having an installed capacity of up to 100 kW. For this analysis, the focus was on residential systems of 1.9 kW and 10 kW. Residential systems tend to be smaller, due to both cost constraints and the amount of energy needed.

The AWEA Small Wind Turbine Global Market Study 2008 conducted a survey with many players in the small wind industry, including researchers, component vendors, manufacturers, engineers, consultants, utilities, local government offices, and dealers/distributors/installers²¹. The survey found that the top market barrier to installing small wind turbines was cost to the customer. Additional key barriers included restrictive zoning and permitting rules, and lack of financial incentives.

Small Wind Energy Costs

The cost for a wind turbine varies by the size of the system installed. In general, as the installed capacity of wind turbines increases, the installed cost per kW decreases. Costs are assumed to be nominally constant. However, it should be recognized that costs may increase due to tighter steel supplies. Costs were taken primarily from turbine manufacturer and distributor websites or discussions with manufacturers.

Table 18. Basic Information and Assumptions

Residential Retail Rate	0.098
Discount Rate	8.25%
Wind Turbine Measure Life	25
O&M costs per KW	\$20.00
Washington State Tax Incentive	\$0.12
Inflation	3%

Table 19. Turbine Installed and O&M Costs

	Installed Cost	O&M cost, yearly
Abundant Renewable Energy Model: ARE 442 10KW	\$90,000	\$200.00
Southwest Windpower Model: Skystream 3.7 1.9KW	\$11,000	\$38.00

²⁰ Compiled from American Wind Energy Association. Home and Farm Wind Energy Systems: Reaching the Next Level. AWEA. June 2005. and American Wind Energy Association. AWEA Small Wind Turbine Global Market Study 2008. AWEA. June 2008.

²¹ American Wind Energy Association. AWEA Small Wind Turbine Global Market Study 2008. AWEA. June 2008.

Table 20. Costs, Measure Life and Capacity Factor for Clean Energy Resources

	Cost
Average Installed Cost	\$8,197
Average O&M Cost	\$20

Table 21. Annual kWh Production by location, per turbine

	Abundant Renewable Energy Model: ARE 442 10KW	Southwest Windpower Model: Skystream 3.7 1.9KW
Seattle	5,972	1,435
Olympia	3,997	965
Yakima	4,762	1,113

Table 22. Estimated Pay-back Period, in years, with tax incentives

	Abundant Renewable Energy Model: ARE 442 10KW	Southwest Windpower Model: Skystream 3.7 1.9KW
Seattle	69	35
Olympia	103	52
Yakima	87	45

Table 23. NPV of Total Cost and Levelized Cost by Turbine and Wind Region

	Abundant Renewable Energy Model: ARE 442 10KW	Southwest Windpower Model: Skystream 3.7 1.9KW
NPV of total cost	\$92,090	\$11,397
Seattle Levelized Cost per kWh	\$1.49	\$0.76
Olympia Levelized Cost per kWh	\$2.20	\$1.13
Yakima Levelized Cost per kWh	\$1.85	\$0.98

Table 24. Power Supply Curves

Company Name:	Abundant Renewable Energy	Southwest Windpower
Model:	ARE 442	Skystream 3.7
Rating (kW):	10	1.9
Installed Cost (\$):	\$90,000	\$11,000
O&M Cost (\$/year)	\$200	\$38
Windspeed (m/s)	Power (kW)	Power (kW)
0	0	0
2	0	0
4	0.8	0.2
6	2	0.5
8	6	1.3
10	9.2	2
12	10.5	2.5
14	10.3	2.6
16	10	2.3
18	10	2.1
20	10	2
22	10	2
24	10	2

Table 25. Technical Potential in 2029 (aMW)

Sector	aMW
Residential	53.01
Commercial	12.94
Industrial	0.44
TOTAL	66.39

Table 26. Nameplate Potential

Sector	MW
Residential	800
Commercial	445
Industrial	17
TOTAL	1,261

Table 27. Peak Hour MW Produced

Sector	MW
Residential	53
Commercial	7,608
Industrial	206
TOTAL	7,867

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