AVISTA CONSERVATION POTENTIAL ASSESSMENT APPENDICES

Final Report — Electricity Potentials

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WASHINGTON MARKET PROFILES, BASELINE FORECAST, AND POTENTIAL RESULTS

This appendix contains Washington-specific tables that summarize the study assumptions, inputs, and results for Avista's Washington service territory only. These tables either repeat Washington-specific information provided previously within the body of the report, or provide Washington-specific information that corresponds to Avista system-level information in the report.

Table A–1 Electricity Sales and Peak Demand by Rate Class, Washington 2009

Sector	Rate Schedule(s)	Number of meters (customers)	2009 Electricity sales (MWh)	Peak demand (MW)
Residential	001	200,134	2,451,687	710
General Service	011, 012	27,142	415,935	64
Large General Service	021, 022	3,352	1,556,929	232
Extra Large General Service	025	22	879,233	134
Pumping	031, 032	2,361	135,999	10
Total		**233,011**	**5,439,850**	**1,150**

Table A-2 Residential Electricity Usage and Intensity by Segment, Washington 2009

Washington Segment	Intensity (kWh/Household)	Number of Customers	% of Customers	2009 Electricity Sales (MWh)	% of Sales
Single Family	14,547	109,134	54%	1,587,572	65%
Multi-Family	8,728	18,219	9%	159,019	6%
Mobile Home	13,092	5,248	3%	68,708	3%
Limited Income	9,424	67,533	34%	636,407	26%
Total	**12,250**	**200,134**	**100%**	**2,451,707**	**100%**

Note: Minor differences with totals in Table A-1 due to calibration.

Table A-3 Single Family Market Profile, 2009, Washington

End Use	Technology	Average Market Profiles Saturation	UEC (kWh)	Intensity (kWh/HH)	Usage (GWh)	New Units Saturation	UEC (kWh)	Intensity (kWh/HH)	Compared to Average
Cooling	Central AC	36.8%	1,857	684	75	73.4%	2,154	1,581	16%
Cooling	Room AC	10.8%	683	74	8	1.4%	793	11	16%
Combined Heating/Cooling	Air Source Heat Pump	18.4%	6,091	1,122	122	15.0%	7,066	1,063	16%
Combined Heating/Cooling	Geothermal Heat Pump	0.7%	3,655	26	3	0.8%	4,239	32	16%
Space Heating	Electric Resistance	6.2%	10,449	647	71	3.0%	12,539	373	20%
Space Heating	Electric Furnace	25.0%	8,360	2,088	228	25.0%	10,031	2,505	20%
Space Heating	Supplemental	6.1%	117	7	1	6.1%	140	9	20%
Water Heating	Water Heater	55.3%	3,466	1,918	209	43.7%	4,177	1,827	21%
Interior Lighting	Screw-in	100.0%	1,452	1,452	158	100.0%	1,452	1,452	0%
Interior Lighting	Linear Fluorescent	69.2%	152	105	11	69.2%	152	105	0%
Interior Lighting	Pin-based	100.0%	60	60	7	100.0%	60	60	0%
Exterior Lighting	Screw-in	86.7%	381	330	36	86.7%	381	330	0%
Exterior Lighting	High Intensity/Flood	1.9%	146	3	0	1.9%	146	3	0%
Appliances	Clothes Washer	98.0%	126	124	13	99.8%	154	154	22%
Appliances	Clothes Dryer	92.8%	609	565	62	89.0%	692	616	14%
Appliances	Dishwasher	93.9%	246	231	25	99.9%	271	271	11%
Appliances	Refrigerator	100.0%	793	793	87	100.0%	625	625	-21%
Appliances	Freezer	69.4%	773	536	58	69.4%	708	491	-8%
Appliances	Second Refrigerator	47.3%	816	386	42	20.5%	711	146	-13%
Appliances	Stove	82.1%	383	314	34	82.1%	465	382	22%
Appliances	Microwave	98.5%	168	166	18	98.5%	173	171	3%
Electronics	Personal Computers	140.0%	279	391	43	147.0%	287	422	3%
Electronics	TVs	260.0%	359	933	102	260.0%	400	1,041	12%
Electronics	Devices and Gadgets	100.0%	60	60	7	100.0%	67	67	10%
Miscellaneous	Pool Pump	13.3%	1,500	200	22	14.0%	1,526	214	2%
Miscellaneous	Furnace Fan	30.1%	500	151	16	30.1%	614	185	23%
Miscellaneous	Miscellaneous	100.0%	1,180	1,180	129	100.0%	1,416	1,416	20%
Total				**14,547**	**1,588**			**15,549**	

Table A-4 Multi-family Market Profile, 2009, Washington

End Use	Technology	Average Market Profiles Saturation	UEC (kWh)	Intensity (kWh/HH)	Usage (GWh)	New Units Saturation	UEC (kWh)	Intensity (kWh/HH)	Compared to Average
Cooling	Central AC	5.0%	928	46	1	24.1%	1,003	241	8%
Cooling	Room AC	25.0%	355	89	2	18.9%	384	73	8%
Combined Heating/Cooling	Air Source Heat Pump	1.0%	2,928	29	1	3.4%	3,163	108	8%
Combined Heating/Cooling	Geothermal Heat Pump	0.0%	1,757	-	-	0.5%	1,898	9	8%
Space Heating	Electric Resistance	59.0%	5,476	3,231	59	59.0%	6,023	3,554	10%
Space Heating	Electric Furnace	5.0%	4,381	219	4	5.0%	4,819	241	10%
Space Heating	Supplemental	18.0%	61	11	0	18.9%	67	13	10%
Water Heating	Water Heater	77.0%	2,142	1,650	30	71.3%	2,362	1,684	10%
Interior Lighting	Screw-in	100.0%	750	750	14	100.0%	750	750	0%
Interior Lighting	Linear Fluorescent	32.0%	76	24	0	32.0%	76	24	0%
Interior Lighting	Pin-based	3.0%	75	2	0	3.0%	75	2	0%
Exterior Lighting	Screw-in	38.5%	55	21	0	38.5%	55	21	0%
Exterior Lighting	High Intensity/Flood	0.2%	73	0	0	0.2%	73	0	0%
Appliances	Clothes Washer	32.0%	63	20	0	32.0%	70	22	11%
Appliances	Clothes Dryer	30.7%	582	179	3	30.7%	621	191	7%
Appliances	Dishwasher	64.0%	88	56	1	64.0%	93	59	5%
Appliances	Refrigerator	100.0%	677	677	12	100.0%	665	665	-2%
Appliances	Freezer	8.4%	734	62	1	8.4%	703	59	-4%
Appliances	Second Refrigerator	5.0%	687	34	1	5.0%	631	32	-8%
Appliances	Stove	96.4%	163	158	3	96.4%	181	175	11%
Appliances	Microwave	90.0%	99	89	2	90.0%	101	91	1%
Electronics	Personal Computers	63.0%	223	141	3	66.2%	226	150	1%
Electronics	TVs	165.0%	178	293	5	165.0%	188	310	6%
Electronics	Devices and Gadgets	100.0%	25	25	0	100.0%	26	26	5%
Miscellaneous	Pool Pump	0.0%	-	-	-	0.0%	-	-	0%
Miscellaneous	Furnace Fan	13.0%	38	5	0	13.0%	42	5	11%
Miscellaneous	Miscellaneous	100.0%	917	917	17	100.0%	963	963	5%
Total				**8,728**	**159**			**9,468**	

Table A-5 Mobile Home Market Profile, 2009, Washington

End Use	Technology	Average Market Profiles Saturation	UEC (kWh)	Intensity (kWh/HH)	Usage (GWh)	New Units Saturation	UEC (kWh)	Intensity (kWh/HH)	Compared to Average
Cooling	Central AC	23.2%	1,106	256	1	35.9%	1,194	428	8%
Cooling	Room AC	23.2%	407	94	0	22.0%	439	97	8%
Combined Heating/Cooling	Air Source Heat Pump	21.7%	3,488	759	4	22.8%	3,767	860	8%
Combined Heating/Cooling	Geothermal Heat Pump	0.0%	2,093	-	-	0.0%	2,260	-	8%
Space Heating	Electric Resistance	0.0%	5,888	-	-	0.0%	6,476	-	10%
Space Heating	Electric Furnace	68.1%	4,710	3,209	17	68.1%	5,181	3,530	10%
Space Heating	Supplemental	1.4%	34	0	0	1.5%	37	1	10%
Water Heating	Water Heater	96.3%	1,766	1,702	9	91.0%	1,947	1,771	10%
Interior Lighting	Screw-in	100.0%	1,307	1,307	7	100.0%	1,307	1,307	0%
Interior Lighting	Linear Fluorescent	69.2%	137	95	0	69.2%	137	95	0%
Interior Lighting	Pin-based	100.0%	54	54	0	100.0%	54	54	0%
Exterior Lighting	Screw-in	86.7%	343	297	2	86.7%	343	297	0%
Exterior Lighting	High Intensity/Flood	1.9%	131	2	0	1.9%	131	2	0%
Appliances	Clothes Washer	96.3%	128	124	1	96.3%	142	137	11%
Appliances	Clothes Dryer	98.8%	620	612	3	98.8%	662	653	7%
Appliances	Dishwasher	89.0%	250	222	1	89.0%	263	234	5%
Appliances	Refrigerator	100.0%	806	806	4	100.0%	792	792	-2%
Appliances	Freezer	59.3%	786	466	2	59.3%	753	446	-4%
Appliances	Second Refrigerator	19.5%	830	162	1	19.5%	762	149	-8%
Appliances	Stove	93.9%	344	323	2	93.9%	381	358	11%
Appliances	Microwave	82.0%	151	124	1	82.0%	154	126	2%
Electronics	Personal Computers	116.5%	262	305	2	122.3%	265	324	1%
Electronics	TVs	260.0%	359	933	5	260.0%	380	987	6%
Electronics	Devices and Gadgets	100.0%	60	60	0	100.0%	64	64	5%
Miscellaneous	Pool Pump	11.1%	1,500	167	1	11.7%	1,513	177	1%
Miscellaneous	Furnace Fan	8.3%	500	42	0	8.3%	557	47	11%
Miscellaneous	Miscellaneous	100.0%	971	971	5	100.0%	1,020	1,020	5%
Total				**13,092**	**69**			**13,955**	

Table A-6 Limited Income Market Profile, 2009, Washington

End Use	Technology	Average Market Profiles Saturation	UEC (kWh)	Intensity (kWh/HH)	Usage (GWh)	New Units Saturation	UEC (kWh)	Intensity (kWh/HH)	Compared to Average
Cooling	Central AC	22.2%	1,049	233	16	28.7%	1,133	325	8%
Cooling	Room AC	35.4%	712	252	17	18.0%	769	138	8%
Combined Heating/Cooling	Air Source Heat Pump	10.4%	2,372	247	17	10.4%	2,561	267	8%
Combined Heating/Cooling	Geothermal Heat Pump	0.0%	1,423	-	-	0.5%	1,537	8	8%
Space Heating	Electric Resistance	32.0%	5,164	1,651	112	28.8%	5,680	1,635	10%
Space Heating	Electric Furnace	19.3%	4,123	796	54	21.2%	4,536	963	10%
Space Heating	Supplemental	12.7%	63	8	1	13.4%	69	9	10%
Water Heating	Water Heater	83.9%	2,334	1,958	132	67.0%	2,574	1,725	10%
Interior Lighting	Screw-in	100.0%	728	728	49	100.0%	728	728	0%
Interior Lighting	Linear Fluorescent	69.2%	75	52	3	69.2%	75	52	0%
Interior Lighting	Pin-based	100.0%	59	59	4	100.0%	59	59	0%
Exterior Lighting	Screw-in	47.1%	106	50	3	47.1%	106	50	0%
Exterior Lighting	High Intensity/Flood	2.7%	84	2	0	2.7%	84	2	0%
Appliances	Clothes Washer	71.3%	55	39	3	71.3%	61	43	11%
Appliances	Clothes Dryer	68.6%	652	447	30	68.6%	696	477	7%
Appliances	Dishwasher	78.5%	72	56	4	78.5%	75	59	5%
Appliances	Refrigerator	100.0%	677	677	46	100.0%	665	665	-2%
Appliances	Freezer	63.4%	734	466	31	63.4%	703	446	-4%
Appliances	Second Refrigerator	23.4%	687	161	11	23.4%	631	148	-8%
Appliances	Stove	89.7%	196	176	12	89.7%	217	195	11%
Appliances	Microwave	92.6%	109	101	7	92.6%	111	102	1%
Electronics	Personal Computers	101.4%	230	233	16	106.5%	233	248	1%
Electronics	TVs	165.0%	204	337	23	165.0%	216	356	6%
Electronics	Devices and Gadgets	100.0%	30	30	2	105.0%	32	33	5%
Miscellaneous	Pool Pump	5.8%	617	36	2	5.8%	622	36	1%
Miscellaneous	Furnace Fan	25.2%	213	54	4	25.2%	238	60	11%
Miscellaneous	Miscellaneous	100.0%	575	575	39	100.0%	604	604	5%
Total				**9,424**	**636**			**9,434**	

Table A-7 Commercial Sector Market Characterization Results, Washington 2009

Avista Rate Schedule		LoadMAP Segment and Typical Building	Electricity sales (MWh)	Intensity (kWh/sq.ft.)
General Service	011, 012	Small and Medium Commercial — Retail	415,935	17.5
Large General Service	021, 022	Large Commercial — Office	1,556,929	16.7
Extra Large General Service Commercial	025C	Extra Large Commercial — University	265,686	13.9
Extra Large General Service Industrial	025I	Extra Large Industrial	613,615	40.0
Total			**2,852,165**	

Table A-8 Small/Medium Commercial Segment Market Profile, Washington, 2009

		Average Market Profiles				New Units			
End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Usage (GWh)	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Compared to Average
Cooling	Central Chiller	13.8%	2.39	0.33	8	13.8%	2.15	0.30	-10%
Cooling	RTU	63.1%	2.46	1.55	37	63.1%	2.22	1.40	-10%
Cooling	PTAC	3.3%	2.44	0.08	2	3.3%	2.20	0.07	-10%
Combined Heating/Cooling	Heat Pump	3.6%	6.19	0.22	5	3.6%	5.57	0.20	-10%
Space Heating	Electric Resistance	5.9%	6.72	0.39	9	5.9%	6.72	0.39	0%
Space Heating	Furnace	17.7%	7.05	1.25	30	17.7%	6.34	1.13	-10%
Ventilation	Ventilation	76.9%	2.09	1.61	38	76.9%	1.88	1.45	-10%
Interior Lighting	Interior Screw-in	100.0%	1.00	1.00	24	100.0%	0.90	0.90	-10%
Interior Lighting	HID	100.0%	0.68	0.68	16	100.0%	0.61	0.61	-10%
Interior Lighting	Linear Fluorescent	100.0%	3.37	3.37	80	100.0%	3.03	3.03	-10%
Exterior Lighting	Exterior Screw-in	82.6%	0.20	0.16	4	82.6%	0.18	0.15	-10%
Exterior Lighting	HID	82.6%	0.76	0.63	15	82.6%	0.68	0.56	-10%
Exterior Lighting	Linear Fluorescent	82.6%	0.16	0.13	3	82.6%	0.14	0.12	-10%
Water Heating	Water Heater	63.0%	2.00	1.26	30	63.0%	1.90	1.19	-5%
Food Preparation	Fryer	25.8%	0.16	0.04	1	25.8%	0.16	0.04	0%
Food Preparation	Oven	25.8%	0.98	0.25	6	25.8%	0.98	0.25	0%
Food Preparation	Dishwasher	25.8%	0.06	0.01	0	25.8%	0.06	0.01	0%
Food Preparation	Hot Food Container	25.8%	0.31	0.08	2	25.8%	0.31	0.08	0%
Food Preparation	Food Prep	25.8%	0.01	0.00	0	25.8%	0.01	0.00	0%
Refrigeration	Walk in Refrigeration	0.0%	-	-	-	0.0%	-	-	
Refrigeration	Glass Door Display	52.4%	0.45	0.23	6	52.4%	0.40	0.21	-10%
Refrigeration	Solid Door Refrigerator	52.4%	0.50	0.26	6	52.4%	0.45	0.24	-10%
Refrigeration	Open Display Case	52.4%	0.04	0.02	1	52.4%	0.04	0.02	-10%
Refrigeration	Vending Machine	52.4%	0.30	0.16	4	52.4%	0.30	0.16	0%
Refrigeration	Icemaker	52.4%	0.34	0.18	4	52.4%	0.34	0.18	0%
Office Equipment	Desktop Computer	99.9%	0.48	0.48	11	99.9%	0.48	0.48	0%
Office Equipment	Laptop Computer	99.9%	0.06	0.06	1	99.9%	0.06	0.06	0%
Office Equipment	Server	99.9%	0.36	0.36	9	99.9%	0.36	0.36	0%
Office Equipment	Monitor	99.9%	0.25	0.25	6	99.9%	0.25	0.25	0%
Office Equipment	Printer/copier/fax	99.9%	0.24	0.24	6	99.9%	0.24	0.24	0%
Office Equipment	POS Terminal	99.9%	0.27	0.27	7	99.9%	0.27	0.27	0%
Miscellaneous	Non-HVAC Motor	40.2%	1.22	0.49	12	40.2%	1.22	0.49	0%
Miscellaneous	Other Miscellaneous	100.0%	1.43	1.43	34	100.0%	1.43	1.43	0%
Total				**17.50**	**416**			**16.3**	

Table A-9 Large Commercial Segment Market Profile, Washington, 2009

Average Market Profiles						New Units			
End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Usage (GWh)	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Compared to Average
Cooling	Central Chiller	24.7%	2.15	0.53	49	24.7%	1.93	0.48	-10%
Cooling	RTU	37.8%	2.52	0.95	89	37.8%	2.26	0.86	-10%
Cooling	PTAC	3.8%	2.49	0.09	9	3.8%	2.24	0.08	-10%
Combined Heating/Cooling	Heat Pump	9.1%	4.81	0.44	41	9.1%	4.33	0.40	-10%
Space Heating	Electric Resistance	5.9%	3.62	0.21	20	5.9%	3.62	0.21	0%
Space Heating	Furnace	12.7%	4.68	0.60	55	12.7%	4.21	0.54	-10%
Ventilation	Ventilation	75.1%	1.66	1.24	116	75.1%	1.49	1.12	-10%
Interior Lighting	Interior Screw-in	100.0%	0.94	0.94	88	100.0%	0.85	0.85	-10%
Interior Lighting	HID	100.0%	0.71	0.71	66	100.0%	0.64	0.64	-10%
Interior Lighting	Linear Fluorescent	100.0%	3.29	3.29	307	100.0%	2.96	2.96	-10%
Exterior Lighting	Exterior Screw-in	89.6%	0.11	0.10	9	89.6%	0.10	0.09	-10%
Exterior Lighting	HID	89.6%	0.62	0.56	52	89.6%	0.56	0.50	-10%
Exterior Lighting	Linear Fluorescent	89.6%	0.16	0.14	13	89.6%	0.14	0.13	-10%
Water Heating	Water Heater	54.2%	2.31	1.25	117	54.2%	2.20	1.19	-5%
Food Preparation	Fryer	18.4%	0.35	0.06	6	18.4%	0.35	0.06	0%
Food Preparation	Oven	18.4%	1.88	0.35	32	18.4%	1.88	0.35	0%
Food Preparation	Dishwasher	18.4%	0.19	0.03	3	18.4%	0.19	0.03	0%
Food Preparation	Hot Food Container	18.4%	0.27	0.05	5	18.4%	0.27	0.05	0%
Food Preparation	Food Prep	18.4%	0.02	0.00	0	18.4%	0.02	0.00	0%
Refrigeration	Walk in Refrigeration	39.1%	0.48	0.19	17	39.1%	0.43	0.17	-10%
Refrigeration	Glass Door Display	39.1%	0.37	0.14	13	39.1%	0.33	0.13	-10%
Refrigeration	Solid Door Refrigerator	39.1%	0.77	0.30	28	39.1%	0.69	0.27	-10%
Refrigeration	Open Display Case	39.1%	0.27	0.10	10	39.1%	0.24	0.09	-10%
Refrigeration	Vending Machine	39.1%	0.36	0.14	13	39.1%	0.36	0.14	0%
Refrigeration	Icemaker	39.1%	0.66	0.26	24	39.1%	0.66	0.26	0%
Office Equipment	Desktop Computer	98.4%	0.90	0.88	82	98.4%	0.90	0.88	0%
Office Equipment	Laptop Computer	98.4%	0.07	0.07	6	98.4%	0.07	0.07	0%
Office Equipment	Server	98.4%	0.42	0.41	38	98.4%	0.42	0.41	0%
Office Equipment	Monitor	98.4%	0.21	0.20	19	98.4%	0.21	0.20	0%
Office Equipment	Printer/copier/fax	98.4%	0.21	0.21	19	98.4%	0.21	0.21	0%
Office Equipment	POS Terminal	98.4%	0.07	0.07	6	98.4%	0.07	0.07	0%
Miscellaneous	Non-HVAC Motor	57.7%	1.40	0.81	75	57.7%	1.40	0.81	0%
Miscellaneous	Other Miscellaneous	100.0%	1.36	1.36	127	100.0%	1.36	1.36	0%
Total				**16.70**	**1,557**			**15.6**	

Table A-10 Extra Large Commercial Segment Market Profile, Washington, 2009

		Average Market Profiles				New Units			
End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Usage (GWh)	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Compared to Average
Cooling	Central Chiller	52.2%	2.13	1.11	21	52.2%	1.92	1.00	-10%
Cooling	RTU	24.7%	2.22	0.55	10	24.7%	2.00	0.49	-10%
Cooling	PTAC	0.0%	2.22	-	-	0.0%	2.00	-	-10%
Combined Heating/Cooling	Heat Pump	4.4%	5.23	0.23	4	4.4%	4.70	0.21	-10%
Space Heating	Electric Resistance	15.8%	4.39	0.69	13	15.8%	4.39	0.69	0%
Space Heating	Furnace	5.6%	5.67	0.32	6	5.6%	5.11	0.29	-10%
Ventilation	Ventilation	90.2%	1.94	1.75	33	90.2%	1.74	1.57	-10%
Interior Lighting	Interior Screw-in	100.0%	1.37	1.37	26	100.0%	1.23	1.23	-10%
Interior Lighting	HID	100.0%	0.29	0.29	6	100.0%	0.26	0.26	-10%
Interior Lighting	Linear Fluorescent	100.0%	2.19	2.19	42	100.0%	1.97	1.97	-10%
Exterior Lighting	Exterior Screw-in	96.3%	0.03	0.03	1	96.3%	0.03	0.03	-10%
Exterior Lighting	HID	96.3%	0.88	0.85	16	96.3%	0.79	0.76	-10%
Exterior Lighting	Linear Fluorescent	96.3%	0.04	0.03	1	96.3%	0.03	0.03	-10%
Water Heating	Water Heater	26.3%	3.72	0.98	19	26.3%	3.53	0.93	-5%
Food Preparation	Fryer	13.8%	0.13	0.02	0	13.8%	0.13	0.02	0%
Food Preparation	Oven	13.8%	2.12	0.29	6	13.8%	2.12	0.29	0%
Food Preparation	Dishwasher	13.8%	0.08	0.01	0	13.8%	0.08	0.01	0%
Food Preparation	Hot Food Container	13.8%	0.13	0.02	0	13.8%	0.13	0.02	0%
Food Preparation	Food Prep	13.8%	0.01	0.00	0	13.8%	0.01	0.00	0%
Refrigeration	Walk in Refrigeration	26.6%	0.19	0.05	1	26.6%	0.17	0.04	-10%
Refrigeration	Glass Door Display	26.6%	0.11	0.03	1	26.6%	0.10	0.03	-10%
Refrigeration	Solid Door Refrigerator	26.6%	0.71	0.19	4	26.6%	0.64	0.17	-10%
Refrigeration	Open Display Case	26.6%	0.50	0.13	3	26.6%	0.45	0.12	-10%
Refrigeration	Vending Machine	26.6%	0.38	0.10	2	26.6%	0.38	0.10	0%
Refrigeration	Icemaker	26.6%	0.31	0.08	2	26.6%	0.31	0.08	0%
Office Equipment	Desktop Computer	100.0%	0.64	0.64	12	100.0%	0.64	0.64	0%
Office Equipment	Laptop Computer	100.0%	0.07	0.07	1	100.0%	0.07	0.07	0%
Office Equipment	Server	100.0%	0.17	0.17	3	100.0%	0.17	0.17	0%
Office Equipment	Monitor	100.0%	0.13	0.13	2	100.0%	0.13	0.13	0%
Office Equipment	Printer/copier/fax	100.0%	0.05	0.05	1	100.0%	0.05	0.05	0%
Office Equipment	POS Terminal	100.0%	0.01	0.01	0	100.0%	0.01	0.01	0%
Miscellaneous	Non-HVAC Motor	88.8%	0.82	0.73	14	88.8%	0.82	0.73	0%
Miscellaneous	Other Miscellaneous	100.0%	0.80	0.80	15	100.0%	0.80	0.80	0%
Total				**13.90**	**266**			**12.9**	

Table A-11 Extra Large Industrial Segment Market Profile, Washington, 2009

Average Market Profiles						New Units			
End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Usage (GWh)	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Compared to Average
Cooling	Central Chiller	14.4%	7.98	1.15	18	14.4%	7.18	1.04	-10%
Cooling	RTU	17.1%	6.32	1.08	17	17.1%	5.68	0.97	-10%
Cooling	PTAC	1.1%	5.50	0.06	1	1.1%	4.95	0.05	-10%
Combined Heating/Cooling	Heat Pump	1.6%	11.13	0.18	3	1.6%	10.01	0.16	-10%
Space Heating	Electric Resistance	10.8%	8.67	0.93	14	10.8%	8.67	0.93	0%
Space Heating	Furnace	2.0%	9.10	0.18	3	2.0%	8.19	0.17	-10%
Ventilation	Ventilation	27.4%	12.31	3.37	52	27.4%	11.08	3.04	-10%
Interior Lighting	Interior Screw-in	100.0%	0.33	0.33	5	100.0%	0.30	0.30	-10%
Interior Lighting	HID	100.0%	1.05	1.05	16	100.0%	0.94	0.94	-10%
Interior Lighting	Linear Fluorescent	100.0%	1.10	1.10	17	100.0%	0.99	0.99	-10%
Exterior Lighting	Exterior Screw-in	92.5%	0.02	0.02	0	92.5%	0.02	0.02	-10%
Exterior Lighting	HID	92.5%	0.25	0.23	4	92.5%	0.23	0.21	-10%
Exterior Lighting	Linear Fluorescent	92.5%	0.01	0.01	0	92.5%	0.01	0.01	-10%
Process	Process Cooling/Refrigeration	2.4%	99.67	2.40	37	2.4%	99.67	2.40	0%
Process	Process Heating	26.2%	13.74	3.60	55	26.2%	13.74	3.60	0%
Process	Electrochemical Process	2.6%	77.43	2.00	31	2.6%	77.43	2.00	0%
Machine Drive	Less than 5 HP	90.5%	0.92	0.84	13	90.5%	0.92	0.84	0%
Machine Drive	5-24 HP	80.1%	2.26	1.81	28	80.1%	2.26	1.81	0%
Machine Drive	25-99 HP	72.4%	6.10	4.42	68	72.4%	6.10	4.42	0%
Machine Drive	100-249 HP	65.3%	3.84	2.51	38	65.3%	3.84	2.51	0%
Machine Drive	250-499 HP	23.7%	11.61	2.75	42	23.7%	11.61	2.75	0%
Machine Drive	500 and more HP	26.1%	19.50	5.08	78	26.1%	19.50	5.08	0%
Miscellaneous	Miscellaneous	100.0%	4.90	4.90	75	100.0%	4.90	4.90	0%
	Total			**40.00**	**614**			**39.1**	

Figure A–1 Residential Baseline Forecast by End Use, Washington

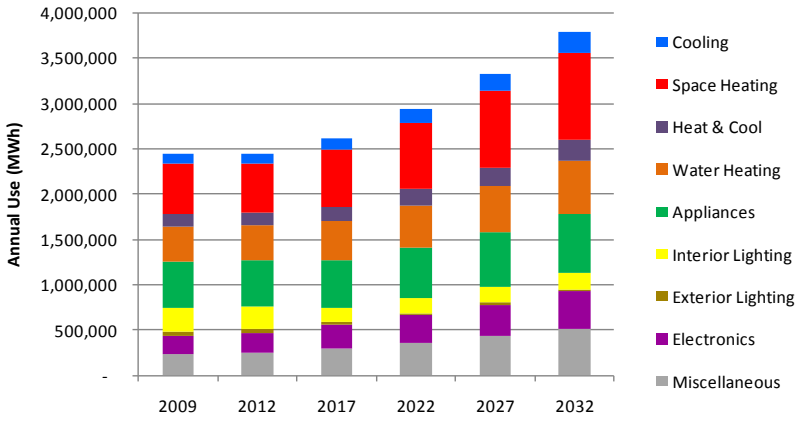

Figure A-2 C&I Baseline Electricity Forecast by End Use, Washington

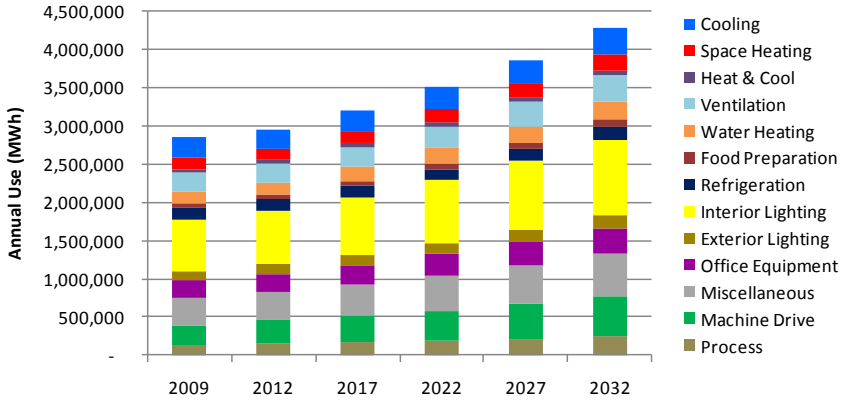

Table A-12 Baseline Forecast Summary by Sector, Washington

End Use	2009	2012	2017	2022	2027	2032	% Change ('09–'32)	Avg. Growth Rate ('09–'32)
Res. WA	2,451,707	2,448,104	2,617,630	2,947,427	3,329,882	3,792,486	54.7%	1.9%
C&I WA	2,852,165	2,955,156	3,209,083	3,509,816	3,869,176	4,280,649	50.1%	1.8%
Total	5,303,872	5,403,260	5,826,712	6,457,243	7,199,059	8,073,136	52.2%	1.8%

Figure A-3 Baseline Forecast Summary by Sector, Washington

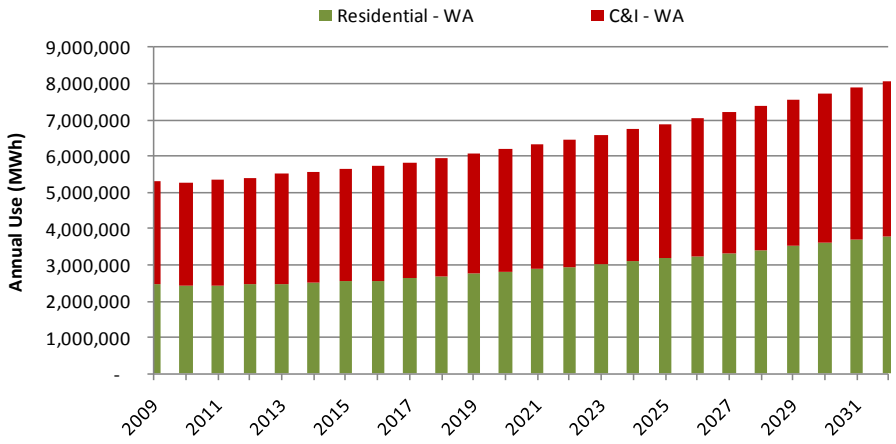

Figure A-4 Summary of Energy Efficiency Potential Savings, Washington, All Sectors

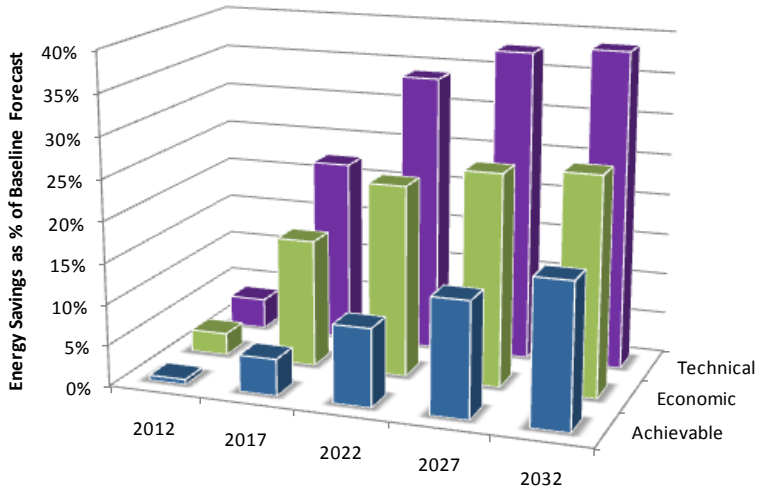

Figure A-5 Energy Efficiency Potential Forecasts, Washington, All Sectors

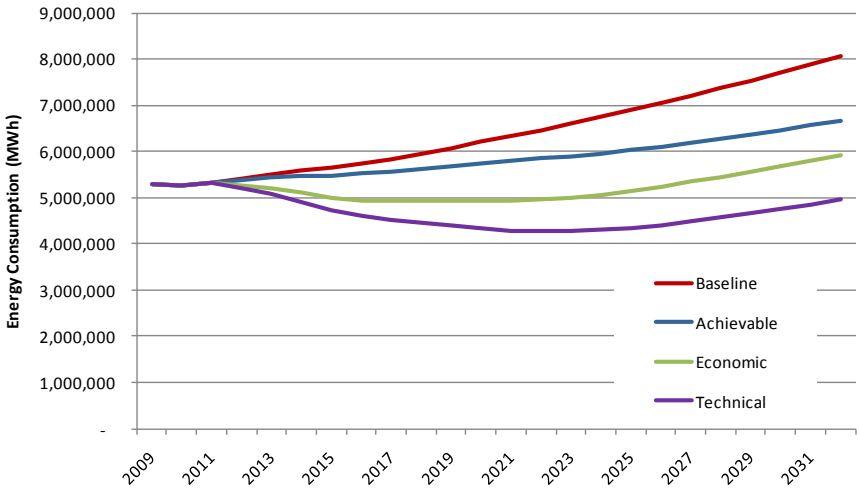

Table A-13 Summary of Energy Efficiency Potential, Washington, All Sectors

	2012	2017	2022	2027	2032
Baseline Forecast (MWh)	5,403,260	5,826,712	6,457,243	7,199,059	8,073,136
Baseline Peak Demand(MW)	1,170	1,236	1,374	1,531	1,713
Cumulative Energy Savings (MWh)					
Achievable	32,799	259,726	612,415	1,008,982	1,412,064
Economic	145,648	904,705	1,504,707	1,856,367	2,144,378
Technical	200,151	1,304,133	2,191,746	2,721,958	3,119,398
Cumulative Energy Savings (% of Baseline)					
Achievable	0.6%	4.5%	9.5%	14.0%	17.5%
Economic	2.7%	15.5%	23.3%	25.8%	26.6%
Technical	3.7%	22.4%	33.9%	37.8%	38.6%
Peak Savings (MW)					
Achievable	10	54	124	212	298
Economic	37	186	320	395	447
Technical	49	272	457	566	645
Peak Savings (% of Baseline)					
Achievable	0.8%	4.4%	9.1%	13.9%	17.4%
Economic	3.2%	15.0%	23.3%	25.8%	26.1%
Technical	4.2%	22.0%	33.3%	37.0%	37.7%

Table A-14 Achievable Cumulative EE Potential by Sector, Washington (MWh)

Segment	2012	2017	2022	2027	2032
Residential, WA	17,067	86,316	234,163	433,646	637,443
C&I, WA	15,732	173,410	378,252	575,336	774,620
Total	**32,799**	**259,726**	**612,415**	**1,008,982**	**1,412,064**

Figure A-6 Achievable Cumulative Potential by Sector, Washington

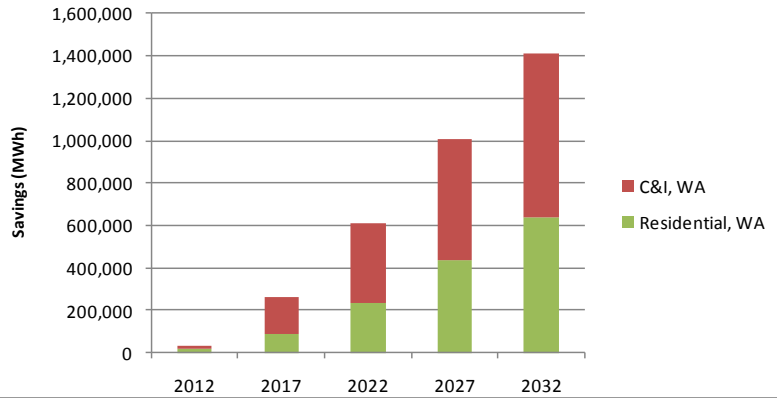

Figure A-7 Residential Energy Efficiency Potential Savings, Washington

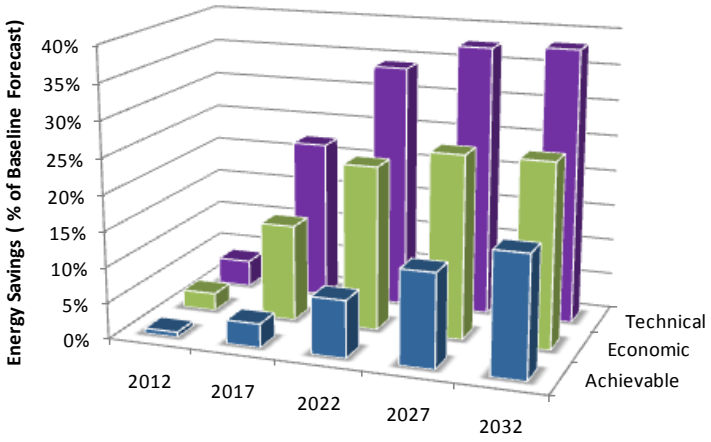

Figure A-8 Residential Energy Efficiency Potential Forecast, Washington

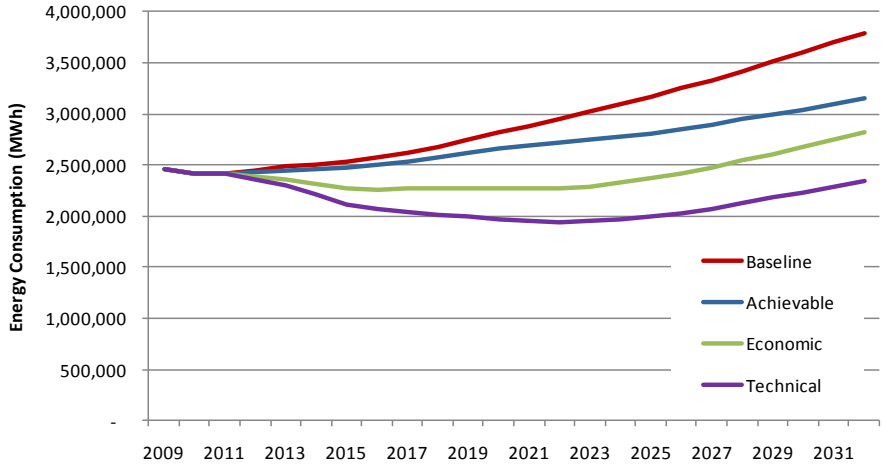

Table A-15 Energy Efficiency Potential for the Residential Sector, Washington

	2012	2017	2022	2027	2032
Baseline Forecast (MWh)	2,448,104	2,617,630	2,947,427	3,329,882	3,792,486
Baseline Peak Demand (MW)	710	736	825	925	1,041
Cumulative Energy Savings (MWh)					
Achievable	17,067	86,316	234,163	433,646	637,443
Economic	59,665	352,264	674,489	850,155	971,365
Technical	91,113	582,799	1,005,455	1,254,299	1,447,635
Cumulative Energy Savings (% of Baseline)					
Achievable	0.7%	3.3%	7.9%	13.0%	16.8%
Economic	2.4%	13.5%	22.9%	25.5%	25.6%
Technical	3.7%	22.3%	34.1%	37.7%	38.2%
Peak Savings (MW)					
Achievable	7	29	72	133	193
Economic	24	106	206	258	290
Technical	33	170	298	369	422
Peak Savings (% of Baseline)					
Achievable	1.0%	3.9%	8.7%	14.4%	18.5%
Economic	3.3%	14.4%	24.9%	27.9%	27.8%
Technical	4.6%	23.1%	36.1%	39.9%	40.5%

Table A-16 Residential Baseline & Achievable Potential by Segment, Washington

	2012	2017	2022	2027	2032
Baseline Forecast (MWh)					
Single Family	1,585,536	1,691,161	1,906,692	2,156,609	2,459,834
Multi Family	160,305	175,186	199,898	227,929	260,943
Mobile Home	68,448	72,476	81,311	91,591	104,051
Limited Income	633,816	678,807	759,527	853,753	967,658
Total	2,448,104	2,617,630	2,947,427	3,329,882	3,792,486
Energy Savings, Achievable Potential (MWh)					
Single Family	12,111	57,948	160,161	292,914	426,927
Multi Family	830	4,393	12,052	24,472	36,922
Mobile Home	520	2,271	4,142	7,644	11,789
Limited Income	3,607	21,704	57,808	108,616	161,805
Total	17,067	86,316	234,163	433,646	637,443
% of Total Residential Energy Savings					
Single Family	71.0%	67.1%	68.4%	67.5%	67.0%
Multi Family	4.9%	5.1%	5.1%	5.6%	5.8%
Mobile Home	3.0%	2.6%	1.8%	1.8%	1.8%
Limited Income	21.1%	25.1%	24.7%	25.0%	25.4%

Table A-17 Residential Potential by Housing Type, 2022, Washington

Forecast	Single Family	Multi Family	Mobile Home	Limited Income	Total
Baseline Forecast (MWh)	1,906,692	199,898	81,311	759,527	2,947,427
Cumulative Energy Savings (MWh)					
Achievable	160,161	12,052	4,142	57,808	234,163
Economic Potential	451,417	39,208	11,573	172,291	674,489
Technical Potential	639,003	61,512	28,913	276,028	1,005,455
Energy Savings % of Baseline					
Achievable	8.4%	6.0%	5.1%	7.6%	7.9%
Economic Potential	23.7%	19.6%	14.2%	22.7%	22.9%
Technical Potential	33.5%	30.8%	35.6%	36.3%	34.1%

Table A-18 Residential Cumulative Savings by End Use and Potential Type, Washington (MWh)

End Use	Case	2012	2017	2022	2027	2032
Cooling	Achievable	9	1,659	5,876	15,615	29,687
	Economic	246	15,452	28,210	40,243	54,276
	Technical	2,766	42,662	68,576	97,845	132,886
Space Heating	Achievable	45	8,226	52,942	132,604	215,180
	Economic	1,304	84,737	201,242	282,651	338,231
	Technical	2,808	120,495	273,139	368,817	453,993
Heat/Cool	Achievable	9	595	1,581	4,130	10,179
	Economic	311	8,778	10,272	12,770	18,457
	Technical	2,278	18,977	32,657	45,591	52,056
Water Heating	Achievable	294	14,753	78,166	155,934	240,383
	Economic	3,663	74,876	226,264	299,791	349,077
	Technical	18,508	176,386	366,992	464,326	517,821
Appliances	Achievable	848	8,195	17,794	28,160	39,054
	Economic	3,663	40,418	53,006	56,444	60,723
	Technical	4,768	51,790	69,442	75,057	79,777
Interior Lighting	Achievable	12,389	34,835	44,682	52,336	47,795
	Economic	36,945	71,839	81,146	74,030	56,992
	Technical	43,188	98,598	97,421	91,087	84,570
Exterior Lighting	Achievable	2,156	6,922	7,102	6,615	5,305
	Economic	6,420	14,434	11,588	8,760	6,252
	Technical	7,353	18,822	16,360	14,884	14,685
Electronics	Achievable	1,173	8,913	21,007	29,939	37,810
	Economic	5,909	30,195	44,462	50,005	57,525
	Technical	8,171	43,205	61,954	70,337	81,054
Miscellaneous	Achievable	145	2,218	5,012	8,312	12,051
	Economic	1,205	11,535	18,300	25,461	29,833
	Technical	1,273	11,864	18,916	26,354	30,793
Total	Achievable	17,067	86,316	234,163	433,646	637,443
	Economic	59,665	352,264	674,489	850,155	971,365
	Technical	91,113	582,799	1,005,455	1,254,299	1,447,635

Figure A–9 Residential Achievable Potential by End Use, Selected Years, Washington

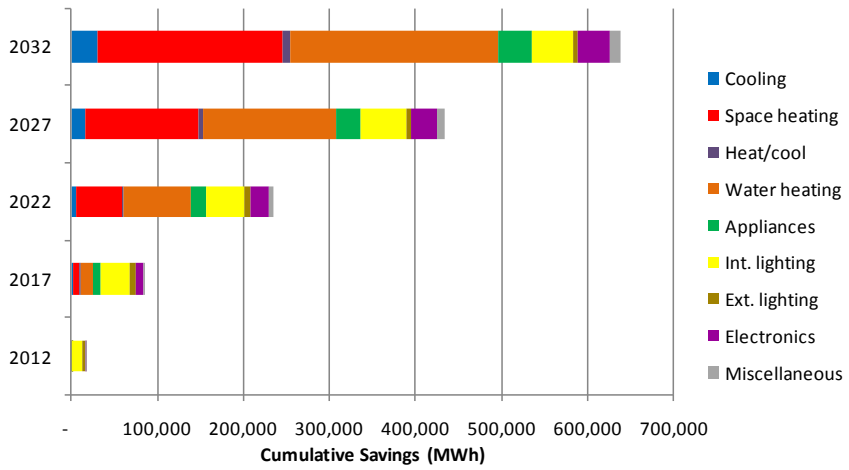

Table A-19 Residential Potential by End Use and Market Segment, 2022, WA (MWh)

	Single Family	Multi Family	Mobile Home	Limited Income	Total
Cooling	3,239	206	70	2,360	5,876
Space heating	39,972	3,183	506	9,282	52,942
Heat/cool	1,464	10	49	58	1,581
Water heating	44,891	5,657	754	26,864	78,166
Appliances	12,433	426	499	4,436	17,794
Interior lighting	31,573	1,880	1,155	10,074	44,682
Exterior lighting	5,854	99	252	896	7,102
Electronics	16,296	587	685	3,438	21,007
Miscellaneous	4,438	5	171	399	5,012
Total	**160,161**	**12,052**	**4,142**	**57,808**	**234,163**

Table A-20 Residential Cumulative Achievable Potential by End Use and Equipment Measures, Washington, Selected Years (MWh)

End Use	Technology	2012	2017	2022	2027	2032
Cooling	Central AC	-	100	112	170	190
Heat/Cool	Air Source Ht. Pump	-	-	-	-	2,863
Water Heating	Water Heater	97	726	760	695	14,069
Appliances	Clothes Washer	54	661	1,664	2,650	3,432
	Clothes Dryer	68	468	858	1,163	1,410
	Dishwasher	75	701	1,709	2,621	3,472
	Refrigerator	293	1,347	2,798	4,266	5,893
	Freezer	220	1,091	2,371	3,039	3,823
	Second Refrigerator	101	490	949	1,474	1,848
	Stove	14	109	245	494	730
Interior Lighting	Screw-in	11,536	28,508	34,316	35,837	24,096
	Linear Fluorescent	117	1,267	2,373	3,569	5,104
	Pin-based	735	4,932	7,438	11,391	15,620
Exterior Lighting	Screw-in	2,139	6,837	6,987	6,456	5,124
	High Intensity/Flood	17	85	115	159	182
Electronics	Personal Computers	758	6,128	10,557	15,516	21,323
	TVs	407	2,139	3,960	4,802	6,568
Miscellaneous	Pool Pump	110	1,022	2,525	4,613	6,855
	Furnace Fan	29	358	1,066	2,182	3,657
Total		16,770	56,971	80,803	101,096	126,255

Table A-21 Residential Achievable Savings for Non-equipment Measures, Washington (MWh)

Measure	2012	2017	2022	2027	2032
Water Heater - Convert to Gas	36	3,966	55,623	117,942	172,631
Furnace - Convert to Gas	1	1,487	30,784	75,608	121,975
Advanced New Construction Designs	1	119	2,781	10,924	22,914
Repair and Sealing - Ducting	13	1,860	5,347	13,639	21,247
Insulation - Infiltration Control	14	1,927	5,432	13,734	21,241
Water Heater - Thermostat Setback	98	5,644	9,489	14,058	18,963
Home Energy Management System	5	798	2,822	7,459	14,451
Water Heater - Hot Water Saver	4	296	3,785	8,669	13,547
Freezer - Remove Second Unit	15	2,142	4,592	8,084	11,994
Thermostat - Clock/Programmable	15	2,060	5,686	9,419	10,195
Electronics - Reduce Standby Wattage	8	646	6,490	9,621	9,920
Insulation - Foundation	1	298	1,351	4,311	8,221
Air Source Heat Pump - Maintenance	9	595	1,581	4,130	7,316
Refrigerator - Remove Second Unit	8	1,185	2,608	4,370	6,453
Water Heater - Faucet Aerators	9	685	1,639	3,578	5,940
Insulation - Ducting	1	146	836	3,522	5,835
Insulation - Wall Cavity	0	190	865	2,770	5,305
Water Heater - Tank Blanket/Insulation	34	1,803	2,812	3,906	5,112
Room AC - Removal of Second Unit	4	638	1,582	2,738	4,070
Ceiling Fan - Installation	0	63	576	2,262	4,070
Water Heater - Timer	8	934	1,676	2,512	3,714
Insulation - Ceiling	2	285	862	2,163	3,527
Water Heater - Low Flow Showerheads	6	617	1,233	1,833	2,515
Water Heater - Heat Pump	-	11	458	1,611	2,495
Central AC - Maintenance and Tune-Up	-	-	-	-	1,879
Insulation - Wall Sheathing	0	36	172	570	1,803
Pool - Pump Timer	5	838	1,421	1,517	1,539
Water Heater - Pipe Insulation	1	72	692	1,131	1,398
Whole-House Fan - Installation	-	6	166	470	918
Total	**297**	**29,345**	**153,359**	**322,550**	**511,188**

Figure A-10 Energy Efficiency Potential Savings, C&I Sector, Washington

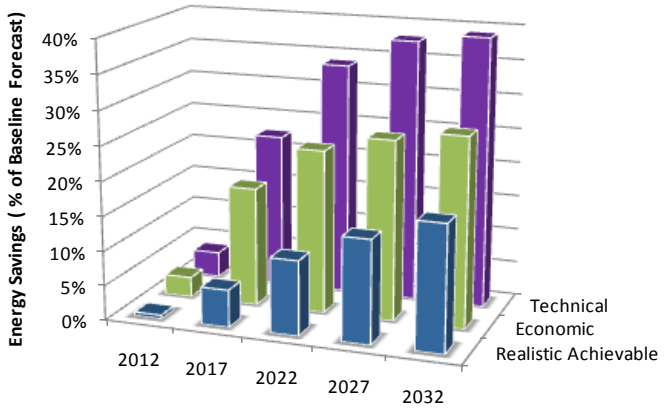

Figure A-11 Energy Efficiency Potential Forecast, C&I Sector, Washington

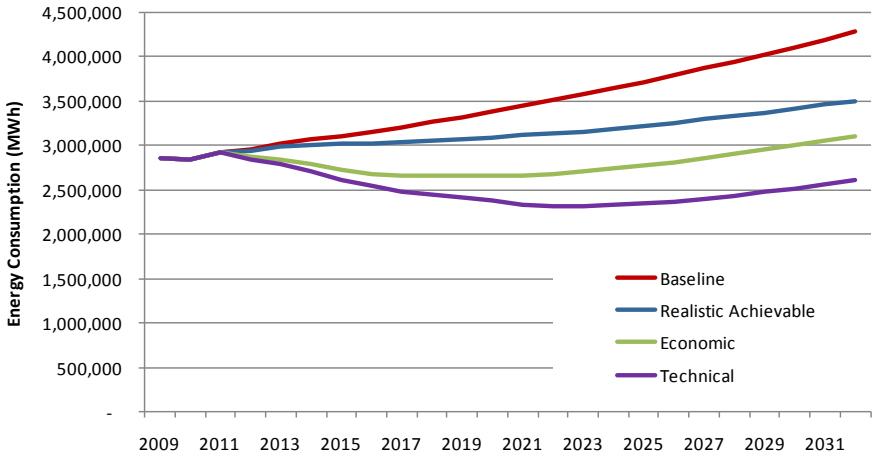

Table A-22 Energy Efficiency Potential, C&I Sector, Washington

	2012	2017	2022	2027	2032
Baseline Forecast (MWh)	2,955,156	3,209,083	3,509,816	3,869,176	4,280,649
Baseline Peak Demand(MW)	460	500	549	607	671
Cumulative Energy Savings (MWh)					
Achievable	15,732	173,410	378,252	575,336	774,620
Economic	85,983	552,442	830,218	1,006,213	1,173,013
Technical	109,038	721,334	1,186,290	1,467,659	1,671,763
Cumulative Energy Savings (% of Baseline)					
Achievable	0.5%	5.4%	10.8%	14.9%	18.1%
Economic	2.9%	17.2%	23.7%	26.0%	27.4%
Technical	3.7%	22.5%	33.8%	37.9%	39.1%
Peak Savings (MW)					
Achievable	2	25	52	79	105
Economic	13	80	114	137	157
Technical	16	102	159	197	223
Peak Savings (% of Baseline)					
Achievable	0.5%	5.4%	10.8%	14.9%	18.1%
Economic	2.9%	17.2%	23.7%	26.0%	27.4%
Technical	3.7%	22.5%	33.8%	37.9%	39.1%

Table A-23 C&I Sector, Baseline and Achievable Potential by Segment, Washington

	2012	2017	2022	2027	2032
Baseline Forecast (MWh)					
Small/Med. Commercial	413,131	436,628	470,488	512,594	560,964
Large Commercial	1,558,848	1,641,938	1,770,523	1,927,937	2,109,236
Extra Large Commercial	275,848	338,184	367,338	399,653	434,542
Extra Large Industrial	707,328	792,332	901,468	1,028,993	1,175,907
Total	2,955,156	3,209,083	3,509,816	3,869,176	4,280,649
Cumulative Energy Savings, Achievable Potential (MWh)					
Small/Med. Commercial	2,550	25,544	52,366	79,365	108,892
Large Commercial	10,092	112,528	231,487	335,497	435,628
Extra Large Commercial	2,607	27,021	56,555	85,997	112,469
Extra Large Industrial	483	8,317	37,844	74,477	117,630
Total	15,732	173,410	378,252	575,336	774,620
% of Total C&I Cumulative Energy Savings					
Small/Med. Commercial	16.2%	14.7%	13.8%	13.8%	14.1%
Large Commercial	64.2%	64.9%	61.2%	58.3%	56.2%
Extra Large Commercial	16.6%	15.6%	15.0%	14.9%	14.5%
Extra Large Industrial	3.1%	4.8%	10.0%	12.9%	15.2%

Table A-24 C&I Potential by Segment, Washington, 2022

Forecast	Small/Med. Commercial	Large Commercial	Extra Large Commercial	Extra Large Industrial	Total
Baseline Forecast (MWh)	470,488	1,770,523	367,338	901,468	3,509,816
Cumulative Energy Savings (MWh)					
Achievable	52,366	231,487	56,555	37,844	378,252
Economic Potential	106,676	441,853	118,311	163,378	830,218
Technical Potential	172,714	650,066	148,095	215,416	1,186,290
Cumulative Energy Savings % of Baseline					
Achievable	11%	13%	15%	4%	11%
Economic Potential	23%	25%	32%	18%	24%
Technical Potential	37%	37%	40%	24%	34%

Table A-25 C&I Cumulative Savings by End Use and Potential Type, Washington (MWh)

End Use	Case	2012	2017	2022	2027	2032
Cooling	Achievable	127	8,672	29,166	48,498	72,425
	Economic	1,709	30,259	62,983	86,699	116,136
	Technical	4,457	60,126	124,114	157,093	189,090
Space Heating	Achievable	9	1,404	7,180	14,053	23,626
	Economic	179	7,402	19,650	28,850	42,277
	Technical	323	11,406	32,534	45,047	60,188
Heat/Cool	Achievable	31	2,494	4,572	5,575	6,982
	Economic	357	5,927	7,558	8,984	10,138
	Technical	483	6,778	9,118	11,073	12,505
Ventilation	Achievable	246	4,256	20,112	40,397	69,089
	Economic	4,017	29,775	75,187	107,501	130,189
	Technical	6,107	47,417	127,261	172,058	190,303
Water Heating		181	4,769	10,742	16,921	23,513
		1,709	15,526	22,956	29,467	31,482
		8,344	62,178	116,091	166,607	183,197
Food Preparation	Achievable	140	1,796	5,159	9,950	14,898
	Economic	1,863	11,976	21,990	26,511	28,922
	Technical	2,173	13,179	24,316	29,162	31,947
Refrigeration	Achievable	123	1,246	4,138	7,959	11,717
	Economic	1,843	8,978	17,215	22,233	24,920
	Technical	2,183	11,986	26,785	34,794	39,418
Interior Lighting	Achievable	11,768	111,221	218,748	316,260	394,891
	Economic	50,511	299,598	396,845	456,682	523,557
	Technical	55,416	327,215	442,057	510,066	581,362
Exterior Lighting	Achievable	1,108	15,661	30,450	38,068	45,433
	Economic	4,693	44,035	50,942	53,236	56,711
	Technical	5,191	48,166	57,089	64,537	72,708
Office Equipment	Achievable	1,779	18,258	30,020	39,448	49,199
	Economic	12,800	58,446	61,458	64,159	66,791
	Technical	17,214	80,539	85,590	90,712	96,009
Machine Drive	Achievable	199	2,492	8,718	15,739	23,806
	Economic	2,252	17,069	40,392	50,946	58,527
	Technical	2,653	26,498	84,466	111,180	128,005
Process	Achievable	17	999	8,473	20,545	35,763
	Economic	3,980	22,472	50,483	66,505	77,283
	Technical	3,980	22,472	50,483	66,505	77,283
Miscellaneous	Achievable	5	142	775	1,924	3,280
	Economic	70	977	2,561	4,439	6,080
	Technical	514	3,373	6,388	8,826	9,749
Total	Achievable	15,732	173,410	378,252	575,336	774,620
	Economic	85,983	552,442	830,218	1,006,213	1,173,013
	Technical	109,038	721,334	1,186,290	1,467,659	1,671,763

Figure A-12 C&I Achievable Potential by End Use, Selected Years, Washington

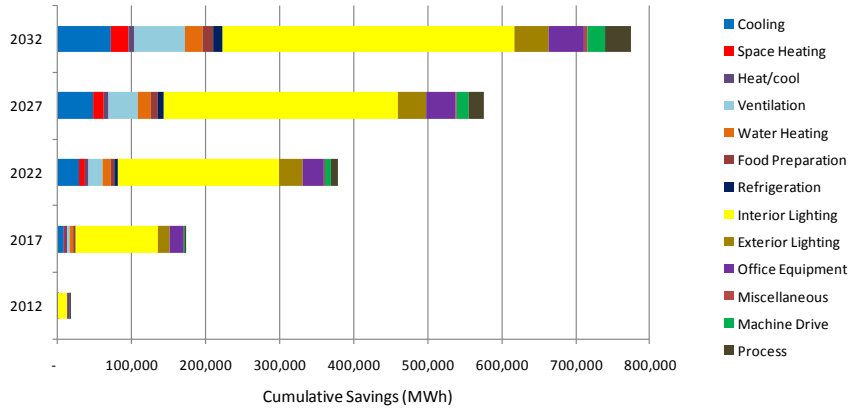

Table A-26 C&I Achievable Potential by End Use and Market Segment, 2022, Washington (MWh)

	Small/Med. Commercial	Large Commercial	Extra Large Commercial	Extra Large Industrial	Total
Cooling	1,017	17,942	4,119	6,087	29,166
Space Heating	440	4,617	1,216	906	7,180
Combined Heating/Cooling	323	3,597	464	188	4,572
Ventilation	4,268	3,818	4,496	7,530	20,112
Water Heating	1,238	3,974	5,530	-	10,742
Food Preparation	700	3,815	644	-	5,159
Refrigeration	741	3,001	396	-	4,138
Interior Lighting	33,054	149,244	30,943	5,507	218,748
Exterior Lighting	5,854	18,916	5,246	434	30,450
Office Equipment	4,529	22,130	3,362	-	30,020
Machine Drive	-	-	-	8,718	8,718
Process	-	-	-	8,473	8,473
Miscellaneous	202	432	141	-	775
Total	**52,366**	**231,487**	**56,555**	**37,844**	**378,252**

Table A-27 C&I Cumulative Achievable Potential by End Use and Equipment Measures, Washington (MWh)

End Use	Technology	2012	2017	2022	2027	2032
Cooling	Central Chiller	53	551	2,062	4,730	7,997
	PTAC	4	4	4	1	0
Heat/Cool	Heat Pump	14	263	795	1,452	2,620
Ventilation	Ventilation	235	3,625	13,529	27,643	49,190
Water Heater	Water Heater	160	1,908	4,354	9,658	15,943
Food Preparation	Fryer	9	101	271	512	781
	Hot Food Container	5	172	488	945	1,454
	Oven	127	1,495	3,996	7,698	11,844
Refrigeration	Glass Door Display	21	279	808	1,618	2,717
	Icemaker	16	216	644	1,152	1,762
	Solid Door	29	332	893	1,685	2,656
	Vending Machine	55	303	740	1,344	1,989
	Walk in Refrigeration	21	279	808	1,618	2,717
Interior Lighting	Interior Screw-in	6,957	45,558	69,399	93,196	104,333
	HID	1,823	16,436	32,323	45,261	55,536
	Linear Fluorescent	2,869	35,193	69,229	100,749	123,637
Exterior Lighting	Screw-in	154	2,018	3,288	2,649	1,418
	HID	864	10,866	21,367	27,244	33,516
	Linear Fluorescent	82	1,472	2,497	3,252	4,101
Office Equipment	Desktop Computer	1,056	9,794	15,665	20,547	25,361
	Laptop Computer	75	700	1,119	1,423	1,675
	Monitor	211	757	1,307	1,768	2,200
	POS Terminal	23	318	580	829	1,112
	Printer/copier/fax	66	1,061	1,963	2,671	3,349
	Server	342	4,823	7,781	10,506	13,767
Machine Drive	Less than 5 HP	13	92	280	489	779
	5-24 HP	28	208	649	1,142	1,820
	25-99 HP	69	518	1,616	2,843	4,533
	100-249 HP	19	146	455	800	1,276
	250-499 HP	21	155	484	851	1,357
	500 and more HP	39	292	913	1,605	2,559
Process	Electrochem. Process	2	138	1,150	2,790	4,892
	Process Cooling/Refrig.	3	185	1,538	3,730	6,541
	Process Heating	11	658	5,482	13,292	23,307
Miscellaneous	Non-HVAC Motor	4	70	339	1,101	2,193
Total		**15,460**	**140,725**	**268,060**	**397,272**	**518,389**

Table A-28 C&I Cumulative Achievable Savings for Non-equipment Measures, Washington (MWh)

Measure	2012	2017	2022	2027	2032
Energy Management System	25	1,553	16,501	29,372	41,039
Advanced New Construction Designs	1	70	1,070	8,737	32,610
Retrocommissioning - Lighting	37	7,653	14,120	17,904	21,751
Interior Fluorescent - High Bay Fixtures	13	787	8,430	15,271	20,828
Retrocommissioning - Comprehensive	29	6,096	10,951	13,491	16,068
Custom Measures	2	533	7,173	14,123	15,541
RTU - Maintenance	39	4,686	8,093	9,375	10,142
Fans - Variable Speed Control	5	218	2,179	4,470	8,493
Fans - Energy Efficient Motors	5	304	3,318	6,101	8,283
Interior Lighting - Photocell Controlled T8 Dimming Ballasts	0	39	342	2,201	7,420
Interior Lighting - Occupancy Sensors	13	477	3,666	5,591	6,881
Interior Fluorescent - Delamp and Install Reflectors	12	506	3,807	5,484	6,156
Water Heater - Faucet Aerators/Low Flow Nozzles	18	2,657	5,409	5,756	5,875
Commissioning - Comprehensive	0	245	1,809	3,533	5,686
Retrocommissioning - HVAC	2	258	2,720	4,574	5,556
Heat Pump - Maintenance	17	2,231	3,777	4,123	4,361
Motors - Variable Frequency Drive	7	883	1,911	3,003	4,356
Motors - Magnetic Adjustable Speed Drives	3	146	1,535	2,875	4,133
Roofs - High Reflectivity	1	33	262	1,431	3,996
Chiller - Turbocor Compressor	2	109	1,244	2,337	3,311
Chiller - Condenser Water Temperature Reset	4	222	2,148	2,756	2,769
Chiller - VSD	1	81	859	1,564	2,143
Commissioning - Lighting	0	155	528	1,031	1,736
Thermostat - Clock/Programmable	3	458	904	1,300	1,735
Office Equipment - ENERGY STAR Power Supply	6	806	1,605	1,705	1,735
Exterior Lighting - Daylighting Controls	2	92	747	1,224	1,596
Water Heater - Heat Pump	0	54	659	1,089	1,187
Cooking - Exhaust Hoods with Sensor Control	0	8	71	445	1,032
Cooling - Economizer Installation	2	83	760	964	967
Insulation - Ducting	1	53	443	700	928
Exterior Lighting - Induction Lamps	0	20	290	617	922
Furnace - Convert to Gas	0	22	297	605	873
Chiller - Chilled Water Reset	1	242	437	589	757
Insulation - Wall Cavity	0	10	146	342	567
Insulation - Ceiling	0	1	17	151	566
Refrigeration - System Optimization	0	10	159	385	537
LED Exit Lighting	17	613	670	576	524
Industrial Process Improvements	0	17	205	415	501

Measure	2012	2017	2022	2027	2032
Refrigeration - System Controls	0	7	112	271	378
Commissioning - HVAC	-	-	16	205	339
Water Heater - Tank Blanket/Insulation	2	144	254	277	290
Pumps - Variable Speed Control	0	9	106	202	287
Miscellaneous - ENERGY STAR Water Cooler	0	40	115	191	282
Refrigeration - Strip Curtain	-	1	20	126	218
Refrigeration - Floating Head Pressure	0	6	59	113	213
Water Heater - Hot Water Saver	-	-	2	46	121
Refrigeration - Anti-Sweat Heater/Auto Door Closer	0	4	46	86	119
Refrigeration - System Maintenance	0	2	32	77	108
Water Heater - High Efficiency Circulation Pump	0	6	64	95	97
Vending Machine - Controller	0	26	44	57	74
Chiller - Chilled Water Variable-Flow System	0	4	32	53	66
Exterior Lighting - Cold Cathode Lighting	0	1	16	34	49
Laundry - High Efficiency Clothes Washer	0	6	10	16	17
Refrigeration - Night Covers	0	0	5	10	14
Total	**272**	**32,685**	**110,192**	**178,064**	**256,232**

IDAHO MARKET PROFILES, BASELINE FORECAST, AND POTENTIAL RESULTS

This appendix contains Idaho-specific tables that summarize the study assumptions, inputs, and results for Avista's Idaho service territory only. These tables either repeat Idaho-specific information provided previously within the body of the report, or provide Idaho-specific information that corresponds to Avista system-level information in the report.

Table B–1 Electricity Use and Peak Demand by Rate Class, Idaho 2009

Sector	Rate Schedule(s)	Number of meters (customers)	2009 Electricity sales (MWh)	Peak demand (MW)
Residential	001	99,580	1,182,368	283
General Service	011, 012	19,245	322,570	61
Large General Service	021, 022	1,456	699,953	115
Extra Large General Service	025, 025P	10	266,044	40
Extra Large GS Potlatch	025P	1	892	101
Pumping	031, 032	1,312	58,885	4
Total		**121,604**	**3,422,111**	**603**

Table B–2 Residential Electricity Usage and Intensity by Segment, Idaho 2009

Idaho Segment	Intensity (kWh/Household)	Number of Customers	% of Customers	2009 Electricity Sales (MWh)	% of Sales
Single Family	13,703	59,205	59%	811,302	69%
Multi-Family	8,213	5,237	5%	43,013	4%
Mobile Home	12,320	4,774	5%	58,815	5%
Limited Income	8,868	30,363	31%	269,249	23%
Total	**11,874**	**99,580**	**100%**	**1,182,379**	**100%**

Note: Minor differences with totals in Table B–1 due to calibration.

Table B–3 Single Family Market Profile, 2009, Idaho

End Use	Technology	Average Market Profiles Saturation	UEC (kWh)	Intensity (kWh/HH)	Usage (GWh)	New Units Saturation	UEC (kWh)	Intensity (kWh/HH)	Compared to Average
Cooling	Central AC	36.8%	1,857	684	41	73.4%	2,154	1,581	16%
Cooling	Room AC	10.8%	683	74	4	1.4%	793	11	16%
Combined Heating/Cooling	Air Source Heat Pump	14.7%	6,377	940	56	13.6%	7,398	1,004	16%
Combined Heating/Cooling	Geothermal Heat Pump	0.7%	3,826	27	2	0.8%	4,439	33	16%
Space Heating	Electric Resistance	5.0%	11,494	570	34	2.5%	13,793	342	20%
Space Heating	Electric Furnace	20.0%	9,195	1,837	109	21.0%	11,035	2,315	20%
Space Heating	Supplemental	6.1%	128	8	0	6.1%	154	9	20%
Water Heating	Water Heater	44.4%	3,813	1,694	100	37.8%	4,595	1,736	21%
Interior Lighting	Screw-in	100.0%	1,394	1,394	83	100.0%	1,394	1,394	0%
Interior Lighting	Linear Fluorescent	69.2%	146	101	6	69.2%	146	101	0%
Interior Lighting	Pin-based	100.0%	58	58	3	100.0%	58	58	0%
Exterior Lighting	Screw-in	86.7%	366	317	19	86.7%	366	317	0%
Exterior Lighting	High Intensity/Flood	1.9%	140	3	0	1.9%	140	3	0%
Appliances	Clothes Washer	98.0%	126	124	7	99.8%	154	154	22%
Appliances	Clothes Dryer	92.8%	609	565	33	89.0%	692	616	14%
Appliances	Dishwasher	93.9%	246	231	14	99.9%	271	271	11%
Appliances	Refrigerator	100.0%	793	793	47	100.0%	625	625	-21%
Appliances	Freezer	69.4%	773	536	32	69.4%	708	491	-8%
Appliances	Second Refrigerator	47.3%	816	386	23	20.5%	711	146	-13%
Appliances	Stove	82.1%	383	314	19	82.1%	465	382	22%
Appliances	Microwave	98.5%	168	166	10	98.5%	173	171	3%
Electronics	Personal Computers	140.0%	279	391	23	147.0%	287	422	3%
Electronics	TVs	260.0%	359	933	55	260.0%	400	1,041	12%
Electronics	Devices and Gadgets	100.0%	60	60	4	100.0%	67	67	10%
Miscellaneous	Pool Pump	13.3%	1,500	200	12	14.0%	1,526	214	2%
Miscellaneous	Furnace Fan	30.1%	550	166	10	30.1%	675	203	23%
Miscellaneous	Miscellaneous	100.0%	1,132	1,132	67	100.0%	1,359	1,359	20%
Total				**13,703**	**811**			**15,063**	

Table B–4 Multi-family Market Profile, 2009, Idaho

End Use	Technology	Average Market Profiles Saturation	UEC (kWh)	Intensity (kWh/HH)	Usage (GWh)	New Units Saturation	UEC (kWh)	Intensity (kWh/HH)	Compared to Average
Cooling	Central AC	5.0%	845	42	0	24.1%	912	220	8%
Cooling	Room AC	25.0%	324	81	0	18.9%	350	66	8%
Combined Heating/Cooling	Air Source Heat Pump	1.0%	2,665	27	0	3.4%	2,878	98	8%
Combined Heating/Cooling	Geothermal Heat Pump	0.0%	1,599	-	-	0.5%	1,727	9	8%
Space Heating	Electric Resistance	59.0%	4,983	2,940	15	59.0%	5,481	3,234	10%
Space Heating	Electric Furnace	5.0%	3,986	199	1	5.0%	4,385	219	10%
Space Heating	Supplemental	18.0%	56	10	0	18.9%	61	12	10%
Water Heating	Water Heater	77.0%	1,936	1,491	8	71.3%	2,134	1,522	10%
Interior Lighting	Screw-in	100.0%	750	750	4	100.0%	750	750	0%
Interior Lighting	Linear Fluorescent	32.0%	76	24	0	32.0%	76	24	0%
Interior Lighting	Pin-based	3.0%	75	2	0	3.0%	75	2	0%
Exterior Lighting	Screw-in	38.5%	55	21	0	38.5%	55	21	0%
Exterior Lighting	High Intensity/Flood	0.2%	73	0	0	0.2%	73	0	0%
Appliances	Clothes Washer	32.0%	63	20	0	32.0%	70	22	11%
Appliances	Clothes Dryer	30.7%	582	179	1	30.7%	621	191	7%
Appliances	Dishwasher	64.0%	88	56	0	64.0%	93	59	5%
Appliances	Refrigerator	100.0%	677	677	4	100.0%	665	665	-2%
Appliances	Freezer	8.4%	734	62	0	8.4%	703	59	-4%
Appliances	Second Refrigerator	5.0%	687	34	0	5.0%	631	32	-8%
Appliances	Stove	96.4%	163	158	1	96.4%	181	175	11%
Appliances	Microwave	90.0%	99	89	0	90.0%	101	91	1%
Electronics	Personal Computers	63.0%	223	141	1	66.2%	226	150	1%
Electronics	TVs	165.0%	178	293	2	165.0%	188	310	6%
Electronics	Devices and Gadgets	100.0%	25	25	0	100.0%	26	26	5%
Miscellaneous	Pool Pump	0.0%	-	-	-	0.0%	-	-	0%
Miscellaneous	Furnace Fan	13.0%	38	5	0	13.0%	42	5	11%
Miscellaneous	Miscellaneous	100.0%	888	888	5	100.0%	932	932	5%
Total				**8,213**	**43**			**8,893**	

Table B–5 Mobile Home Market Profile, 2009, Idaho

End Use	Technology	Average Market Profiles Saturation	UEC (kWh)	Intensity (kWh/HH)	Usage (GWh)	New Units Saturation	UEC (kWh)	Intensity (kWh/HH)	Compared to Average
Cooling	Central AC	23.2%	962	223	1	35.9%	1,039	373	8%
Cooling	Room AC	23.2%	354	82	0	22.0%	382	84	8%
Combined Heating/Cooling	Air Source Heat Pump	21.7%	3,035	660	3	22.8%	3,277	748	8%
Combined Heating/Cooling	Geothermal Heat Pump	0.0%	1,821	-	-	0.0%	1,966	-	8%
Space Heating	Electric Resistance	0.0%	5,122	-	-	0.0%	5,634	-	10%
Space Heating	Electric Furnace	68.1%	4,098	2,792	13	68.1%	4,508	3,071	10%
Space Heating	Supplemental	1.4%	30	0	0	1.5%	33	0	10%
Water Heating	Water Heater	96.3%	1,607	1,549	7	91.0%	1,772	1,612	10%
Interior Lighting	Screw-in	100.0%	1,307	1,307	6	100.0%	1,307	1,307	0%
Interior Lighting	Linear Fluorescent	69.2%	137	95	0	69.2%	137	95	0%
Interior Lighting	Pin-based	100.0%	54	54	0	100.0%	54	54	0%
Exterior Lighting	Screw-in	86.7%	343	297	1	86.7%	343	297	0%
Exterior Lighting	High Intensity/Flood	1.9%	131	2	0	1.9%	131	2	0%
Appliances	Clothes Washer	96.3%	128	124	1	96.3%	142	137	11%
Appliances	Clothes Dryer	98.8%	620	612	3	98.8%	662	653	7%
Appliances	Dishwasher	89.0%	250	222	1	89.0%	263	234	5%
Appliances	Refrigerator	100.0%	806	806	4	100.0%	792	792	-2%
Appliances	Freezer	59.3%	786	466	2	59.3%	753	446	-4%
Appliances	Second Refrigerator	19.5%	830	162	1	19.5%	762	149	-8%
Appliances	Stove	93.9%	344	323	2	93.9%	381	358	11%
Appliances	Microwave	82.0%	151	124	1	82.0%	154	126	2%
Electronics	Personal Computers	116.5%	262	305	1	122.3%	265	324	1%
Electronics	TVs	260.0%	359	933	4	260.0%	380	987	6%
Electronics	Devices and Gadgets	100.0%	60	60	0	100.0%	64	64	5%
Miscellaneous	Pool Pump	11.1%	1,500	167	1	11.7%	1,513	177	1%
Miscellaneous	Furnace Fan	8.3%	500	42	0	8.3%	557	47	11%
Miscellaneous	Miscellaneous	100.0%	913	913	4	100.0%	959	959	5%
Total				**12,320**	**59**			**13,096**	

Table B–6 Limited Income Market Profile, 2009, Idaho

End Use	Technology	Average Market Profiles Saturation	UEC (kWh)	Intensity (kWh/HH)	Usage (GWh)	New Units Saturation	UEC (kWh)	Intensity (kWh/HH)	Compared to Average
Cooling	Central AC	22.2%	944	210	6	28.7%	1,019	293	8%
Cooling	Room AC	35.4%	641	227	7	18.0%	692	124	8%
Combined Heating/Cooling	Air Source Heat Pump	10.4%	2,134	222	7	10.4%	2,305	240	8%
Combined Heating/Cooling	Geothermal Heat Pump	0.0%	1,281	-	-	0.5%	1,383	7	8%
Space Heating	Electric Resistance	32.0%	4,647	1,486	45	28.8%	5,112	1,471	10%
Space Heating	Electric Furnace	19.3%	3,711	716	22	21.2%	4,082	867	10%
Space Heating	Supplemental	12.7%	57	7	0	13.4%	62	8	10%
Water Heating	Water Heater	83.9%	2,101	1,762	54	67.0%	2,316	1,552	10%
Interior Lighting	Screw-in	100.0%	728	728	22	100.0%	728	728	0%
Interior Lighting	Linear Fluorescent	69.2%	75	52	2	69.2%	75	52	0%
Interior Lighting	Pin-based	100.0%	59	59	2	100.0%	59	59	0%
Exterior Lighting	Screw-in	47.1%	106	50	2	47.1%	106	50	0%
Exterior Lighting	High Intensity/Flood	2.7%	84	2	0	2.7%	84	2	0%
Appliances	Clothes Washer	71.3%	55	39	1	71.3%	61	43	11%
Appliances	Clothes Dryer	68.6%	652	447	14	68.6%	696	477	7%
Appliances	Dishwasher	78.5%	72	56	2	78.5%	75	59	5%
Appliances	Refrigerator	100.0%	677	677	21	100.0%	665	665	-2%
Appliances	Freezer	63.4%	734	466	14	63.4%	703	446	-4%
Appliances	Second Refrigerator	23.4%	687	161	5	23.4%	631	148	-8%
Appliances	Stove	89.7%	196	176	5	89.7%	217	195	11%
Appliances	Microwave	92.6%	109	101	3	92.6%	111	102	1%
Electronics	Personal Computers	101.4%	230	233	7	106.5%	233	248	1%
Electronics	TVs	165.0%	204	337	10	165.0%	216	356	6%
Electronics	Devices and Gadgets	100.0%	30	30	1	105.0%	32	33	5%
Miscellaneous	Pool Pump	5.8%	617	36	1	5.8%	622	36	1%
Miscellaneous	Furnace Fan	25.2%	213	54	2	25.2%	238	60	11%
Miscellaneous	Miscellaneous	100.0%	534	534	16	100.0%	561	561	5%
Total				**8,868**	**269**			**8,884**	

Table B–7 Commercial Sector Market Characterization Results, Idaho 2009

Avista Rate Schedule		LoadMAP Segment and Typical Building	Electricity sales (MWh)	Intensity (kWh/sq.ft.)
General Service	011, 012	Small and Medium Commercial — Retail	322,570	17.5
Large General Service	021, 022	Large Commercial — Office	699,953	16.7
Extra Large General Service Commercial	025C	Extra Large Commercial — University	70,361	13.9
Extra Large General Service Industrial	025I, 025P	Extra Large Industrial	1,087,974	40.0
Total			**2,180,858**	

Table B–8 Small/Medium Commercial Segment Market Profile, Idaho, 2009

Average Market Profiles						New Units			
End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Usage (GWh)	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Compared to Average
Cooling	Central Chiller	13.8%	2.39	0.33	6	13.8%	2.15	0.30	-10%
Cooling	RTU	63.1%	2.46	1.55	29	63.1%	2.22	1.40	-10%
Cooling	PTAC	3.3%	2.44	0.08	1	3.3%	2.20	0.07	-10%
Combined Heating/Cooling	Heat Pump	3.6%	6.19	0.22	4	3.6%	5.57	0.20	-10%
Space Heating	Electric Resistance	5.9%	6.72	0.39	7	5.9%	6.72	0.39	0%
Space Heating	Furnace	17.7%	7.05	1.25	23	17.7%	6.34	1.13	-10%
Ventilation	Ventilation	76.9%	2.09	1.61	30	76.9%	1.88	1.45	-10%
Interior Lighting	Interior Screw-in	100.0%	1.00	1.00	18	100.0%	0.90	0.90	-10%
Interior Lighting	HID	100.0%	0.68	0.68	13	100.0%	0.61	0.61	-10%
Interior Lighting	Linear Fluorescent	100.0%	3.37	3.37	62	100.0%	3.03	3.03	-10%
Exterior Lighting	Exterior Screw-in	82.6%	0.20	0.16	3	82.6%	0.18	0.15	-10%
Exterior Lighting	HID	82.6%	0.76	0.63	12	82.6%	0.68	0.56	-10%
Exterior Lighting	Linear Fluorescent	82.6%	0.16	0.13	2	82.6%	0.14	0.12	-10%
Water Heating	Water Heater	63.0%	2.00	1.26	23	63.0%	1.90	1.19	-5%
Food Preparation	Fryer	25.8%	0.16	0.04	1	25.8%	0.16	0.04	0%
Food Preparation	Oven	25.8%	0.98	0.25	5	25.8%	0.98	0.25	0%
Food Preparation	Dishwasher	25.8%	0.06	0.01	0	25.8%	0.06	0.01	0%
Food Preparation	Hot Food Container	25.8%	0.31	0.08	1	25.8%	0.31	0.08	0%
Food Preparation	Food Prep	25.8%	0.01	0.00	0	25.8%	0.01	0.00	0%
Refrigeration	Walk in Refrigeration	52.4%	-	-	-	52.4%	-	-	0%
Refrigeration	Glass Door Display	52.4%	0.45	0.23	4	52.4%	0.40	0.21	-10%
Refrigeration	Solid Door Refrigerator	52.4%	0.50	0.26	5	52.4%	0.45	0.24	-10%
Refrigeration	Open Display Case	52.4%	0.04	0.02	0	52.4%	0.04	0.02	-10%
Refrigeration	Vending Machine	52.4%	0.30	0.16	3	52.4%	0.30	0.16	0%
Refrigeration	Icemaker	52.4%	0.34	0.18	3	52.4%	0.34	0.18	0%
Office Equipment	Desktop Computer	99.9%	0.48	0.48	9	99.9%	0.48	0.48	0%
Office Equipment	Laptop Computer	99.9%	0.06	0.06	1	99.9%	0.06	0.06	0%
Office Equipment	Server	99.9%	0.36	0.36	7	99.9%	0.36	0.36	0%
Office Equipment	Monitor	99.9%	0.25	0.25	5	99.9%	0.25	0.25	0%
Office Equipment	Printer/copier/fax	99.9%	0.24	0.24	4	99.9%	0.24	0.24	0%
Office Equipment	POS Terminal	99.9%	0.27	0.27	5	99.9%	0.27	0.27	0%
Miscellaneous	Non-HVAC Motor	40.2%	1.22	0.49	9	40.2%	1.22	0.49	0%
Miscellaneous	Other Miscellaneous	100.0%	1.43	1.43	26	100.0%	1.43	1.43	0%
Total				**17.50**	**323**			**16.3**	

Table B–9 Large Commercial Segment Market Profile, Idaho, 2009

		Average Market Profiles				New Units			
End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Usage (GWh)	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Compared to Average
Cooling	Central Chiller	24.7%	2.15	0.53	22	24.7%	1.93	0.48	-10%
Cooling	RTU	37.8%	2.52	0.95	40	37.8%	2.26	0.86	-10%
Cooling	PTAC	3.8%	2.49	0.09	4	3.8%	2.24	0.08	-10%
Combined Heating/Cooling	Heat Pump	9.1%	4.81	0.44	18	9.1%	4.33	0.40	-10%
Space Heating	Electric Resistance	5.9%	3.62	0.21	9	5.9%	3.62	0.21	0%
Space Heating	Furnace	12.7%	4.68	0.60	25	12.7%	4.21	0.54	-10%
Ventilation	Ventilation	75.1%	1.66	1.24	52	75.1%	1.49	1.12	-10%
Interior Lighting	Interior Screw-in	100.0%	0.94	0.94	39	100.0%	0.85	0.85	-10%
Interior Lighting	HID	100.0%	0.71	0.71	30	100.0%	0.64	0.64	-10%
Interior Lighting	Linear Fluorescent	100.0%	3.29	3.29	138	100.0%	2.96	2.96	-10%
Exterior Lighting	Exterior Screw-in	89.6%	0.11	0.10	4	89.6%	0.10	0.09	-10%
Exterior Lighting	HID	89.6%	0.62	0.56	23	89.6%	0.56	0.50	-10%
Exterior Lighting	Linear Fluorescent	89.6%	0.16	0.14	6	89.6%	0.14	0.13	-10%
Water Heating	Water Heater	54.2%	2.31	1.25	53	54.2%	2.20	1.19	-5%
Food Preparation	Fryer	18.4%	0.35	0.06	3	18.4%	0.35	0.06	0%
Food Preparation	Oven	18.4%	1.88	0.35	14	18.4%	1.88	0.35	0%
Food Preparation	Dishwasher	18.4%	0.19	0.03	1	18.4%	0.19	0.03	0%
Food Preparation	Hot Food Container	18.4%	0.27	0.05	2	18.4%	0.27	0.05	0%
Food Preparation	Food Prep	18.4%	0.02	0.00	0	18.4%	0.02	0.00	0%
Refrigeration	Walk in Refrigeration	39.1%	0.48	0.19	8	39.1%	0.43	0.17	-10%
Refrigeration	Glass Door Display	39.1%	0.37	0.14	6	39.1%	0.33	0.13	-10%
Refrigeration	Solid Door Refrigerator	39.1%	0.77	0.30	13	39.1%	0.69	0.27	-10%
Refrigeration	Open Display Case	39.1%	0.27	0.10	4	39.1%	0.24	0.09	-10%
Refrigeration	Vending Machine	39.1%	0.36	0.14	6	39.1%	0.36	0.14	0%
Refrigeration	Icemaker	39.1%	0.66	0.26	11	39.1%	0.66	0.26	0%
Office Equipment	Desktop Computer	98.4%	0.90	0.88	37	98.4%	0.90	0.88	0%
Office Equipment	Laptop Computer	98.4%	0.07	0.07	3	98.4%	0.07	0.07	0%
Office Equipment	Server	98.4%	0.42	0.41	17	98.4%	0.42	0.41	0%
Office Equipment	Monitor	98.4%	0.21	0.20	9	98.4%	0.21	0.20	0%
Office Equipment	Printer/copier/fax	98.4%	0.21	0.21	9	98.4%	0.21	0.21	0%
Office Equipment	POS Terminal	98.4%	0.07	0.07	3	98.4%	0.07	0.07	0%
Miscellaneous	Non-HVAC Motor	57.7%	1.40	0.81	34	57.7%	1.40	0.81	0%
Miscellaneous	Other Miscellaneous	100.0%	1.36	1.36	57	100.0%	1.36	1.36	0%
Total				**16.70**	**700**			**15.6**	

Table B–10 Extra Large Commercial Segment Market Profile, Idaho, 2009

Average Market Profiles						New Units			
End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Usage (GWh)	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Compared to Average
Cooling	Central Chiller	52.2%	2.13	1.11	6	52.2%	1.92	1.00	-10%
Cooling	RTU	24.7%	2.22	0.55	3	24.7%	2.00	0.49	-10%
Cooling	PTAC	0.0%	2.22	-	-	0.0%	2.00	-	-10%
Combined Heating/Cooling	Heat Pump	4.4%	5.23	0.23	1	4.4%	4.70	0.21	-10%
Space Heating	Electric Resistance	15.8%	4.39	0.69	4	15.8%	4.39	0.69	0%
Space Heating	Furnace	5.6%	5.67	0.32	2	5.6%	5.11	0.29	-10%
Ventilation	Ventilation	90.2%	1.94	1.75	9	90.2%	1.74	1.57	-10%
Interior Lighting	Interior Screw-in	100.0%	1.37	1.37	7	100.0%	1.23	1.23	-10%
Interior Lighting	HID	100.0%	0.29	0.29	1	100.0%	0.26	0.26	-10%
Interior Lighting	Linear Fluorescent	100.0%	2.19	2.19	11	100.0%	1.97	1.97	-10%
Exterior Lighting	Exterior Screw-in	96.3%	0.03	0.03	0	96.3%	0.03	0.03	-10%
Exterior Lighting	HID	96.3%	0.88	0.85	4	96.3%	0.79	0.76	-10%
Exterior Lighting	Linear Fluorescent	96.3%	0.04	0.03	0	96.3%	0.03	0.03	-10%
Water Heating	Water Heater	26.3%	3.72	0.98	5	26.3%	3.53	0.93	-5%
Food Preparation	Fryer	13.8%	0.13	0.02	0	13.8%	0.13	0.02	0%
Food Preparation	Oven	13.8%	2.12	0.29	1	13.8%	2.12	0.29	0%
Food Preparation	Dishwasher	13.8%	0.08	0.01	0	13.8%	0.08	0.01	0%
Food Preparation	Hot Food Container	13.8%	0.13	0.02	0	13.8%	0.13	0.02	0%
Food Preparation	Food Prep	13.8%	0.01	0.00	0	13.8%	0.01	0.00	0%
Refrigeration	Walk in Refrigeration	26.6%	0.19	0.05	0	26.6%	0.17	0.04	-10%
Refrigeration	Glass Door Display	26.6%	0.11	0.03	0	26.6%	0.10	0.03	-10%
Refrigeration	Solid Door Refrigerator	26.6%	0.71	0.19	1	26.6%	0.64	0.17	-10%
Refrigeration	Open Display Case	26.6%	0.50	0.13	1	26.6%	0.45	0.12	-10%
Refrigeration	Vending Machine	26.6%	0.38	0.10	1	26.6%	0.38	0.10	0%
Refrigeration	Icemaker	26.6%	0.31	0.08	0	26.6%	0.31	0.08	0%
Office Equipment	Desktop Computer	100.0%	0.64	0.64	3	100.0%	0.64	0.64	0%
Office Equipment	Laptop Computer	100.0%	0.07	0.07	0	100.0%	0.07	0.07	0%
Office Equipment	Server	100.0%	0.17	0.17	1	100.0%	0.17	0.17	0%
Office Equipment	Monitor	100.0%	0.13	0.13	1	100.0%	0.13	0.13	0%
Office Equipment	Printer/copier/fax	100.0%	0.05	0.05	0	100.0%	0.05	0.05	0%
Office Equipment	POS Terminal	100.0%	0.01	0.01	0	100.0%	0.01	0.01	0%
Miscellaneous	Non-HVAC Motor	88.8%	0.82	0.73	4	88.8%	0.82	0.73	0%
Miscellaneous	Other Miscellaneous	100.0%	0.80	0.80	4	100.0%	0.80	0.80	0%
Total				**13.90**	**70**			**12.9**	

Table B–11 Extra Large Industrial Segment Market Profile, Idaho, 2009

Average Market Profiles						New Units			
End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Usage (GWh)	Saturation	EUI (kWh)	Intensity (kWh/Sqft.)	Compared to Average
Cooling	Central Chiller	14.4%	7.98	1.15	31	14.4%	7.18	1.04	-10%
Cooling	RTU	17.1%	6.32	1.08	29	17.1%	5.68	0.97	-10%
Cooling	PTAC	1.1%	5.50	0.06	2	1.1%	4.95	0.05	-10%
Combined Heating/Cooling	Heat Pump	1.6%	11.13	0.18	5	1.6%	10.01	0.16	-10%
Space Heating	Electric Resistance	10.8%	8.67	0.93	25	10.8%	8.67	0.93	0%
Space Heating	Furnace	2.0%	9.10	0.18	5	2.0%	8.19	0.17	-10%
Ventilation	Ventilation	27.4%	12.31	3.37	92	27.4%	11.08	3.04	-10%
Interior Lighting	Interior Screw-in	100.0%	0.33	0.33	9	100.0%	0.30	0.30	-10%
Interior Lighting	HID	100.0%	1.05	1.05	28	100.0%	0.94	0.94	-10%
Interior Lighting	Linear Fluorescent	100.0%	1.10	1.10	30	100.0%	0.99	0.99	-10%
Exterior Lighting	Exterior Screw-in	92.5%	0.02	0.02	1	92.5%	0.02	0.02	-10%
Exterior Lighting	HID	92.5%	0.25	0.23	6	92.5%	0.23	0.21	-10%
Exterior Lighting	Linear Fluorescent	92.5%	0.01	0.01	0	92.5%	0.01	0.01	-10%
Process	Process Cooling/Refrigeration	2.4%	99.67	2.40	65	2.4%	99.67	2.40	0%
Process	Process Heating	26.2%	13.74	3.60	98	26.2%	13.74	3.60	0%
Process	Electrochemical Process	2.6%	77.43	2.00	54	2.6%	77.43	2.00	0%
Machine Drive	Less than 5 HP	90.5%	0.92	0.84	23	90.5%	0.92	0.84	0%
Machine Drive	5-24 HP	80.1%	2.26	1.81	49	80.1%	2.26	1.81	0%
Machine Drive	25-99 HP	72.4%	6.10	4.42	120	72.4%	6.10	4.42	0%
Machine Drive	100-249 HP	65.3%	3.84	2.51	68	65.3%	3.84	2.51	0%
Machine Drive	250-499 HP	23.7%	11.61	2.75	75	23.7%	11.61	2.75	0%
Machine Drive	500 and more HP	26.1%	19.50	5.08	138	26.1%	19.50	5.08	0%
Miscellaneous	Miscellaneous	100.0%	4.90	4.90	133	100.0%	4.90	4.90	0%
	Total			**40.00**	**1,088**			**39.1**	

Figure B–1 Residential Baseline Forecast by End Use, Idaho

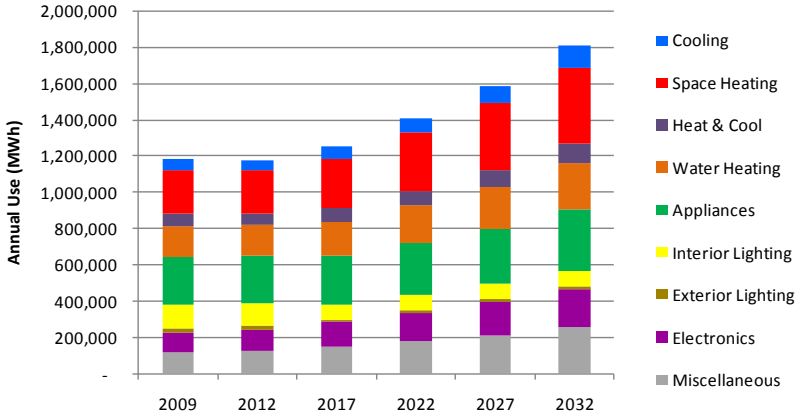

Figure B–2 C&I Baseline Electricity Forecast by End Use, Idaho

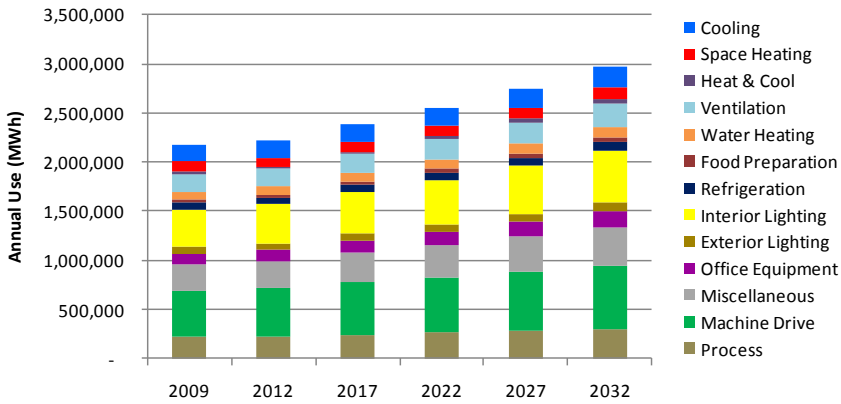

Table B-12 Baseline Forecast Summary by Sector, Idaho

End Use	2009	2012	2017	2022	2027	2032	% Change ('09–'32)	Avg. Growth Rate ('09–'32)
Res. ID	1,182,379	1,178,591	1,253,664	1,408,812	1,588,965	1,808,300	52.9%	1.8%
C&I ID	2,180,858	2,217,188	2,383,504	2,551,291	2,748,846	2,970,324	36.2%	1.3%
Total	3,363,237	3,395,780	3,637,168	3,960,104	4,337,811	4,778,624	42.1%	1.5%

Figure B–3 Baseline Forecast Summary by Sector, Idaho

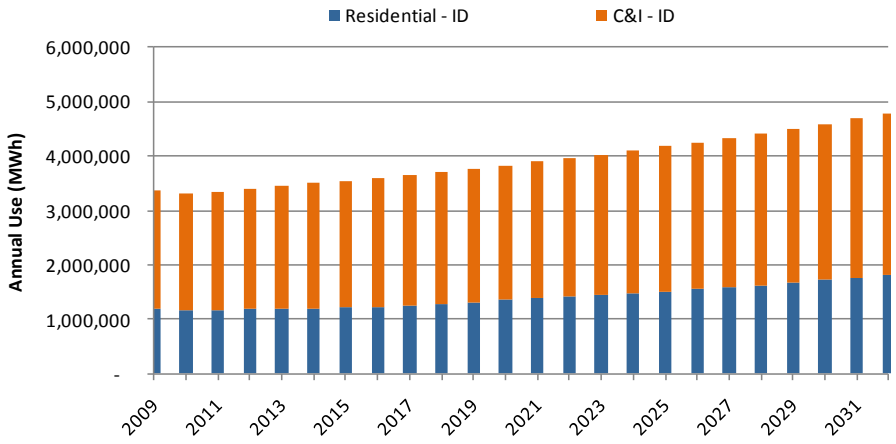

Figure B–4 Summary of Energy Efficiency Potential Savings, Idaho, All Sectors

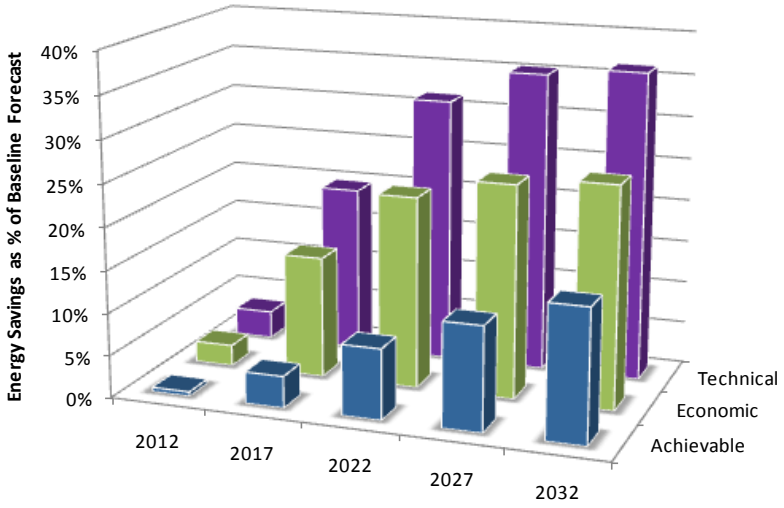

Figure B–5 Energy Efficiency Potential Forecasts, Idaho, All Sectors

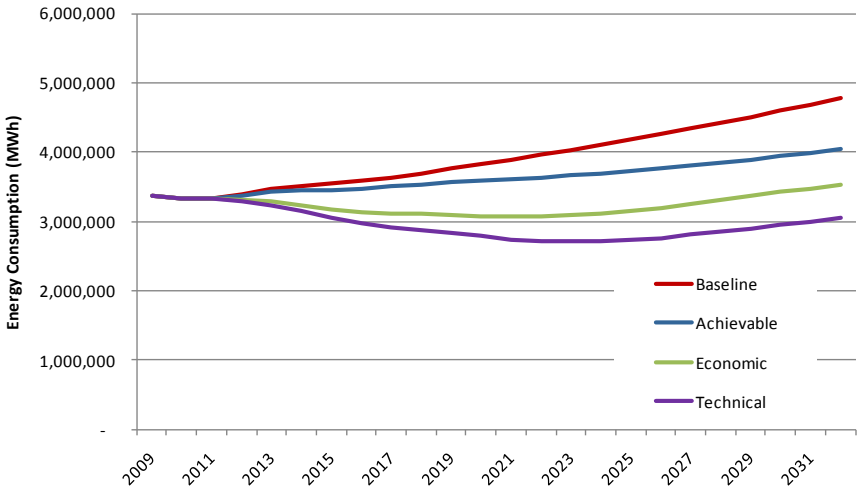

Table B–13 Summary of Energy Efficiency Potential, Idaho, All Sectors

	2012	2017	2022	2027	2032
Baseline Forecast (MWh)	3,395,780	3,637,168	3,960,104	4,337,811	4,778,624
Baseline Peak Demand(MW)	610	644	705	775	854
Cumulative Energy Savings (MWh)					
Achievable	17,005	135,670	328,163	529,886	742,264
Economic	84,010	521,749	893,647	1,086,090	1,241,812
Technical	111,123	717,982	1,243,729	1,533,706	1,733,907
Cumulative Energy Savings (% of Baseline)					
Achievable	0.5%	3.7%	8.3%	12.2%	15.5%
Economic	2.5%	14.3%	22.6%	25.0%	26.0%
Technical	3.3%	19.7%	31.4%	35.4%	36.3%
Peak Savings (MW)					
Achievable	4	26	57	94	133
Economic	18	93	154	187	212
Technical	22	126	212	262	299
Peak Savings (% of Baseline)					
Achievable	0.7%	4.0%	8.1%	12.2%	15.6%
Economic	2.9%	14.4%	21.9%	24.1%	24.9%
Technical	3.7%	19.6%	30.1%	33.9%	35.0%

Table B–14 Achievable Cumulative EE Potential by Sector, Idaho (MWh)

Segment	2012	2017	2022	2027	2032
Residential, Idaho	8,583	41,586	97,676	173,001	258,780
C&I, Idaho	8,422	94,084	230,487	356,884	483,484
Total	**17,005**	**135,670**	**328,163**	**529,886**	**742,264**

Figure B–6 Achievable Cumulative Potential by Sector, Idaho

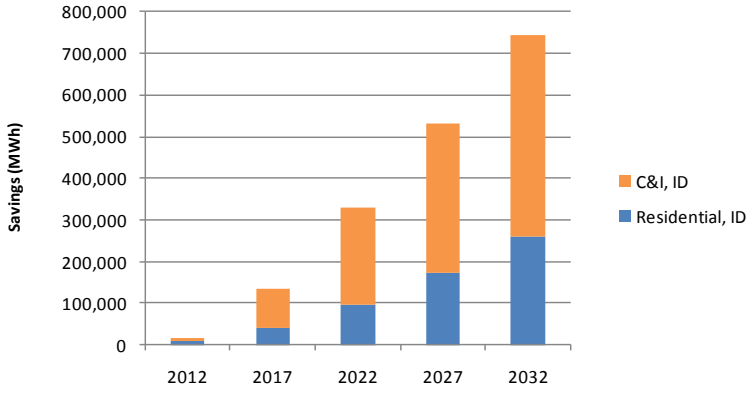

Figure B–7 Residential Energy Efficiency Potential Savings, Idaho

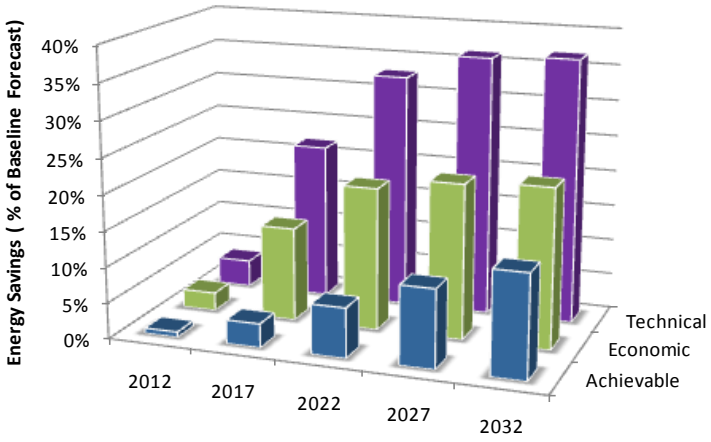

Figure B–8 Residential Energy Efficiency Potential Forecast, Idaho

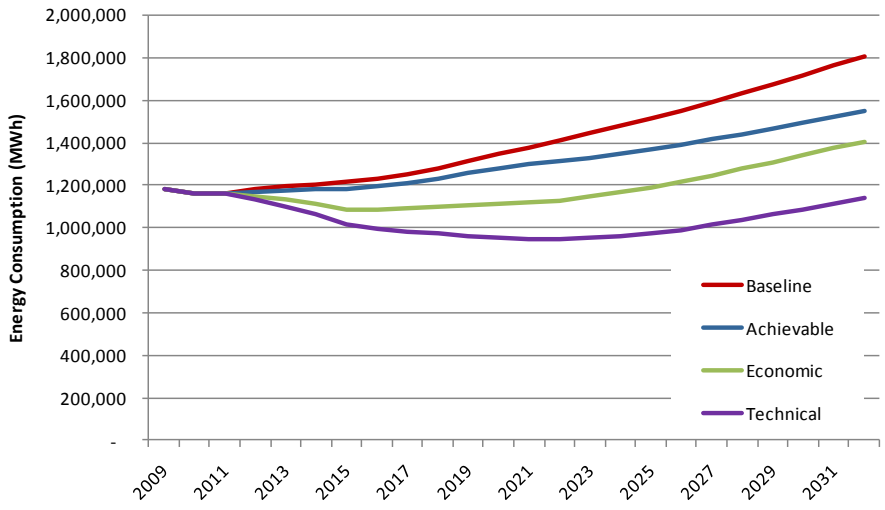

Table B–15 Energy Efficiency Potential for the Residential Sector, Idaho

	2012	2017	2022	2027	2032
Baseline Forecast (MWh)	1,178,591	1,253,664	1,408,812	1,588,965	1,808,300
Baseline Peak Demand(MW)	281	290	325	363	408
Cumulative Energy Savings (MWh)					
Achievable	8,583	41,586	97,676	173,001	258,780
Economic	29,871	164,293	280,254	342,994	401,487
Technical	44,595	274,139	462,586	576,602	666,142
Cumulative Energy Savings (% of Baseline)					
Achievable	0.7%	3.3%	6.9%	10.9%	14.3%
Economic	2.5%	13.1%	19.9%	21.6%	22.2%
Technical	3.8%	21.9%	32.8%	36.3%	36.8%
Peak Savings (MW)					
Achievable	3	11	26	47	69
Economic	9	42	75	93	106
Technical	12	63	109	136	158
Peak Savings (% of Baseline)					
Achievable	1.0%	3.9%	7.9%	12.9%	17.0%
Economic	3.4%	14.5%	23.2%	25.5%	26.0%
Technical	4.3%	21.7%	33.5%	37.3%	38.6%

Table B-16 Residential Baseline & Achievable Potential by Segment, Idaho

	2012	2017	2022	2027	2032
Baseline Forecast (MWh)					
Single Family	809,394	860,796	969,610	1,095,955	1,250,124
Multi Family	43,239	46,927	53,367	60,656	69,266
Mobile Home	58,491	61,447	68,664	77,048	87,262
Limited Income	267,467	284,494	317,172	355,306	401,648
Total	1,178,591	1,253,664	1,408,812	1,588,965	1,808,300
Energy Savings, Achievable Potential (MWh)					
Single Family	6,285	29,733	76,498	136,424	203,945
Multi Family	236	1,141	2,100	3,882	5,835
Mobile Home	465	1,997	3,373	5,534	8,065
Limited Income	1,597	8,715	15,705	27,160	40,935
Total	8,583	41,586	97,676	173,001	258,780
% of Total Residential Energy Savings					
Single Family	73.2%	71.5%	78.3%	78.9%	78.8%
Multi Family	2.7%	2.7%	2.2%	2.2%	2.3%
Mobile Home	5.4%	4.8%	3.5%	3.2%	3.1%
Limited Income	18.6%	21.0%	16.1%	15.7%	15.8%

Table B-17 Residential Potential by Housing Type, 2022, Idaho

Forecast	Single Family	Multi Family	Mobile Home	Limited Income	Total
Baseline Forecast (MWh)	969,610	53,367	68,664	317,172	1,408,812
Cumulative Energy Savings (MWh)					
Achievable	76,498	2,100	3,373	15,705	97,676
Economic Potential	215,829	7,112	9,362	47,950	280,254
Technical Potential	311,446	15,951	23,241	111,948	462,586
Energy Savings % of Baseline					
Achievable	7.9%	3.9%	4.9%	5.0%	6.9%
Economic Potential	22.3%	13.3%	13.6%	15.1%	19.9%
Technical Potential	32.1%	29.9%	33.8%	35.3%	32.8%

Table A-18 Residential Cumulative Savings by End Use and Potential Type, Oregon (MWh)

End Use	Case	2012	2017	2022	2027	2032
Cooling	Achievable	4	784	2,713	7,797	15,205
	Economic	118	7,473	13,481	20,239	27,909
	Technical	1,389	21,223	34,387	49,464	67,702
Space Heating	Achievable	27	3,826	23,932	55,648	89,148
	Economic	836	38,676	90,434	119,911	142,198
	Technical	1,207	51,873	117,487	159,290	197,078
Heat/Cool	Achievable	4	277	772	1,917	5,360
	Economic	136	4,094	5,019	5,928	9,460
	Technical	1,056	8,796	15,144	21,238	24,333
Water Heating	Achievable	121	5,591	23,945	46,999	76,467
	Economic	1,388	27,667	69,866	91,573	112,448
	Technical	8,160	77,402	160,064	203,991	227,631
Appliances	Achievable	434	4,216	9,065	14,393	20,002
	Economic	1,885	20,859	27,076	28,751	30,895
	Technical	2,461	26,764	35,893	38,774	41,155
Interior Lighting	Achievable	6,180	17,434	19,757	22,622	23,650
	Economic	18,432	36,002	35,080	32,028	29,190
	Technical	21,560	49,417	48,706	45,433	42,120
Exterior Lighting	Achievable	1,125	3,610	3,675	3,426	2,753
	Economic	3,350	7,531	6,023	4,553	3,242
	Technical	3,846	9,858	8,546	7,753	7,635
Electronics	Achievable	607	4,630	11,073	15,629	19,572
	Economic	3,058	15,658	23,240	26,031	29,797
	Technical	4,219	22,321	32,027	36,258	41,681
Miscellaneous	Achievable	80	1,217	2,744	4,568	6,622
	Economic	667	6,334	10,036	13,980	16,348
	Technical	697	6,484	10,331	14,400	16,807
Total	Achievable	8,583	41,586	97,676	173,001	258,780
	Economic	29,871	164,293	280,254	342,994	401,487
	Technical	44,595	274,139	462,586	576,602	666,142

Figure B–9 Residential Achievable Potential by End Use, Selected Years, Idaho

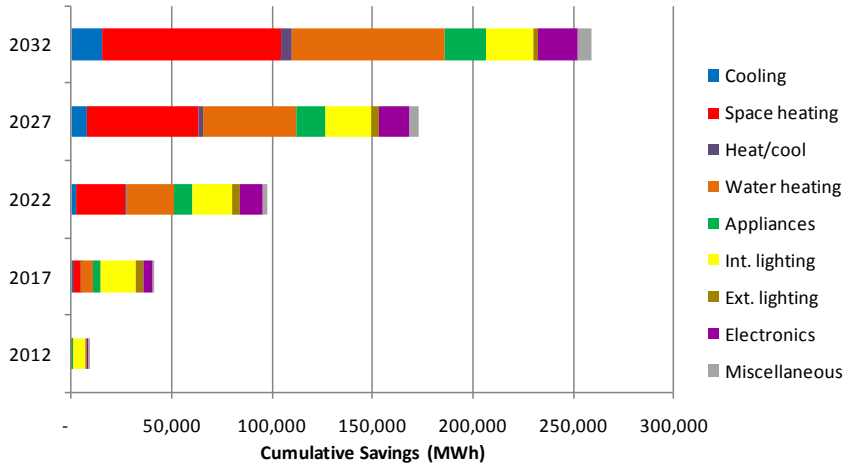

Table B-19 Residential Potential by End Use and Market Segment, 2022, WA (MWh)

	Single Family	Multi Family	Mobile Home	Limited Income	Total
Cooling	1,736	51	59	866	2,713
Space heating	19,066	789	402	3,676	23,932
Heat/cool	675	3	39	56	772
Water heating	20,270	422	378	2,875	23,945
Appliances	6,657	103	451	1,854	9,065
Interior lighting	13,894	535	1,047	4,281	19,757
Exterior lighting	3,020	28	227	399	3,675
Electronics	8,757	167	617	1,531	11,073
Miscellaneous	2,422	1	153	168	2,744
Total	**76,498**	**2,100**	**3,373**	**15,705**	**97,676**

Table B–20 Residential Cumulative Achievable Potential by End Use and Equipment Measures, Oregon, Selected Years (MWh)

End Use	Technology	2012	2017	2022	2027	2032
Cooling	Central AC	-	51	55	67	41
Heat/Cool	Air Source Ht. Pump	-	-	-	-	1,972
Water Heating	Water Heater	43	321	336	1,435	8,172
Appliances	Clothes Washer	29	352	888	1,410	1,823
	Clothes Dryer	35	240	440	597	722
	Dishwasher	40	373	912	1,394	1,844
	Refrigerator	146	652	1,266	1,966	2,762
	Freezer	113	560	1,221	1,561	1,960
	Second Refrigerator	53	257	475	749	945
	Stove	7	56	126	254	375
Interior Lighting	Screw-in	5,757	14,262	14,623	14,913	12,531
	Linear Fluorescent	56	639	1,202	1,775	2,475
	Pin-based	367	2,466	3,641	5,130	7,141
Exterior Lighting	Screw-in	1,117	3,567	3,619	3,352	2,662
	High Intensity/Flood	8	43	56	74	91
Electronics	Personal Computers	389	3,151	5,418	7,945	10,893
	TVs	213	1,121	2,079	2,515	3,436
Miscellaneous	Pool Pump	61	559	1,372	2,520	3,726
	Furnace Fan	16	202	602	1,229	2,067
Total		**8,450**	**28,875**	**38,332**	**48,887**	**65,639**

Table B–21 Residential Achievable Savings for Non-equipment Measures, Idaho (MWh)

Measure	2012	2017	2022	2027	2032
Furnace - Convert to Gas	9	1,001	14,668	31,768	48,995
Water Heater - Convert to Gas	10	1,001	13,783	28,893	43,060
Advanced New Construction Designs	0	62	1,426	5,606	11,781
Repair and Sealing - Ducting	6	853	2,417	6,257	9,754
Insulation - Infiltration Control	6	804	2,265	5,721	8,841
Water Heater - Thermostat Setback	44	2,506	4,232	6,263	8,451
Home Energy Management System	2	377	1,323	3,471	6,667
Freezer - Remove Second Unit	8	1,104	2,367	4,168	6,184
Water Heater - Hot Water Saver	2	130	1,663	3,784	5,884
Electronics - Reduce Standby Wattage	4	358	3,576	5,169	5,243
Thermostat - Clock/Programmable	6	799	2,222	3,710	4,048
Insulation - Foundation	0	141	628	1,993	3,795
Air Source Heat Pump - Maintenance	4	277	772	1,917	3,388
Refrigerator - Remove Second Unit	4	622	1,369	2,294	3,387
Water Heater - Heat Pump	-	12	334	1,036	3,208
Water Heater - Faucet Aerators	4	293	702	1,525	2,523
Insulation - Ducting	0	49	188	721	2,255
Water Heater - Tank Blanket/Insulation	15	794	1,238	1,720	2,251
Insulation - Wall Cavity	0	85	369	1,134	2,110
Ceiling Fan - Installation	0	24	167	1,068	1,984
Room AC - Removal of Second Unit	2	281	698	1,209	1,799
Insulation - Ceiling	1	115	339	816	1,288
Water Heater - Timer	0	231	801	1,049	1,235
Water Heater - Low Flow Showerheads	3	270	529	771	1,041
Central AC - Maintenance and Tune-Up	-	-	-	-	1,020
Whole-House Fan - Installation	0	21	112	521	938
Pool - Pump Timer	3	456	771	819	829
Water Heater - Pipe Insulation	0	34	326	524	643
Insulation - Wall Sheathing	0	13	58	187	539
Total	**133**	**12,712**	**59,344**	**124,114**	**193,141**

Figure B–10 Energy Efficiency Potential Savings, C&I Sector, Idaho

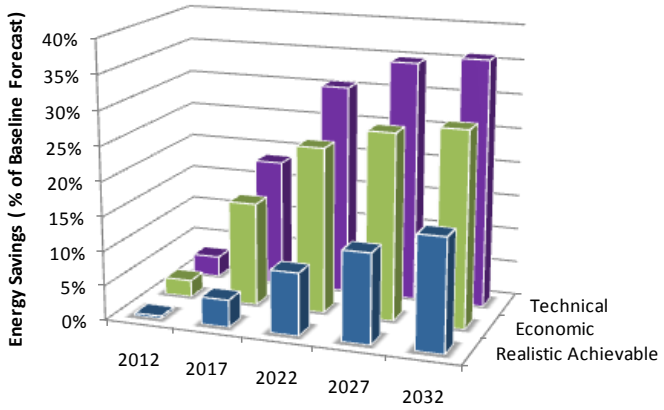

Figure B–11 Energy Efficiency Potential Forecast, C&I Sector, Idaho

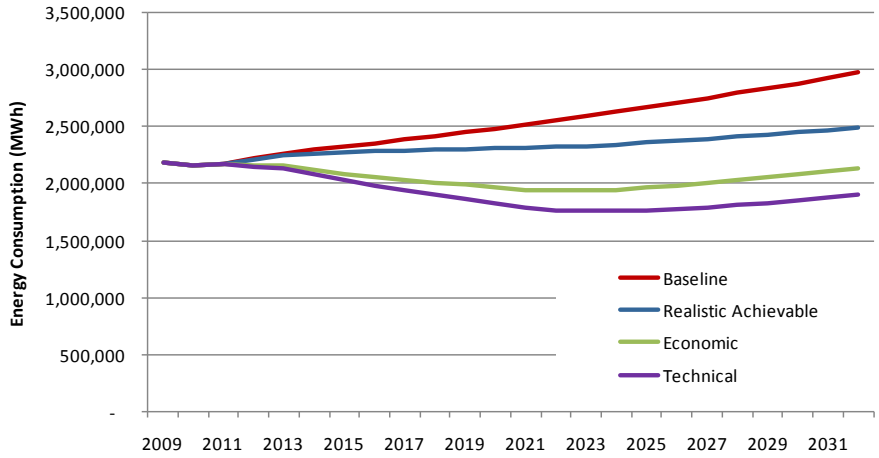

Table B–22 Energy Efficiency Potential, C&I Sector, Idaho

	2012	2017	2022	2027	2032
Baseline Forecast (MWh)	2,217,188	2,383,504	2,551,291	2,748,846	2,970,324
Baseline Peak Demand(MW)	329	354	380	411	446
Cumulative Energy Savings (MWh)					
Achievable	8,422	94,084	230,487	356,884	483,484
Economic	54,139	357,456	613,394	743,096	840,325
Technical	66,528	443,843	781,143	957,103	1,067,765
Cumulative Energy Savings (% of Baseline)					
Achievable	0.4%	3.9%	9.0%	13.0%	16.3%
Economic	2.4%	15.0%	24.0%	27.0%	28.3%
Technical	3.0%	18.6%	30.6%	34.8%	35.9%
Peak Savings (MW)					
Achievable	1	14	31	48	64
Economic	8	51	79	94	106
Technical	10	64	103	127	141
Peak Savings (% of Baseline)					
Achievable	0.4%	3.9%	9.0%	13.0%	16.3%
Economic	2.4%	15.0%	24.0%	27.0%	28.3%
Technical	3.0%	18.6%	30.6%	34.8%	35.9%

Table B–23 C&I Sector, Baseline and Achievable Potential by Segment, Idaho

	2012	2017	2022	2027	2032
Baseline Forecast (MWh)					
Small/Med. Commercial	317,367	335,813	361,837	394,213	431,409
Large Commercial	707,532	761,508	821,587	894,850	979,118
Extra Large Commercial	72,013	83,305	90,387	98,291	106,847
Extra Large Industrial	1,120,277	1,202,878	1,277,480	1,361,492	1,452,949
Total	2,217,188	2,383,504	2,551,291	2,748,846	2,970,324
Cumulative Energy Savings, Achievable Potential (MWh)					
Small/Med. Commercial	1,961	20,790	43,865	65,463	88,729
Large Commercial	4,662	52,140	106,963	155,523	202,933
Extra Large Commercial	609	6,178	13,050	19,166	24,274
Extra Large Industrial	1,190	14,977	66,609	116,733	167,548
Total	8,422	94,084	230,487	356,884	483,484
% of Total C&I Cumulative Energy Savings					
Small/Med. Commercial	23.3%	22.1%	19.0%	18.3%	18.4%
Large Commercial	55.4%	55.4%	46.4%	43.6%	42.0%
Extra Large Commercial	7.2%	6.6%	5.7%	5.4%	5.0%
Extra Large Industrial	14.1%	15.9%	28.9%	32.7%	34.7%

Table B–24 C&I Potential by Segment, Idaho, 2022

Forecast	Small/Med. Commercial	Large Commercial	Extra Large Commercial	Extra Large Industrial	Total
Baseline Forecast (MWh)	361,837	821,587	90,387	1,277,480	2,551,291
Cumulative Energy Savings (MWh)					
Achievable	43,865	106,963	13,050	66,609	230,487
Economic Potential	87,274	204,790	25,964	295,365	613,394
Technical Potential	135,405	301,217	36,465	308,056	781,143
Cumulative Energy Savings % of Baseline					
Achievable	12%	13%	14%	5%	9%
Economic Potential	24%	25%	29%	23%	24%
Technical Potential	37%	37%	40%	24%	31%

Table B-25 C&I Cumulative Savings by End Use and Potential Type, Idaho (MWh)

End Use	Case	2012	2017	2022	2027	2032
Cooling	Achievable	78	5,923	21,250	33,605	47,275
	Economic	1,138	20,975	45,413	59,510	75,348
	Technical	2,968	36,760	76,374	95,858	113,212
Space Heating	Achievable	5	741	4,296	8,185	13,309
	Economic	107	3,860	11,757	17,097	24,438
	Technical	189	6,330	19,442	26,598	34,709
Heat/Cool	Achievable	16	1,271	2,302	2,778	3,432
	Economic	185	3,001	3,761	4,432	4,954
	Technical	260	3,540	4,747	5,741	6,445
Ventilation	Achievable	211	2,846	15,356	29,448	47,931
	Economic	3,528	26,446	69,343	93,958	107,124
	Technical	4,612	34,655	93,204	122,731	132,705
Water Heating	Achievable	25	1,545	3,227	3,742	4,068
	Economic	198	3,518	4,823	5,295	5,309
	Technical	4,117	31,197	58,774	83,041	91,298
Food Preparation	Achievable	72	868	2,449	4,745	7,111
	Economic	962	5,813	10,539	12,677	13,834
	Technical	1,043	6,341	11,660	14,033	15,375
Refrigeration	Achievable	62	631	2,054	3,943	5,850
	Economic	925	4,540	8,629	11,127	12,502
	Technical	1,091	5,996	13,223	17,139	19,437
Interior Lighting	Achievable	5,851	55,282	110,129	160,780	203,673
	Economic	27,689	162,081	212,672	243,913	279,638
	Technical	30,318	177,750	239,322	274,804	311,478
Exterior Lighting	Achievable	526	7,858	15,569	19,409	23,034
	Economic	2,403	23,137	27,251	28,628	29,938
	Technical	2,701	25,247	30,174	34,115	38,276
Office Equipment	Achievable	862	8,854	14,582	19,189	23,952
	Economic	6,253	28,449	29,883	31,230	32,556
	Technical	8,238	38,728	41,183	43,665	46,239
Machine Drive	Achievable	382	6,612	33,312	56,917	77,212
	Economic	4,308	40,409	117,995	145,338	156,337
	Technical	4,341	40,906	119,993	147,502	158,642
Process	Achievable	328	1,590	5,541	13,154	24,996
	Economic	6,410	34,803	69,990	87,646	95,276
	Technical	6,410	34,803	69,990	87,646	95,276
Miscellaneous	Achievable	2	62	419	989	1,641
	Economic	33	426	1,336	2,245	3,070
	Technical	239	1,591	3,058	4,230	4,673
Total	Achievable	8,422	94,084	230,487	356,884	483,484
	Economic	54,139	357,456	613,394	743,096	840,325
	Technical	66,528	443,843	781,143	957,103	1,067,765

Figure B-12 C&I Achievable Potential by End Use, Selected Years, Idaho

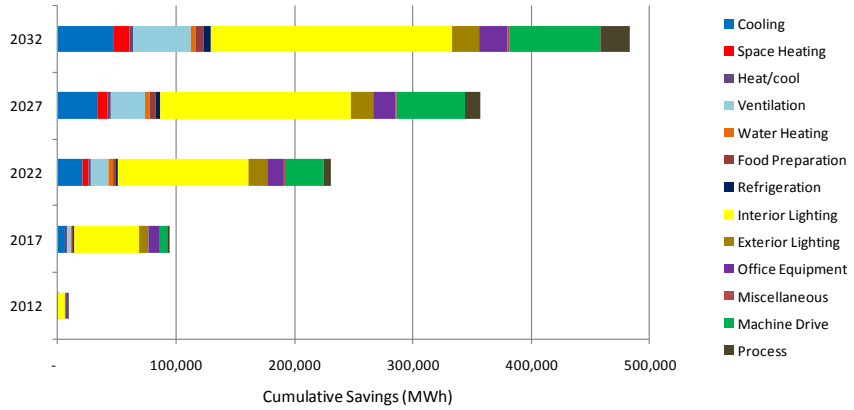

Table B-26 C&I Achievable Potential by End Use Market Segment, 2022, Idaho (MWh)

	Small/Med. Commercial	Large Commercial	Extra Large Commercial	Extra Large Industrial	Total
Cooling	2,805	8,283	1,032	9,129	21,250
Space Heating	338	2,110	305	1,544	4,296
Combined Heating/Cooling	249	1,666	119	267	2,302
Ventilation	4,489	1,846	1,131	7,890	15,356
Water Heating	952	1,851	424	-	3,227
Food Preparation	538	1,748	163	-	2,449
Refrigeration	572	1,382	100	-	2,054
Interior Lighting	25,426	68,834	7,612	8,256	110,129
Exterior Lighting	4,866	8,723	1,312	669	15,569
Office Equipment	3,482	10,274	825	-	14,582
Machine Drive	-	-	-	33,312	33,312
Process	-	-	-	5,541	5,541
Miscellaneous	146	246	26	-	419
Total	**43,865**	**106,963**	**13,050**	**66,609**	**230,487**

Table B-27 C&I Cumulative Achievable Potential by End Use and Equipment Measures, Washington (MWh)

End Use	Technology	2012	2017	2022	2027	2032
Cooling	Central Chiller	29	304	1,225	2,910	4,777
	PTAC	2	2	2	1	0
Heat/Cool	Heat Pump	7	128	376	687	1,230
Ventilation	Ventilation	196	2,023	7,393	14,940	27,505
Water Heater	Water Heater	14	111	109	96	1
Food Preparation	Fryer	4	46	121	232	351
	Hot Food Container	9	102	274	527	806
	Oven	60	708	1,884	3,650	5,606
Refrigeration	Glass Door Display	11	155	440	877	1,485
	Icemaker	8	108	317	574	873
	Solid Door	14	165	438	823	1,305
	Vending Machine	27	152	371	674	997
	Walk in Refriger'n	0	5	13	24	43
Interior Lighting	Interior Screw-in	3,326	21,132	32,157	43,618	50,332
	HID	1,014	9,151	18,439	26,367	32,921
	Linear Fluorescent	1,450	17,918	35,222	51,450	63,434
Exterior Lighting	Screw-in	76	1,138	1,977	1,666	772
	HID	403	5,269	10,440	13,248	16,451
	Linear Fluorescent	42	758	1,287	1,682	2,120
Office Equipment	Desktop Computer	490	4,569	7,322	9,610	11,862
	Laptop Computer	35	331	530	675	794
	Monitor	106	383	662	896	1,115
	POS Terminal	14	196	359	512	687
	Printer/copier/fax	44	564	1,025	1,396	1,750
	Server	169	2,412	3,889	5,254	6,883
Machine Drive	Less than 5 HP	21	144	383	639	947
	5-24 HP	46	324	887	1,494	2,213
	25-99 HP	114	808	2,209	3,719	5,511
	100-249 HP	32	227	622	1,047	1,552
	250-499 HP	34	242	661	1,113	1,650
	500 and more HP	64	456	1,247	2,100	3,112
Process	Electrochem. Process	46	220	719	1,711	3,334
	Process Cooling/Refrig.	62	294	961	2,288	4,458
	Process Heating	220	1,048	3,426	8,153	15,885
Miscellaneous	Non-HVAC Motor	2	25	181	536	1,050
Total		8,194	71,620	137,570	205,189	273,811

Table B-28 C&I Cumulative Achievable Savings for Non-equipment Measures, Idaho (MWh)

Measure	2012	2017	2022	2027	2032
Energy Management System	13	819	8,607	15,077	20,537
Advanced New Construction Designs	0	36	557	4,543	16,923
Retrocommissioning - Lighting	20	4,122	7,640	9,707	11,740
Interior Fluorescent - High Bay Fixtures	8	475	4,877	8,650	11,615
Pumping System - Optimization	11	507	4,907	8,488	11,303
Compressed Air - System Optimization and Improvements	11	506	4,837	8,282	10,961
Custom Measures	2	296	4,148	8,434	9,658
Fans - Variable Speed Control	7	335	3,189	6,134	9,460
Compressed Air - System Controls	7	355	3,457	6,003	8,017
RTU - Maintenance	24	3,277	6,364	7,245	7,740
Fans - Energy Efficient Motors	6	346	3,463	5,936	7,615
Retrocommissioning - Comprehensive	12	2,552	4,572	5,623	6,688
Retrocommissioning - HVAC	3	323	3,038	4,884	5,936
Motors - Variable Frequency Drive	11	1,338	2,707	3,976	5,391
Pumps - Variable Speed Control	5	241	2,289	3,900	5,145
Motors - Magnetic Adjustable Speed Drives	5	221	2,171	3,794	5,087
Compressed Air - Compressor Replacement	4	203	1,982	3,451	4,615
Pumping System - Controls	4	202	1,942	3,332	4,417
Chiller - Turbocor Compressor	3	167	1,764	3,081	4,110
Interior Lighting - Photocell Controlled T8 Dimming Ballasts	0	22	193	1,238	4,107
Interior Lighting - Occupancy Sensors	7	249	1,949	3,002	3,684
Water Heater - Faucet Aerators/Low Flow Nozzles	9	1,306	2,692	2,936	3,076
Chiller - VSD	2	127	1,257	2,141	2,771
Interior Fluorescent - Delamp and Install Reflectors	6	222	1,622	2,346	2,712
Roofs - High Reflectivity	1	21	165	899	2,498
Commissioning - Comprehensive	0	123	805	1,536	2,453
Chiller - Condenser Water Temperature Reset	3	196	1,839	2,281	2,231
Heat Pump - Maintenance	9	1,143	1,925	2,091	2,202
Compressed Air - System Maintenance	13	717	1,198	1,647	2,149
Pumping System - Maintenance	-	43	606	1,200	1,590
Exterior Lighting - Daylighting Controls	2	70	562	925	1,226
Insulation - Ducting	1	93	778	1,078	1,172
Chiller - Chilled Water Reset	2	403	705	915	1,137
Thermostat - Clock/Programmable	2	304	595	846	1,116
Commissioning - Lighting	0	94	314	608	1,012
Office Equipment - ENERGY STAR Power Supply	3	399	795	845	861
Cooking - Exhaust Hoods with Sensor Control	0	6	56	354	818
Refrigeration - System Optimization	0	15	229	526	692

Measure	2012	2017	2022	2027	2032
Furnace - Convert to Gas	0	17	229	467	674
Water Heater - Heat Pump	0	16	211	442	662
Refrigeration - System Controls	0	10	160	370	487
Cooling - Economizer Installation	1	42	378	472	469
Exterior Lighting - Induction Lamps	0	10	140	297	447
Insulation - Ceiling	0	1	13	115	433
Industrial Process Improvements	0	11	127	256	309
LED Exit Lighting	9	319	358	317	278
Commissioning - HVAC	-	-	4	160	270
Water Heater - Tank Blanket/Insulation	2	111	195	213	223
Miscellaneous - ENERGY STAR Water Cooler	0	20	58	96	141
Refrigeration - System Maintenance	0	3	46	106	139
Refrigeration - Floating Head Pressure	0	4	46	86	138
Insulation - Wall Cavity	0	2	31	76	128
Refrigeration - Strip Curtain	-	0	14	61	102
Refrigeration - Anti-Sweat Heater/Auto Door Closer	0	3	35	66	92
Water Heater - Hot Water Saver	-	-	1	21	56
Water Heater - High Efficiency Circulation Pump	0	2	19	35	49
Vending Machine - Controller	0	13	22	29	37
Chiller - Chilled Water Variable-Flow System	0	2	19	28	32
Exterior Lighting - Cold Cathode Lighting	0	1	8	16	23
Refrigeration - Night Covers	0	0	4	7	11
Laundry - High Efficiency Clothes Washer	0	3	5	8	8
Total	**228**	**22,464**	**92,917**	**151,695**	**209,673**

APPENDIX | **C**

RESIDENTIAL ENERGY EFFICIENCY EQUIPMENT AND MEASURE DATA

This appendix presents detailed information for all residential energy efficiency equipment and measures that were evaluated in LoadMAP. Several sets of tables are provided. Table C-1 provides brief descriptions for all equipment and measures that were assessed for potenital. Tables C-2 through C-9 list the detailed unit-level data (including economic screen results) list the detailed unit-level data (including economic screen results) for the energy efficiency measures for each of the housing type segments — single family, multi-family, mobile home, and limited income — and for existing and new construction, respectively. Tables C-10 through C-17 list the detailed unit-level data (including economic screen results) for the energy efficiency measures for each of the housing type segments and for existing and new construction, respectively. The detailed measure-level tables below present the results of the benefit/cost (B/C) analysis for the first year of the forecast. The B/C ratio is zero if the measure represents the baseline technology or if the technology or non-equipment measure is not available in the first year of the forecast. The B/C ratio is calculated within LoadMAP for each year of the forecast and is available once the technology or measure becomes available.

Table C–1 Residential Energy Efficiency Equipment/Measure Descriptions

End-Use	Equipment/ Measure	Description
Cooling	Air Conditioner — Central (CAC)	Central air conditioners consist of a refrigeration system using a direct expansion cycle. Equipment includes a compressor, an air-cooled condenser (located outdoors), an expansion valve, and an evaporator coil. A supply fan near the evaporator coil distributes supply air through air ducts to the building. Cooling efficiencies vary based on materials used, equipment size, condenser type, and system configuration. CACs may be unitary (all components housed in a factory-built assembly) or split system (an outdoor condenser section and an indoor evaporator section connected by refrigerant lines and with the compressor either indoors or outdoors). Energy efficiency is rated according to the size of the unit using the Seasonal Energy Efficiency Rating (SEER). Systems with Variable Refrigerant Flow further improve the operating efficiency. A high-efficiency option for a ductless mini-split system was also analyzed.
Cooling	Central Air Conditioner, Early Replacement	CAC systems currently on the market are significantly more efficient that older units, due to technology improvement and stricter appliance standards. This measure incents homeowners to replace an aging but still working unit with a new, higher-efficiency one.
Cooling	Central Air Conditioner Maintenance and Tune Up	An air conditioner's filters, coils, and fins require regular cleaning and maintenance for the unit to function effectively and efficiently throughout its life. Neglecting necessary maintenance leads to a steady decline in performance, requiring the AC unit to use more energy for the same cooling load.
Cooling	Air Conditioner - Room, ENERGY STAR or better	Room air conditioners are designed to cool a single room or space. They incorporate a complete air-cooled refrigeration and air-handling system in an individual package. Room air conditioners come in several forms, including window, split-type, and packaged terminal units. Energy efficiency is rated according to the size of the unit using the Energy Efficiency Rating (EER).
Cooling	Room AC — Removal of Second Unit	Homeowners may have a second room AC unit that is extremely inefficient. This measure incents homeowners to recycle the second unit and thus also eliminates associated electricity use.
Cooling	Attic Fan Attic Fan, Photovoltaic	Attic fans can reduce the need for AC by reducing heat transfer from the attic through the ceiling of the house. A well-ventilated attic can be several degrees cooler than a comparable, unventilated attic. An option for an attic fan equipped with a small solar photovoltaic generator was also modeled.
Cooling	Ceiling Fan	Ceiling fans can reduce the need for air conditioning. However, the house occupants must also select a ceiling fan with a high-efficiency motor and either shutoff the AC system or setup the thermostat temperature of the air conditioning system to realize the potential energy savings. Some ceiling fans also come with lamps. In this analysis, it is assumed that there are no lamps, and installing a ceiling fan will allow occupants to increase the thermostat cooling setpoint up by 2°F.
Cooling	Whole-House Fan	Whole-house fans can reduce the need for AC on moderate-weather days or on cool evenings. The fan facilitates a quick air change throughout the entire house. Several windows must be open to achieve the best results. The fan is mounted on the top floor of the house, usually in a hallway ceiling.

Comment [JB1]: Need to say something else??

End-Use	Equipment/ Measure	Description
Space Heating	Convert to Gas	This fuel-switching measure is the replacement of an electric furnace with a gas-fired furnace. This measure will eliminate all electricity consumption and demand due to electric space heating. In this study, it is assumed that this measure can be implemented only in homes within 500 feet of a gas main.
Heat/Cool	Air Source Heat Pump	A central heat pump consists of components similar to a CAC system, but is usually designed to function both as a heat pump and an air conditioner. It consists of a refrigeration system using a direct expansion (DX) cycle. Equipment includes a compressor, an air-cooled condenser (located outdoors), an expansion valve, and an evaporator coil (located in the supply air duct near the supply fan) and a reversing valve to change the DX cycle from cooling to heating when required. The cooling and heating efficiencies vary based on the materials used, equipment size, condenser type, and system configuration. Heat pumps may be unitary (all components housed in a factory-built assembly) or a split system (an outdoor condenser section and an indoor evaporator section connected by refrigerant lines, with either outdoors or indoors. A high-efficiency option for a ductless mini-split system was also analyzed.
Heat / Cool	Geothermal Heat Pump	Geothermal heat pumps are similar to air-source heat pumps, but use the ground or groundwater instead of outside air to provide a heat source/sink. A geothermal heat pump system generally consists of three major subsystems or parts: a geothermal heat pump to move heat between the building and the fluid in the earth connection, an earth connection for transferring heat between the fluid and the earth, and a distribution subsystem for delivering heating or cooling to the building. The system may also have a desuperheater to supplement the building's water heater, or a full-demand water heater to meet all of the building's hot water needs.
Heat / Cool	Air Source Heat Pump Maintenance	A heat pump's filters, coils, and fins require regular cleaning and maintenance for the unit to function effectively and efficiently throughout its life. Neglecting necessary maintenance ensures a steady decline in performance while energy use steadily increases.
HVAC (all)	Insulation – Ducting	Air distribution ducts can be insulated to reduce heating or cooling losses. Best results can be achieved by covering the entire surface area with insulation. Several types of ducts and duct insulation are available, including flexible duct, pre-insulated duct, duct board, duct wrap, tacked, or glued rigid insulation, and waterproof hard shell materials for exterior ducts. This analysis assumes that installing duct insulation can reduce the temperature drop/gain in ducts by 50%.
HVAC (all)	Repair and Sealing – Ducting	An ideal duct system would be free of leaks. Leakage in unsealed ducts varies considerably because of differences in fabricating machinery used, methods for assembly, installation workmanship, and age of the ductwork. Air leaks from the system to the outdoors result in a direct loss proportional to the amount of leakage and the difference in enthalpy between the outdoor air and the conditioned air. This analysis assumes that over time air loss from ducts has doubled, and conducting repair and sealing of the ducts will restore leakage from ducts to the original baseline level.

End-Use	Equipment/ Measure	Description
HVAC (all)	Thermostat — Clock/Programmable	A programmable thermostat can be added to most heating/cooling systems. They are typically used during winter to lower temperatures at night and in summer to increase temperatures during the afternoon. The energy savings from this type of thermostat are identical to those of a "setback" strategy with standard thermostats, but the convenience of a programmable thermostat makes it a much more attractive option. In this analysis, the baseline is assumed to have no thermostat setback.
HVAC (all)	Doors — Storm and Thermal	Like other components of the shell, doors are subject to several types of heat loss: conduction, infiltration, and radiant losses. Similar to a storm window, a storm door creates an insulating air space between the storm and primary doors. A tight fitting storm door can also help reduce air leakage or infiltration. Thermal doors have exceptional thermal insulation properties and also are provided with weather-stripping on the doorframe to reduce air leakage.
HVAC (all)	Insulation — Infiltration Control	Lowering the air infiltration rate by caulking small leaks and weather-stripping around window frames, doorframes, power outlets, plumbing, and wall corners can provide significant energy savings. Weather-stripping doors and windows will create a tight seal and further reduce air infiltration.
HVAC (all)	Insulation —Ceiling	Thermal insulation is material or combinations of materials that are used to inhibit the flow of heat energy by conductive, convective, and radiative transfer modes. Thus, thermal insulation above ceilings can conserve energy by reducing the heat loss or gain into attics and/or through roofs. The type of building construction defines insulating possibilities. Typical insulating materials include: loose-fill (blown) cellulose, loose-fill (blown) fiberglass, and rigid polystyrene.
HVAC (all)	Insulation — Radiant Barrier	Radiant barriers are materials installed to reduce the heat gain in buildings. Radiant barriers are made from materials that are highly reflective and have low emissivity like aluminum. The closer the emissivity is to 0 the better they will perform. Radiant barriers can be placed above the insulation or on the roof rafters.
HVAC (all)	Insulation — Foundation Insulation — Wall Cavity Insulation — Wall Sheathing	Thermal insulation is material or combinations of materials that are used to inhibit the flow of heat energy by conductive, convective, and radiative transfer modes. Thus, thermal insulation can conserve energy by reducing heat loss or gain from a building. The type of building construction defines insulating possibilities. Typical insulating materials include: loose-fill (blown) cellulose, loose-fill (blown) fiberglass, and rigid polystyrene. Foundation, insulation, wall cavity insulation, and wall sheathing were modeled for new construction / major retrofits only.
Cooling	Roof — High Reflectivity	The color and material of a building structure surface determine the amount of solar radiation absorbed by that surface and subsequently transferred into a building. This is called solar absorptance. Using a roofing material with low solar absorptance or painting the roof a light color reduces the cooling load. This analysis assumes that implementing high reflectivity roofs will decrease the roof's absorptance of solar radiation by 45%.
Cooling	Windows — Reflective Film	Reflective films applied to the window interior help reduce solar gain into the space and thus lower cooling energy use.

Comment [JB2]: Need a better description here

End-Use	Equipment/ Measure	Description
HVAC (all)	Windows — High Efficiency / ENERGY STAR	High-efficiency windows, such as those labeled under the ENERGY STAR Program, are designed to reduce energy use and increase occupant comfort. High-efficiency windows reduce the amount of heat transfer through the glazing surface. For example, some windows have a low-E coating, a thin film of metallic oxide coating on the glass surface that allows passage of short-wave solar energy through glass and prevents long-wave energy from escaping. Another example is double-pane glass that reduces conductive and convective heat transfer. Some double-pane windows are gas-filled (usually argon) to further increase the insulating properties of the window.
Water Heating	Water Heater - Electric, High Efficiency	For electric hot water heating, the most common type is a storage heater, which incorporates an electric heating element, storage tank, outer jacket, insulation, and controls in a single unit. Efficient units are characterized by a high recovery or thermal efficiency and low standby losses (the ratio of heat lost per hour to the content of the stored water). Electric instantaneous water heaters are available, but are excluded from this study due to potentially high instantaneous demand concerns.
Water Heating	Water Heater, Heat Pump	An electric heat pump water heater (HPWH) uses a vapor-compression thermodynamic cycle similar to that found in an air-conditioner or refrigerator. Electrical work input allows a heat pump water heater to extract heat from an available source (e.g., air) and reject that heat to a higher temperature sink, in this case, the water in the water heater. Because a HPWH makes use of available ambient heat, the coefficient of performance is greater than one — typically in the range of 2 to 3. These devices are available as an alternative to conventional tank water heaters of 55 gallons or larger. By utilizing the earth as a thermal reservoir, ground source HPWH systems can reach even higher levels of efficiency. The heat pump can be integrated with a traditional water storage tank or installed remote to the storage tank.
Water Heating	Water Heating, Solar	Solar water heating systems can be used in residential buildings that have an appropriate near-south-facing roof or nearby unshaded grounds for installing a collector. Although system types vary, in general these systems use a solar absorber surface within a solar collector or an actual storage tank. Either a heat-transfer fluid or the actual potable water flows through tubes attached to the absorber and transfers heat from it. (Systems with a separate heat-transfer-fluid loop include a heat exchanger that then heats the potable water.) The heated water is stored in a separate preheat tank or a conventional water heater tank. If additional heat is needed, it is provided by a conventional water-heating system.
Water Heating	Convert to Gas	This fuel-switching measure is the replacement of an electric water heater with a gas-fired water heater. This measure will eliminate all electricity consumption and demand due to electric water heating. In this study, it is assumed that this measure can be implemented only in home within 500 feet of a gas main.
Water Heating	Faucet Aerators	Water faucet aerators are threaded screens that attach to existing faucets. They reduce the volume of water coming out of faucets while introducing air into the water stream. This measure provides energy saving by reducing hot water use, as well as water conservation for both hot and cold water.

End-Use	Equipment/ Measure	Description
Water Heating	Pipe Insulation	Insulating hot water pipes decreases energy losses from piping that distributes hot water throughout the building. I also results in quicker delivery of hot water and may allow lower the hot water set point, which saves energy. The most common insulation materials for this purpose are polyethylene and neoprene.
Water Heating	Low-Flow Showerheads	Similar to faucet aerators, low-flow showerheads reduce the consumption of hot water, which in turn decreases water heating energy use.
Water Heating	Tank Blanket	Insulating hot water tanks decreases standby energy losses from the tank. Pre-fitted insulating blankets are readily available.
Water Heating	Thermostat Setback / Timer	These measures use either a programmable thermostat or a timer to adjust the water heater setpoint at times of low usage, typically when a home is unoccupied.
Water Heating	Hot Water Saver	A hot water saver is a plumbing device that attaches to the showerhead and that pauses the flow of water until the water is hot enough for use. The water is re-started by the flip of a switch.
Interior Lighting / Exterior Lighting	Infrared Halogen Lamps	Infrared halogen lamps are designed to be a replacement for standards incandescent lamps. Also referred to as advanced incandescent lamps, these products meet the Energy Independence and Security Act (EISA) lighting standards and are phased in as the baseline technology screw-in lamp technology to reflect the timeline over which the EISA lighting standards take effect.
Interior Lighting / Exterior Lighting	Compact Fluorescent Lamps	Compact fluorescent lamps are designed to be a replacement for standard incandescent lamps and use about 25% ~~to 30%~~ of the energy used by standard incandescent lamps to produce the same lumen output. The can use either electronic or magnetic ballasts. Integral compact fluorescent lamps have the ballast integrated into the base of the lamp and have a standard screw-in base that permits installation into existing incandescent fixtures.
Interior Lighting / Exterior Lighting	Solid State Lighting, LEDs (Screw-in and linear)	Light-emitting diode (LED) lighting has seen recent penetration in specific applications such as traffic lights and exit signs. With the potential for extremely high efficiency, LEDs show promise to provide general-use lighting for interior spaces. Current models commercially available have efficacies comparable to CFLs. However, theoretical efficiencies are significantly higher. LED models under development are expected to provide improved efficacies.
Interior Lighting	Fluorescent, T8, Super T8, and T5 Lamps and Electronic Ballasts	T8 fluorescent lamps are smaller in diameter than standard T12 lamps, resulting in greater light output per watt. T8 lamps also operate at a lower current and wattage, which increases the efficiency of the ballast but requires the lamps to be compatible with the ballast. Fluorescent lamp fixtures can include a reflector that increases the light output from the fixture, and thus make it possible to use a fewer number of lamps in each fixture. T5 lamps further increase efficiency by reducing the lamp diameter to 5/8".
Exterior Lighting	Metal Halide and High Pressure Sodium	These lamps technologies can provide slightly higher efficiencies than CFLs in exterior applications.
Interior Lighting	Occupancy Sensors	Occupancy sensors turn lights off when a space is unoccupied. They are appropriate for areas with intermittent use, such as bathrooms or storage areas.

End-Use	Equipment/ Measure	Description
Exterior Lighting	Photovoltaic Installation	Solar photovoltaic generation may be used to power exterior lighting and thus eliminate all or part of the electrical energy use.
Exterior Lighting	Photosensor Control	Photosensor controls turn exterior lighting on or off based on ambient lighting levels. Compared with manual operation, this can reduce the operation of exterior lighting during daylight hours.
Exterior Lighting	Timeclock Installation	Lighting timers turn exterior lighting on or off based on a preset schedule. Compared with manual operation, this can reduce the operation of exterior lighting during daylight hours.
Appliances	Refrigerator/Freezer, ENERGY STAR or better	Energy-efficient refrigerators/freezers incorporate features such as improved cabinet insulation, more efficient compressors and evaporator fans, defrost controls, mullion heaters, oversized condenser coils, and improved door seals. Further efficiency increases can be obtained by reducing the volume of refrigerated space, or adding multiple compartments to reduce losses from opening doors.
Appliances	Refrigerator/Freezer — Early Replacement	Refrigerators/freezers currently on the market are significantly more efficient that older units, due to technology improvement and stricter appliance standards. This measure incents homeowners to replace an aging but still working unit with a new, higher-efficiency one.
Appliances	Refrigerator/Freezer — Remove Second Unit	Homeowners may have a second refrigerator or freezer that is not used to full capacity and that, because of its age, is extremely inefficient. This measure incents homeowners to recycle the second unit and thus also eliminates associated electricity use.
Appliances	Dishwasher, ENERGY STAR or better	ENERGY STAR labeled dishwashers save by using both improved technology for the primary wash cycle, and by using less hot water. Construction includes more effective washing action, energy-efficient motors, and other advanced technology such as sensors that determine the length of the wash cycle and the temperature of the water necessary to clean the dishes.
Appliances	Clothes Washer, ENERGY STAR or better	ENERGY STAR labeled clothes washers use superior designs that require less water. Sensors match the hot water needs to the size and soil level of the load, preventing energy waste. Further energy and water savings can be achieved through advanced technologies such as inverter-drive or combination washer-dryer units.
Appliances	Clothes Dryer – Electric, High Efficiency	An energy-efficient clothes dryer has a moisture-sensing device to terminate the drying cycle rather than using a timer, and an energy-efficient motor is used for spinning the dryer tub. Application of a heat pump cycle for extracting the moisture from clothes leads to additional energy savings.
Appliances	Range and Oven – Electric, High Efficiency	These products have additional insulation in the oven compartment and tighter-fitting oven door gaskets and hinges to save energy. Conventional ovens must first heat up about 35 pounds of steel and a large amount of air before they heat up the food. Tests indicate that only 6% of the energy output of a typical oven is actually absorbed by the food.
Electronics	Color TVs and Home Electronics, ENERGY STAR or better	In the average home, electronic products consumed significant energy, even when they are turn off, to maintain features like clocks, remote control, and channel/station memory. ENERGY STAR labeled consumer electronics can drastically reduce consumption during standby mode, in addition to saving energy through advanced power management during normal use.

End-Use	Equipment/ Measure	Description
Electronics	Personal Computers, ENERGY STAR or better	Improved power management can significantly reduce the annual energy consumption of PCs and monitors in both standby and normal operation. ENERGY STAR and Climate Savers labeled products provide increasing level of energy efficiency.
Electronics	Reduce Standby Wattage	Representing a growing portion of home electricity consumption, plug-in electronics such as set-top boxes, DVD players, gaming systems, digital video recorders, and even battery chargers for mobile phones and laptop computers are often designed to supply a set voltage. When the units are not in use, this voltage could be dropped significantly (~1 W) and thereby generate a significant energy savings, assumed for this analysis to be between 4-5% on average. These savings are in excess of the measures already discussed for computers and televisions.
Misc.	Furnace Fans, Electronically Commutating Motor	In homes heated by a furnace, there is still substantial energy use by the fan responsible for moving the hot air throughout the ductwork. Application of an Electronically Commutating Motor (ECM) ensures that motor speed matches the heating requirements of the system and saves energy when compared to a continuously operating standard motor.
Miscellaneous	Pool Pump	High-efficiency motors and two-speed pumps provide improved energy efficiency for this load.
Miscellaneous	Pool Pump Timer	A pool pump timer allows the pump to turn off automatically, eliminating the wasted energy associated with unnecessary pumping.
Miscellaneous	Trees for Shading	Planting of shade trees, suitable to the local climate, can reduce the need for air conditioning and provide non-energy benefits as well.
Cooling / Space Heating / Interior Lighting	Home Energy Management System	A centralized home energy management system can be used to control and schedule cooling, space heating, lighting, and possibly appliances as well. Some designs also allow the homeowner to remotely control loads via the Internet.
Cooling / Space Heating	Solar Photovoltaic	Adding a solar photovoltaic (PV) system to the home can meet a portion of the home's electric load and in some cases nearly the entire load, depending on the PV system size, orientation, solar resource, and other factors. For this analysis, we assume a grid-connected system and apply the electricity savings to the home's cooling and space heating loads.
Cooling / Space Heating / Interior Lighting	Advanced New Construction Designs	Advanced new construction designs use an integrated approach to the design of new buildings to account for the interaction of building systems. Typically, designs specify the building orientation, building shell, building mechanical systems, and controls strategies with the goal of optimizing building energy efficiency and comfort. Options that may be evaluated and incorporated include passive solar strategies, increased thermal mass, natural ventilation, daylighting strategies, and shading strategies, This measure was modeled for new construction only.
Cooling / Space Heating / Interior Lighting	ENERGY STAR Homes	This measure was modeled for new construction only.
Cooling / Space Heating / Interior Lighting	Energy-Efficient Manufactured Homes	This measure was modeled for new construction only.

Table C-2 Energy Efficiency Equipment Data — Single Family, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central AC	SEER 13	-	$0	15	-
Cooling	Central AC	SEER 14 (Energy Star)	134	$278	15	0.41
Cooling	Central AC	SEER 15 (CEE Tier 2)	184	$556	15	0.28
Cooling	Central AC	SEER 16 (CEE Tier 3)	226	$834	15	0.23
Cooling	Central AC	Ductless Mini-Split System	405	$4,399	20	0.14
Cooling	Room AC	EER 9.8	-	$0	10	-
Cooling	Room AC	EER 10.8 (Energy Star)	62	$104	10	0.33
Cooling	Room AC	EER 11	73	$282	10	0.15
Cooling	Room AC	EER 11.5	99	$626	10	0.09
Combined Heating/Cooling	Air Source Heat Pump	SEER 13	-	$0	15	-
Combined Heating/Cooling	Air Source Heat Pump	SEER 14 (Energy Star)	492	$1,000	15	0.43
Combined Heating/Cooling	Air Source Heat Pump	SEER 15 (CEE Tier 2)	675	$2,318	15	0.26
Combined Heating/Cooling	Air Source Heat Pump	SEER 16 (CEE Tier 3)	829	$3,505	15	0.21
Combined Heating/Cooling	Air Source Heat Pump	Ductless Mini-Split System	1,486	$5,655	20	0.45
Combined Heating/Cooling	Geothermal Heat Pump	Standard	-	$0	14	-
Combined Heating/Cooling	Geothermal Heat Pump	High Efficiency	516	$1,500	14	0.28
Space Heating	Electric Resistance	Electric Resistance	-	$0	20	-
Space Heating	Electric Furnace	3400 BTU/KW	-	$0	15	-
Space Heating	Supplemental	Supplemental	-	$0	5	-
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	173	$41	15	5.79
Water Heating	Water Heater	Geothermal Heat Pump	2,269	$6,586	15	0.47
Water Heating	Water Heater	Solar	2,493	$5,653	15	0.60
Interior Lighting	Screw-in	Incandescent	-	$0	4	-
Interior Lighting	Screw-in	Infrared Halogen	338	$188	5	-
Interior Lighting	Screw-in	CFL	1,396	$76	6	14.44
Interior Lighting	Screw-in	LED	1,543	$2,587	12	0.90
Interior Lighting	Linear Fluorescent	T12	-	$0	6	-
Interior Lighting	Linear Fluorescent	T8	14	($4)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	43	$29	6	1.16
Interior Lighting	Linear Fluorescent	T5	44	$49	6	0.71
Interior Lighting	Linear Fluorescent	LED	47	$434	10	0.14
Interior Lighting	Pin-based	Halogen	-	$0	4	-
Interior Lighting	Pin-based	CFL	50	($7)	6	1.00
Interior Lighting	Pin-based	LED	55	$108	10	0.77
Exterior Lighting	Screw-in	Incandescent	-	$0	4	-
Exterior Lighting	Screw-in	Infrared Halogen	107	$51	5	-
Exterior Lighting	Screw-in	CFL	413	$17	6	22.43
Exterior Lighting	Screw-in	LED	444	$757	12	0.89
Exterior Lighting	High Intensity/Flood	Incandescent	-	$0	4	-
Exterior Lighting	High Intensity/Flood	Infrared Halogen	23	$13	4	-
Exterior Lighting	High Intensity/Flood	CFL	139	$12	5	7.40
Exterior Lighting	High Intensity/Flood	Metal Halide	142	$22	5	4.03
Exterior Lighting	High Intensity/Flood	High Pressure Sodium	158	$11	5	9.14
Exterior Lighting	High Intensity/Flood	LED	161	$254	10	0.82
Appliances	Clothes Washer	Baseline	-	$0	10	-
Appliances	Clothes Washer	Energy Star (MEF > 1.8)	45	$0	10	1.00
Appliances	Clothes Washer	Horizontal Axis	88	$487	10	0.16
Appliances	Clothes Dryer	Baseline	-	$0	13	-
Appliances	Clothes Dryer	Moisture Detection	98	$48	13	2.39
Appliances	Dishwasher	Baseline	-	$0	9	-
Appliances	Dishwasher	Energy Star	41	$1	9	-
Appliances	Dishwasher	Energy Star (2011)	53	$1	9	31.05
Appliances	Refrigerator	Baseline	-	$0	13	-
Appliances	Refrigerator	Energy Star	108	$89	13	1.28
Appliances	Refrigerator	Baseline (2014)	144	$0	13	-
Appliances	Refrigerator	Energy Star (2014)	230	$89	13	-

Table C-2 Energy Efficiency Equipment Data — Single Family, Existing Vintage (cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Appliances	Freezer	Baseline	-	$0	11	-
Appliances	Freezer	Energy Star	114	$32	11	3.03
Appliances	Freezer	Baseline (2014)	152	$0	11	-
Appliances	Freezer	Energy Star (2014)	243	$32	11	-
Appliances	Second Refrigerator	Baseline	-	$0	13	-
Appliances	Second Refrigerator	Energy Star	111	$89	13	1.31
Appliances	Second Refrigerator	Baseline (2014)	148	$0	13	-
Appliances	Second Refrigerator	Energy Star (2014)	237	$89	13	-
Appliances	Stove	Baseline	-	$0	13	-
Appliances	Stove	Convection Oven	9	$2	13	7.00
Appliances	Stove	Induction (High Efficiency)	46	$1,432	13	0.05
Appliances	Microwave	Baseline	-	$0	9	-
Electronics	Personal Computers	Baseline	-	$0	5	-
Electronics	Personal Computers	Energy Star	108	$1	5	35.63
Electronics	Personal Computers	Climate Savers	154	$175	5	0.35
Electronics	TVs	Baseline	-	$0	11	-
Electronics	TVs	Energy Star	87	$1	11	133.21
Electronics	Devices and Gadgets	Devices and Gadgets	-	$0	5	-
Miscellaneous	Pool Pump	Baseline Pump	-	$0	15	-
Miscellaneous	Pool Pump	High Efficiency Pump	138	$85	15	1.96
Miscellaneous	Pool Pump	Two-Speed Pump	551	$579	15	1.15
Miscellaneous	Furnace Fan	Baseline	-	$0	18	-
Miscellaneous	Furnace Fan	Furnace Fan with ECM	127	$1	18	281.65
Miscellaneous	Miscellaneous	Miscellaneous	-	$0	5	-

Table C-3 Energy Efficiency Equipment Data — Multi Family, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central AC	SEER 13	-	$0	15	-
Cooling	Central AC	SEER 14 (Energy Star)	67	$93	15	0.62
Cooling	Central AC	SEER 15 (CEE Tier 2)	133	$185	15	0.61
Cooling	Central AC	SEER 16 (CEE Tier 3)	187	$278	15	0.57
Cooling	Central AC	Ductless Mini-Split System	245	$2,012	20	0.19
Cooling	Room AC	EER 9.8	-	$0	10	-
Cooling	Room AC	EER 10.8 (Energy Star)	32	$52	10	0.35
Cooling	Room AC	EER 11	38	$141	10	0.15
Cooling	Room AC	EER 11.5	52	$313	10	0.09
Combined Heating/Cooling	Air Source Heat Pump	SEER 13	-	$0	15	-
Combined Heating/Cooling	Air Source Heat Pump	SEER 14 (Energy Star)	238	$1,246	15	0.17
Combined Heating/Cooling	Air Source Heat Pump	SEER 15 (CEE Tier 2)	467	$2,315	15	0.18
Combined Heating/Cooling	Air Source Heat Pump	SEER 16 (CEE Tier 3)	659	$3,277	15	0.18
Combined Heating/Cooling	Air Source Heat Pump	Ductless Mini-Split System	862	$5,022	20	0.27
Combined Heating/Cooling	Geothermal Heat Pump	Standard	-	$0	14	-
Combined Heating/Cooling	Geothermal Heat Pump	High Efficiency	248	$1,500	14	0.14
Space Heating	Electric Resistance	Electric Resistance	-	$0	20	-
Space Heating	Electric Furnace	3400 BTU/KW	-	$0	15	-
Space Heating	Supplemental	Supplemental	-	$0	5	-
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	107	$41	15	3.61
Water Heating	Water Heater	Solar	1,539	$5,653	15	0.38
Interior Lighting	Screw-in	Incandescent	-	$0	4	-
Interior Lighting	Screw-in	Infrared Halogen	174	$134	5	-
Interior Lighting	Screw-in	CFL	721	$54	6	10.47
Interior Lighting	Screw-in	LED	797	$1,844	12	0.65
Interior Lighting	Linear Fluorescent	T12	-	$0	6	-
Interior Lighting	Linear Fluorescent	T8	7	($2)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	21	$15	6	1.16
Interior Lighting	Linear Fluorescent	T5	22	$25	6	0.71
Interior Lighting	Linear Fluorescent	LED	23	$217	10	0.14
Interior Lighting	Pin-based	Halogen	-	$0	4	-
Interior Lighting	Pin-based	CFL	62	($9)	6	1.00
Interior Lighting	Pin-based	LED	68	$135	10	0.77
Exterior Lighting	Screw-in	Incandescent	-	$0	4	-
Exterior Lighting	Screw-in	Infrared Halogen	15	$5	5	-
Exterior Lighting	Screw-in	CFL	59	$2	6	32.52
Exterior Lighting	Screw-in	LED	64	$75	12	1.29
Exterior Lighting	High Intensity/Flood	Incandescent	-	$0	4	-
Exterior Lighting	High Intensity/Flood	Infrared Halogen	11	$6	4	-
Exterior Lighting	High Intensity/Flood	CFL	70	$6	5	7.40
Exterior Lighting	High Intensity/Flood	Metal Halide	71	$11	5	4.03
Exterior Lighting	High Intensity/Flood	High Pressure Sodium	79	$5	5	9.14
Exterior Lighting	High Intensity/Flood	LED	81	$127	10	0.82
Appliances	Clothes Washer	Baseline	-	$0	10	-
Appliances	Clothes Washer	Energy Star (MEF > 1.8)	23	$0	10	1.00
Appliances	Clothes Washer	Horizontal Axis	44	$487	10	0.08
Appliances	Clothes Dryer	Baseline	-	$0	13	-
Appliances	Clothes Dryer	Moisture Detection	93	$48	13	2.28
Appliances	Dishwasher	Baseline	-	$0	9	-
Appliances	Dishwasher	Energy Star	15	$1	9	-
Appliances	Dishwasher	Energy Star (2011)	19	$1	9	11.14
Appliances	Refrigerator	Baseline	-	$0	13	-
Appliances	Refrigerator	Energy Star	92	$89	13	1.09
Appliances	Refrigerator	Baseline (2014)	123	$0	13	-
Appliances	Refrigerator	Energy Star (2014)	196	$89	13	-
Appliances	Freezer	Baseline	-	$0	11	-

Table C-3 Energy Efficiency Equipment Data—Multi Family, Existing Vintage (cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Appliances	Freezer	Energy Star	108	$32	11	2.88
Appliances	Freezer	Baseline (2014)	145	$0	11	-
Appliances	Freezer	Energy Star (2014)	231	$32	11	-
Appliances	Second Refrigerator	Baseline	-	$0	13	-
Appliances	Second Refrigerator	Energy Star	93	$89	13	1.11
Appliances	Second Refrigerator	Baseline (2014)	124	$0	13	-
Appliances	Second Refrigerator	Energy Star (2014)	199	$89	13	-
Appliances	Stove	Baseline	-	$0	13	-
Appliances	Stove	Convection Oven	4	$2	13	2.99
Appliances	Stove	Induction (High Efficiency)	20	$1,432	13	0.02
Appliances	Microwave	Baseline	-	$0	9	-
Electronics	Personal Computers	Baseline	-	$0	5	-
Electronics	Personal Computers	Energy Star	86	$1	5	29.28
Electronics	Personal Computers	Climate Savers	123	$175	5	0.29
Electronics	TVs	Baseline	-	$0	11	-
Electronics	TVs	Energy Star	43	$1	11	67.65
Electronics	Devices and Gadgets	Devices and Gadgets	-	$0	5	-
Miscellaneous	Pool Pump	Baseline Pump	-	$0	15	-
Miscellaneous	Pool Pump	High Efficiency Pump	-	$85	15	-
Miscellaneous	Pool Pump	Two-Speed Pump	-	$579	15	-
Miscellaneous	Furnace Fan	Baseline	-	$0	18	-
Miscellaneous	Furnace Fan	Furnace Fan with ECM	10	$1	18	21.87
Miscellaneous	Miscellaneous	Miscellaneous	-	$0	5	-

Table C-4 Energy Efficiency Equipment Data — Mobile Home, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central AC	SEER 13	-	$0	15	-
Cooling	Central AC	SEER 14 (Energy Star)	80	$278	15	0.24
Cooling	Central AC	SEER 15 (CEE Tier 2)	110	$556	15	0.17
Cooling	Central AC	SEER 16 (CEE Tier 3)	134	$834	15	0.14
Cooling	Central AC	Ductless Mini-Split System	241	$4,399	20	0.08
Cooling	Room AC	EER 9.8	-	$0	10	-
Cooling	Room AC	EER 10.8 (Energy Star)	37	$52	10	0.40
Cooling	Room AC	EER 11	44	$141	10	0.17
Cooling	Room AC	EER 11.5	59	$313	10	0.11
Combined Heating/Cooling	Air Source Heat Pump	SEER 13	-	$0	15	-
Combined Heating/Cooling	Air Source Heat Pump	SEER 14 (Energy Star)	282	$1,246	15	0.20
Combined Heating/Cooling	Air Source Heat Pump	SEER 15 (CEE Tier 2)	387	$2,315	15	0.15
Combined Heating/Cooling	Air Source Heat Pump	SEER 16 (CEE Tier 3)	475	$3,277	15	0.13
Combined Heating/Cooling	Air Source Heat Pump	Ductless Mini-Split System	852	$5,022	20	0.27
Combined Heating/Cooling	Geothermal Heat Pump	Standard	-	$0	14	-
Combined Heating/Cooling	Geothermal Heat Pump	High Efficiency	295	$1,500	14	0.16
Space Heating	Electric Resistance	Electric Resistance	-	$0	20	-
Space Heating	Electric Furnace	3400 BTU/KW	-	$0	15	-
Space Heating	Supplemental	Supplemental	-	$0	5	-
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	88	$41	15	2.95
Water Heating	Water Heater	Solar	1,271	$5,653	15	0.31
Interior Lighting	Screw-in	Incandescent	-	$0	4	-
Interior Lighting	Screw-in	Infrared Halogen	304	$188	5	-
Interior Lighting	Screw-in	CFL	1,257	$76	6	13.00
Interior Lighting	Screw-in	LED	1,389	$2,587	12	0.81
Interior Lighting	Linear Fluorescent	T12	-	$0	6	-
Interior Lighting	Linear Fluorescent	T8	13	($4)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	38	$29	6	1.04
Interior Lighting	Linear Fluorescent	T5	40	$49	6	0.64
Interior Lighting	Linear Fluorescent	LED	42	$434	10	0.13
Interior Lighting	Pin-based	Halogen	-	$0	4	-
Interior Lighting	Pin-based	CFL	45	($7)	6	1.00
Interior Lighting	Pin-based	LED	49	$106	10	0.70
Exterior Lighting	Screw-in	Incandescent	-	$0	4	-
Exterior Lighting	Screw-in	Infrared Halogen	96	$51	5	-
Exterior Lighting	Screw-in	CFL	372	$17	6	20.19
Exterior Lighting	Screw-in	LED	400	$757	12	0.80
Exterior Lighting	High Intensity/Flood	Incandescent	-	$0	4	-
Exterior Lighting	High Intensity/Flood	Infrared Halogen	21	$13	4	-
Exterior Lighting	High Intensity/Flood	CFL	125	$12	5	6.66
Exterior Lighting	High Intensity/Flood	Metal Halide	128	$22	5	3.63
Exterior Lighting	High Intensity/Flood	High Pressure Sodium	142	$11	5	8.23
Exterior Lighting	High Intensity/Flood	LED	145	$254	10	0.74
Appliances	Clothes Washer	Baseline	-	$0	10	-
Appliances	Clothes Washer	Energy Star (MEF > 1.8)	46	$0	10	1.00
Appliances	Clothes Washer	Horizontal Axis	89	$487	10	0.16
Appliances	Clothes Dryer	Baseline	-	$0	13	-
Appliances	Clothes Dryer	Moisture Detection	99	$48	13	2.43
Appliances	Dishwasher	Baseline	-	$0	9	-
Appliances	Dishwasher	Energy Star	41	$1	9	-
Appliances	Dishwasher	Energy Star (2011)	54	$1	9	31.57
Appliances	Refrigerator	Baseline	-	$0	13	-
Appliances	Refrigerator	Energy Star	110	$89	13	1.30
Appliances	Refrigerator	Baseline (2014)	146	$0	13	-
Appliances	Refrigerator	Energy Star (2014)	234	$89	13	-
Appliances	Freezer	Baseline	-	$0	11	-

Table C-4 Energy Efficiency Equipment Data — Mobile Home, Existing Vintage (cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Appliances	Freezer	Energy Star	116	$32	11	3.08
Appliances	Freezer	Baseline (2014)	155	$0	11	-
Appliances	Freezer	Energy Star (2014)	248	$32	11	-
Appliances	Second Refrigerator	Baseline	-	$0	13	-
Appliances	Second Refrigerator	Energy Star	113	$89	13	1.34
Appliances	Second Refrigerator	Baseline (2014)	150	$0	13	-
Appliances	Second Refrigerator	Energy Star (2014)	241	$89	13	-
Appliances	Stove	Baseline	-	$0	13	-
Appliances	Stove	Convection Oven	8	$2	13	6.30
Appliances	Stove	Induction (High Efficiency)	41	$1,432	13	0.04
Appliances	Microwave	Baseline	-	$0	9	-
Electronics	Personal Computers	Baseline	-	$0	5	-
Electronics	Personal Computers	Energy Star	101	$1	5	33.39
Electronics	Personal Computers	Climate Savers	144	$175	5	0.33
Electronics	TVs	Baseline	-	$0	11	-
Electronics	TVs	Energy Star	87	$1	11	133.21
Electronics	Devices and Gadgets	Devices and Gadgets	-	$0	5	-
Miscellaneous	Pool Pump	Baseline Pump	-	$0	15	-
Miscellaneous	Pool Pump	High Efficiency Pump	138	$85	15	1.96
Miscellaneous	Pool Pump	Two-Speed Pump	551	$579	15	1.15
Miscellaneous	Furnace Fan	Baseline	-	$0	18	-
Miscellaneous	Furnace Fan	Furnace Fan with ECM	127	$1	18	281.65
Miscellaneous	Miscellaneous	Miscellaneous	-	$0	5	-

Table C-5 Energy Efficiency Equipment Data — Limited Income, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central AC	SEER 13	-	$0	15	-
Cooling	Central AC	SEER 14 (Energy Star)	76	$185	15	0.35
Cooling	Central AC	SEER 15 (CEE Tier 2)	104	$370	15	0.24
Cooling	Central AC	SEER 16 (CEE Tier 3)	127	$556	15	0.19
Cooling	Central AC	Ductless Mini-Split System	229	$2,394	20	0.15
Cooling	Room AC	EER 9.8	-	$0	10	-
Cooling	Room AC	EER 10.8 (Energy Star)	65	$104	10	0.35
Cooling	Room AC	EER 11	77	$282	10	0.15
Cooling	Room AC	EER 11.5	104	$626	10	0.09
Combined Heating/Cooling	Air Source Heat Pump	SEER 13	-	$0	15	-
Combined Heating/Cooling	Air Source Heat Pump	SEER 14 (Energy Star)	192	$1,246	15	0.13
Combined Heating/Cooling	Air Source Heat Pump	SEER 15 (CEE Tier 2)	263	$2,315	15	0.10
Combined Heating/Cooling	Air Source Heat Pump	SEER 16 (CEE Tier 3)	323	$3,277	15	0.09
Combined Heating/Cooling	Air Source Heat Pump	Ductless Mini-Split System	579	$5,022	20	0.18
Combined Heating/Cooling	Geothermal Heat Pump	Standard	-	$0	14	-
Combined Heating/Cooling	Geothermal Heat Pump	High Efficiency	201	$1,500	14	0.11
Space Heating	Electric Resistance	Electric Resistance	-	$0	20	-
Space Heating	Electric Furnace	3400 BTU/KW	-	$0	15	-
Space Heating	Supplemental	Supplemental	-	$0	5	-
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	116	$41	15	3.94
Water Heating	Water Heater	Solar	1,679	$5,653	15	0.41
Interior Lighting	Screw-in	Incandescent	-	$0	4	-
Interior Lighting	Screw-in	Infrared Halogen	169	$98	5	-
Interior Lighting	Screw-in	CFL	700	$40	6	13.85
Interior Lighting	Screw-in	LED	773	$1,352	12	0.86
Interior Lighting	Linear Fluorescent	T12	-	$0	6	-
Interior Lighting	Linear Fluorescent	T8	7	($2)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	21	$14	6	1.16
Interior Lighting	Linear Fluorescent	T5	22	$24	6	0.71
Interior Lighting	Linear Fluorescent	LED	23	$213	10	0.14
Interior Lighting	Pin-based	Halogen	-	$0	4	-
Interior Lighting	Pin-based	CFL	49	($7)	6	1.00
Interior Lighting	Pin-based	LED	54	$106	10	0.77
Exterior Lighting	Screw-in	Incandescent	-	$0	4	-
Exterior Lighting	Screw-in	Infrared Halogen	30	$10	5	-
Exterior Lighting	Screw-in	CFL	115	$3	6	32.52
Exterior Lighting	Screw-in	LED	123	$145	12	1.29
Exterior Lighting	High Intensity/Flood	Incandescent	-	$0	4	-
Exterior Lighting	High Intensity/Flood	Infrared Halogen	13	$7	4	-
Exterior Lighting	High Intensity/Flood	CFL	80	$7	5	7.40
Exterior Lighting	High Intensity/Flood	Metal Halide	81	$12	5	4.03
Exterior Lighting	High Intensity/Flood	High Pressure Sodium	91	$6	5	9.14
Exterior Lighting	High Intensity/Flood	LED	92	$146	10	0.82
Appliances	Clothes Washer	Baseline	-	$0	10	-
Appliances	Clothes Washer	Energy Star (MEF > 1.8)	20	$0	10	1.00
Appliances	Clothes Washer	Horizontal Axis	38	$487	10	0.07
Appliances	Clothes Dryer	Baseline	-	$0	13	-
Appliances	Clothes Dryer	Moisture Detection	104	$48	13	2.56
Appliances	Dishwasher	Baseline	-	$0	9	-
Appliances	Dishwasher	Energy Star	12	$1	9	-
Appliances	Dishwasher	Energy Star (2011)	15	$1	9	9.07
Appliances	Refrigerator	Baseline	-	$0	13	-
Appliances	Refrigerator	Energy Star	92	$89	13	1.09
Appliances	Refrigerator	Baseline (2014)	123	$0	13	-
Appliances	Refrigerator	Energy Star (2014)	196	$89	13	-
Appliances	Freezer	Baseline	-	$0	11	-

Table C-5 Energy Efficiency Equipment Data — Limited Income, Existing Vintage (cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Appliances	Freezer	Energy Star	108	$32	11	2.88
Appliances	Freezer	Baseline (2014)	145	$0	11	-
Appliances	Freezer	Energy Star (2014)	231	$32	11	-
Appliances	Second Refrigerator	Baseline	-	$0	13	-
Appliances	Second Refrigerator	Energy Star	93	$89	13	1.11
Appliances	Second Refrigerator	Baseline (2014)	124	$0	13	-
Appliances	Second Refrigerator	Energy Star (2014)	199	$89	13	-
Appliances	Stove	Baseline	-	$0	13	-
Appliances	Stove	Convection Oven	5	$2	13	3.59
Appliances	Stove	Induction (High Efficiency)	24	$1,432	13	0.02
Appliances	Microwave	Baseline	-	$0	9	-
Electronics	Personal Computers	Baseline	-	$0	5	-
Electronics	Personal Computers	Energy Star	89	$1	5	30.10
Electronics	Personal Computers	Climate Savers	127	$175	5	0.29
Electronics	TVs	Baseline	-	$0	11	-
Electronics	TVs	Energy Star	49	$1	11	77.80
Electronics	Devices and Gadgets	Devices and Gadgets	-	$0	5	-
Miscellaneous	Pool Pump	Baseline Pump	-	$0	15	-
Miscellaneous	Pool Pump	High Efficiency Pump	57	$85	15	0.83
Miscellaneous	Pool Pump	Two-Speed Pump	226	$579	15	0.49
Miscellaneous	Furnace Fan	Baseline	-	$0	18	-
Miscellaneous	Furnace Fan	Furnace Fan with ECM	54	$1	18	123.18
Miscellaneous	Miscellaneous	Miscellaneous	-	$0	5	-

Table C-6 Energy Efficiency Equipment Data —Single Family, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central AC	SEER 13	-	$0	15	-
Cooling	Central AC	SEER 14 (Energy Star)	180	$278	15	0.55
Cooling	Central AC	SEER 15 (CEE Tier 2)	240	$556	15	0.36
Cooling	Central AC	SEER 16 (CEE Tier 3)	290	$834	15	0.29
Cooling	Central AC	Ductless Mini-Split System	543	$4,399	20	0.19
Cooling	Room AC	EER 9.8	-	$0	10	-
Cooling	Room AC	EER 10.8 (Energy Star)	76	$104	10	0.41
Cooling	Room AC	EER 11	90	$282	10	0.18
Cooling	Room AC	EER 11.5	122	$626	10	0.11
Combined Heating/Cooling	Air Source Heat Pump	SEER 13	-	$0	15	-
Combined Heating/Cooling	Air Source Heat Pump	SEER 14 (Energy Star)	588	$1,000	15	0.51
Combined Heating/Cooling	Air Source Heat Pump	SEER 15 (CEE Tier 2)	783	$2,318	15	0.30
Combined Heating/Cooling	Air Source Heat Pump	SEER 16 (CEE Tier 3)	946	$3,505	15	0.24
Combined Heating/Cooling	Air Source Heat Pump	Ductless Mini-Split System	1,775	$5,655	20	0.54
Combined Heating/Cooling	Geothermal Heat Pump	Standard	-	$0	14	-
Combined Heating/Cooling	Geothermal Heat Pump	High Efficiency	630	$1,500	14	0.35
Space Heating	Electric Resistance	Electric Resistance	-	$0	20	-
Space Heating	Electric Furnace	3400 BTU/KW	-	$0	15	-
Space Heating	Supplemental	Supplemental	-	$0	5	-
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	219	$41	15	7.35
Water Heating	Water Heater	Geothermal Heat Pump	2,878	$6,586	15	0.60
Water Heating	Water Heater	Solar	3,163	$5,653	15	0.77
Interior Lighting	Screw-in	Incandescent	-	$0	4	-
Interior Lighting	Screw-in	Infrared Halogen	328	$188	5	-
Interior Lighting	Screw-in	CFL	1,358	$76	6	14.05
Interior Lighting	Screw-in	LED	1,501	$2,587	12	0.87
Interior Lighting	Linear Fluorescent	T12	-	$0	6	-
Interior Lighting	Linear Fluorescent	T8	14	($4)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	43	$29	6	1.16
Interior Lighting	Linear Fluorescent	T5	44	$49	6	0.71
Interior Lighting	Linear Fluorescent	LED	47	$434	10	0.14
Interior Lighting	Pin-based	Halogen	-	$0	4	-
Interior Lighting	Pin-based	CFL	50	($7)	6	1.00
Interior Lighting	Pin-based	LED	55	$108	10	0.77
Exterior Lighting	Screw-in	Incandescent	-	$0	4	-
Exterior Lighting	Screw-in	Infrared Halogen	104	$51	5	-
Exterior Lighting	Screw-in	CFL	401	$17	6	21.82
Exterior Lighting	Screw-in	LED	432	$757	12	0.87
Exterior Lighting	High Intensity/Flood	Incandescent	-	$0	4	-
Exterior Lighting	High Intensity/Flood	Infrared Halogen	23	$13	4	-
Exterior Lighting	High Intensity/Flood	CFL	139	$12	5	7.40
Exterior Lighting	High Intensity/Flood	Metal Halide	142	$22	5	4.03
Exterior Lighting	High Intensity/Flood	High Pressure Sodium	158	$11	5	9.14
Exterior Lighting	High Intensity/Flood	LED	161	$254	10	0.82
Appliances	Clothes Washer	Baseline	-	$0	10	-
Appliances	Clothes Washer	Energy Star (MEF > 1.8)	58	$0	10	1.00
Appliances	Clothes Washer	Horizontal Axis	112	$487	10	0.21
Appliances	Clothes Dryer	Baseline	-	$0	13	-
Appliances	Clothes Dryer	Moisture Detection	117	$48	13	2.86
Appliances	Dishwasher	Baseline	-	$0	9	-
Appliances	Dishwasher	Energy Star	47	$1	9	-
Appliances	Dishwasher	Energy Star (2011)	62	$1	9	36.25
Appliances	Refrigerator	Baseline	-	$0	13	-
Appliances	Refrigerator	Energy Star	102	$89	13	1.20
Appliances	Refrigerator	Baseline (2014)	135	$0	13	-
Appliances	Refrigerator	Energy Star (2014)	217	$89	13	-

Table C-6 Energy Efficiency Equipment Data —Single Family, New Vintage (cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Appliances	Freezer	Baseline	-	$0	11	-
Appliances	Freezer	Energy Star	116	$32	11	3.08
Appliances	Freezer	Baseline (2014)	155	$0	11	-
Appliances	Freezer	Energy Star (2014)	248	$32	11	-
Appliances	Second Refrigerator	Baseline	-	$0	13	-
Appliances	Second Refrigerator	Energy Star	116	$89	13	1.37
Appliances	Second Refrigerator	Baseline (2014)	154	$0	13	-
Appliances	Second Refrigerator	Energy Star (2014)	247	$89	13	-
Appliances	Stove	Baseline	-	$0	13	-
Appliances	Stove	Convection Oven	11	$2	13	8.51
Appliances	Stove	Induction (High Efficiency)	56	$1,432	13	0.06
Appliances	Microwave	Baseline	-	$0	9	-
Electronics	Personal Computers	Baseline	-	$0	5	-
Electronics	Personal Computers	Energy Star	111	$1	5	36.63
Electronics	Personal Computers	Climate Savers	158	$175	5	0.36
Electronics	TVs	Baseline	-	$0	11	-
Electronics	TVs	Energy Star	96	$1	11	148.53
Electronics	Devices and Gadgets	Devices and Gadgets	-	$0	5	-
Miscellaneous	Pool Pump	Baseline Pump	-	$0	15	-
Miscellaneous	Pool Pump	High Efficiency Pump	156	$85	15	2.22
Miscellaneous	Pool Pump	Two-Speed Pump	623	$579	15	1.30
Miscellaneous	Furnace Fan	Baseline	-	$0	18	-
Miscellaneous	Furnace Fan	Furnace Fan with ECM	155	$1	18	345.87
Miscellaneous	Miscellaneous	Miscellaneous	-	$0	5	-

Table C-7 Energy Efficiency Equipment Data — Multi Family, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central AC	SEER 13	-	$0	15	-
Cooling	Central AC	SEER 14 (Energy Star)	85	$93	15	0.78
Cooling	Central AC	SEER 15 (CEE Tier 2)	166	$185	15	0.76
Cooling	Central AC	SEER 16 (CEE Tier 3)	234	$278	15	0.71
Cooling	Central AC	Ductless Mini-Split System	308	$2,012	20	0.24
Cooling	Room AC	EER 9.8	-	$0	10	-
Cooling	Room AC	EER 10.8 (Energy Star)	37	$52	10	0.39
Cooling	Room AC	EER 11	43	$141	10	0.17
Cooling	Room AC	EER 11.5	59	$313	10	0.10
Combined Heating/Cooling	Air Source Heat Pump	SEER 13	-	$0	15	-
Combined Heating/Cooling	Air Source Heat Pump	SEER 14 (Energy Star)	292	$1,246	15	0.21
Combined Heating/Cooling	Air Source Heat Pump	SEER 15 (CEE Tier 2)	571	$2,315	15	0.22
Combined Heating/Cooling	Air Source Heat Pump	SEER 16 (CEE Tier 3)	804	$3,277	15	0.21
Combined Heating/Cooling	Air Source Heat Pump	Ductless Mini-Split System	1,058	$5,022	20	0.33
Combined Heating/Cooling	Geothermal Heat Pump	Standard	-	$0	14	-
Combined Heating/Cooling	Geothermal Heat Pump	High Efficiency	282	$1,500	14	0.15
Space Heating	Electric Resistance	Electric Resistance	-	$0	20	-
Space Heating	Electric Furnace	3400 BTU/KW	-	$0	15	-
Space Heating	Supplemental	Supplemental	-	$0	5	-
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	124	$41	15	4.19
Water Heating	Water Heater	Solar	1,786	$5,653	15	0.44
Interior Lighting	Screw-in	Incandescent	-	$0	4	-
Interior Lighting	Screw-in	Infrared Halogen	170	$134	5	-
Interior Lighting	Screw-in	CFL	702	$54	6	10.18
Interior Lighting	Screw-in	LED	775	$1,844	12	0.63
Interior Lighting	Linear Fluorescent	T12	-	$0	6	-
Interior Lighting	Linear Fluorescent	T8	7	($2)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	21	$15	6	1.16
Interior Lighting	Linear Fluorescent	T5	22	$25	6	0.71
Interior Lighting	Linear Fluorescent	LED	23	$217	10	0.14
Interior Lighting	Pin-based	Halogen	-	$0	4	-
Interior Lighting	Pin-based	CFL	62	($9)	6	1.00
Interior Lighting	Pin-based	LED	68	$135	10	0.77
Exterior Lighting	Screw-in	Incandescent	-	$0	4	-
Exterior Lighting	Screw-in	Infrared Halogen	15	$5	5	-
Exterior Lighting	Screw-in	CFL	58	$2	6	31.63
Exterior Lighting	Screw-in	LED	62	$75	12	1.26
Exterior Lighting	High Intensity/Flood	Incandescent	-	$0	4	-
Exterior Lighting	High Intensity/Flood	Infrared Halogen	11	$6	4	-
Exterior Lighting	High Intensity/Flood	CFL	70	$6	5	7.40
Exterior Lighting	High Intensity/Flood	Metal Halide	71	$11	5	4.03
Exterior Lighting	High Intensity/Flood	High Pressure Sodium	79	$5	5	9.14
Exterior Lighting	High Intensity/Flood	LED	81	$127	10	0.82
Appliances	Clothes Washer	Baseline	-	$0	10	-
Appliances	Clothes Washer	Energy Star (MEF > 1.8)	26	$0	10	1.00
Appliances	Clothes Washer	Horizontal Axis	51	$487	10	0.09
Appliances	Clothes Dryer	Baseline	-	$0	13	-
Appliances	Clothes Dryer	Moisture Detection	105	$48	13	2.56
Appliances	Dishwasher	Baseline	-	$0	9	-
Appliances	Dishwasher	Energy Star	16	$1	9	-
Appliances	Dishwasher	Energy Star (2011)	21	$1	9	12.38
Appliances	Refrigerator	Baseline	-	$0	13	-
Appliances	Refrigerator	Energy Star	108	$89	13	1.28
Appliances	Refrigerator	Baseline (2014)	144	$0	13	-
Appliances	Refrigerator	Energy Star (2014)	230	$89	13	-
Appliances	Freezer	Baseline	-	$0	11	-

Table C-7 Energy Efficiency Equipment Data — Multi Family, New Vintage (cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Appliances	Freezer	Energy Star	115	$32	11	3.06
Appliances	Freezer	Baseline (2014)	154	$0	11	-
Appliances	Freezer	Energy Star (2014)	246	$32	11	-
Appliances	Second Refrigerator	Baseline	-	$0	13	-
Appliances	Second Refrigerator	Energy Star	103	$89	13	1.21
Appliances	Second Refrigerator	Baseline (2014)	137	$0	13	-
Appliances	Second Refrigerator	Energy Star (2014)	219	$89	13	-
Appliances	Stove	Baseline	-	$0	13	-
Appliances	Stove	Convection Oven	4	$2	13	3.31
Appliances	Stove	Induction (High Efficiency)	22	$1,432	13	0.02
Appliances	Microwave	Baseline	-	$0	9	-
Electronics	Personal Computers	Baseline	-	$0	5	-
Electronics	Personal Computers	Energy Star	88	$1	5	29.69
Electronics	Personal Computers	Climate Savers	125	$175	5	0.29
Electronics	TVs	Baseline	-	$0	11	-
Electronics	TVs	Energy Star	45	$1	11	71.54
Electronics	Devices and Gadgets	Devices and Gadgets	-	$0	5	-
Miscellaneous	Pool Pump	Baseline Pump	-	$0	15	-
Miscellaneous	Pool Pump	High Efficiency Pump	-	$85	15	-
Miscellaneous	Pool Pump	Two-Speed Pump	-	$579	15	-
Miscellaneous	Furnace Fan	Baseline	-	$0	18	-
Miscellaneous	Furnace Fan	Furnace Fan with ECM	11	$1	18	24.36
Miscellaneous	Miscellaneous	Miscellaneous	-	$0	5	-

Table C-8 Energy Efficiency Equipment Data — Mobile Home, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central AC	SEER 13	-	$0	15	-
Cooling	Central AC	SEER 14 (Energy Star)	100	$278	15	0.30
Cooling	Central AC	SEER 15 (CEE Tier 2)	133	$556	15	0.20
Cooling	Central AC	SEER 16 (CEE Tier 3)	161	$834	15	0.16
Cooling	Central AC	Ductless Mini-Split System	301	$4,399	20	0.11
Cooling	Room AC	EER 9.8	-	$0	10	-
Cooling	Room AC	EER 10.8 (Energy Star)	42	$52	10	0.45
Cooling	Room AC	EER 11	50	$141	10	0.20
Cooling	Room AC	EER 11.5	67	$313	10	0.12
Combined Heating/Cooling	Air Source Heat Pump	SEER 13	-	$0	15	-
Combined Heating/Cooling	Air Source Heat Pump	SEER 14 (Energy Star)	313	$1,246	15	0.22
Combined Heating/Cooling	Air Source Heat Pump	SEER 15 (CEE Tier 2)	417	$2,315	15	0.16
Combined Heating/Cooling	Air Source Heat Pump	SEER 16 (CEE Tier 3)	505	$3,277	15	0.13
Combined Heating/Cooling	Air Source Heat Pump	Ductless Mini-Split System	946	$5,022	20	0.30
Combined Heating/Cooling	Geothermal Heat Pump	Standard	-	$0	14	-
Combined Heating/Cooling	Geothermal Heat Pump	High Efficiency	336	$1,500	14	0.18
Space Heating	Electric Resistance	Electric Resistance	-	$0	20	-
Space Heating	Electric Furnace	3400 BTU/KW	-	$0	15	-
Space Heating	Supplemental	Supplemental	-	$0	5	-
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	102	$41	15	3.42
Water Heating	Water Heater	Solar	1,474	$5,653	15	0.36
Interior Lighting	Screw-in	Incandescent	-	$0	4	-
Interior Lighting	Screw-in	Infrared Halogen	295	$188	5	-
Interior Lighting	Screw-in	CFL	1,222	$76	6	12.64
Interior Lighting	Screw-in	LED	1,351	$2,587	12	0.79
Interior Lighting	Linear Fluorescent	T12	-	$0	6	-
Interior Lighting	Linear Fluorescent	T8	13	($4)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	38	$29	6	1.04
Interior Lighting	Linear Fluorescent	T5	40	$49	6	0.64
Interior Lighting	Linear Fluorescent	LED	42	$434	10	0.13
Interior Lighting	Pin-based	Halogen	-	$0	4	-
Interior Lighting	Pin-based	CFL	45	($7)	6	1.00
Interior Lighting	Pin-based	LED	49	$106	10	0.70
Exterior Lighting	Screw-in	Incandescent	-	$0	4	-
Exterior Lighting	Screw-in	Infrared Halogen	93	$51	5	-
Exterior Lighting	Screw-in	CFL	361	$17	6	19.63
Exterior Lighting	Screw-in	LED	389	$757	12	0.78
Exterior Lighting	High Intensity/Flood	Incandescent	-	$0	4	-
Exterior Lighting	High Intensity/Flood	Infrared Halogen	21	$13	4	-
Exterior Lighting	High Intensity/Flood	CFL	125	$12	5	6.66
Exterior Lighting	High Intensity/Flood	Metal Halide	128	$22	5	3.63
Exterior Lighting	High Intensity/Flood	High Pressure Sodium	142	$11	5	8.23
Exterior Lighting	High Intensity/Flood	LED	145	$254	10	0.74
Appliances	Clothes Washer	Baseline	-	$0	10	-
Appliances	Clothes Washer	Energy Star (MEF > 1.8)	54	$0	10	1.00
Appliances	Clothes Washer	Horizontal Axis	104	$487	10	0.19
Appliances	Clothes Dryer	Baseline	-	$0	13	-
Appliances	Clothes Dryer	Moisture Detection	111	$48	13	2.73
Appliances	Dishwasher	Baseline	-	$0	9	-
Appliances	Dishwasher	Energy Star	46	$1	9	-
Appliances	Dishwasher	Energy Star (2011)	60	$1	9	35.11
Appliances	Refrigerator	Baseline	-	$0	13	-
Appliances	Refrigerator	Energy Star	129	$89	13	1.52
Appliances	Refrigerator	Baseline (2014)	172	$0	13	-
Appliances	Refrigerator	Energy Star (2014)	275	$89	13	-
Appliances	Freezer	Baseline	-	$0	11	-

Table C-8 Energy Efficiency Equipment Data — Mobile Home, Existing (cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Appliances	Freezer	Energy Star	124	$32	11	3.28
Appliances	Freezer	Baseline (2014)	165	$0	11	-
Appliances	Freezer	Energy Star (2014)	263	$32	11	-
Appliances	Second Refrigerator	Baseline	-	$0	13	-
Appliances	Second Refrigerator	Energy Star	124	$89	13	1.47
Appliances	Second Refrigerator	Baseline (2014)	165	$0	13	-
Appliances	Second Refrigerator	Energy Star (2014)	264	$89	13	-
Appliances	Stove	Baseline	-	$0	13	-
Appliances	Stove	Convection Oven	9	$2	13	6.98
Appliances	Stove	Induction (High Efficiency)	46	$1,432	13	0.05
Appliances	Microwave	Baseline	-	$0	9	-
Electronics	Personal Computers	Baseline	-	$0	5	-
Electronics	Personal Computers	Energy Star	103	$1	5	33.86
Electronics	Personal Computers	Climate Savers	146	$175	5	0.33
Electronics	TVs	Baseline	-	$0	11	-
Electronics	TVs	Energy Star	91	$1	11	140.87
Electronics	Devices and Gadgets	Devices and Gadgets	-	$0	5	-
Miscellaneous	Pool Pump	Baseline Pump	-	$0	15	-
Miscellaneous	Pool Pump	High Efficiency Pump	154	$85	15	2.20
Miscellaneous	Pool Pump	Two-Speed Pump	617	$579	15	1.29
Miscellaneous	Furnace Fan	Baseline	-	$0	18	-
Miscellaneous	Furnace Fan	Furnace Fan with ECM	141	$1	18	313.76
Miscellaneous	Miscellaneous	Miscellaneous	-	$0	5	-

Table C-9 Energy Efficiency Equipment Data — Limited Income, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central AC	SEER 13	-	$0	15	-
Cooling	Central AC	SEER 14 (Energy Star)	95	$185	15	0.43
Cooling	Central AC	SEER 15 (CEE Tier 2)	126	$370	15	0.29
Cooling	Central AC	SEER 16 (CEE Tier 3)	152	$556	15	0.23
Cooling	Central AC	Ductless Mini-Split System	286	$2,394	20	0.18
Cooling	Room AC	EER 9.8	-	$0	10	-
Cooling	Room AC	EER 10.8 (Energy Star)	74	$104	10	0.40
Cooling	Room AC	EER 11	87	$282	10	0.17
Cooling	Room AC	EER 11.5	118	$626	10	0.11
Combined Heating/Cooling	Air Source Heat Pump	SEER 13	-	$0	15	-
Combined Heating/Cooling	Air Source Heat Pump	SEER 14 (Energy Star)	213	$1,246	15	0.15
Combined Heating/Cooling	Air Source Heat Pump	SEER 15 (CEE Tier 2)	284	$2,315	15	0.11
Combined Heating/Cooling	Air Source Heat Pump	SEER 16 (CEE Tier 3)	343	$3,277	15	0.09
Combined Heating/Cooling	Air Source Heat Pump	Ductless Mini-Split System	643	$5,022	20	0.20
Combined Heating/Cooling	Geothermal Heat Pump	Standard	-	$0	14	-
Combined Heating/Cooling	Geothermal Heat Pump	High Efficiency	228	$1,500	14	0.13
Space Heating	Electric Resistance	Electric Resistance	-	$0	20	-
Space Heating	Electric Furnace	3400 BTU/KW	-	$0	15	-
Space Heating	Supplemental	Supplemental	-	$0	5	-
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	135	$41	15	4.57
Water Heating	Water Heater	Solar	1,949	$5,653	15	0.48
Interior Lighting	Screw-in	Incandescent	-	$0	4	-
Interior Lighting	Screw-in	Infrared Halogen	165	$98	5	-
Interior Lighting	Screw-in	CFL	681	$40	6	13.47
Interior Lighting	Screw-in	LED	752	$1,352	12	0.84
Interior Lighting	Linear Fluorescent	T12	-	$0	6	-
Interior Lighting	Linear Fluorescent	T8	7	($2)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	21	$14	6	1.16
Interior Lighting	Linear Fluorescent	T5	22	$24	6	0.71
Interior Lighting	Linear Fluorescent	LED	23	$213	10	0.14
Interior Lighting	Pin-based	Halogen	-	$0	4	-
Interior Lighting	Pin-based	CFL	49	($7)	6	1.00
Interior Lighting	Pin-based	LED	54	$106	10	0.77
Exterior Lighting	Screw-in	Incandescent	-	$0	4	-
Exterior Lighting	Screw-in	Infrared Halogen	29	$10	5	-
Exterior Lighting	Screw-in	CFL	111	$3	6	31.63
Exterior Lighting	Screw-in	LED	120	$145	12	1.26
Exterior Lighting	High Intensity/Flood	Incandescent	-	$0	4	-
Exterior Lighting	High Intensity/Flood	Infrared Halogen	13	$7	4	-
Exterior Lighting	High Intensity/Flood	CFL	80	$7	5	7.40
Exterior Lighting	High Intensity/Flood	Metal Halide	81	$12	5	4.03
Exterior Lighting	High Intensity/Flood	High Pressure Sodium	91	$6	5	9.14
Exterior Lighting	High Intensity/Flood	LED	92	$146	10	0.82
Appliances	Clothes Washer	Baseline	-	$0	10	-
Appliances	Clothes Washer	Energy Star (MEF > 1.8)	23	$0	10	1.00
Appliances	Clothes Washer	Horizontal Axis	44	$487	10	0.08
Appliances	Clothes Dryer	Baseline	-	$0	13	-
Appliances	Clothes Dryer	Moisture Detection	117	$48	13	2.87
Appliances	Dishwasher	Baseline	-	$0	9	-
Appliances	Dishwasher	Energy Star	13	$1	9	-
Appliances	Dishwasher	Energy Star (2011)	17	$1	9	10.08
Appliances	Refrigerator	Baseline	-	$0	13	-
Appliances	Refrigerator	Energy Star	108	$89	13	1.28
Appliances	Refrigerator	Baseline (2014)	144	$0	13	-
Appliances	Refrigerator	Energy Star (2014)	230	$89	13	-
Appliances	Freezer	Baseline	-	$0	11	-

Table C-9 Energy Efficiency Equipment Data — Limited Income, Existing (cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Appliances	Freezer	Energy Star	115	$32	11	3.06
Appliances	Freezer	Baseline (2014)	154	$0	11	-
Appliances	Freezer	Energy Star (2014)	246	$32	11	-
Appliances	Second Refrigerator	Baseline	-	$0	13	-
Appliances	Second Refrigerator	Energy Star	103	$89	13	1.21
Appliances	Second Refrigerator	Baseline (2014)	137	$0	13	-
Appliances	Second Refrigerator	Energy Star (2014)	219	$89	13	-
Appliances	Stove	Baseline	-	$0	13	-
Appliances	Stove	Convection Oven	5	$2	13	3.98
Appliances	Stove	Induction (High Efficiency)	26	$1,432	13	0.03
Appliances	Microwave	Baseline	-	$0	9	-
Electronics	Personal Computers	Baseline	-	$0	5	-
Electronics	Personal Computers	Energy Star	90	$1	5	30.52
Electronics	Personal Computers	Climate Savers	129	$175	5	0.30
Electronics	TVs	Baseline	-	$0	11	-
Electronics	TVs	Energy Star	52	$1	11	82.28
Electronics	Devices and Gadgets	Devices and Gadgets	-	$0	5	-
Miscellaneous	Pool Pump	Baseline Pump	-	$0	15	-
Miscellaneous	Pool Pump	High Efficiency Pump	63	$85	15	0.93
Miscellaneous	Pool Pump	Two-Speed Pump	254	$579	15	0.54
Miscellaneous	Furnace Fan	Baseline	-	$0	18	-
Miscellaneous	Furnace Fan	Furnace Fan with ECM	60	$1	18	137.23
Miscellaneous	Miscellaneous	Miscellaneous	-	$0	5	-

Table C-10 Energy-Efficiency Measure Data—Single Family, Existing Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
Central AC - Early Replacement	Cooling	10%	0%	0%	8%	$2,895	15	0.05
Central AC - Maintenance and Tune-Up	Cooling	10%	0%	41%	100%	$125	4	0.70
Room AC - Removal of Second Unit	Cooling	100%	0%	0%	25%	$75	5	2.45
Attic Fan - Installation	Cooling	1%	0%	12%	23%	$116	18	0.08
Attic Fan - Photovoltaic - Installation	Cooling	1%	0%	13%	45%	$350	19	0.06
Ceiling Fan - Installation	Cooling	11%	0%	51%	75%	$160	15	0.81
Whole-House Fan - Installation	Cooling	9%	0%	7%	19%	$200	18	0.62
Air Source Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	25%	90%	$125	4	1.49
Insulation - Ducting	Cooling	3%	0%	15%	75%	$500	18	0.78
Insulation - Ducting	Space Heating	4%	4%	15%	75%	$500	18	0.78
Repair and Sealing - Ducting	Cooling	10%	0%	12%	50%	$500	18	2.08
Repair and Sealing - Ducting	Space Heating	15%	15%	12%	50%	$500	18	2.08
Thermostat - Clock/Programmable	Cooling	8%	0%	55%	56%	$114	11	2.89
Thermostat - Clock/Programmable	Space Heating	9%	5%	55%	56%	$114	11	2.89
Doors - Storm and Thermal	Cooling	1%	0%	38%	75%	$320	12	0.25
Doors - Storm and Thermal	Space Heating	2%	2%	38%	75%	$320	12	0.25
Insulation - Infiltration Control	Cooling	3%	0%	46%	90%	$266	12	1.72
Insulation - Infiltration Control	Space Heating	10%	10%	46%	90%	$266	12	1.72
Insulation - Ceiling	Cooling	3%	0%	68%	72%	$594	20	1.11
Insulation - Ceiling	Space Heating	10%	5%	68%	72%	$594	20	1.11
Insulation - Radiant Barrier	Cooling	5%	0%	5%	90%	$923	12	0.41
Insulation - Radiant Barrier	Space Heating	2%	1%	5%	90%	$923	12	0.41
Roofs - High Reflectivity	Cooling	6%	0%	5%	10%	$1,550	15	0.05
Windows - Reflective Film	Cooling	7%	0%	5%	45%	$267	10	0.21
Windows - High Efficiency/Energy Star	Cooling	12%	0%	83%	90%	$7,500	25	0.38
Windows - High Efficiency/Energy Star	Space Heating	7%	5%	83%	90%	$7,500	25	0.38
Interior Lighting - Occupancy Sensor	Interior Lighting	9%	5%	24%	25%	$750	15	0.10
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	50%	0%	10%	80%	$2,975	15	0.03
Exterior Lighting - Photosensor Control	Exterior Lighting	15%	0%	24%	45%	$90	8	0.21
Exterior Lighting - Timeclock Installation	Exterior Lighting	20%	0%	10%	45%	$72	8	0.35
Water Heater - Faucet Aerators	Water Heating	4%	2%	53%	90%	$24	25	8.78
Water Heater - Pipe Insulation	Water Heating	6%	3%	17%	38%	$180	13	1.05
Water Heater - Low Flow Showerheads	Water Heating	17%	9%	75%	80%	$96	10	4.56
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	54%	75%	$15	10	15.53
Water Heater - Thermostat Setback	Water Heating	9%	5%	17%	75%	$40	5	2.99
Water Heater - Timer	Water Heating	8%	4%	17%	40%	$194	10	1.06
Water Heater - Hot Water Saver	Water Heating	9%	4%	5%	50%	$35	5	3.28
Electronics - Reduce Standby Wattage	Electronics	5%	5%	5%	90%	$20	8	1.76
Refrigerator - Early Replacement	Appliances	15%	15%	0%	20%	$1,203	13	0.08
Refrigerator - Remove Second Unit	Appliances	100%	100%	0%	25%	$75	5	3.99
Freezer - Early Replacement	Appliances	15%	15%	0%	20%	$484	11	0.18
Freezer - Remove Second Unit	Appliances	100%	100%	0%	25%	$75	5	3.76
Home Energy Management System	Cooling	10%	0%	20%	38%	$300	20	2.46
Home Energy Management System	Space Heating	10%	5%	20%	38%	$300	20	2.46
Home Energy Management System	Interior Lighting	10%	5%	20%	38%	$300	20	2.46
Photovoltaics	Cooling	50%	0%	0%	48%	$17,000	15	0.10
Photovoltaics	Space Heating	25%	25%	0%	48%	$17,000	15	0.10
Pool - Pump Timer	Miscellaneous	60%	0%	59%	90%	$160	15	4.92
Trees for Shading	Cooling	1%	0%	10%	68%	$40	20	0.43
Water Heater - Heat Pump	Water Heating	30%	15%	0%	25%	$1,500	15	0.75
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	50%	$3,675	15	1.22
Furnace - Convert to Gas	Space Heating	100%	100%	0%	45%	$13,769	15	0.95

Table C-11 Energy-Efficiency Measure Data — Multi Family, Existing Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
Central AC - Early Replacement	Cooling	10%	0%	0%	8%	$2,895	15	0.02
Central AC - Maintenance and Tune-Up	Cooling	10%	0%	33%	100%	$100	4	0.59
Room AC - Removal of Second Unit	Cooling	100%	0%	0%	25%	$75	5	1.28
Ceiling Fan - Installation	Cooling	11%	0%	32%	75%	$80	15	0.49
Air Source Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	25%	90%	$100	4	1.05
Insulation - Ducting	Cooling	3%	0%	13%	75%	$375	18	1.16
Insulation - Ducting	Space Heating	4%	4%	13%	75%	$375	18	1.16
Repair and Sealing - Ducting	Cooling	4%	0%	12%	50%	$500	18	0.95
Repair and Sealing - Ducting	Space Heating	4%	4%	12%	50%	$500	18	0.95
Thermostat - Clock/Programmable	Cooling	8%	0%	27%	68%	$114	11	2.39
Thermostat - Clock/Programmable	Space Heating	6%	3%	27%	68%	$114	11	2.39
Doors - Storm and Thermal	Cooling	1%	0%	17%	75%	$320	12	0.35
Doors - Storm and Thermal	Space Heating	2%	2%	17%	75%	$320	12	0.35
Insulation - Infiltration Control	Cooling	1%	0%	19%	90%	$266	12	2.95
Insulation - Infiltration Control	Space Heating	13%	13%	19%	90%	$266	12	2.95
Insulation - Ceiling	Cooling	13%	0%	27%	30%	$215	20	5.67
Insulation - Ceiling	Space Heating	13%	13%	27%	30%	$215	20	5.67
Insulation - Radiant Barrier	Cooling	4%	0%	5%	90%	$923	12	0.52
Insulation - Radiant Barrier	Space Heating	4%	4%	5%	90%	$923	12	0.52
Roofs - High Reflectivity	Cooling	13%	0%	3%	10%	$1,550	15	0.03
Windows - Reflective Film	Cooling	7%	0%	5%	45%	$167	10	0.10
Windows - High Efficiency/Energy Star	Cooling	13%	0%	70%	90%	$2,500	25	0.56
Windows - High Efficiency/Energy Star	Space Heating	7%	5%	70%	90%	$2,500	25	0.56
Interior Lighting - Occupancy Sensor	Interior Lighting	9%	5%	6%	10%	$256	15	0.14
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	50%	0%	10%	50%	$2,975	15	0.00
Exterior Lighting - Photosensor Control	Exterior Lighting	20%	0%	7%	45%	$90	8	0.04
Exterior Lighting - Timeclock Installation	Exterior Lighting	20%	0%	6%	45%	$72	8	0.05
Water Heater - Faucet Aerators	Water Heating	5%	2%	43%	90%	$24	25	6.63
Water Heater - Pipe Insulation	Water Heating	6%	3%	6%	38%	$180	13	0.65
Water Heater - Low Flow Showerheads	Water Heating	17%	9%	71%	75%	$96	10	2.84
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	54%	75%	$15	10	9.66
Water Heater - Thermostat Setback	Water Heating	9%	5%	17%	75%	$40	5	1.86
Water Heater - Timer	Water Heating	8%	4%	5%	40%	$194	10	0.66
Water Heater - Hot Water Saver	Water Heating	9%	4%	5%	50%	$35	5	2.04
Electronics - Reduce Standby Wattage	Electronics	5%	5%	5%	90%	$20	8	0.58
Refrigerator - Early Replacement	Appliances	15%	15%	0%	20%	$1,203	13	0.07
Refrigerator - Remove Second Unit	Appliances	100%	100%	0%	25%	$75	5	3.36
Freezer - Early Replacement	Appliances	15%	15%	0%	20%	$484	11	0.17
Freezer - Remove Second Unit	Appliances	100%	100%	0%	25%	$75	5	3.57
Home Energy Management System	Cooling	10%	0%	5%	13%	$300	20	2.46
Home Energy Management System	Space Heating	10%	5%	5%	13%	$300	20	2.46
Home Energy Management System	Interior Lighting	10%	5%	5%	13%	$300	20	2.46
Photovoltaics	Cooling	50%	0%	0%	12%	$8,500	15	0.22
Photovoltaics	Space Heating	25%	25%	0%	12%	$8,500	15	0.22
Trees for Shading	Cooling	1%	0%	10%	68%	$40	20	0.13
Water Heater - Heat Pump	Water Heating	30%	15%	0%	10%	$1,500	15	0.47
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	50%	$2,845	15	0.99
Furnace - Convert to Gas	Space Heating	100%	100%	0%	45%	$10,946	15	0.72

Table C-12 Energy-Efficiency Measure Data — Mobile Home, Existing Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
Central AC - Early Replacement	Cooling	10%	0%	0%	8%	$2,895	15	0.03
Central AC - Maintenance and Tune-Up	Cooling	10%	0%	59%	100%	$100	4	0.63
Room AC - Removal of Second Unit	Cooling	100%	0%	0%	25%	$75	5	1.46
Ceiling Fan - Installation	Cooling	11%	0%	60%	75%	$80	15	0.79
Whole-House Fan - Installation	Cooling	9%	0%	5%	19%	$150	18	0.41
Air Source Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	25%	90%	$125	4	1.02
Insulation - Ducting	Cooling	3%	0%	15%	75%	$375	18	0.94
Insulation - Ducting	Space Heating	4%	4%	15%	75%	$375	18	0.94
Repair and Sealing - Ducting	Cooling	10%	0%	12%	50%	$500	18	2.08
Repair and Sealing - Ducting	Space Heating	15%	15%	12%	50%	$500	18	2.08
Thermostat - Clock/Programmable	Cooling	8%	0%	51%	56%	$114	11	2.78
Thermostat - Clock/Programmable	Space Heating	9%	5%	51%	56%	$114	11	2.78
Doors - Storm and Thermal	Cooling	1%	0%	38%	75%	$320	12	0.25
Doors - Storm and Thermal	Space Heating	2%	2%	38%	75%	$320	12	0.25
Insulation - Infiltration Control	Cooling	3%	0%	46%	90%	$266	12	1.80
Insulation - Infiltration Control	Space Heating	10%	10%	46%	90%	$266	12	1.80
Insulation - Ceiling	Cooling	3%	0%	79%	81%	$707	20	1.00
Insulation - Ceiling	Space Heating	10%	5%	79%	81%	$707	20	1.00
Insulation - Radiant Barrier	Cooling	2%	0%	5%	90%	$923	12	0.35
Insulation - Radiant Barrier	Space Heating	1%	1%	5%	90%	$923	12	0.35
Roofs - High Reflectivity	Cooling	6%	0%	5%	10%	$1,550	15	0.02
Windows - Reflective Film	Cooling	7%	0%	5%	45%	$167	10	0.16
Windows - High Efficiency/Energy Star	Cooling	12%	0%	47%	90%	$7,500	25	0.37
Windows - High Efficiency/Energy Star	Space Heating	7%	5%	47%	90%	$7,500	25	0.37
Interior Lighting - Occupancy Sensor	Interior Lighting	9%	5%	67%	72%	$750	15	0.09
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	50%	0%	10%	80%	$2,975	15	0.03
Exterior Lighting - Photosensor Control	Exterior Lighting	15%	0%	23%	45%	$90	8	0.19
Exterior Lighting - Timeclock Installation	Exterior Lighting	20%	0%	10%	45%	$72	8	0.32
Water Heater - Faucet Aerators	Water Heating	4%	2%	79%	90%	$24	25	4.47
Water Heater - Pipe Insulation	Water Heating	6%	3%	17%	38%	$180	13	0.53
Water Heater - Low Flow Showerheads	Water Heating	17%	9%	92%	95%	$96	10	2.32
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	54%	75%	$15	10	7.91
Water Heater - Thermostat Setback	Water Heating	9%	5%	17%	75%	$40	5	1.52
Water Heater - Timer	Water Heating	8%	4%	17%	40%	$194	10	0.54
Water Heater - Hot Water Saver	Water Heating	9%	4%	5%	50%	$35	5	1.67
Electronics - Reduce Standby Wattage	Electronics	5%	5%	5%	90%	$20	8	1.65
Refrigerator - Early Replacement	Appliances	15%	15%	0%	20%	$1,203	13	0.08
Refrigerator - Remove Second Unit	Appliances	100%	100%	0%	25%	$75	5	4.06
Freezer - Early Replacement	Appliances	15%	15%	0%	20%	$484	11	0.18
Freezer - Remove Second Unit	Appliances	100%	100%	0%	25%	$75	5	3.82
Home Energy Management System	Cooling	10%	0%	20%	38%	$300	20	2.28
Home Energy Management System	Space Heating	10%	5%	20%	38%	$300	20	2.28
Home Energy Management System	Interior Lighting	10%	5%	20%	38%	$300	20	2.28
Photovoltaics	Cooling	50%	0%	0%	48%	$17,000	15	0.09
Photovoltaics	Space Heating	25%	25%	0%	48%	$17,000	15	0.09
Pool - Pump Timer	Miscellaneous	60%	0%	50%	90%	$160	15	4.92
Trees for Shading	Cooling	1%	0%	10%	68%	$40	20	0.21
Water Heater - Heat Pump	Water Heating	30%	15%	0%	10%	$1,500	15	0.38
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	50%	$2,616	15	0.88
Furnace - Convert to Gas	Space Heating	100%	100%	0%	45%	$11,135	15	0.62

Table C-13 Energy-Efficiency Measure Data — Limited Income, Existing Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
Central AC - Early Replacement	Cooling	10%	0%	0%	8%	$2,895	15	0.03
Central AC - Maintenance and Tune-Up	Cooling	10%	0%	25%	100%	$100	4	0.61
Room AC - Removal of Second Unit	Cooling	100%	0%	0%	25%	$75	5	2.56
Attic Fan - Installation	Cooling	1%	0%	3%	23%	$116	18	0.05
Attic Fan - Photovoltaic - Installation	Cooling	1%	0%	2%	11%	$350	19	0.03
Ceiling Fan - Installation	Cooling	11%	0%	41%	75%	$80	15	0.89
Whole-House Fan - Installation	Cooling	9%	0%	5%	19%	$150	18	0.46
Air Source Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	25%	90%	$125	4	0.82
Insulation - Ducting	Cooling	3%	0%	13%	75%	$395	18	0.90
Insulation - Ducting	Space Heating	4%	4%	13%	75%	$395	18	0.90
Repair and Sealing - Ducting	Cooling	10%	0%	12%	50%	$500	18	2.07
Repair and Sealing - Ducting	Space Heating	15%	15%	12%	50%	$500	18	2.07
Thermostat - Clock/Programmable	Cooling	8%	0%	27%	68%	$114	11	2.63
Thermostat - Clock/Programmable	Space Heating	9%	5%	27%	68%	$114	11	2.63
Doors - Storm and Thermal	Cooling	1%	0%	17%	75%	$320	12	0.25
Doors - Storm and Thermal	Space Heating	2%	2%	17%	75%	$320	12	0.25
Insulation - Infiltration Control	Cooling	3%	0%	19%	90%	$266	12	1.78
Insulation - Infiltration Control	Space Heating	10%	10%	19%	90%	$266	12	1.78
Insulation - Ceiling	Cooling	3%	0%	36%	41%	$215	20	2.44
Insulation - Ceiling	Space Heating	10%	5%	36%	41%	$215	20	2.44
Insulation - Radiant Barrier	Cooling	2%	0%	5%	90%	$923	12	0.35
Insulation - Radiant Barrier	Space Heating	1%	1%	5%	90%	$923	12	0.35
Roofs - High Reflectivity	Cooling	6%	0%	3%	10%	$1,550	15	0.03
Windows - Reflective Film	Cooling	7%	0%	5%	45%	$167	10	0.18
Windows - High Efficiency/Energy Star	Cooling	12%	0%	68%	90%	$2,500	25	0.51
Windows - High Efficiency/Energy Star	Space Heating	7%	5%	68%	90%	$2,500	25	0.51
Interior Lighting - Occupancy Sensor	Interior Lighting	9%	5%	8%	10%	$256	15	0.16
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	50%	50%	10%	50%	$2,975	15	0.01
Exterior Lighting - Photosensor Control	Exterior Lighting	15%	0%	8%	45%	$90	8	0.06
Exterior Lighting - Timeclock Installation	Exterior Lighting	20%	0%	6%	45%	$72	8	0.10
Water Heater - Faucet Aerators	Water Heating	4%	2%	46%	90%	$24	25	5.95
Water Heater - Pipe Insulation	Water Heating	6%	3%	6%	38%	$180	13	0.71
Water Heater - Low Flow Showerheads	Water Heating	17%	9%	73%	75%	$96	10	3.09
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	54%	75%	$15	10	10.53
Water Heater - Thermostat Setback	Water Heating	9%	5%	17%	75%	$40	5	2.03
Water Heater - Timer	Water Heating	8%	4%	5%	40%	$194	10	0.72
Water Heater - Hot Water Saver	Water Heating	9%	4%	5%	50%	$35	5	2.23
Electronics - Reduce Standby Wattage	Electronics	5%	5%	5%	90%	$20	8	0.77
Refrigerator - Early Replacement	Appliances	15%	15%	0%	20%	$1,203	13	0.07
Refrigerator - Remove Second Unit	Appliances	100%	100%	0%	25%	$75	5	3.36
Freezer - Early Replacement	Appliances	15%	15%	0%	20%	$484	11	0.17
Freezer - Remove Second Unit	Appliances	100%	100%	0%	25%	$75	5	3.57
Home Energy Management System	Cooling	10%	0%	5%	13%	$300	20	2.00
Home Energy Management System	Space Heating	10%	5%	5%	13%	$300	20	2.00
Home Energy Management System	Interior Lighting	10%	5%	5%	13%	$300	20	2.00
Photovoltaics	Cooling	50%	0%	0%	48%	$8,500	15	0.17
Photovoltaics	Space Heating	25%	25%	0%	48%	$8,500	15	0.17
Pool - Pump Timer	Miscellaneous	60%	0%	50%	90%	$160	15	2.02
Trees for Shading	Cooling	1%	0%	10%	68%	$40	20	0.24
Water Heater - Heat Pump	Water Heating	30%	15%	0%	20%	$1,500	15	0.51
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	50%	$2,970	15	1.03
Furnace - Convert to Gas	Space Heating	100%	100%	0%	45%	$10,798	15	0.69

Table C-14 Energy-Efficiency Measure Data — Single Family, New Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
Central AC - Maintenance and Tune-Up	Cooling	10%	0%	41%	100%	$125	4	0.78
Attic Fan - Installation	Cooling	1%	0%	13%	23%	$97	18	0.15
Attic Fan - Photovoltaic - Installation	Cooling	1%	0%	4%	11%	$200	19	0.15
Ceiling Fan - Installation	Cooling	10%	0%	53%	75%	$160	15	1.09
Whole-House Fan - Installation	Cooling	9%	0%	4%	19%	$200	18	0.92
Air Source Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	25%	90%	$125	4	1.69
Insulation - Ducting	Cooling	3%	0%	50%	75%	$250	18	1.31
Insulation - Ducting	Space Heating	4%	4%	50%	75%	$250	18	1.31
Thermostat - Clock/Programmable	Cooling	8%	0%	91%	95%	$114	11	2.91
Thermostat - Clock/Programmable	Space Heating	8%	4%	91%	95%	$114	11	2.91
Doors - Storm and Thermal	Cooling	1%	0%	13%	75%	$180	12	0.45
Doors - Storm and Thermal	Space Heating	2%	2%	13%	75%	$180	12	0.45
Insulation - Ceiling	Cooling	3%	0%	68%	71%	$634	20	0.99
Insulation - Ceiling	Space Heating	8%	6%	68%	71%	$634	20	0.99
Insulation - Radiant Barrier	Cooling	2%	0%	25%	90%	$923	12	0.37
Insulation - Radiant Barrier	Space Heating	1%	1%	25%	90%	$923	12	0.37
Insulation - Foundation	Cooling	3%	0%	20%	90%	$358	20	1.35
Insulation - Foundation	Space Heating	6%	6%	20%	90%	$358	20	1.35
Insulation - Wall Cavity	Cooling	2%	0%	20%	90%	$236	20	1.15
Insulation - Wall Cavity	Space Heating	3%	3%	20%	90%	$236	20	1.15
Insulation - Wall Sheathing	Cooling	1%	0%	64%	90%	$300	20	0.89
Insulation - Wall Sheathing	Space Heating	3%	3%	64%	90%	$300	20	0.89
Roofs - High Reflectivity	Cooling	5%	0%	5%	90%	$517	15	0.17
Windows - Reflective Film	Cooling	7%	0%	2%	45%	$267	10	0.31
Windows - High Efficiency/Energy Star	Cooling	12%	0%	100%	100%	$2,200	25	0.62
Windows - High Efficiency/Energy Star	Space Heating	7%	5%	100%	100%	$2,200	25	0.62
Interior Lighting - Occupancy Sensor	Interior Lighting	9%	5%	24%	27%	$500	15	0.16
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	50%	0%	10%	80%	$2,975	15	0.04
Exterior Lighting - Photosensor Control	Exterior Lighting	13%	0%	13%	45%	$90	8	0.19
Exterior Lighting - Timeclock Installation	Exterior Lighting	20%	0%	16%	45%	$72	8	0.36
Water Heater - Faucet Aerators	Water Heating	4%	2%	38%	90%	$24	25	11.03
Water Heater - Pipe Insulation	Water Heating	6%	3%	8%	41%	$50	13	4.71
Water Heater - Low Flow Showerheads	Water Heating	17%	9%	90%	95%	$48	10	11.33
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	0%	0%	$15	10	19.30
Water Heater - Thermostat Setback	Water Heating	9%	5%	5%	75%	$40	5	3.70
Water Heater - Timer	Water Heating	8%	4%	5%	40%	$194	10	1.31
Water Heater - Drainwater Heat Reocvery	Water Heating	9%	5%	1%	90%	$899	15	0.47
Water Heater - Hot Water Saver	Water Heating	9%	4%	5%	50%	$35	5	4.06
Electronics - Reduce Standby Wattage	Electronics	5%	5%	5%	90%	$20	8	1.99
Home Energy Management System	Cooling	10%	0%	20%	68%	$250	20	3.16
Home Energy Management System	Space Heating	10%	5%	20%	68%	$250	20	3.16
Home Energy Management System	Interior Lighting	10%	5%	20%	68%	$250	20	3.16
Photovoltaics	Cooling	50%	0%	1%	48%	$15,800	15	0.12
Photovoltaics	Space Heating	25%	25%	1%	48%	$15,800	15	0.12
Pool - Pump Timer	Miscellaneous	60%	0%	55%	90%	$160	15	5.43
Trees for Shading	Cooling	1%	0%	10%	68%	$40	20	0.64
Advanced New Construction Designs	Cooling	40%	0%	2%	45%	$4,500	18	1.09
Advanced New Construction Designs	Space Heating	40%	40%	2%	45%	$4,500	18	1.09
Advanced New Construction Designs	Interior Lighting	20%	20%	2%	45%	$4,500	18	1.09
Energy Star Homes	Cooling	20%	0%	12%	75%	$5,000	18	0.75
Energy Star Homes	Space Heating	20%	20%	12%	75%	$5,000	18	0.75
Energy Star Homes	Interior Lighting	20%	20%	12%	75%	$5,000	18	0.75
Water Heater - Heat Pump	Water Heating	30%	15%	0%	25%	$1,500	15	0.94
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	50%	$3,675	15	1.53
Furnace - Convert to Gas	Space Heating	100%	100%	0%	45%	$13,769	15	1.14

Table C-15 Energy-Efficiency Measure Data — Multi Family, New Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
Central AC - Maintenance and Tune-Up	Cooling	10%	0%	33%	100%	$100	4	0.62
Ceiling Fan - Installation	Cooling	10%	0%	18%	75%	$80	15	0.77
Air Source Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	25%	90%	$100	4	1.12
Insulation - Ducting	Cooling	2%	0%	50%	75%	$200	18	1.18
Insulation - Ducting	Space Heating	2%	2%	50%	75%	$200	18	1.18
Thermostat - Clock/Programmable	Cooling	8%	0%	77%	80%	$114	11	2.29
Thermostat - Clock/Programmable	Space Heating	5%	3%	77%	80%	$114	11	2.29
Doors - Storm and Thermal	Cooling	1%	0%	19%	75%	$180	12	0.66
Doors - Storm and Thermal	Space Heating	2%	2%	19%	75%	$180	12	0.66
Insulation - Ceiling	Cooling	12%	0%	27%	48%	$152	20	10.12
Insulation - Ceiling	Space Heating	16%	16%	27%	48%	$152	20	10.12
Insulation - Radiant Barrier	Cooling	2%	0%	5%	90%	$923	12	0.50
Insulation - Radiant Barrier	Space Heating	3%	3%	5%	90%	$923	12	0.50
Insulation - Wall Cavity	Cooling	2%	0%	4%	90%	$63	20	6.14
Insulation - Wall Cavity	Space Heating	4%	4%	4%	90%	$63	20	6.14
Insulation - Wall Sheathing	Cooling	1%	0%	55%	90%	$210	20	1.59
Insulation - Wall Sheathing	Space Heating	3%	3%	55%	90%	$210	20	1.59
Roofs - High Reflectivity	Cooling	8%	0%	0%	90%	$517	15	0.10
Windows - Reflective Film	Cooling	7%	0%	2%	45%	$167	10	0.17
Windows - High Efficiency/Energy Star	Cooling	13%	0%	100%	100%	$2,200	25	0.63
Windows - High Efficiency/Energy Star	Space Heating	7%	5%	100%	100%	$2,200	25	0.63
Interior Lighting - Occupancy Sensor	Interior Lighting	9%	5%	6%	9%	$256	15	0.14
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	50%	0%	10%	50%	$2,975	15	0.01
Exterior Lighting - Photosensor Control	Exterior Lighting	20%	0%	1%	45%	$90	8	0.04
Exterior Lighting - Timeclock Installation	Exterior Lighting	20%	0%	11%	45%	$72	8	0.05
Water Heater - Faucet Aerators	Water Heating	5%	2%	11%	90%	$24	25	7.63
Water Heater - Pipe Insulation	Water Heating	6%	3%	0%	41%	$50	13	2.68
Water Heater - Low Flow Showerheads	Water Heating	17%	9%	66%	75%	$48	10	6.45
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	0%	0%	$15	10	10.99
Water Heater - Thermostat Setback	Water Heating	9%	5%	5%	75%	$40	5	2.11
Water Heater - Timer	Water Heating	8%	4%	5%	40%	$194	10	0.75
Water Heater - Drainwater Heat Reocvery	Water Heating	9%	5%	1%	90%	$899	15	0.27
Water Heater - Hot Water Saver	Water Heating	9%	4%	5%	50%	$35	5	2.31
Electronics - Reduce Standby Wattage	Electronics	5%	5%	5%	90%	$20	8	0.63
Home Energy Management System	Cooling	10%	0%	5%	68%	$250	20	3.19
Home Energy Management System	Space Heating	10%	5%	5%	68%	$250	20	3.19
Home Energy Management System	Interior Lighting	10%	5%	5%	68%	$250	20	3.19
Photovoltaics	Cooling	50%	0%	0%	12%	$7,900	15	0.26
Photovoltaics	Space Heating	25%	25%	0%	12%	$7,900	15	0.26
Trees for Shading	Cooling	1%	0%	10%	68%	$40	20	0.23
Advanced New Construction Designs	Cooling	40%	0%	2%	45%	$2,500	18	1.47
Advanced New Construction Designs	Space Heating	40%	40%	2%	45%	$2,500	18	1.47
Advanced New Construction Designs	Interior Lighting	20%	20%	2%	45%	$2,500	18	1.47
Water Heater - Heat Pump	Water Heating	30%	15%	0%	10%	$1,500	15	0.53
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	50%	$2,845	15	1.13
Furnace - Convert to Gas	Space Heating	100%	100%	0%	45%	$10,946	15	0.84

Table C-16 Energy-Efficiency Measure Data — Mobile Home, New Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
Central AC - Maintenance and Tune-Up	Cooling	10%	0%	59%	100%	$100	4	0.66
Ceiling Fan - Installation	Cooling	10%	0%	57%	75%	$80	15	0.95
Whole-House Fan - Installation	Cooling	9%	0%	4%	19%	$150	18	0.53
Air Source Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	25%	90%	$125	4	1.09
Insulation - Ducting	Cooling	3%	0%	50%	75%	$200	18	1.59
Insulation - Ducting	Space Heating	4%	4%	50%	75%	$200	18	1.59
Thermostat - Clock/Programmable	Cooling	8%	0%	57%	75%	$114	11	2.77
Thermostat - Clock/Programmable	Space Heating	8%	4%	57%	75%	$114	11	2.77
Doors - Storm and Thermal	Cooling	1%	0%	13%	75%	$180	12	0.49
Doors - Storm and Thermal	Space Heating	2%	2%	13%	75%	$180	12	0.49
Insulation - Ceiling	Cooling	3%	0%	79%	81%	$176	20	3.02
Insulation - Ceiling	Space Heating	8%	6%	79%	81%	$176	20	3.02
Insulation - Radiant Barrier	Cooling	2%	0%	25%	90%	$923	12	0.36
Insulation - Radiant Barrier	Space Heating	1%	1%	25%	90%	$923	12	0.36
Insulation - Wall Cavity	Cooling	2%	0%	20%	90%	$197	20	1.35
Insulation - Wall Cavity	Space Heating	3%	3%	20%	90%	$197	20	1.35
Insulation - Wall Sheathing	Cooling	1%	0%	64%	90%	$300	20	0.96
Insulation - Wall Sheathing	Space Heating	3%	3%	64%	90%	$300	20	0.96
Roofs - High Reflectivity	Cooling	5%	0%	5%	90%	$517	15	0.07
Windows - Reflective Film	Cooling	7%	0%	2%	45%	$167	10	0.21
Windows - High Efficiency/Energy Star	Cooling	12%	0%	85%	90%	$2,200	25	0.57
Windows - High Efficiency/Energy Star	Space Heating	7%	5%	85%	90%	$2,200	25	0.57
Interior Lighting - Occupancy Sensor	Interior Lighting	9%	5%	67%	72%	$500	15	0.14
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	50%	50%	10%	80%	$2,975	15	0.03
Exterior Lighting - Photosensor Control	Exterior Lighting	13%	0%	13%	45%	$90	8	0.17
Exterior Lighting - Timeclock Installation	Exterior Lighting	20%	0%	16%	45%	$72	8	0.32
Water Heater - Faucet Aerators	Water Heating	4%	2%	57%	90%	$24	25	5.14
Water Heater - Pipe Insulation	Water Heating	6%	3%	8%	41%	$50	13	2.20
Water Heater - Low Flow Showerheads	Water Heating	17%	9%	92%	95%	$48	10	5.28
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	0%	0%	$15	10	9.00
Water Heater - Thermostat Setback	Water Heating	9%	5%	5%	75%	$40	5	1.72
Water Heater - Timer	Water Heating	8%	4%	5%	40%	$194	10	0.61
Water Heater - Drainwater Heat Reocvery	Water Heating	9%	5%	1%	90%	$899	15	0.22
Water Heater - Hot Water Saver	Water Heating	9%	4%	5%	50%	$35	5	1.89
Electronics - Reduce Standby Wattage	Electronics	5%	5%	5%	90%	$20	8	1.79
Home Energy Management System	Cooling	10%	0%	20%	68%	$250	20	2.94
Home Energy Management System	Space Heating	10%	5%	20%	68%	$250	20	2.94
Home Energy Management System	Interior Lighting	10%	5%	20%	68%	$250	20	2.94
Photovoltaics	Cooling	50%	0%	1%	48%	$15,800	15	0.10
Photovoltaics	Space Heating	25%	25%	1%	48%	$15,800	15	0.10
Pool - Pump Timer	Miscellaneous	60%	0%	35%	90%	$160	15	5.38
Trees for Shading	Cooling	1%	0%	10%	68%	$40	20	0.28
Advanced New Construction Designs	Cooling	30%	0%	2%	45%	$4,500	18	0.52
Advanced New Construction Designs	Space Heating	30%	30%	2%	45%	$4,500	18	0.52
Advanced New Construction Designs	Interior Lighting	20%	20%	2%	45%	$4,500	18	0.52
Energy Efficient Manufactured Homes	Cooling	20%	0%	10%	75%	$3,500	18	0.88
Energy Efficient Manufactured Homes	Space Heating	20%	20%	10%	75%	$3,500	18	0.88
Energy Efficient Manufactured Homes	Interior Lighting	20%	20%	10%	75%	$3,500	18	0.88
Water Heater - Heat Pump	Water Heating	30%	15%	0%	10%	$1,500	15	0.44
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	50%	$2,616	15	1.00
Furnace - Convert to Gas	Space Heating	100%	100%	0%	45%	$11,738	15	0.69

Table C-17 Energy-Efficiency Measure Data — Limited Income, New Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
Central AC - Maintenance and Tune-Up	Cooling	10%	0%	25%	100%	$100	4	0.65
Attic Fan - Installation	Cooling	1%	0%	15%	23%	$97	18	0.07
Attic Fan - Photovoltaic - Installation	Cooling	1%	0%	5%	11%	$200	19	0.07
Ceiling Fan - Installation	Cooling	10%	0%	33%	75%	$80	15	1.03
Whole-House Fan - Installation	Cooling	9%	0%	4%	19%	$150	18	0.58
Air Source Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	25%	90%	$125	4	0.87
Insulation - Ducting	Cooling	3%	0%	50%	75%	$210	18	1.47
Insulation - Ducting	Space Heating	4%	4%	50%	75%	$210	18	1.47
Thermostat - Clock/Programmable	Cooling	8%	0%	29%	30%	$114	11	2.54
Thermostat - Clock/Programmable	Space Heating	8%	4%	29%	30%	$114	11	2.54
Doors - Storm and Thermal	Cooling	1%	0%	19%	75%	$180	12	0.46
Doors - Storm and Thermal	Space Heating	2%	2%	19%	75%	$180	12	0.46
Insulation - Ceiling	Cooling	3%	0%	36%	48%	$152	20	3.20
Insulation - Ceiling	Space Heating	8%	6%	36%	48%	$152	20	3.20
Insulation - Radiant Barrier	Cooling	2%	0%	5%	90%	$923	12	0.36
Insulation - Radiant Barrier	Space Heating	1%	1%	5%	90%	$923	12	0.36
Insulation - Foundation	Cooling	3%	0%	4%	90%	$358	20	1.37
Insulation - Foundation	Space Heating	6%	6%	4%	90%	$358	20	1.37
Insulation - Wall Cavity	Cooling	2%	0%	4%	90%	$63	20	3.46
Insulation - Wall Cavity	Space Heating	3%	3%	4%	90%	$63	20	3.46
Insulation - Wall Sheathing	Cooling	1%	0%	59%	90%	$210	20	1.19
Insulation - Wall Sheathing	Space Heating	3%	3%	59%	90%	$210	20	1.19
Roofs - High Reflectivity	Cooling	5%	0%	0%	90%	$517	15	0.08
Windows - Reflective Film	Cooling	7%	0%	2%	45%	$167	10	0.23
Windows - High Efficiency/Energy Star	Cooling	12%	0%	78%	90%	$2,200	25	0.55
Windows - High Efficiency/Energy Star	Space Heating	7%	5%	78%	90%	$2,200	25	0.55
Interior Lighting - Occupancy Sensor	Interior Lighting	9%	5%	8%	9%	$256	15	0.17
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	50%	50%	10%	50%	$2,975	15	0.01
Exterior Lighting - Photosensor Control	Exterior Lighting	13%	0%	0%	45%	$90	8	0.06
Exterior Lighting - Timeclock Installation	Exterior Lighting	20%	0%	11%	45%	$72	8	0.10
Water Heater - Faucet Aerators	Water Heating	4%	2%	11%	90%	$24	25	6.84
Water Heater - Pipe Insulation	Water Heating	6%	3%	0%	41%	$50	13	2.92
Water Heater - Low Flow Showerheads	Water Heating	17%	9%	21%	75%	$48	10	7.03
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	0%	0%	$15	10	11.97
Water Heater - Thermostat Setback	Water Heating	9%	5%	5%	75%	$40	5	2.29
Water Heater - Timer	Water Heating	8%	4%	5%	40%	$194	10	0.81
Water Heater - Drainwater Heat Reocvery	Water Heating	9%	5%	1%	90%	$899	15	0.29
Water Heater - Hot Water Saver	Water Heating	9%	4%	5%	50%	$35	5	2.52
Electronics - Reduce Standby Wattage	Electronics	5%	5%	5%	90%	$20	8	0.83
Home Energy Management System	Cooling	10%	0%	5%	68%	$250	20	2.50
Home Energy Management System	Space Heating	10%	5%	5%	68%	$250	20	2.50
Home Energy Management System	Interior Lighting	10%	5%	5%	68%	$250	20	2.50
Photovoltaics	Cooling	50%	0%	0%	48%	$7,900	15	0.20
Photovoltaics	Space Heating	25%	25%	0%	48%	$7,900	15	0.20
Pool - Pump Timer	Miscellaneous	60%	0%	35%	90%	$160	15	2.21
Trees for Shading	Cooling	1%	0%	10%	68%	$40	20	0.30
Advanced New Construction Designs	Cooling	30%	0%	2%	45%	$2,500	18	1.25
Advanced New Construction Designs	Space Heating	30%	30%	2%	45%	$2,500	18	1.25
Advanced New Construction Designs	Interior Lighting	20%	20%	2%	45%	$2,500	18	1.25
Water Heater - Heat Pump	Water Heating	30%	15%	0%	20%	$1,500	15	0.58
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	50%	$2,970	15	1.18
Furnace - Convert to Gas	Space Heating	100%	100%	0%	45%	$10,798	15	0.81

APPENDIX | **D**

COMMERCIAL ENERGY EFFICIENCY EQUIPMENT AND MEASURE DATA

This appendix presents detailed information for all commercial and industrial energy efficiency equipment and measures that were evaluated in LoadMAP. Several sets of tables are provided. Table D-1 provides brief descriptions for all equipment and measures that were assessed for potenital. Tables D-2 through D-9 list the detailed unit-level data (including economic screen results) list the detailed unit-level data (including economic screen results) for the energy efficiency measures for each of the C&I segments — small/medium commercial, large commercial, extra-large commercial, and extra-large industial — and for existing and new construction, respectively. Tables D-10 through D-17 list the detailed unit-level data (including economic screen results) for the energy efficiency measures for each of the segments and for existing and new construction, respectively. The detailed measure-level tables below present the results of the benefit/cost (B/C) analysis for the first year of the forecast. The B/C ratio is zero if the measure represents the baseline technology or if the technology or non-equipment measure is not available in the first year of the forecast. The B/C ratio is calculated within LoadMAP for each year of the forecast and is available once the technology or measure becomes available.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Cooling	Central Cooling Systems	Commercial buildings are often cooled with a central chiller plant that creates chilled water for distribution throughout the facility. Chillers can be air source or water source, which include heat rejection via a condenser loop and cooling tower. Because of the wide variety of system types and sizes, savings and cost values for efficiency improvements in chiller systems represent an average over air- and water-cooled systems, as well as screw, reciprocating, and centrifugal technologies. Under this simplified approach, each central system is characterized by an aggregate efficiency value (inclusive of chiller, pumps, motors and condenser loop equipment), in kW/ton with a further efficiency upgrade through the application of variable refrigerant flow technology.
Cooling	Chilled Water Variable Flow System	The chilled water variable flow system is essentially a single chilled water loop with variable volume and speed. A single set of pumps operated by a VSD eliminates the need for separate distribution pumps and makes the chilled water flow throughout the entire system be variable. The use of adjustable flow limiting valves is designed to optimize water flow. Such valves provide flow limiting, shut-off and adjustment functions, automatically compensating for changes in system pressure to maximize energy efficiency.
Cooling	Packaged Cooling Systems / Rooftop Units (RTUs) and Heat Pumps	Packaged cooling systems are simple to install and maintain, and are commonly used in small and medium-sized commercial buildings. Applications range from a single supply system with air intake filters, supply fan, and cooling coil, or can become more complex with the addition of a return air duct, return air fan, and various controls to optimize performance. For packaged RTUs, varying Energy Efficiency Ratios (EER) were considered, as well as ductless or “mini-split” systems with variable refrigerant flow. For heat pumps, units with increasing EER and COP levels were evaluated, as well as a ductless mini-split system.
Cooling	Packaged Terminal Air Conditioners (PTAC)	Window (or wall) mounted room air conditioners (and heat pumps) are designed to cool (or heat) a single room or space. This type of unit incorporates a complete air-cooled refrigeration and air-handling system in an individual package. Conditioned air is discharged in response to thermostatic control to meet room requirements. Each unit has a self-contained, air-cooled direct expansion (DX) cooling system, a heat pump or other fuel-based heating system and associated controls. The energy savings increase with each incremental increase in efficiency, measured in terms of EER level.
Space Heating	Convert to Gas	This fuel-switching measure is the replacement of an electric furnace with a gas furnace. This measure eliminates all prior electricity consumption and demand due to electric space heating. In this study, it is assumed this measure can be implemented only in buildings within 500 feet of a gas main.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Cooling, Space Heating, Interior Lighting	Energy Management System	An energy management system (EMS) allows managers/owners to monitor and control the major energy-consuming systems within a commercial building. At the minimum, the EMS can be used to monitor and record energy consumption of the different end-uses in a building, and can control operation schedules of the HVAC and lighting systems. The monitoring function helps building managers/owners to identify systems that are operating inefficiently so that actions can be taken to correct the problem. The EMS can also provide preventive maintenance scheduling that will reduce the cost of operations and maintenance in the long run. The control functionality of the EMS allows the building manager/owner to operate building systems from one central location. The operation schedules set via the EMS help to prevent building systems from operating during unwanted or unoccupied periods. This analysis assumes that this measure is limited to buildings with a central HVAC system.
Cooling, Space Heating	Economizer	Economizers allow outside air (when it is cool and dry enough) to be brought into the building space to meet cooling loads instead of using mechanically cooled interior air. A dual enthalpy economizer consists of indoor and outdoor temperature and humidity sensors, dampers, motors, and motor controls. Economizers are most applicable to temperate climates and savings will be smaller in extremely hot or humid areas.
Cooling	VSD on Water Pumps	The part-load efficiency of chilled water loop pumps can be improved substantially by varying the speed of the motor drive according to the building demand for cooling. There is also a reduction in piping losses associated with this measure that has a major impact on the energy use for a building. However, pump speeds can generally only be reduced to a minimum specified rate, because chillers and the control valves may require a minimum flow rate to operate. There are two major types of variable speed drives: mechanical and electronic. An additional benefit of variable-speed drives is the ability to start and stop the motor gradually, thus extending the life of the motor and associated machinery. This analysis assumes that electronic variable speed drives are installed.
Cooling	Turbocor Compressor	Turbocor compressors use oil-free magnetic bearings to reduce friction losses and couples that with a two-stage centrifugal compressor to reduce central chiller energy consumption.
Cooling	High-Efficiency Cooling Tower Fans	High efficiency cooling tower fans utilize variable frequency drives in the cooling tower design. VFDs improve fan performance by adjusting fan speed and rotation as conditions change.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Cooling	Condenser Water Temperature Reset	Chilled water reset controls save energy by improving chiller performance through increasing the supply chilled water temperature, which allows increased suction pressure during low load periods. Raising the chilled water temperature also reduces chilled water piping losses. However, the primary savings from the chilled water reset measure results from chiller efficiency improvement. This is due partly to the smaller temperature difference between chilled water and ambient air, and partly due to the sensitivity of chiller performance to suction temperature.
Cooling	Maintenance	Filters, coils, and fins require regular cleaning and maintenance for the heat pump or roof top unit to function effectively and efficiently throughout its years of service. Neglecting necessary maintenance leads to a steady decline in performance while energy use increases. Maintenance can increase the efficiency of poorly performing equipment by as much as 10%.
Cooling	Evaporative Precooler	Evaporative precooling can improve the performance of air conditioning systems, most commonly RTUs. These systems typically use indirect evaporative cooling as a first stage to pre-cool outside air. If the evaporative system cannot meet the full cooling load, the air steam is further cooled with conventional refrigerative air conditioning technology.
Cooling	Roof- High Reflectivity (Cool Roof)	The color and material of a building structure surface will determine the amount of solar radiation absorbed by that surface and subsequently transferred into a building. This is called solar absorptance. By using a material or painting the roof with a light color (and a lower solar absorptance), the roof will absorb less solar radiation and consequently reduce the cooling load.
Cooling, Space Heating	Green Roofs	A green roof covers a section or the entire building roof with a waterproof membrane and vegetative material. Like cool roofs, green roofs can reduce solar absorptance and they can also provide insulation. They also provide non-energy benefits by absorbing rainwater and thus reducing storm water run-off, providing wildlife habitat, and reducing so-called urban heat island effects.
Cooling, Space Heating, Ventilation	HVAC Retrocommissioning	Over time, the performance of complex mechanical systems providing heating and cooling to existing commercial spaces degrades as a result of inappropriate changes to or overrides of controls, deteriorating equipment, clogged filters, changing demands and schedules, and pressure imbalances. Retrocommissioning is a comprehensive analysis of an entire system in which an engineer assesses shortcomings in system performance, and then optimizes through a process of tune-up, maintenance, and reprogramming of control or automation software. Energy efficiency programs throughout the country promote retrocommissioning as a means of greatly reducing energy consumption in existing buildings.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Cooling, Space Heating, Ventilation, Interior Lighting	Comprehensive Retrocommissioning	Comprehensive retrocommissioning covers not only HVAC and lighting, but other existing building systems as well. For example, it can improve efficiency of non-HVAC motors, vertical transport systems, and domestic hot water systems.
Cooling, Space Heating, Ventilation, Interior Lighting/Exterior Lighting	HVAC Commissioning Lighting Commissioning Comprehensive Commissioning	For new construction and major renovations, commissioning ensures that building systems are properly designed, specified, and installed to meet the design intent and provide high-efficiency performance. As the names suggests, HVAC Commissioning and Lighting Commissioning focus only on HVAC and lighting equipment and controls. Comprehensive commissioning addresses these systems but usually begins earlier in the design process, and may also address domestic hot water, non-HVAC fans, vertical transport, telecommunications, fire protection, and other building systems.
Cooling, Space Heating, Interior Lighting	Advanced New Construction Designs	Advanced new construction designs use an integrated approach to the design of new buildings to account for the interaction of building systems. Typically, architects and engineers work closely to specify the building orientation, building shell, building mechanical systems, and controls strategies with the goal of optimizing building energy efficiency and comfort. Options that may be evaluated and incorporated include passive solar strategies, increased thermal mass, daylighting strategies, and shading strategies, This measure was modeled for new construction only.
Cooling, Space Heating	Programmable Thermostat	A programmable thermostat can be added to most heating/cooling systems. They are typically used during winter to lower temperatures at night and in summer to increase temperatures during the afternoon. There are two-setting models, and well as models that allow separate programming for each day of the week. The energy savings from this type of thermostat are identical to those of a "setback" strategy with standard thermostats, but the convenience of a programmable thermostat makes it a much more attractive option. In this analysis, the baseline is assumed to have no thermostat setback.
Cooling, Space Heating	Duct Repair and Sealing	An ideal duct system would be free of leaks. Leakage in unsealed ducts varies considerably because of the differences in fabricating machinery used, the methods for assembly, installation workmanship, and age of the ductwork. Air leaks from the system to the outdoors result in a direct loss proportional to the amount of leakage and the difference in enthalpy between the outdoor air and the conditioned air. To seal ducts, a wide variety of sealing methods and products exist. Each has a relatively short shelf life, and no documented research has identified the aging characteristics of sealant applications. This analysis assumes that the baseline air loss from ducts has doubled, and conducting repair and sealing of the ducts will restore leakage from ducts to the original baseline level.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Cooling, Space Heating	Duct Insulation	Air distribution ducts can be insulated to reduce heating or cooling losses. Best results can be achieved by covering the entire surface area with insulation. Insulation material inhibits the transfer of heat through the air-supply duct. Several types of ducts and duct insulation are available, including flexible duct, pre-insulated duct, duct board, duct wrap, tacked, or glued rigid insulation, and waterproof hard shell materials for exterior ducts.
Cooling, Space Heating	Insulation – Radiant Barrier	Radiant barriers inhibit heat transfer by thermal radiation. When a radiant barrier is installed beneath the roofing material much of the heat radiated from a hot roof is reflected back to the roof limiting the amount of heat emitted downwards.
Cooling, Space Heating	High-Efficiency Windows	High-efficiency windows, such as those labeled under the ENERGY STAR Program, are designed to reduce a building's energy bill while increasing comfort for the occupants at the same time. High-efficiency windows have reducing properties that reduce the amount of heat transfer through the glazing surface. For example, some windows have a low-E coating, which is a thin film of metallic oxide coating on the glass surface that allows passage of short-wave solar energy through glass and prevents long-wave energy from escaping. Another example is double-pane glass that reduces conductive and convective heat transfer. There are also double-pane glasses that are gas-filled (usually argon) to further increase the insulating properties of the window.
Cooling, Space Heating	Ceiling and Wall Cavity Insulation	Thermal insulation is material or combinations of materials that are used to inhibit the flow of heat energy by conductive, convective, and radiative transfer modes. Thus, thermal insulation can conserve energy by reducing the heat loss or gain of a building. The type of building construction defines insulating possibilities. Typical insulating materials include: loose-fill (blown) cellulose; loose-fill (blown) fiberglass; and rigid polystyrene.
Ventilation	Cooking – Exhaust Hoods with Sensor Controls	Improved exhaust hoods involve installing variable-speed controls on commercial kitchen hoods. These controls provide ventilation based on actual cooking loads. When grills, broilers, stoves, fryers or other kitchen appliances are not being used, the controls automatically sense the reduced load and decrease the fan speed accordingly. This results in lower energy consumption because the system is only running as needed rather than at 100% capacity at all times.
Ventilation	Variable Air Volume	A variable air volume ventilation system modulates the air flow rate as needed based on the interior conditions of the building to reduce fan load, improve dehumidification, and reduce energy usage.
Ventilation	Fans – Energy Efficient Motors	High-efficiency motors are essentially interchangeable with standard motors, but differences in construction make them more efficient. Energy-efficient motors achieve their improved efficiency by reducing the losses that occur in the conversion of electrical energy to mechanical energy. This analysis assumes that the efficiency of supply fans is increased by 5% due to installing energy-efficient motors.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Ventilation	Fans – Variable Speed Control (VSD)	The part-load efficiency of ventilation fans can be improved substantially by varying the speed of the motor drive. There are two major types of variable speed controls: mechanical and electronic. An additional benefit of variable-speed controls is the ability to start and stop the motor gradually, thus extending the life of the motor and associated machinery. This analysis assumes that electronic variable speed controls are installed.
Water Heating	High-Efficiency Water Heater Systems	Efficient electric water heaters are characterized by a high recovery or thermal efficiency (percentage of delivered electric energy which is transferred to the water) and low standby losses (the ratio of heat lost per hour to the content of the stored water). Included in the savings associated with high-efficiency electric water heaters are timers that allow temperature setpoints to change with hot water demand patterns. For example, the heating element could be shut off throughout the night, increasing the overall energy factor of the unit. In addition, tank and pipe insulation reduces standby losses and therefore reduces the demands on the water heater. This analysis considers conventional electric water heaters with efficiency greater than 96%, as well as geothermal heat pump water heaters for effective efficiency greater than one. Solar water heating was evaluated as well.
Water Heating	Convert to Gas	This fuel-switching measure is the replacement of an electric water heater with a gas-fired water heater. This measure will eliminate all prior electricity consumption and demand due to electric water heating. In this study, it is assumed that this measure can be implemented only in buildings within 500 feet of a gas main.
Water Heating	Heat Pump Water Heater	Heat pump water heaters use heat pump technology to extract heat from the ambient surroundings and transfer it to a hot water tank. These devices are available as an alternative to conventional tank water heaters of 55 gallons or larger.
Water Heating	Faucet Aerators/Low Flow Nozzles	A faucet aerator or low flow nozzle spreads the stream from a faucet helping to reduce water usage. The amount of water passing through the aerator is measured in gallons per minute (GPM) and the lower the GPM the more water the aerator conserves.
Water Heating	Pipe Insulation	Insulating hot water pipes decreases the amount of energy lost during distribution of hot water throughout the building. Insulating pipes will result in quicker delivery of hot water and allows lowering the water heating set point. There are several different types of insulation, the most common being polyethylene and neoprene.
Water Heating	High-Efficiency Circulation Pump	A high efficiency circulation pump uses an electronically commutated motor (ECM) to improve motor efficiency over a larger range of partial loads. In addition, an ECM allows for improved low RPM performance with greater torque and smaller pump dimensions.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Water Heating	Tank Blanket/Insulation	Insulation levels on domestic hot water heaters can be increased by installing a fiberglass blanket on the outside of the tank. This increase in insulation reduces standby losses and thus saves energy. Water heater insulation is available either by the blanket or by square foot of fiberglass insulation with R-values ranging from 5 to 14.
Water Heating	Thermostat Setback	Installing a setback thermostat on the water heater can lead to significant energy savings during periods when there is no one in the building.
Water Heating	Hot Water Saver	A hot water saver is a plumbing device that attaches to the showerhead and that pauses the flow of water until the water is hot enough for use. The water is re-started by the flip of a switch.
Interior Lighting, Exterior Lighting	Lamp Replacement (Interior Screw-in, HID, and Linear Fluorescent Exterior Screw-in, HID, and Linear Fluorescent)	Commercial lighting differs from the residential sector in that efficiency changes typically require more than the simple purchase and quick installation of a screw-in compact fluorescent lamp. Restrictions regarding ballasts, fixtures, and circuitry limit the potential for direct substitution of one lamp type for another. However, such replacements do exist. For example, screw-in incandescent lamps can readily be replaced with CFLs or LEDs. Also, during the buildout for a leased office space, the management could decide to replace all T12 lamps and magnetic ballasts with T8/electronic ballast configurations. This type of decision-making is modeled on a stock turnover basis because of the time between opportunities for upgrades.
Interior Lighting, Exterior Lighting	Lighting Retrocommissioning	Lighting retrocommissioning projects in existing commercial buildings do not require an event such as a tenant turnover, a major renovation, or an update to electrical circuits to drive its adoption. Rather, a decision-maker can decide at any time to perform a comprehensive audit of a facility's lighting systems, followed by an upgrade of equipment (lamps, ballasts, fixtures, reflectors), controls (occupancy sensors, daylighting controls, and central automation).
Interior Lighting	Delamping and Install Reflectors	While sometimes included in lighting retrofit projects, delamping is often performed as a separate energy efficiency measure in which a lighting engineer analyzes the lighting provided by current systems compared to the requirements of building occupants. This often leads to the removal of unnecessary lamps corresponding to an overall reduction in energy usage. .In addition, installing a reflector in each fixture can improve light distribution from the remaining lamps.
Interior Lighting, Exterior Lighting	Lighting Time Clocks and Timers	While outdoor lighting is typically required only at night, in many cases lighting remains on during daylight hours. A simple timer can set a diurnal schedule for outdoor lighting and thus reduce the operating hours by as much as 50%.
Interior Lighting	Central Lighting Controls	Central lighting control systems provide building-wide control of interior lighting to ensure that lights are properly scheduled based on expected building occupancy. Individual zones or circuits can be controlled.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Interior Lighting	Photocell Controlled T8 Dimming Ballasts	Photocells, in concert with dimming ballasts, can detect when adequate daylighting is available and dim or turn off lights to reduce electricity consumption. Usually one photocell is used to control a group of fixtures, a zone, or a circuit.
Interior Lighting	Bi-Level Fixture with Occupancy Sensor	Bi-level fixtures with occupancy sensors detect when a space is unoccupied and reduce light output to a lower level. These devices
Interior Lighting	High Bay Fixtures	Fluorescent fixtures designed for high-bay applications have several advantages over similar HID fixtures: lower energy consumption, lower lumen depreciation rates, better dimming options, faster start-up and restrike, better color rendition, more pupil lumens, and reduced glare.
Interior Lighting	Occupancy Sensor	The installation of occupancy sensors allows lights to be turned off during periods when a space is unoccupied, virtually eliminating the wasted energy due to lights being left on. There are several types of occupancy sensors in the market.
Interior Lighting	LED Exit Lighting	The lamps inside exit signs represent a significant energy end-use, since they usually operate 24 hours per day. Many old exit signs use incandescent lamps, which consume approximately 40 watts per sign. The incandescent lamps can be replaced with LED lamps that are specially designed for this specific purpose. In comparison, the LED lamps consume approximately 2-5 watts.
Interior Lighting	Task Lighting	In commercial facilities, individual work areas can use task lighting instead of brightly lighting the entire area. Significant energy savings can be realized by focusing light directly where it is needed and lowering the general lighting level. An example of task lighting is the common desk lamp. A 25W desk lamp can be installed in place of a typical lamp in a fixture.
Interior Lighting, Cooling	Hotel Guestroom Controls	Hotel guestrooms can be fitted with occupancy controls that turn off energy-using equipment when the guest is not using the room. The occupancy controls comes in several forms, but this analysis assumes the simplest kind, which is a simple switch near the room's entry where the guest can deposit their room key or card. If the key or card is present, then lights, TV, and air conditioning can receive power and operate. When the guest leaves and takes the key, all equipment shuts off.
Exterior Lighting	Daylighting Controls	Daylighting controls use a photosensor to detect ambient light and turn off exterior lights accordingly.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Exterior Lighting	Photovoltaic Lighting	Outdoor photovoltaic (PV) lighting systems use PV panels (or modules), which convert sunlight to electricity. The electricity is stored in batteries for use at night. They can be cost effective relative to installing power cables and/or step down transformers for relatively small lighting loads. The "nightly run time" listings on most "off-the-shelf" products are based on specific sunlight conditions. Systems located in places that receive less sunlight than the system is designed for will operate for fewer hours per night than expected. Nightly run times may also vary depending on how clear the sky is on any given day. Shading of the PV panel by landscape features (vegetation, buildings, etc.) will also have a large impact on battery charging and performance. Open areas with no shading, such as parking lots, are ideal places where PV lighting systems can be used.
Exterior Lighting	Cold Cathode Lighting	Cold cathode lighting does not use an external heat source to provide thermionic emission of electrons. Cold cathode lighting is typically used for exterior signage or where temperatures are likely to drop below freezing.
Exterior Lighting	Induction Lamps	Induction lamps use a contactless bulb and rely on electromagnetic fields to transfer power. This allows for the lamp to utilize more efficient materials that would otherwise react with metal electrodes. In addition, the lack of an electrode significantly extends lamp life while reducing lumen depreciation.
Office Equipment	Desktop and Laptop Computing Equipment	ENERGY STAR labeled office equipment saves energy by powering down and "going to sleep" when not in use. ENERGY STAR labeled computers automatically power down to 15 watts or less when not in use and may actually last longer than conventional products because they spend a large portion of time in a low-power sleep mode. ENERGY STAR labeled computers also generate less heat than conventional models. The ClimateSavers Initiative, made up of leading computer processor manufacturers, has stated a goal of reducing power consumption in active mode by 50% by integrating innovative power management into the chip design process.
Office Equipment	Monitors	ENERGY STAR labeled office equipment saves energy by powering down and "going to sleep" when not in use. ENERGY STAR labeled monitors automatically power down to 15 watts or less when not in use.
Office Equipment	Servers	In addition to the "sleep" mode a reductions and the efficient processors being designed by members of the ClimateSavers Initiative, servers have additional energy-saving opportunities through "virtualization" and other architecture solutions that involve optimal matching of computation tasks to hardware requirements

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Office Equipment	Printers/Copiers/ Fax/ POS Terminals	ENERGY STAR labeled office equipment saves energy by powering down and "going to sleep" when not in use. ENERGY STAR labeled copiers are equipped with a feature that allows them to automatically turn off after a period of inactivity, reducing a copier's annual electricity costs by over 60%. High-speed copiers that include a duplexing unit that is set to automatically make double-sided copies can reduce paper costs and help to save trees.
Office Equipment	ENERGY STAR Power Supply	Power supplies with an efficient ac-dc or ac-ac conversion process can obtain the ENERGY STAR label. These devices can be used to power computers, phones, and other office equipment.
Refrigeration	Walk-in Refrigeration Systems	Standard compressors typically operate at approximately 65% efficiency. High-efficiency models are available that can improve compressor efficiency by 15%.
Refrigeration	Glass Door and Solid Door Refrigeration Units (Reach-in /Open Display Case/Vending Machine) Door Gasket Replacement High Efficiency Case Lighting	In addition to walk-in, "cold-storage" refrigeration, a significant amount of energy in the commercial sector can be attributed to "reach-in" units. These stand-alone appliances can range from a residential-style refrigerator/freezer unit in an office kitchen or the breakroom of a retail store to the refrigerated display cases in some grocery or convenience stores. As in the case of residential units, these refrigerators can be designed to perform at higher efficiency through a combination of compressor equipment upgrades, default temperature settings, and defrost patterns. Other measures for these units are replacing aging door gaskets that no longer adequately seal the case, and replacing inefficient display lights with CFL or LED systems to reduce internal heat gains in the cases.
Refrigeration	Open Display Case	Glass doors can be used to enclose multi-deck display cases for refrigerated items in supermarkets. In addition, more efficient units are designed to perform at higher efficiency through a combination of compressor equipment upgrades, default temperature settings, and defrost patterns.
Refrigeration	Anti-Sweat Heater/ Auto Door Closer Controls	Anti-sweat heaters are used in virtually all low-temperature display cases and many medium-temperature cases to control humidity and prevent the condensation of water vapor on the sides and doors and on the products contained in the cases. Typically, these heaters stay on all the time, even though they only need to be on about half the time. Anti-sweat heater controls can come in the form of humidity sensors or time clocks.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Refrigeration	Floating Head Pressure Controls	Floating head pressure control allows the pressure in the condenser to "float" with ambient temperatures. This method reduces refrigeration compression ratios, improves system efficiency and extends the compressor life. The greatest savings with a floating head pressure approach occurs when the ambient temperatures are low, such as in the winter season. Floating head pressure control is most practical for new installations. However, retrofits installation can be completed with some existing refrigeration systems. Installing floating head pressure control increases the capacity of the compressor when temperatures are low, which may lead to short cycling.
Refrigeration	Bare Suction Lines	Insulating bare suction lines reduces heat
Refrigeration	Night Covers	Night covers can be used on open refrigeration cases when a facility is closed or few customers are in the store.
Refrigeration	Strip Curtain	Strip curtains at the entrances to large walk-in coolers or freezers, such as those used in supermarkets, reduce air transfer between the refrigerated space and the surrounding space.
Refrigeration	Icemakers	In certain building types (restaurant, hotel), the production of ice is a significant usage of electricity. By optimizing the timing of ice production and the type of output to the specific application, icemakers are assumed to deliver electricity savings.
Refrigeration	Vending Machine - Controller	Cold beverage vending machines usually operate 24 hours a day regardless of whether the surrounding area is occupied or not. The result is that the vending machine consumes energy unnecessarily, because it will operate all night to keep the beverage cold even when there would be no customer until the next morning. A vending machine controller can reduce energy consumption without compromising the temperature of the vended product. The controller uses an infrared sensor to monitor the surrounding area's occupancy and will power down the vending machine when the area is unoccupied. It will also monitor the room's temperature and will re -power the machine at one to three hour intervals independent of occupancy to ensure that the product stays cold.
Food Service	Kitchen Equipment	Commercial cooking and food preparation equipment represent a significant contribution to energy consumption in restaurants and other food service applications. By replacing old units with efficient ones, this energy consumption can be greatly reduced. These measures include fryers, commercial ovens, dishwashers, hot food containers and miscellaneous other food preparation equipment. Savings range between 15 and 65%, depending on the specific unit being replaced.
Cooling, Space Heating, Interior Lighting, Food Preparation, Refrigeration	Custom Measures	Custom measures were included in the CPA analysis to serve as a "catch all" for measures for which costs and savings are not easily quantified and that could be part of a program such as Avista's existing Site-Specific incentive program. Costs and energy savings were assumed such that the measures passed the economic screen.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Miscellaneous	Non-HVAC motor	Because the Small/Medium Commercial and Large Commercial segments include some industrial customers, the CPA analysis included equipment upgrades for non-HVAC motors. This equipment measure also incorporates improvements for vertical transport. Premium efficiency motors reduce the amount of lost energy going into heat rather than power. Since less heat is generated, less energy is needed to cool the motor with a fan. Therefore, the initial cost of energy efficient motors is generally higher than for standard motors. However their life-cycle costs can make them far more economical because of savings they generate in operating expense. Premium efficiency motors can provide savings of 0.5% to 3% over standard motors. The savings results from the fact that energy efficient motors run cooler than their standard counterparts, resulting in an increase in the life of the motor insulation and bearing. In general, an efficient motor is a more reliable motor because there are fewer winding failures, longer periods between needed maintenance, and fewer forced outages. For example, using copper instead of aluminum in the windings, and increasing conductor cross-sectional area, lowers a motor's I2R losses.
Miscellaneous	Pumps – Variable Speed Control	The part-load efficiency of chilled and hot water loop pumps can be improved substantially by varying the speed of the motor drive according to the building demand for heating or cooling. There is also a reduction in piping losses associated with this measure that has a major impact on the heating loads and energy use for a building. However, pump speeds can generally only be reduced to a minimum specified rate, because chillers, boilers, and the control valves may require a minimum flow rate to operate. There are two major types of variable speed controls: mechanical and electronic. An additional benefit of variable-speed drives is the ability to start and stop the motor gradually, thus extending the life of the motor and associated machinery. This analysis assumes that electronic variable speed controls are installed.
Miscellaneous	Laundry – High Efficiency Clothes Washer	High efficiency clothes washers use designs that require less water. These machines use sensors to match the hot water needs to the load, preventing energy waste. There are two designs: top-loading and front-loading. Further energy and water savings can be achieved through advanced technologies such as inverter-drive or combination washer-dryer units.
Miscellaneous	ENERGY STAR Water Cooler	An ENERGY STAR water cooler has more insulation and improved chilling mechanisms, resulting in about half the energy use of a standard cooler.
Miscellaneous	Industrial Process Improvements	Because the Avista C&I sector segmentation was based on Avista's rate classes, the commercial building segments include a small percentage or industrial business types. This measure was included to account for energy efficiency potential that could be achieved through various process improvements at these customers.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Machine Drive.	Motors, Premium Efficiency	Premium efficiency motors reduce the amount of lost energy going into heat rather than power. Since less heat is generated, less energy is needed to cool the motor with a fan. Therefore, the initial cost of energy efficient motors is generally higher than for standard motors. However their life-cycle costs can make them far more economical because of savings they generate in operating expense. Premium efficiency motors can provide savings of 0.5% to 3% over standard motors. The savings results from the fact that energy efficient motors run cooler than their standard counterparts, resulting in an increase in the life of the motor insulation and bearing. In general, an efficient motor is a more reliable motor because there are fewer winding failures, longer periods between needed maintenance, and fewer forced outages. For example, using copper instead of aluminum in the windings, and increasing conductor cross-sectional area, lowers a motor's I2R losses. This analysis assumes 75% loading factor (for peak efficiency) for 1800 rpm motor. Hours of operation vary depending on horsepower size. In addition, improved drives and controls are assumed to be implemented along with the motors, resulting in savings as high as 10% of annual energy consumption
Machine Drive	Motors – Variable Frequency Drive	In addition to energy savings, VFDs increase motor and system life and provide a greater degree of control over the motor system. Especially for motor systems handling fluids, VFDs can efficiently respond to changing operating conditions.
Machine Drive	Magnetic Adjustable Speed Drive	To allow for adjustable speed operation, this technology uses magnetic induction to couple a drive to its load. Varying the magnetic slip within the coupling controls the speed of the output shaft. Magnetic drives perform best at the upper end of the speed range due to the energy consumed by the slip. Unlike traditional ASDs, magnetically coupled ASDs create no power distortion on the electrical system. However, magnetically coupled ASD efficiency is best when power needs are greatest. VFDs may show greater efficiency when the average load speed is below 90% of the motor speed, however this occurs when power demands are reduced.
Machine Drive	Compressed Air – System Controls, Optimization and Improvements, Maintenance	Controls for compressed air systems can shift load from two partially loaded compressors to one compressor in order to maximize compression efficiency and may also involve the addition of VFDs. Improvements include installing high-efficiency motors. Maintenance includes fixing air leaks and replacing air filters.
Machine Drive	Fan Systems – Controls, Optimization and Maintenance	Certain practices require a consistent flow rate, such as indoor air quality and clean room ventilation. To achieve this, fan flow controls can be used to maintain precise volume flow control ensuring a constant air delivery even on fluctuating pressure conditions. This is done through programmable circuitry to electronically control fan motor speed. Motors can be configured to accept a signal from a controller that would vary the flow rate in direct proportion to the signal.

Table D-1 Commercial and Industrial Energy-Efficiency Equipment/Measure Descriptions

End-Use	Energy Efficiency Measure	Description
Machine Drive	Pumping Systems – Controls, Optimization and Maintenance	Pumping systems optimization includes installing VFDs, correctly resizing the motors, and installing timers and automated on-off controls. Maintenance includes repairing diaphragms and fixing piping leaks.
Process	Process Cooling/Refrigeration	Because of the customized nature of industrial cooling and refrigeration applications, a variety of opportunities are summarized as a general improvement in cooling and cold storage equipment. Costs and savings were developed using average values for this group of measures from the Sixth Plan industrial supply curve workbooks.
Process	Process Heating	Because of the customized nature of industrial heating applications, a variety of opportunities are summarized as a general improvement in process heating equipment, such as arc furnaces. Costs and savings were developed using average values for this group of measures from the Sixth Plan industrial supply curve workbooks.
Process	Electrochemical Process	Because of the customized nature of industrial electrochemical applications, a variety of opportunities are summarized as a general improvement in equipment and processes. Costs and savings were developed using average values for this group of measures from the Sixth Plan industrial supply curve workbooks.
Process	Refrigeration – System Controls, Maintenance, and Optimization	Because refrigeration equipment performance degrades over time and control settings are frequently overridden, these measures account for savings that can be achieved through system maintenance and controls optimization.

Table D-2 Energy Efficiency Equipment Data — Small/Medium Commercial, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central Chiller	1.5 kw/ton, COP 2.3	-	$0.00	20	-
Cooling	Central Chiller	1.3 kw/ton, COP 2.7	0.29	$0.39	20	-
Cooling	Central Chiller	1.26 kw/ton, COP 2.8	0.35	$0.50	20	0.51
Cooling	Central Chiller	1.0 kw/ton, COP 3.5	0.73	$0.62	20	1.90
Cooling	Central Chiller	0.97 kw/ton, COP 3.6	0.77	$0.74	20	1.39
Cooling	Central Chiller	Variable Refrigerant Flow	1.01	$11.57	20	0.07
Cooling	RTU	EER 9.2	-	$0.00	16	-
Cooling	RTU	EER 10.1	0.22	$0.18	16	-
Cooling	RTU	EER 11.2	0.43	$0.35	16	-
Cooling	RTU	EER 12.0	0.57	$0.58	16	0.49
Cooling	RTU	Ductless VRF	0.69	$5.12	16	0.05
Cooling	PTAC	EER 9.8	-	$0.00	14	-
Cooling	PTAC	EER 10.2	0.09	$0.08	14	0.86
Cooling	PTAC	EER 10.8	0.21	$0.16	14	1.00
Cooling	PTAC	EER 11	0.25	$0.43	14	0.43
Cooling	PTAC	EER 11.5	0.33	$0.96	14	0.27
Combined Heating/Cooling	Heat Pump	EER 9.3, COP 3.1	-	$0.00	15	-
Combined Heating/Cooling	Heat Pump	EER 10.3, COP 3.2	0.57	$0.39	15	-
Combined Heating/Cooling	Heat Pump	EER 11.0, COP 3.3	0.90	$1.18	15	-
Combined Heating/Cooling	Heat Pump	EER 11.7, COP 3.4	1.20	$1.57	15	0.98
Combined Heating/Cooling	Heat Pump	EER 12, COP 3.4	1.31	$1.96	15	0.68
Combined Heating/Cooling	Heat Pump	Ductless Mini-Split System	1.46	$11.50	20	0.10
Space Heating	Electric Resistance	Standard	-	$0.00	25	-
Space Heating	Furnace	Standard	-	$0.00	18	-
Ventilation	Ventilation	Constant Volume	-	$0.00	15	-
Ventilation	Ventilation	Variable Air Volume	1.30	$1.22	15	1.07
Interior Lighting	Interior Screw-in	Incandescents	-	$0.00	4	-
Interior Lighting	Interior Screw-in	Infrared Halogen	0.23	$0.09	4	-
Interior Lighting	Interior Screw-in	CFL	0.94	$0.03	7	16.50
Interior Lighting	Interior Screw-in	LED	1.04	$1.18	12	0.84
Interior Lighting	HID	Metal Halides	-	$0.00	6	-
Interior Lighting	HID	High Pressure Sodium	0.30	($0.07)	9	1.00
Interior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Interior Lighting	Linear Fluorescent	T8	0.30	($0.03)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	0.91	$0.25	6	1.73
Interior Lighting	Linear Fluorescent	T5	0.95	$0.43	6	1.06
Interior Lighting	Linear Fluorescent	LED	0.99	$3.74	15	0.33
Exterior Lighting	Exterior Screw-in	Incandescent	-	$0.00	4	-
Exterior Lighting	Exterior Screw-in	Infrared Halogen	0.14	$0.05	4	-
Exterior Lighting	Exterior Screw-in	CFL	0.60	$0.02	7	17.60
Exterior Lighting	Exterior Screw-in	Metal Halides	0.60	$0.05	4	3.16
Exterior Lighting	Exterior Screw-in	LED	0.66	$0.64	12	0.90
Exterior Lighting	HID	Metal Halides	-	$0.00	6	-
Exterior Lighting	HID	High Pressure Sodium	0.22	($0.13)	9	1.00
Exterior Lighting	HID	Low Pressure Sodium	0.24	$0.55	9	0.37
Exterior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Exterior Lighting	Linear Fluorescent	T8	0.01	($0.00)	6	1.00
Exterior Lighting	Linear Fluorescent	Super T8	0.04	$0.02	6	1.12
Exterior Lighting	Linear Fluorescent	T5	0.04	$0.03	6	0.69
Exterior Lighting	Linear Fluorescent	LED	0.05	$0.24	15	0.22
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0.00	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	0.10	$0.02	15	5.23
Water Heating	Water Heater	Geothermal Heat Pump	1.33	$3.53	15	0.43
Water Heating	Water Heater	Solar	1.46	$3.03	15	0.55
Food Preparation	Fryer	Standard	-	$0.00	12	-
Food Preparation	Fryer	Efficient	0.03	$0.04	12	0.80
Food Preparation	Oven	Standard	-	$0.00	12	-

Table D-2 Energy Efficiency Equipment Data — Small/Medium Commercial, Existing Vintage (Cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Food Preparation	Oven	Efficient	0.39	$0.36	12	1.02
Food Preparation	Dishwasher	Standard	-	$0.00	12	-
Food Preparation	Dishwasher	Efficient	0.02	$0.05	12	0.36
Food Preparation	Hot Food Container	Standard	-	$0.00	12	-
Food Preparation	Hot Food Container	Efficient	0.40	$0.16	12	2.29
Food Preparation	Food Prep	Standard	-	$0.00	12	-
Food Preparation	Food Prep	Efficient	0.00	$0.03	12	0.07
Refrigeration	Walk in Refrigeration	Standard	-	$0.00	18	-
Refrigeration	Walk in Refrigeration	Efficient	-	$0.09	18	-
Refrigeration	Glass Door Display	Standard	-	$0.00	18	-
Refrigeration	Glass Door Display	Efficient	0.16	$0.00	18	56.08
Refrigeration	Solid Door Refrigerator	Standard	-	$0.00	18	-
Refrigeration	Solid Door Refrigerator	Efficient	0.19	$0.02	18	9.87
Refrigeration	Open Display Case	Standard	-	$0.00	18	-
Refrigeration	Open Display Case	Efficient	0.00	$0.00	18	0.24
Refrigeration	Vending Machine	Base	-	$0.00	10	-
Refrigeration	Vending Machine	Base (2012)	0.11	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency	0.13	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency (2012)	0.20	$0.00	10	46.48
Refrigeration	Icemaker	Standard	-	$0.00	12	-
Refrigeration	Icemaker	Efficient	0.05	$0.00	12	12.76
Office Equipment	Desktop Computer	Baseline	-	$0.00	4	-
Office Equipment	Desktop Computer	Energy Star	0.19	$0.00	4	23.04
Office Equipment	Desktop Computer	Climate Savers	0.27	$0.36	4	0.23
Office Equipment	Laptop Computer	Baseline	-	$0.00	4	-
Office Equipment	Laptop Computer	Energy Star	0.02	$0.00	4	7.34
Office Equipment	Laptop Computer	Climate Savers	0.03	$0.12	4	0.08
Office Equipment	Server	Standard	-	$0.00	3	-
Office Equipment	Server	Energy Star	0.12	$0.01	3	2.14
Office Equipment	Monitor	Standard	-	$0.00	4	-
Office Equipment	Monitor	Energy Star	0.22	$0.00	4	19.68
Office Equipment	Printer/copier/fax	Standard	-	$0.00	6	-
Office Equipment	Printer/copier/fax	Energy Star	0.09	$0.04	6	0.98
Office Equipment	POS Terminal	Standard	-	$0.00	4	-
Office Equipment	POS Terminal	Energy Star	0.03	$0.00	4	2.96
Miscellaneous	Non-HVAC Motor	Standard	-	$0.00	15	-
Miscellaneous	Non-HVAC Motor	Standard (2015)	0.01	$0.00	15	-
Miscellaneous	Non-HVAC Motor	High Efficiency	0.05	$0.06	15	0.95
Miscellaneous	Non-HVAC Motor	High Efficiency (2015)	0.06	$0.06	15	-
Miscellaneous	Non-HVAC Motor	Premium	0.07	$0.11	15	0.72
Miscellaneous	Non-HVAC Motor	Premium (2015)	0.08	$0.11	15	-
Miscellaneous	Other Miscellaneous	Miscellaneous	-	$0.00	5	-
Miscellaneous	Other Miscellaneous	Miscellaneous (2013)	0.00	$0.00	5	-

Table D-3 Energy Efficiency Equipment Data — Large Commercial, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central Chiller	1.5 kw/ton, COP 2.3	-	$0.00	20	-
Cooling	Central Chiller	1.3 kw/ton, COP 2.7	0.30	$0.26	20	-
Cooling	Central Chiller	1.26 kw/ton, COP 2.8	0.36	$0.33	20	0.83
Cooling	Central Chiller	1.0 kw/ton, COP 3.5	0.75	$0.41	20	3.11
Cooling	Central Chiller	0.97 kw/ton, COP 3.6	0.79	$0.49	20	2.28
Cooling	Central Chiller	Variable Refrigerant Flow	1.04	$7.63	20	0.11
Cooling	RTU	EER 9.2	-	$0.00	16	-
Cooling	RTU	EER 10.1	0.22	$0.13	16	-
Cooling	RTU	EER 11.2	0.45	$0.25	16	-
Cooling	RTU	EER 12.0	0.59	$0.41	16	0.75
Cooling	RTU	Ductless VRF	0.72	$3.67	16	0.07
Cooling	PTAC	EER 9.8	-	$0.00	14	-
Cooling	PTAC	EER 10.2	0.09	$0.09	14	0.86
Cooling	PTAC	EER 10.8	0.21	$0.17	14	1.00
Cooling	PTAC	EER 11	0.25	$0.46	14	0.43
Cooling	PTAC	EER 11.5	0.34	$1.03	14	0.27
Combined Heating/Cooling	Heat Pump	EER 9.3, COP 3.1	-	$0.00	15	-
Combined Heating/Cooling	Heat Pump	EER 10.3, COP 3.2	0.46	$0.18	15	-
Combined Heating/Cooling	Heat Pump	EER 11.0, COP 3.3	0.73	$0.55	15	-
Combined Heating/Cooling	Heat Pump	EER 11.7, COP 3.4	0.97	$0.73	15	1.85
Combined Heating/Cooling	Heat Pump	EER 12, COP 3.4	1.07	$0.91	15	1.28
Combined Heating/Cooling	Heat Pump	Ductless Mini-Split System	1.19	$5.35	20	0.19
Space Heating	Electric Resistance	Standard	-	$0.00	25	-
Space Heating	Furnace	Standard	-	$0.00	18	-
Ventilation	Ventilation	Constant Volume	-	$0.00	15	-
Ventilation	Ventilation	Variable Air Volume	1.03	$1.22	15	0.86
Interior Lighting	Interior Screw-in	Incandescents	-	$0.00	4	-
Interior Lighting	Interior Screw-in	Infrared Halogen	0.19	$0.08	4	-
Interior Lighting	Interior Screw-in	CFL	0.78	$0.03	7	14.13
Interior Lighting	Interior Screw-in	LED	0.87	$1.11	12	0.72
Interior Lighting	HID	Metal Halides	-	$0.00	6	-
Interior Lighting	HID	High Pressure Sodium	0.31	($0.08)	9	1.00
Interior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Interior Lighting	Linear Fluorescent	T8	0.30	($0.03)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	0.89	$0.25	6	1.66
Interior Lighting	Linear Fluorescent	T5	0.92	$0.42	6	1.02
Interior Lighting	Linear Fluorescent	LED	0.97	$3.67	15	0.32
Exterior Lighting	Exterior Screw-in	Incandescent	-	$0.00	4	-
Exterior Lighting	Exterior Screw-in	Infrared Halogen	0.08	$0.01	4	-
Exterior Lighting	Exterior Screw-in	CFL	0.34	$0.01	7	34.02
Exterior Lighting	Exterior Screw-in	Metal Halides	0.34	$0.02	4	6.10
Exterior Lighting	Exterior Screw-in	LED	0.38	$0.19	12	1.73
Exterior Lighting	HID	Metal Halides	-	$0.00	6	-
Exterior Lighting	HID	High Pressure Sodium	0.19	($0.11)	9	1.00
Exterior Lighting	HID	Low Pressure Sodium	0.20	$0.45	9	0.37
Exterior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Exterior Lighting	Linear Fluorescent	T8	0.01	($0.00)	6	1.00
Exterior Lighting	Linear Fluorescent	Super T8	0.04	$0.02	6	1.18
Exterior Lighting	Linear Fluorescent	T5	0.04	$0.03	6	0.72
Exterior Lighting	Linear Fluorescent	LED	0.05	$0.24	15	0.23
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0.00	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	0.12	$0.02	15	5.71
Water Heating	Water Heater	Geothermal Heat Pump	1.54	$3.53	15	0.46
Water Heating	Water Heater	Solar	1.69	$3.03	15	0.60
Food Preparation	Fryer	Standard	-	$0.00	12	-
Food Preparation	Fryer	Efficient	0.07	$0.02	12	3.52
Food Preparation	Oven	Standard	-	$0.00	12	-

Table D-3 Energy Efficiency Equipment Data — Large Commercial, Existing Vintage (Cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Food Preparation	Oven	Efficient	0.75	$0.46	12	1.43
Food Preparation	Dishwasher	Standard	-	$0.00	12	-
Food Preparation	Dishwasher	Efficient	0.07	$0.10	12	0.58
Food Preparation	Hot Food Container	Standard	-	$0.00	12	-
Food Preparation	Hot Food Container	Efficient	0.35	$0.30	12	0.99
Food Preparation	Food Prep	Standard	-	$0.00	12	-
Food Preparation	Food Prep	Efficient	0.01	$0.03	12	0.24
Refrigeration	Walk in Refrigeration	Standard	-	$0.00	18	-
Refrigeration	Walk in Refrigeration	Efficient	0.15	$1.26	18	0.13
Refrigeration	Glass Door Display	Standard	-	$0.00	18	-
Refrigeration	Glass Door Display	Efficient	0.13	$0.01	18	24.96
Refrigeration	Solid Door Refrigerator	Standard	-	$0.00	18	-
Refrigeration	Solid Door Refrigerator	Efficient	0.30	$0.08	18	4.39
Refrigeration	Open Display Case	Standard	-	$0.00	18	-
Refrigeration	Open Display Case	Efficient	0.00	$0.04	18	0.16
Refrigeration	Vending Machine	Base	-	$0.00	10	-
Refrigeration	Vending Machine	Base (2012)	0.13	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency	0.15	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency (2012)	0.23	$0.00	10	20.70
Refrigeration	Icemaker	Standard	-	$0.00	12	-
Refrigeration	Icemaker	Efficient	0.11	$0.02	12	5.62
Office Equipment	Desktop Computer	Baseline	-	$0.00	4	-
Office Equipment	Desktop Computer	Energy Star	0.35	$0.00	4	47.46
Office Equipment	Desktop Computer	Climate Savers	0.50	$0.32	4	0.46
Office Equipment	Laptop Computer	Baseline	-	$0.00	4	-
Office Equipment	Laptop Computer	Energy Star	0.02	$0.00	4	15.12
Office Equipment	Laptop Computer	Climate Savers	0.04	$0.06	4	0.17
Office Equipment	Server	Standard	-	$0.00	3	-
Office Equipment	Server	Energy Star	0.13	$0.01	3	4.41
Office Equipment	Monitor	Standard	-	$0.00	4	-
Office Equipment	Monitor	Energy Star	0.19	$0.01	4	9.14
Office Equipment	Printer/copier/fax	Standard	-	$0.00	6	-
Office Equipment	Printer/copier/fax	Energy Star	0.08	$0.02	6	2.02
Office Equipment	POS Terminal	Standard	-	$0.00	4	-
Office Equipment	POS Terminal	Energy Star	0.01	$0.00	4	2.94
Miscellaneous	Non-HVAC Motor	Standard	-	$0.00	15	-
Miscellaneous	Non-HVAC Motor	Standard (2015)	0.01	$0.00	15	-
Miscellaneous	Non-HVAC Motor	High Efficiency	0.06	$0.06	15	0.92
Miscellaneous	Non-HVAC Motor	High Efficiency (2015)	0.06	$0.06	15	-
Miscellaneous	Non-HVAC Motor	Premium	0.08	$0.13	15	0.69
Miscellaneous	Non-HVAC Motor	Premium (2015)	0.09	$0.13	15	-
Miscellaneous	Other Miscellaneous	Miscellaneous	-	$0.00	5	-
Miscellaneous	Other Miscellaneous	Miscellaneous (2013)	0.00	$0.00	5	-

Table D-4 Energy Efficiency Equipment Data — Extra Large Commercial, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central Chiller	0.75 kw/ton, COP 4.7	-	$0.00	20	-
Cooling	Central Chiller	0.60 kw/ton, COP 5.9	0.43	$0.09	20	-
Cooling	Central Chiller	0.58 kw/ton, COP 6.1	0.49	$0.18	20	0.66
Cooling	Central Chiller	0.55 kw/Ton, COP 6.4	0.57	$0.25	20	0.91
Cooling	Central Chiller	0.51 kw/ton, COP 6.9	0.69	$0.44	20	0.78
Cooling	Central Chiller	0.50 kw/Ton, COP 7.0	0.72	$0.53	20	0.69
Cooling	Central Chiller	0.48 kw/ton, COP 7.3	0.77	$0.62	20	0.68
Cooling	Central Chiller	Variable Refrigerant Flow	1.00	$10.92	20	0.05
Cooling	RTU	EER 9.2	-	$0.00	16	-
Cooling	RTU	EER 10.1	0.20	$0.24	16	-
Cooling	RTU	EER 11.2	0.41	$0.45	16	-
Cooling	RTU	EER 12.0	0.53	$0.75	16	0.37
Cooling	RTU	Ductless VRF	0.65	$6.64	16	0.03
Cooling	PTAC	EER 9.8	-	$0.00	14	-
Cooling	PTAC	EER 10.2	0.08	$0.06	14	1.09
Cooling	PTAC	EER 10.8	0.19	$0.12	14	1.28
Cooling	PTAC	EER 11	0.22	$0.32	14	0.55
Cooling	PTAC	EER 11.5	0.30	$0.71	14	0.34
Combined Heating/Cooling	Heat Pump	EER 9.3, COP 3.1	-	$0.00	15	-
Combined Heating/Cooling	Heat Pump	EER 10.3, COP 3.2	0.50	$0.24	15	-
Combined Heating/Cooling	Heat Pump	EER 11.0, COP 3.3	0.79	$0.73	15	-
Combined Heating/Cooling	Heat Pump	EER 11.7, COP 3.4	1.06	$0.97	15	1.34
Combined Heating/Cooling	Heat Pump	EER 12, COP 3.4	1.16	$1.21	15	0.93
Combined Heating/Cooling	Heat Pump	Ductless Mini-Split System	1.29	$7.10	20	0.14
Space Heating	Electric Resistance	Standard	-	$0.00	25	-
Space Heating	Furnace	Standard	-	$0.00	18	-
Ventilation	Ventilation	Constant Volume	-	$0.00	15	-
Ventilation	Ventilation	Variable Air Volume	1.21	$1.22	15	1.01
Interior Lighting	Interior Screw-in	Incandescents	-	$0.00	4	-
Interior Lighting	Interior Screw-in	Infrared Halogen	0.30	$0.14	4	-
Interior Lighting	Interior Screw-in	CFL	1.25	$0.06	7	13.22
Interior Lighting	Interior Screw-in	LED	1.38	$1.90	12	0.67
Interior Lighting	HID	Metal Halides	-	$0.00	6	-
Interior Lighting	HID	High Pressure Sodium	0.13	($0.05)	9	1.00
Interior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Interior Lighting	Linear Fluorescent	T8	0.20	($0.03)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	0.59	$0.21	6	1.31
Interior Lighting	Linear Fluorescent	T5	0.61	$0.35	6	0.80
Interior Lighting	Linear Fluorescent	LED	0.64	$3.08	15	0.25
Exterior Lighting	Exterior Screw-in	Incandescent	-	$0.00	4	-
Exterior Lighting	Exterior Screw-in	Infrared Halogen	0.02	$0.00	4	-
Exterior Lighting	Exterior Screw-in	CFL	0.10	$0.00	7	37.00
Exterior Lighting	Exterior Screw-in	Metal Halides	0.10	$0.00	4	6.64
Exterior Lighting	Exterior Screw-in	LED	0.11	$0.05	12	1.89
Exterior Lighting	HID	Metal Halides	-	$0.00	6	-
Exterior Lighting	HID	High Pressure Sodium	0.26	($0.16)	9	1.00
Exterior Lighting	HID	Low Pressure Sodium	0.28	$0.64	9	0.37
Exterior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Exterior Lighting	Linear Fluorescent	T8	0.00	($0.00)	6	1.00
Exterior Lighting	Linear Fluorescent	Super T8	0.01	$0.00	6	1.12
Exterior Lighting	Linear Fluorescent	T5	0.01	$0.01	6	0.69
Exterior Lighting	Linear Fluorescent	LED	0.01	$0.06	15	0.22
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0.00	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	0.19	$0.02	15	9.79
Water Heating	Water Heater	Geothermal Heat Pump	2.47	$3.53	15	0.80
Water Heating	Water Heater	Solar	2.72	$3.03	15	1.02
Food Preparation	Fryer	Standard	-	$0.00	12	-

Table D-4 Energy Efficiency Equipment Data — Extra Large Commercial, Existing Vintage (Cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Food Preparation	Fryer	Efficient	0.03	$0.00	12	6.02
Food Preparation	Oven	Standard	-	$0.00	12	-
Food Preparation	Oven	Efficient	0.85	$0.38	12	2.11
Food Preparation	Dishwasher	Standard	-	$0.00	12	-
Food Preparation	Dishwasher	Efficient	0.03	$0.04	12	0.57
Food Preparation	Hot Food Container	Standard	-	$0.00	12	-
Food Preparation	Hot Food Container	Efficient	0.17	$0.22	12	0.73
Food Preparation	Food Prep	Standard	-	$0.00	12	-
Food Preparation	Food Prep	Efficient	0.00	$0.03	12	0.15
Refrigeration	Walk in Refrigeration	Standard	-	$0.00	18	-
Refrigeration	Walk in Refrigeration	Efficient	0.06	$0.05	18	1.42
Refrigeration	Glass Door Display	Standard	-	$0.00	18	-
Refrigeration	Glass Door Display	Efficient	0.04	$0.00	18	78.11
Refrigeration	Solid Door Refrigerator	Standard	-	$0.00	18	-
Refrigeration	Solid Door Refrigerator	Efficient	0.27	$0.02	18	12.81
Refrigeration	Open Display Case	Standard	-	$0.00	18	-
Refrigeration	Open Display Case	Efficient	0.01	$0.03	18	0.34
Refrigeration	Vending Machine	Base	-	$0.00	10	-
Refrigeration	Vending Machine	Base (2012)	0.13	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency	0.16	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency (2012)	0.24	$0.00	10	68.21
Refrigeration	Icemaker	Standard	-	$0.00	12	-
Refrigeration	Icemaker	Efficient	0.05	$0.00	12	17.60
Office Equipment	Desktop Computer	Baseline	-	$0.00	4	-
Office Equipment	Desktop Computer	Energy Star	0.25	$0.00	4	32.37
Office Equipment	Desktop Computer	Climate Savers	0.35	$0.33	4	0.32
Office Equipment	Laptop Computer	Baseline	-	$0.00	4	-
Office Equipment	Laptop Computer	Energy Star	0.02	$0.00	4	10.31
Office Equipment	Laptop Computer	Climate Savers	0.04	$0.10	4	0.12
Office Equipment	Server	Standard	-	$0.00	3	-
Office Equipment	Server	Energy Star	0.06	$0.00	3	3.01
Office Equipment	Monitor	Standard	-	$0.00	4	-
Office Equipment	Monitor	Energy Star	0.11	$0.01	4	6.80
Office Equipment	Printer/copier/fax	Standard	-	$0.00	6	-
Office Equipment	Printer/copier/fax	Energy Star	0.02	$0.01	6	1.38
Office Equipment	POS Terminal	Standard	-	$0.00	4	-
Office Equipment	POS Terminal	Energy Star	0.00	$0.00	4	2.01
Miscellaneous	Non-HVAC Motor	Standard	-	$0.00	15	-
Miscellaneous	Non-HVAC Motor	Standard (2015)	0.01	$0.00	15	-
Miscellaneous	Non-HVAC Motor	High Efficiency	0.03	$0.03	15	1.02
Miscellaneous	Non-HVAC Motor	High Efficiency (2015)	0.04	$0.03	15	-
Miscellaneous	Non-HVAC Motor	Premium	0.05	$0.07	15	0.76
Miscellaneous	Non-HVAC Motor	Premium (2015)	0.05	$0.07	15	-
Miscellaneous	Other Miscellaneous	Miscellaneous	-	$0.00	5	-
Miscellaneous	Other Miscellaneous	Miscellaneous (2013)	0.00	$0.00	5	-

Table D-5 Energy Efficiency Equipment Data — Extra Large Industrial, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central Chiller	0.75 kw/ton, COP 4.7	-	$0.00	20	-
Cooling	Central Chiller	0.60 kw/ton, COP 5.9	1.61	$0.33	20	-
Cooling	Central Chiller	0.58 kw/ton, COP 6.1	1.82	$0.66	20	0.68
Cooling	Central Chiller	0.55 kw/Ton, COP 6.4	2.15	$0.93	20	0.94
Cooling	Central Chiller	0.51 kw/ton, COP 6.9	2.58	$1.59	20	0.80
Cooling	Central Chiller	0.50 kw/Ton, COP 7.0	2.68	$1.92	20	0.71
Cooling	Central Chiller	0.48 kw/ton, COP 7.3	2.90	$2.25	20	0.70
Cooling	Central Chiller	Variable Refrigerant Flow	3.74	$39.62	20	0.06
Cooling	RTU	EER 9.2	-	$0.00	16	-
Cooling	RTU	EER 10.1	0.56	$0.39	16	-
Cooling	RTU	EER 11.2	1.12	$0.73	16	-
Cooling	RTU	EER 12.0	1.47	$1.22	16	0.62
Cooling	RTU	Ductless VRF	1.79	$10.83	16	0.06
Cooling	PTAC	EER 9.8	-	$0.00	14	-
Cooling	PTAC	EER 10.2	0.20	$0.06	14	2.79
Cooling	PTAC	EER 10.8	0.47	$0.11	14	3.27
Cooling	PTAC	EER 11	0.55	$0.31	14	1.41
Cooling	PTAC	EER 11.5	0.75	$0.69	14	0.87
Combined Heating/Cooling	Heat Pump	EER 9.3, COP 3.1	-	$0.00	15	-
Combined Heating/Cooling	Heat Pump	EER 10.3, COP 3.2	1.07	$0.92	15	-
Combined Heating/Cooling	Heat Pump	EER 11.0, COP 3.3	1.69	$2.75	15	-
Combined Heating/Cooling	Heat Pump	EER 11.7, COP 3.4	2.25	$3.66	15	0.75
Combined Heating/Cooling	Heat Pump	EER 12, COP 3.4	2.47	$4.58	15	0.52
Combined Heating/Cooling	Heat Pump	Ductless Mini-Split System	2.74	$26.86	20	0.08
Space Heating	Electric Resistance	Standard	-	$0.00	25	-
Space Heating	Furnace	Standard	-	$0.00	18	-
Ventilation	Ventilation	Constant Volume	-	$0.00	15	-
Ventilation	Ventilation	Variable Air Volume	7.66	$1.22	15	6.38
Interior Lighting	Interior Screw-in	Incandescents	-	$0.00	4	-
Interior Lighting	Interior Screw-in	Infrared Halogen	0.09	$0.04	4	-
Interior Lighting	Interior Screw-in	CFL	0.38	$0.02	7	14.80
Interior Lighting	Interior Screw-in	LED	0.42	$0.52	12	0.75
Interior Lighting	HID	Metal Halides	-	$0.00	6	-
Interior Lighting	HID	High Pressure Sodium	0.46	($0.14)	9	1.00
Interior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Interior Lighting	Linear Fluorescent	T8	0.10	($0.01)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	0.31	$0.08	6	1.73
Interior Lighting	Linear Fluorescent	T5	0.32	$0.14	6	1.06
Interior Lighting	Linear Fluorescent	LED	0.33	$1.21	15	0.33
Exterior Lighting	Exterior Screw-in	Incandescent	-	$0.00	4	-
Exterior Lighting	Exterior Screw-in	Infrared Halogen	0.01	$0.00	4	-
Exterior Lighting	Exterior Screw-in	CFL	0.02	$0.00	7	15.02
Exterior Lighting	Exterior Screw-in	Metal Halides	0.02	$0.00	4	2.69
Exterior Lighting	Exterior Screw-in	LED	0.03	$0.03	12	0.77
Exterior Lighting	HID	Metal Halides	-	$0.00	6	-
Exterior Lighting	HID	High Pressure Sodium	0.07	($0.04)	9	1.00
Exterior Lighting	HID	Low Pressure Sodium	0.08	$0.18	9	0.37
Exterior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Exterior Lighting	Linear Fluorescent	T8	0.00	($0.00)	6	1.00
Exterior Lighting	Linear Fluorescent	Super T8	0.00	$0.00	6	1.16
Exterior Lighting	Linear Fluorescent	T5	0.00	$0.00	6	0.71
Exterior Lighting	Linear Fluorescent	LED	0.00	$0.01	15	0.22
Process	Process Cooling/Refrigera	Standard	-	$0.00	10	-
Process	Process Cooling/Refrigera	Efficient	18.88	$5.59	10	2.49
Process	Process Heating	Standard	-	$0.00	10	-
Process	Process Heating	Efficient	6.18	$0.57	10	7.97
Process	Electrochemical Process	Standard	-	$0.00	10	-

Table D-5 Energy Efficiency Equipment Data — Extra Large Industrial, Existing Vintage (Cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Process	Electrochemical Process	Efficient	13.16	$2.64	10	3.67
Machine Drive	Less than 5 HP	Standard	-	$0.00	10	-
Machine Drive	Less than 5 HP	High Efficiency	0.05	$0.02	10	2.08
Machine Drive	Less than 5 HP	Standard (2015)	0.07	$0.00	10	-
Machine Drive	Less than 5 HP	Premium	0.07	$0.03	10	1.66
Machine Drive	Less than 5 HP	High Efficiency (2015)	0.11	$0.02	10	-
Machine Drive	Less than 5 HP	Premium (2015)	0.14	$0.03	10	-
Machine Drive	5-24 HP	Standard	-	$0.00	10	-
Machine Drive	5-24 HP	High	0.11	$0.02	10	5.09
Machine Drive	5-24 HP	Premium	0.18	$0.03	10	4.07
Machine Drive	25-99 HP	Standard	-	$0.00	10	-
Machine Drive	25-99 HP	High	0.31	$0.02	10	13.72
Machine Drive	25-99 HP	Premium	0.49	$0.03	10	10.97
Machine Drive	100-249 HP	Standard	-	$0.00	10	-
Machine Drive	100-249 HP	High	0.12	$0.02	10	5.17
Machine Drive	100-249 HP	Premium	0.15	$0.03	10	3.44
Machine Drive	250-499 HP	Standard	-	$0.00	10	-
Machine Drive	250-499 HP	High	0.35	$0.02	10	15.66
Machine Drive	250-499 HP	Premium	0.47	$0.03	10	10.44
Machine Drive	500 and more HP	Standard	-	$0.00	10	-
Machine Drive	500 and more HP	High	0.59	$0.02	10	26.28
Machine Drive	500 and more HP	Premium	0.78	$0.03	10	17.52
Miscellaneous	Miscellaneous	Miscellaneous	-	$0.00	5	-

Table D-6 Energy Efficiency Equipment Data — Small/Medium Commercial, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central Chiller	1.5 kw/ton, COP 2.3	-	$0.00	20	-
Cooling	Central Chiller	1.3 kw/ton, COP 2.7	0.29	$0.39	20	-
Cooling	Central Chiller	1.26 kw/ton, COP 2.8	0.35	$0.50	20	0.51
Cooling	Central Chiller	1.0 kw/ton, COP 3.5	0.73	$0.62	20	1.90
Cooling	Central Chiller	0.97 kw/ton, COP 3.6	0.77	$0.74	20	1.39
Cooling	Central Chiller	Variable Refrigerant Flow	1.01	$11.57	20	0.07
Cooling	RTU	EER 9.2	-	$0.00	16	-
Cooling	RTU	EER 10.1	0.22	$0.18	16	-
Cooling	RTU	EER 11.2	0.43	$0.35	16	-
Cooling	RTU	EER 12.0	0.57	$0.58	16	0.49
Cooling	RTU	Ductless VRF	0.69	$5.12	16	0.05
Cooling	PTAC	EER 9.8	-	$0.00	14	-
Cooling	PTAC	EER 10.2	0.09	$0.08	14	0.86
Cooling	PTAC	EER 10.8	0.21	$0.16	14	1.00
Cooling	PTAC	EER 11	0.25	$0.43	14	0.43
Cooling	PTAC	EER 11.5	0.33	$0.96	14	0.27
Combined Heating/Cooling	Heat Pump	EER 9.3, COP 3.1	-	$0.00	15	-
Combined Heating/Cooling	Heat Pump	EER 10.3, COP 3.2	0.57	$0.39	15	-
Combined Heating/Cooling	Heat Pump	EER 11.0, COP 3.3	0.90	$1.18	15	-
Combined Heating/Cooling	Heat Pump	EER 11.7, COP 3.4	1.20	$1.57	15	0.98
Combined Heating/Cooling	Heat Pump	EER 12, COP 3.4	1.31	$1.96	15	0.68
Combined Heating/Cooling	Heat Pump	Ductless Mini-Split System	1.46	$11.50	20	0.10
Combined Heating/Cooling	Heat Pump	Geothermal Heat Pump	1.75	$20.69	20	-
Space Heating	Electric Resistance	Standard	-	$0.00	25	-
Space Heating	Furnace	Standard	-	$0.00	18	-
Ventilation	Ventilation	Constant Volume	-	$0.00	15	-
Ventilation	Ventilation	Variable Air Volume	1.64	$1.22	15	1.35
Interior Lighting	Interior Screw-in	Incandescents	-	$0.00	4	-
Interior Lighting	Interior Screw-in	Infrared Halogen	0.20	$0.09	4	-
Interior Lighting	Interior Screw-in	CFL	0.85	$0.03	7	14.85
Interior Lighting	Interior Screw-in	LED	0.93	$1.18	12	0.76
Interior Lighting	HID	Metal Halides	-	$0.00	6	-
Interior Lighting	HID	High Pressure Sodium	0.27	($0.07)	9	1.00
Interior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Interior Lighting	Linear Fluorescent	T8	0.27	($0.03)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	0.82	$0.25	6	1.56
Interior Lighting	Linear Fluorescent	T5	0.85	$0.43	6	0.95
Interior Lighting	Linear Fluorescent	LED	0.89	$3.74	15	0.30
Exterior Lighting	Exterior Screw-in	Incandescent	-	$0.00	4	-
Exterior Lighting	Exterior Screw-in	Infrared Halogen	0.13	$0.05	4	-
Exterior Lighting	Exterior Screw-in	CFL	0.54	$0.02	7	15.84
Exterior Lighting	Exterior Screw-in	Metal Halides	0.54	$0.05	4	2.84
Exterior Lighting	Exterior Screw-in	LED	0.60	$0.64	12	0.81
Exterior Lighting	HID	Metal Halides	-	$0.00	6	-
Exterior Lighting	HID	High Pressure Sodium	0.20	($0.13)	9	1.00
Exterior Lighting	HID	Low Pressure Sodium	0.22	$0.55	9	0.33
Exterior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Exterior Lighting	Linear Fluorescent	T8	0.01	($0.00)	6	1.00
Exterior Lighting	Linear Fluorescent	Super T8	0.04	$0.02	6	1.01
Exterior Lighting	Linear Fluorescent	T5	0.04	$0.03	6	0.62
Exterior Lighting	Linear Fluorescent	LED	0.04	$0.24	15	0.20
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0.00	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	0.10	$0.02	15	5.23
Water Heating	Water Heater	Geothermal Heat Pump	1.33	$3.53	15	0.43
Water Heating	Water Heater	Solar	1.46	$3.03	15	0.55
Food Preparation	Fryer	Standard	-	$0.00	12	-
Food Preparation	Fryer	Efficient	0.03	$0.04	12	0.80

Table D-6 Energy Efficiency Equipment Data — Small/Medium Commercial, New Vintage (Cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Food Preparation	Oven	Standard	-	$0.00	12	-
Food Preparation	Oven	Efficient	0.39	$0.36	12	1.02
Food Preparation	Dishwasher	Standard	-	$0.00	12	-
Food Preparation	Dishwasher	Efficient	0.02	$0.05	12	0.36
Food Preparation	Hot Food Container	Standard	-	$0.00	12	-
Food Preparation	Hot Food Container	Efficient	0.40	$0.16	12	2.29
Food Preparation	Food Prep	Standard	-	$0.00	12	-
Food Preparation	Food Prep	Efficient	0.00	$0.03	12	0.07
Refrigeration	Walk in Refrigeration	Standard	-	$0.00	18	-
Refrigeration	Walk in Refrigeration	Efficient	-	$0.09	18	-
Refrigeration	Glass Door Display	Standard	-	$0.00	18	-
Refrigeration	Glass Door Display	Efficient	0.16	$0.00	18	56.08
Refrigeration	Solid Door Refrigerator	Standard	-	$0.00	18	-
Refrigeration	Solid Door Refrigerator	Efficient	0.19	$0.02	18	9.87
Refrigeration	Open Display Case	Standard	-	$0.00	18	-
Refrigeration	Open Display Case	Efficient	0.00	$0.00	18	0.24
Refrigeration	Vending Machine	Base	-	$0.00	10	-
Refrigeration	Vending Machine	Base (2012)	0.11	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency	0.13	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency (2012)	0.20	$0.00	10	46.48
Refrigeration	Icemaker	Standard	-	$0.00	12	-
Refrigeration	Icemaker	Efficient	0.05	$0.00	12	12.76
Office Equipment	Desktop Computer	Baseline	-	$0.00	4	-
Office Equipment	Desktop Computer	Energy Star	0.19	$0.00	4	23.04
Office Equipment	Desktop Computer	Climate Savers	0.27	$0.36	4	0.23
Office Equipment	Laptop Computer	Baseline	-	$0.00	4	-
Office Equipment	Laptop Computer	Energy Star	0.02	$0.00	4	7.34
Office Equipment	Laptop Computer	Climate Savers	0.03	$0.12	4	0.08
Office Equipment	Server	Standard	-	$0.00	3	-
Office Equipment	Server	Energy Star	0.12	$0.01	3	2.14
Office Equipment	Monitor	Standard	-	$0.00	4	-
Office Equipment	Monitor	Energy Star	0.22	$0.00	4	19.68
Office Equipment	Printer/copier/fax	Standard	-	$0.00	6	-
Office Equipment	Printer/copier/fax	Energy Star	0.09	$0.04	6	0.98
Office Equipment	POS Terminal	Standard	-	$0.00	4	-
Office Equipment	POS Terminal	Energy Star	0.03	$0.00	4	2.96
Miscellaneous	Non-HVAC Motor	Standard	-	$0.00	15	-
Miscellaneous	Non-HVAC Motor	Standard (2015)	0.01	$0.00	15	-
Miscellaneous	Non-HVAC Motor	High Efficiency	0.05	$0.06	15	0.95
Miscellaneous	Non-HVAC Motor	High Efficiency (2015)	0.06	$0.06	15	-
Miscellaneous	Non-HVAC Motor	Premium	0.07	$0.11	15	0.72
Miscellaneous	Non-HVAC Motor	Premium (2015)	0.08	$0.11	15	-
Miscellaneous	Other Miscellaneous	Miscellaneous	-	$0.00	5	-
Miscellaneous	Other Miscellaneous	Miscellaneous (2013)	0.00	$0.00	5	-

Table D-7 Energy Efficiency Equipment Data — Large Commercial, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central Chiller	1.5 kw/ton, COP 2.3	-	$0.00	20	-
Cooling	Central Chiller	1.3 kw/ton, COP 2.7	0.32	$0.24	20	-
Cooling	Central Chiller	1.26 kw/ton, COP 2.8	0.39	$0.31	20	0.97
Cooling	Central Chiller	1.0 kw/ton, COP 3.5	0.80	$0.38	20	3.62
Cooling	Central Chiller	0.97 kw/ton, COP 3.6	0.85	$0.45	20	2.66
Cooling	Central Chiller	Variable Refrigerant Flow	1.12	$7.06	20	0.12
Cooling	RTU	EER 9.2	-	$0.00	16	-
Cooling	RTU	EER 10.1	0.22	$0.13	16	-
Cooling	RTU	EER 11.2	0.45	$0.25	16	-
Cooling	RTU	EER 12.0	0.59	$0.41	16	0.75
Cooling	RTU	Ductless VRF	0.72	$3.67	16	0.07
Cooling	PTAC	EER 9.8	-	$0.00	14	-
Cooling	PTAC	EER 10.2	0.09	$0.09	14	0.86
Cooling	PTAC	EER 10.8	0.21	$0.17	14	1.00
Cooling	PTAC	EER 11	0.25	$0.46	14	0.43
Cooling	PTAC	EER 11.5	0.34	$1.03	14	0.27
Combined Heating/Cooling	Heat Pump	EER 9.3, COP 3.1	-	$0.00	15	-
Combined Heating/Cooling	Heat Pump	EER 10.3, COP 3.2	0.46	$0.18	15	-
Combined Heating/Cooling	Heat Pump	EER 11.0, COP 3.3	0.73	$0.55	15	-
Combined Heating/Cooling	Heat Pump	EER 11.7, COP 3.4	0.97	$0.73	15	1.85
Combined Heating/Cooling	Heat Pump	EER 12, COP 3.4	1.07	$0.91	15	1.28
Combined Heating/Cooling	Heat Pump	Ductless Mini-Split System	1.19	$5.35	20	0.19
Combined Heating/Cooling	Heat Pump	Geothermal Heat Pump	1.42	$9.62	20	-
Space Heating	Electric Resistance	Standard	-	$0.00	25	-
Space Heating	Furnace	Standard	-	$0.00	18	-
Ventilation	Ventilation	Constant Volume	-	$0.00	15	-
Ventilation	Ventilation	Variable Air Volume	1.30	$1.22	15	1.09
Interior Lighting	Interior Screw-in	Incandescents	-	$0.00	4	-
Interior Lighting	Interior Screw-in	Infrared Halogen	0.17	$0.08	4	-
Interior Lighting	Interior Screw-in	CFL	0.71	$0.03	7	12.72
Interior Lighting	Interior Screw-in	LED	0.78	$1.11	12	0.65
Interior Lighting	HID	Metal Halides	-	$0.00	6	-
Interior Lighting	HID	High Pressure Sodium	0.28	($0.08)	9	1.00
Interior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Interior Lighting	Linear Fluorescent	T8	0.27	($0.03)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	0.80	$0.25	6	1.49
Interior Lighting	Linear Fluorescent	T5	0.83	$0.42	6	0.92
Interior Lighting	Linear Fluorescent	LED	0.87	$3.67	15	0.29
Exterior Lighting	Exterior Screw-in	Incandescent	-	$0.00	4	-
Exterior Lighting	Exterior Screw-in	Infrared Halogen	0.07	$0.01	4	-
Exterior Lighting	Exterior Screw-in	CFL	0.31	$0.01	7	30.62
Exterior Lighting	Exterior Screw-in	Metal Halides	0.31	$0.02	4	5.49
Exterior Lighting	Exterior Screw-in	LED	0.34	$0.19	12	1.56
Exterior Lighting	HID	Metal Halides	-	$0.00	6	-
Exterior Lighting	HID	High Pressure Sodium	0.17	($0.11)	9	1.00
Exterior Lighting	HID	Low Pressure Sodium	0.18	$0.45	9	0.34
Exterior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Exterior Lighting	Linear Fluorescent	T8	0.01	($0.00)	6	1.00
Exterior Lighting	Linear Fluorescent	Super T8	0.04	$0.02	6	1.06
Exterior Lighting	Linear Fluorescent	T5	0.04	$0.03	6	0.65
Exterior Lighting	Linear Fluorescent	LED	0.04	$0.24	15	0.20
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0.00	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	0.12	$0.02	15	5.71
Water Heating	Water Heater	Geothermal Heat Pump	1.54	$3.53	15	0.46
Water Heating	Water Heater	Solar	1.69	$3.03	15	0.60
Food Preparation	Fryer	Standard	-	$0.00	12	-
Food Preparation	Fryer	Efficient	0.07	$0.02	12	3.52

Table D-7 Energy Efficiency Equipment Data — Large Commercial, New Vintage (Cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Food Preparation	Oven	Standard	-	$0.00	12	-
Food Preparation	Oven	Efficient	0.75	$0.46	12	1.43
Food Preparation	Dishwasher	Standard	-	$0.00	12	-
Food Preparation	Dishwasher	Efficient	0.07	$0.10	12	0.58
Food Preparation	Hot Food Container	Standard	-	$0.00	12	-
Food Preparation	Hot Food Container	Efficient	0.35	$0.30	12	0.99
Food Preparation	Food Prep	Standard	-	$0.00	12	-
Food Preparation	Food Prep	Efficient	0.01	$0.03	12	0.24
Refrigeration	Walk in Refrigeration	Standard	-	$0.00	18	-
Refrigeration	Walk in Refrigeration	Efficient	0.15	$1.26	18	0.13
Refrigeration	Glass Door Display	Standard	-	$0.00	18	-
Refrigeration	Glass Door Display	Efficient	0.13	$0.01	18	24.96
Refrigeration	Solid Door Refrigerator	Standard	-	$0.00	18	-
Refrigeration	Solid Door Refrigerator	Efficient	0.30	$0.08	18	4.39
Refrigeration	Open Display Case	Standard	-	$0.00	18	-
Refrigeration	Open Display Case	Efficient	0.00	$0.04	18	0.16
Refrigeration	Vending Machine	Base	-	$0.00	10	-
Refrigeration	Vending Machine	Base (2012)	0.13	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency	0.15	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency (2012)	0.23	$0.00	10	20.70
Refrigeration	Icemaker	Standard	-	$0.00	12	-
Refrigeration	Icemaker	Efficient	0.11	$0.02	12	5.62
Office Equipment	Desktop Computer	Baseline	-	$0.00	4	-
Office Equipment	Desktop Computer	Energy Star	0.35	$0.00	4	47.46
Office Equipment	Desktop Computer	Climate Savers	0.50	$0.32	4	0.46
Office Equipment	Laptop Computer	Baseline	-	$0.00	4	-
Office Equipment	Laptop Computer	Energy Star	0.02	$0.00	4	15.12
Office Equipment	Laptop Computer	Climate Savers	0.04	$0.06	4	0.17
Office Equipment	Server	Standard	-	$0.00	3	-
Office Equipment	Server	Energy Star	0.13	$0.01	3	4.41
Office Equipment	Monitor	Standard	-	$0.00	4	-
Office Equipment	Monitor	Energy Star	0.19	$0.01	4	9.14
Office Equipment	Printer/copier/fax	Standard	-	$0.00	6	-
Office Equipment	Printer/copier/fax	Energy Star	0.08	$0.02	6	2.02
Office Equipment	POS Terminal	Standard	-	$0.00	4	-
Office Equipment	POS Terminal	Energy Star	0.01	$0.00	4	2.94
Miscellaneous	Non-HVAC Motor	Standard	-	$0.00	15	-
Miscellaneous	Non-HVAC Motor	Standard (2015)	0.01	$0.00	15	-
Miscellaneous	Non-HVAC Motor	High Efficiency	0.06	$0.06	15	0.92
Miscellaneous	Non-HVAC Motor	High Efficiency (2015)	0.06	$0.06	15	-
Miscellaneous	Non-HVAC Motor	Premium	0.08	$0.13	15	0.69
Miscellaneous	Non-HVAC Motor	Premium (2015)	0.09	$0.13	15	-
Miscellaneous	Other Miscellaneous	Miscellaneous	-	$0.00	5	-
Miscellaneous	Other Miscellaneous	Miscellaneous (2013)	0.00	$0.00	5	-

Table D-8 Energy Efficiency Equipment Data — Extra Large Commercial, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central Chiller	0.75 kw/ton, COP 4.7	-	$0.00	20	-
Cooling	Central Chiller	0.60 kw/ton, COP 5.9	0.43	$0.09	20	-
Cooling	Central Chiller	0.58 kw/ton, COP 6.1	0.49	$0.18	20	0.66
Cooling	Central Chiller	0.55 kw/Ton, COP 6.4	0.57	$0.25	20	0.91
Cooling	Central Chiller	0.51 kw/ton, COP 6.9	0.69	$0.44	20	0.78
Cooling	Central Chiller	0.50 kw/Ton, COP 7.0	0.72	$0.53	20	0.69
Cooling	Central Chiller	0.48 kw/ton, COP 7.3	0.77	$0.62	20	0.68
Cooling	Central Chiller	Variable Refrigerant Flow	1.00	$10.92	20	0.05
Cooling	RTU	EER 9.2	-	$0.00	16	-
Cooling	RTU	EER 10.1	0.20	$0.24	16	-
Cooling	RTU	EER 11.2	0.41	$0.44	16	-
Cooling	RTU	EER 12.0	0.53	$0.73	16	0.37
Cooling	RTU	Ductless VRF	0.65	$6.51	16	0.04
Cooling	PTAC	EER 9.8	-	$0.00	14	-
Cooling	PTAC	EER 10.2	0.08	$0.06	14	1.09
Cooling	PTAC	EER 10.8	0.19	$0.12	14	1.28
Cooling	PTAC	EER 11	0.22	$0.32	14	0.55
Cooling	PTAC	EER 11.5	0.30	$0.71	14	0.34
Combined Heating/Cooling	Heat Pump	EER 9.3, COP 3.1	-	$0.00	15	-
Combined Heating/Cooling	Heat Pump	EER 10.3, COP 3.2	0.50	$0.24	15	-
Combined Heating/Cooling	Heat Pump	EER 11.0, COP 3.3	0.79	$0.73	15	-
Combined Heating/Cooling	Heat Pump	EER 11.7, COP 3.4	1.06	$0.97	15	1.34
Combined Heating/Cooling	Heat Pump	EER 12, COP 3.4	1.16	$1.21	15	0.93
Combined Heating/Cooling	Heat Pump	Ductless Mini-Split System	1.29	$7.10	20	0.14
Combined Heating/Cooling	Heat Pump	Geothermal Heat Pump	1.55	$12.77	20	-
Space Heating	Electric Resistance	Standard	-	$0.00	25	-
Space Heating	Furnace	Standard	-	$0.00	18	-
Ventilation	Ventilation	Constant Volume	-	$0.00	15	-
Ventilation	Ventilation	Variable Air Volume	1.52	$1.22	15	1.27
Interior Lighting	Interior Screw-in	Incandescents	-	$0.00	4	-
Interior Lighting	Interior Screw-in	Infrared Halogen	0.27	$0.14	4	-
Interior Lighting	Interior Screw-in	CFL	1.13	$0.06	7	11.90
Interior Lighting	Interior Screw-in	LED	1.24	$1.90	12	0.61
Interior Lighting	HID	Metal Halides	-	$0.00	6	-
Interior Lighting	HID	High Pressure Sodium	0.11	($0.05)	9	1.00
Interior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Interior Lighting	Linear Fluorescent	T8	0.18	($0.03)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	0.53	$0.21	6	1.18
Interior Lighting	Linear Fluorescent	T5	0.55	$0.35	6	0.72
Interior Lighting	Linear Fluorescent	LED	0.58	$3.08	15	0.23
Exterior Lighting	Exterior Screw-in	Incandescent	-	$0.00	4	-
Exterior Lighting	Exterior Screw-in	Infrared Halogen	0.02	$0.00	4	-
Exterior Lighting	Exterior Screw-in	CFL	0.09	$0.00	7	33.30
Exterior Lighting	Exterior Screw-in	Metal Halides	0.09	$0.00	4	5.97
Exterior Lighting	Exterior Screw-in	LED	0.10	$0.05	12	1.70
Exterior Lighting	HID	Metal Halides	-	$0.00	6	-
Exterior Lighting	HID	High Pressure Sodium	0.24	($0.16)	9	1.00
Exterior Lighting	HID	Low Pressure Sodium	0.25	$0.64	9	0.33
Exterior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Exterior Lighting	Linear Fluorescent	T8	0.00	($0.00)	6	1.00
Exterior Lighting	Linear Fluorescent	Super T8	0.01	$0.00	6	1.01
Exterior Lighting	Linear Fluorescent	T5	0.01	$0.01	6	0.62
Exterior Lighting	Linear Fluorescent	LED	0.01	$0.06	15	0.19
Water Heating	Water Heater	Baseline (EF=0.90)	-	$0.00	15	-
Water Heating	Water Heater	High Efficiency (EF=0.95)	0.19	$0.02	15	9.79
Water Heating	Water Heater	Geothermal Heat Pump	2.47	$3.53	15	0.80
Water Heating	Water Heater	Solar	2.72	$3.03	15	1.02

Table D-9 Energy Efficiency Equipment Data — Extra Large Commercial, New Vintage (Cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Food Preparation	Fryer	Standard	-	$0.00	12	-
Food Preparation	Fryer	Efficient	0.03	$0.00	12	6.02
Food Preparation	Oven	Standard	-	$0.00	12	-
Food Preparation	Oven	Efficient	0.85	$0.38	12	2.11
Food Preparation	Dishwasher	Standard	-	$0.00	12	-
Food Preparation	Dishwasher	Efficient	0.03	$0.04	12	0.57
Food Preparation	Hot Food Container	Standard	-	$0.00	12	-
Food Preparation	Hot Food Container	Efficient	0.17	$0.22	12	0.73
Food Preparation	Food Prep	Standard	-	$0.00	12	-
Food Preparation	Food Prep	Efficient	0.00	$0.03	12	0.15
Refrigeration	Walk in Refrigeration	Standard	-	$0.00	18	-
Refrigeration	Walk in Refrigeration	Efficient	0.06	$0.05	18	1.42
Refrigeration	Glass Door Display	Standard	-	$0.00	18	-
Refrigeration	Glass Door Display	Efficient	0.04	$0.00	18	78.11
Refrigeration	Solid Door Refrigerator	Standard	-	$0.00	18	-
Refrigeration	Solid Door Refrigerator	Efficient	0.27	$0.02	18	13.75
Refrigeration	Open Display Case	Standard	-	$0.00	18	-
Refrigeration	Open Display Case	Efficient	0.01	$0.03	18	0.34
Refrigeration	Vending Machine	Base	-	$0.00	10	-
Refrigeration	Vending Machine	Base (2012)	0.13	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency	0.16	$0.00	10	-
Refrigeration	Vending Machine	High Efficiency (2012)	0.24	$0.00	10	68.21
Refrigeration	Icemaker	Standard	-	$0.00	12	-
Refrigeration	Icemaker	Efficient	0.05	$0.00	12	17.60
Office Equipment	Desktop Computer	Baseline	-	$0.00	4	-
Office Equipment	Desktop Computer	Energy Star	0.25	$0.00	4	32.37
Office Equipment	Desktop Computer	Climate Savers	0.35	$0.33	4	0.32
Office Equipment	Laptop Computer	Baseline	-	$0.00	4	-
Office Equipment	Laptop Computer	Energy Star	0.02	$0.00	4	10.31
Office Equipment	Laptop Computer	Climate Savers	0.04	$0.10	4	0.12
Office Equipment	Server	Standard	-	$0.00	3	-
Office Equipment	Server	Energy Star	0.06	$0.00	3	3.01
Office Equipment	Monitor	Standard	-	$0.00	4	-
Office Equipment	Monitor	Energy Star	0.11	$0.01	4	6.80
Office Equipment	Printer/copier/fax	Standard	-	$0.00	6	-
Office Equipment	Printer/copier/fax	Energy Star	0.02	$0.01	6	1.38
Office Equipment	POS Terminal	Standard	-	$0.00	4	-
Office Equipment	POS Terminal	Energy Star	0.00	$0.00	4	2.01
Miscellaneous	Non-HVAC Motor	Standard	-	$0.00	15	-
Miscellaneous	Non-HVAC Motor	Standard (2015)	0.01	$0.00	15	-
Miscellaneous	Non-HVAC Motor	High Efficiency	0.03	$0.03	15	1.02
Miscellaneous	Non-HVAC Motor	High Efficiency (2015)	0.04	$0.03	15	-
Miscellaneous	Non-HVAC Motor	Premium	0.05	$0.07	15	0.76
Miscellaneous	Non-HVAC Motor	Premium (2015)	0.05	$0.07	15	-
Miscellaneous	Other Miscellaneous	Miscellaneous	-	$0.00	5	-
Miscellaneous	Other Miscellaneous	Miscellaneous (2013)	0.00	$0.00	5	-

Table D-9 Energy Efficiency Equipment Data — Extra Large Industrial, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Cooling	Central Chiller	0.75 kw/ton, COP 4.7	-	$0.00	20	-
Cooling	Central Chiller	0.60 kw/ton, COP 5.9	1.61	$0.33	20	-
Cooling	Central Chiller	0.58 kw/ton, COP 6.1	1.82	$0.66	20	0.68
Cooling	Central Chiller	0.55 kw/Ton, COP 6.4	2.15	$0.93	20	0.94
Cooling	Central Chiller	0.51 kw/ton, COP 6.9	2.58	$1.59	20	0.80
Cooling	Central Chiller	0.50 kw/Ton, COP 7.0	2.68	$1.92	20	0.71
Cooling	Central Chiller	0.48 kw/ton, COP 7.3	2.90	$2.25	20	0.70
Cooling	Central Chiller	Variable Refrigerant Flow	3.74	$39.62	20	0.06
Cooling	RTU	EER 9.2	-	$0.00	16	-
Cooling	RTU	EER 10.1	0.56	$0.39	16	-
Cooling	RTU	EER 11.2	1.12	$0.74	16	-
Cooling	RTU	EER 12.0	1.47	$1.23	16	0.62
Cooling	RTU	Ductless VRF	1.79	$10.88	16	0.06
Cooling	PTAC	EER 9.8	-	$0.00	14	-
Cooling	PTAC	EER 10.2	0.20	$0.06	14	2.79
Cooling	PTAC	EER 10.8	0.47	$0.11	14	3.27
Cooling	PTAC	EER 11	0.55	$0.31	14	1.41
Cooling	PTAC	EER 11.5	0.75	$0.69	14	0.87
Combined Heating/Cooling	Heat Pump	EER 9.3, COP 3.1	-	$0.00	15	-
Combined Heating/Cooling	Heat Pump	EER 10.3, COP 3.2	1.07	$0.92	15	-
Combined Heating/Cooling	Heat Pump	EER 11.0, COP 3.3	1.69	$2.75	15	-
Combined Heating/Cooling	Heat Pump	EER 11.7, COP 3.4	2.25	$3.66	15	0.75
Combined Heating/Cooling	Heat Pump	EER 12, COP 3.4	2.47	$4.58	15	0.52
Combined Heating/Cooling	Heat Pump	Ductless Mini-Split System	2.74	$26.86	20	0.08
Combined Heating/Cooling	Heat Pump	Geothermal Heat Pump	3.29	$48.32	20	-
Space Heating	Electric Resistance	Standard	-	$0.00	25	-
Space Heating	Furnace	Standard	-	$0.00	18	-
Ventilation	Ventilation	Constant Volume	-	$0.00	15	-
Ventilation	Ventilation	Variable Air Volume	9.66	$1.22	15	8.05
Interior Lighting	Interior Screw-in	Incandescents	-	$0.00	4	-
Interior Lighting	Interior Screw-in	Infrared Halogen	0.08	$0.04	4	-
Interior Lighting	Interior Screw-in	CFL	0.34	$0.02	7	13.32
Interior Lighting	Interior Screw-in	LED	0.38	$0.52	12	0.68
Interior Lighting	HID	Metal Halides	-	$0.00	6	-
Interior Lighting	HID	High Pressure Sodium	0.41	($0.14)	9	1.00
Interior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Interior Lighting	Linear Fluorescent	T8	0.09	($0.01)	6	1.00
Interior Lighting	Linear Fluorescent	Super T8	0.28	$0.08	6	1.56
Interior Lighting	Linear Fluorescent	T5	0.29	$0.14	6	0.96
Interior Lighting	Linear Fluorescent	LED	0.30	$1.21	15	0.30
Exterior Lighting	Exterior Screw-in	Incandescent	-	$0.00	4	-
Exterior Lighting	Exterior Screw-in	Infrared Halogen	0.01	$0.00	4	-
Exterior Lighting	Exterior Screw-in	CFL	0.02	$0.00	7	13.52
Exterior Lighting	Exterior Screw-in	Metal Halides	0.02	$0.00	4	2.42
Exterior Lighting	Exterior Screw-in	LED	0.02	$0.03	12	0.69
Exterior Lighting	HID	Metal Halides	-	$0.00	6	-
Exterior Lighting	HID	High Pressure Sodium	0.07	($0.04)	9	1.00
Exterior Lighting	HID	Low Pressure Sodium	0.07	$0.18	9	0.33
Exterior Lighting	Linear Fluorescent	T12	-	$0.00	6	-
Exterior Lighting	Linear Fluorescent	T8	0.00	($0.00)	6	1.00
Exterior Lighting	Linear Fluorescent	Super T8	0.00	$0.00	6	1.05
Exterior Lighting	Linear Fluorescent	T5	0.00	$0.00	6	0.64
Exterior Lighting	Linear Fluorescent	LED	0.00	$0.01	15	0.20
Process	Process Cooling/Refrigera	Standard	-	$0.00	10	-
Process	Process Cooling/Refrigera	Efficient	18.88	$5.59	10	2.49
Process	Process Heating	Standard	-	$0.00	10	-
Process	Process Heating	Efficient	6.18	$0.57	10	7.97

Table D-9 Energy Efficiency Equipment Data — Extra Large Industrial, New Vintage (Cont.)

End Use	Technology	Efficiency Definition	Savings (kWh/yr)	Incremental Cost	Lifetime (yrs)	BC Ratio
Process	Electrochemical Process	Standard	-	$0.00	10	-
Process	Electrochemical Process	Efficient	13.16	$2.64	10	3.67
Machine Drive	Less than 5 HP	Standard	-	$0.00	10	-
Machine Drive	Less than 5 HP	High Efficiency	0.05	$0.02	10	2.08
Machine Drive	Less than 5 HP	Standard (2015)	0.07	$0.00	10	-
Machine Drive	Less than 5 HP	Premium	0.07	$0.03	10	1.66
Machine Drive	Less than 5 HP	High Efficiency (2015)	0.11	$0.02	10	-
Machine Drive	Less than 5 HP	Premium (2015)	0.14	$0.03	10	-
Machine Drive	5-24 HP	Standard	-	$0.00	10	-
Machine Drive	5-24 HP	High	0.11	$0.02	10	5.09
Machine Drive	5-24 HP	Premium	0.18	$0.03	10	4.07
Machine Drive	25-99 HP	Standard	-	$0.00	10	-
Machine Drive	25-99 HP	High	0.31	$0.02	10	13.72
Machine Drive	25-99 HP	Premium	0.49	$0.03	10	10.97
Machine Drive	100-249 HP	Standard	-	$0.00	10	-
Machine Drive	100-249 HP	High	0.12	$0.02	10	5.17
Machine Drive	100-249 HP	Premium	0.15	$0.03	10	3.44
Machine Drive	250-499 HP	Standard	-	$0.00	10	-
Machine Drive	250-499 HP	High	0.35	$0.02	10	15.66
Machine Drive	250-499 HP	Premium	0.47	$0.03	10	10.44
Machine Drive	500 and more HP	Standard	-	$0.00	10	-
Machine Drive	500 and more HP	High	0.59	$0.02	10	26.28
Machine Drive	500 and more HP	Premium	0.78	$0.03	10	17.52
Miscellaneous	Miscellaneous	Miscellaneous	-	$0.00	5	-

Table D-10 Energy Efficiency Measure Data — Small/Medium Commercial, Existing Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
RTU - Maintenance	Cooling	14%	0%	14%	90%	$0.08	4	0.75
RTU - Evaporative Precooler	Cooling	10%	0%	0%	0%	$0.88	15	0.20
Chiller - Chilled Water Reset	Cooling	14%	0%	0%	0%	$0.86	4	0.08
Chiller - Chilled Water Variable-Flow System	Cooling	5%	0%	0%	0%	$0.86	10	0.07
Chiller - Turbocor Compressor	Cooling	30%	0%	0%	0%	$0.90	20	0.70
Chiller - VSD	Cooling	27%	0%	0%	0%	$1.17	20	0.48
Chiller - High Efficiency Cooling Tower Fans	Cooling	0%	0%	0%	0%	$0.04	10	0.01
Chiller - Condenser Water Temprature Reset	Cooling	10%	0%	0%	0%	$0.87	14	0.18
Cooling - Economizer Installation	Cooling	6%	0%	45%	49%	$0.15	15	0.71
Heat Pump - Maintenance	Combined Heating/Cooling	7%	7%	10%	95%	$0.03	4	5.00
Insulation - Ducting	Cooling	6%	0%	9%	50%	$0.41	20	0.71
Insulation - Ducting	Space Heating	3%	1%	9%	50%	$0.41	20	0.71
Repair and Sealing - Ducting	Cooling	2%	0%	5%	25%	$0.38	15	0.45
Repair and Sealing - Ducting	Space Heating	2%	1%	5%	25%	$0.38	15	0.45
Energy Management System	Cooling	6%	0%	24%	75%	$0.35	14	0.72
Energy Management System	Space Heating	5%	3%	24%	75%	$0.35	14	0.72
Energy Management System	Interior Lighting	2%	1%	24%	75%	$0.35	14	0.72
Cooking - Exhaust Hoods with Sensor Control	Ventilation	25%	13%	1%	15%	$0.04	10	7.36
Fans - Energy Efficient Motors	Ventilation	5%	5%	11%	90%	$0.05	10	1.38
Fans - Variable Speed Control	Ventilation	15%	5%	8%	90%	$0.20	10	0.89
Retrocommissioning - HVAC	Cooling	9%	0%	15%	90%	$0.60	4	0.50
Retrocommissioning - HVAC	Space Heating	9%	6%	15%	90%	$0.60	4	0.50
Retrocommissioning - HVAC	Ventilation	9%	6%	15%	90%	$0.60	4	0.50
Pumps - Variable Speed Control	Miscellaneous	1%	0%	0%	34%	$0.44	10	1.01
Thermostat - Clock/Programmable	Cooling	5%	0%	34%	50%	$0.13	11	1.12
Thermostat - Clock/Programmable	Space Heating	5%	1%	34%	50%	$0.13	11	1.12
Insulation - Ceiling	Cooling	2%	0%	10%	18%	$0.64	20	0.70
Insulation - Ceiling	Space Heating	17%	4%	10%	18%	$0.64	20	0.70
Insulation - Radiant Barrier	Cooling	3%	0%	7%	13%	$0.26	20	0.81
Insulation - Radiant Barrier	Space Heating	5%	2%	7%	13%	$0.26	20	0.81
Roofs - High Reflectivity	Cooling	15%	0%	2%	95%	$0.18	15	1.47
Windows - High Efficiency	Cooling	5%	0%	61%	75%	$0.44	20	0.63
Windows - High Efficiency	Space Heating	3%	2%	61%	75%	$0.44	20	0.63
Interior Lighting - Central Lighting Controls	Interior Lighting	10%	5%	81%	90%	$0.65	8	0.34
Interior Lighting - Photocell Controlled T8 Dimming Ballasts	Interior Lighting	25%	13%	1%	45%	$0.50	8	0.90
Exterior Lighting - Daylighting Controls	Exterior Lighting	30%	0%	2%	50%	$0.11	8	1.36
Interior Fluorescent - Delamp and Install Reflectors	Interior Lighting	20%	10%	18%	25%	$0.50	11	0.97
Interior Fluorescent - Bi-Level Fixture w/Occupancy Sensor	Interior Lighting	10%	5%	10%	23%	$0.50	8	0.36
Interior Fluorescent - High Bay Fixtures	Interior Lighting	50%	25%	10%	23%	$0.70	11	1.73
Interior Lighting - Occupancy Sensors	Interior Lighting	10%	5%	7%	45%	$0.20	8	1.11
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	75%	75%	5%	13%	$0.92	5	0.26
Interior Screw-in - Task Lighting	Interior Lighting	7%	4%	25%	75%	$0.24	5	0.09
Interior Lighting - Time Clocks and Timers	Interior Lighting	5%	3%	9%	56%	$0.20	8	0.56
Water Heater - Faucet Aerators/Low Flow Nozzles	Water Heating	4%	1%	8%	90%	$0.01	9	4.28
Water Heater - Pipe Insulation	Water Heating	6%	3%	46%	50%	$0.28	15	0.37
Water Heater - High Efficiency Circulation Pump	Water Heating	5%	4%	0%	0%	$0.11	10	0.64
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	40%	50%	$0.02	10	5.87
Water Heater - Thermostat Setback	Water Heating	4%	2%	5%	75%	$0.11	10	0.47
Water Heater - Hot Water Saver	Water Heating	5%	1%	0%	0%	$0.02	5	1.56
Refrigeration - Anti-Sweat Heater/Auto Door Closer	Refrigeration	5%	3%	0%	75%	$0.20	16	1.10
Refrigeration - Floating Head Pressure	Refrigeration	7%	4%	18%	38%	$0.35	16	1.25
Refrigeration - Door Gasket Replacement	Refrigeration	4%	2%	5%	75%	$0.10	8	0.10
Insulation - Bare Suction Lines	Refrigeration	3%	2%	5%	75%	$0.10	8	0.21
Refrigeration - Night Covers	Refrigeration	6%	3%	5%	75%	$0.05	8	1.02
Refrigeration - Strip Curtain	Refrigeration	4%	2%	5%	56%	$0.02	8	0.00
Retrocommissioning - Comprehensive	Cooling	12%	0%	40%	90%	$0.70	4	0.71
Retrocommissioning - Comprehensive	Space Heating	12%	9%	40%	90%	$0.70	4	0.71
Retrocommissioning - Comprehensive	Interior Lighting	12%	9%	40%	90%	$0.70	4	0.71
Office Equipment - Energy Star Power Supply	Office Equipment	1%	1%	10%	95%	$0.00	7	61.20
Vending Machine - Controller	Refrigeration	15%	11%	2%	10%	$0.27	10	1.09
LED Exit Lighting	Interior Lighting	2%	2%	9%	86%	$0.00	10	12.75
Retrocommissioning - Lighting	Interior Lighting	9%	6%	5%	90%	$0.10	5	1.59
Retrocommissioning - Lighting	Exterior Lighting	9%	6%	5%	90%	$0.10	5	1.59
Refrigeration - High Efficiency Case Lighting	Refrigeration	4%	2%	5%	75%	$0.20	8	0.00
Exterior Lighting - Cold Cathode Lighting	Exterior Lighting	1%	1%	5%	25%	$0.00	5	1.37
Exterior Lighting - Induction Lamps	Exterior Lighting	3%	3%	5%	56%	$0.00	5	8.10
Laundry - High Efficiency Clothes Washer	Miscellaneous	0%	0%	5%	10%	$0.00	10	36.95
Interior Lighting - Hotel Guestroom Controls	Interior Lighting	10%	5%	0%	0%	$0.14	8	0.33
Miscellaneous - Energy Star Water Cooler	Miscellaneous	0%	0%	5%	95%	$0.00	8	1.95
Industrial Process Improvements	Miscellaneous	10%	8%	0%	23%	$0.52	10	1.16
Custom Measures	Cooling	10%	0%	10%	45%	$1.50	15	0.59
Custom Measures	Space Heating	10%	8%	10%	45%	$1.50	15	0.59
Custom Measures	Interior Lighting	10%	6%	10%	45%	$1.50	15	0.59
Custom Measures	Food Preparation	10%	7%	10%	45%	$1.50	15	0.59
Custom Measures	Refrigeration	10%	5%	10%	45%	$1.50	15	0.59
Water Heater - Heat Pump	Water Heating	30%	15%	0%	19%	$0.80	15	0.69
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	50%	$4.00	15	0.54
Furnace - Convert to Gas	Space Heating	100%	100%	0%	47%	$8.04	15	1.08

Table D-11 Energy Efficiency Measure Data — Large Commercial, Existing Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
RTU - Maintenance	Cooling	14%	0%	27%	90%	$0.06	4	1.30
RTU - Evaporative Precooler	Cooling	10%	0%	0%	0%	$0.88	15	0.21
Chiller - Chilled Water Reset	Cooling	19%	0%	15%	75%	$0.18	4	0.50
Chiller - Chilled Water Variable-Flow System	Cooling	5%	0%	30%	34%	$0.18	10	0.31
Chiller - Turbocor Compressor	Cooling	30%	0%	0%	66%	$0.90	20	0.64
Chiller - VSD	Cooling	32%	0%	15%	66%	$1.17	20	0.52
Chiller - High Efficiency Cooling Tower Fans	Cooling	0%	0%	15%	41%	$0.04	10	0.01
Chiller - Condenser Water Temprature Reset	Cooling	9%	0%	5%	75%	$0.18	14	0.76
Cooling - Economizer Installation	Cooling	11%	0%	44%	49%	$0.15	15	1.29
Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	10%	95%	$0.06	4	3.04
Insulation - Ducting	Cooling	3%	0%	8%	50%	$0.41	20	0.52
Insulation - Ducting	Space Heating	3%	1%	8%	50%	$0.41	20	0.52
Repair and Sealing - Ducting	Cooling	2%	0%	5%	25%	$0.38	15	0.43
Repair and Sealing - Ducting	Space Heating	2%	1%	5%	25%	$0.38	15	0.43
Energy Management System	Cooling	23%	0%	37%	90%	$0.35	14	2.63
Energy Management System	Space Heating	18%	12%	37%	90%	$0.35	14	2.63
Energy Management System	Interior Lighting	9%	6%	37%	90%	$0.35	14	2.63
Cooking - Exhaust Hoods with Sensor Control	Ventilation	13%	7%	1%	11%	$0.04	10	2.97
Fans - Energy Efficient Motors	Ventilation	5%	5%	11%	90%	$0.05	10	1.11
Fans - Variable Speed Control	Ventilation	15%	5%	2%	90%	$0.20	10	0.71
Retrocommissioning - HVAC	Cooling	12%	0%	15%	90%	$0.30	4	0.72
Retrocommissioning - HVAC	Space Heating	12%	9%	15%	90%	$0.30	4	0.72
Retrocommissioning - HVAC	Ventilation	9%	6%	15%	90%	$0.30	4	0.72
Pumps - Variable Speed Control	Miscellaneous	1%	0%	0%	34%	$0.13	10	1.05
Thermostat - Clock/Programmable	Cooling	5%	0%	33%	50%	$0.13	11	1.02
Thermostat - Clock/Programmable	Space Heating	5%	1%	33%	50%	$0.13	11	1.02
Insulation - Ceiling	Cooling	1%	0%	9%	30%	$0.85	20	0.45
Insulation - Ceiling	Space Heating	12%	3%	9%	30%	$0.85	20	0.45
Insulation - Radiant Barrier	Cooling	2%	0%	7%	13%	$0.26	20	0.64
Insulation - Radiant Barrier	Space Heating	5%	2%	7%	13%	$0.26	20	0.64
Roofs - High Reflectivity	Cooling	5%	0%	2%	75%	$0.08	15	1.08
Windows - High Efficiency	Cooling	12%	0%	72%	75%	$0.88	20	0.74
Windows - High Efficiency	Space Heating	11%	8%	72%	75%	$0.88	20	0.74
Interior Lighting - Central Lighting Controls	Interior Lighting	10%	5%	86%	90%	$0.65	8	0.34
Interior Lighting - Photocell Controlled T8 Dimming Ballasts	Interior Lighting	25%	13%	1%	45%	$0.45	8	0.96
Exterior Lighting - Daylighting Controls	Exterior Lighting	30%	0%	2%	13%	$0.29	8	0.42
Interior Fluorescent - Delamp and Install Reflectors	Interior Lighting	30%	15%	17%	38%	$0.50	11	1.40
Interior Fluorescent - Bi-Level Fixture w/Occupancy Sensor	Interior Lighting	10%	5%	10%	23%	$0.40	8	0.43
Interior Fluorescent - High Bay Fixtures	Interior Lighting	50%	25%	10%	23%	$0.63	11	1.85
Interior Lighting - Occupancy Sensors	Interior Lighting	10%	5%	13%	45%	$0.20	8	1.10
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	75%	75%	5%	13%	$0.92	5	0.21
Interior Screw-in - Task Lighting	Interior Lighting	10%	5%	10%	75%	$0.24	5	0.13
Interior Lighting - Time Clocks and Timers	Interior Lighting	5%	3%	9%	56%	$0.20	8	0.55
Water Heater - Faucet Aerators/Low Flow Nozzles	Water Heating	4%	1%	3%	90%	$0.03	9	1.62
Water Heater - Pipe Insulation	Water Heating	6%	3%	0%	0%	$0.28	15	0.42
Water Heater - High Efficiency Circulation Pump	Water Heating	5%	4%	0%	23%	$0.11	10	0.70
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	0%	0%	$0.04	10	3.28
Water Heater - Thermostat Setback	Water Heating	4%	2%	0%	0%	$0.11	10	0.52
Water Heater - Hot Water Saver	Water Heating	5%	1%	0%	3%	$0.04	5	0.88
Refrigeration - Anti-Sweat Heater/Auto Door Closer	Refrigeration	5%	3%	0%	75%	$0.20	16	0.58
Refrigeration - Floating Head Pressure	Refrigeration	7%	4%	38%	45%	$0.35	16	0.95
Refrigeration - Door Gasket Replacement	Refrigeration	4%	2%	5%	75%	$0.10	8	0.65
Insulation - Bare Suction Lines	Refrigeration	3%	2%	5%	75%	$0.10	8	0.37
Refrigeration - Night Covers	Refrigeration	6%	3%	5%	75%	$0.05	8	0.65
Refrigeration - Strip Curtain	Refrigeration	4%	2%	5%	56%	$0.02	8	0.96
Retrocommissioning - Comprehensive	Cooling	12%	0%	40%	90%	$0.35	4	1.06
Retrocommissioning - Comprehensive	Space Heating	12%	9%	40%	90%	$0.35	4	1.06
Retrocommissioning - Comprehensive	Interior Lighting	12%	9%	40%	90%	$0.35	4	1.06
Office Equipment - Energy Star Power Supply	Office Equipment	1%	1%	10%	95%	$0.00	7	68.11
Vending Machine - Controller	Refrigeration	15%	11%	2%	10%	$0.27	10	1.11
LED Exit Lighting	Interior Lighting	2%	2%	9%	86%	$0.00	10	12.29
Retrocommissioning - Lighting	Interior Lighting	9%	6%	5%	90%	$0.05	5	3.07
Retrocommissioning - Lighting	Exterior Lighting	9%	6%	5%	90%	$0.05	5	3.07
Refrigeration - High Efficiency Case Lighting	Refrigeration	4%	2%	5%	75%	$0.20	8	0.52
Exterior Lighting - Cold Cathode Lighting	Exterior Lighting	1%	1%	5%	25%	$0.00	5	1.14
Exterior Lighting - Induction Lamps	Exterior Lighting	3%	3%	5%	56%	$0.00	5	6.50
Laundry - High Efficiency Clothes Washer	Miscellaneous	0%	0%	5%	10%	$0.00	10	33.94
Interior Lighting - Hotel Guestroom Controls	Interior Lighting	10%	5%	1%	2%	$0.14	8	0.32
Miscellaneous - Energy Star Water Cooler	Miscellaneous	0%	0%	5%	95%	$0.00	8	1.78
Industrial Process Improvements	Miscellaneous	10%	8%	0%	5%	$0.52	10	1.18
Custom Measures	Cooling	10%	0%	10%	45%	$0.90	15	0.99
Custom Measures	Space Heating	10%	8%	10%	45%	$0.90	15	0.99
Custom Measures	Interior Lighting	10%	8%	10%	45%	$0.90	15	0.99
Custom Measures	Food Preparation	10%	8%	10%	45%	$0.90	15	0.99
Custom Measures	Refrigeration	10%	8%	10%	45%	$0.90	15	0.99
Water Heater - Heat Pump	Water Heating	30%	15%	0%	28%	$0.80	15	0.77
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	0%	$4.00	15	0.59
Furnace - Convert to Gas	Space Heating	100%	100%	0%	0%	$6.00	15	1.04

Table D-12 Energy Efficiency Measure Data — Extra Large Commercial, Existing Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
RTU - Maintenance	Cooling	14%	0%	47%	90%	$0.06	4	1.15
RTU - Evaporative Precooler	Cooling	10%	0%	0%	0%	$0.88	15	0.19
Chiller - Chilled Water Reset	Cooling	15%	0%	30%	75%	$0.09	4	0.79
Chiller - Chilled Water Variable-Flow System	Cooling	8%	0%	30%	34%	$0.09	10	1.00
Chiller - Turbocor Compressor	Cooling	30%	0%	0%	75%	$0.90	20	0.66
Chiller - VSD	Cooling	28%	0%	3%	75%	$1.17	20	0.47
Chiller - High Efficiency Cooling Tower Fans	Cooling	0%	0%	25%	37%	$0.04	10	0.01
Chiller - Condenser Water Temprature Reset	Cooling	9%	0%	0%	75%	$0.09	14	1.49
Cooling - Economizer Installation	Cooling	11%	0%	73%	81%	$0.15	15	1.20
Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	5%	95%	$0.06	4	2.91
Insulation - Ducting	Cooling	8%	0%	2%	50%	$0.41	20	0.77
Insulation - Ducting	Space Heating	3%	1%	2%	50%	$0.41	20	0.77
Repair and Sealing - Ducting	Cooling	5%	0%	5%	25%	$0.38	15	0.65
Repair and Sealing - Ducting	Space Heating	5%	3%	5%	25%	$0.38	15	0.65
Energy Management System	Cooling	12%	0%	80%	90%	$0.35	14	1.21
Energy Management System	Space Heating	9%	6%	80%	90%	$0.35	14	1.21
Energy Management System	Interior Lighting	5%	3%	80%	90%	$0.35	14	1.21
Cooking - Exhaust Hoods with Sensor Control	Ventilation	13%	7%	1%	8%	$0.04	10	3.46
Fans - Energy Efficient Motors	Ventilation	5%	5%	11%	90%	$0.05	10	1.30
Fans - Variable Speed Control	Ventilation	15%	5%	2%	90%	$0.20	10	0.83
Retrocommissioning - HVAC	Cooling	12%	0%	15%	90%	$0.20	4	1.00
Retrocommissioning - HVAC	Space Heating	12%	9%	15%	90%	$0.20	4	1.00
Retrocommissioning - HVAC	Ventilation	9%	6%	15%	90%	$0.20	4	1.00
Pumps - Variable Speed Control	Miscellaneous	1%	0%	1%	34%	$0.44	10	1.01
Thermostat - Clock/Programmable	Cooling	3%	0%	25%	50%	$0.13	11	0.69
Thermostat - Clock/Programmable	Space Heating	3%	1%	25%	50%	$0.13	11	0.69
Insulation - Ceiling	Cooling	1%	0%	2%	9%	$0.85	20	0.48
Insulation - Ceiling	Space Heating	12%	3%	2%	9%	$0.85	20	0.48
Insulation - Radiant Barrier	Cooling	1%	0%	2%	13%	$0.26	20	0.57
Insulation - Radiant Barrier	Space Heating	4%	2%	2%	13%	$0.26	20	0.57
Roofs - High Reflectivity	Cooling	10%	0%	0%	95%	$0.18	15	0.90
Windows - High Efficiency	Cooling	6%	0%	95%	100%	$2.10	20	0.37
Windows - High Efficiency	Space Heating	2%	2%	95%	100%	$2.10	20	0.37
Interior Lighting - Central Lighting Controls	Interior Lighting	10%	5%	78%	90%	$0.65	8	0.26
Interior Lighting - Photocell Controlled T8 Dimming Ballasts	Interior Lighting	25%	13%	3%	45%	$0.40	8	0.72
Exterior Lighting - Daylighting Controls	Exterior Lighting	30%	0%	2%	10%	$0.29	8	0.45
Interior Fluorescent - Delamp and Install Reflectors	Interior Lighting	30%	15%	3%	25%	$0.50	11	0.93
Interior Fluorescent - Bi-Level Fixture w/Occupancy Sensor	Interior Lighting	10%	5%	10%	23%	$0.20	8	0.57
Interior Fluorescent - High Bay Fixtures	Interior Lighting	50%	25%	10%	23%	$0.56	11	1.38
Interior Lighting - Occupancy Sensors	Interior Lighting	10%	5%	42%	45%	$0.20	8	0.84
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	75%	75%	5%	13%	$0.92	5	0.23
Interior Screw-in - Task Lighting	Interior Lighting	10%	5%	5%	75%	$0.24	5	0.18
Interior Lighting - Time Clocks and Timers	Interior Lighting	5%	3%	12%	56%	$0.20	8	0.42
Water Heater - Faucet Aerators/Low Flow Nozzles	Water Heating	4%	1%	2%	90%	$0.03	9	2.66
Water Heater - Pipe Insulation	Water Heating	6%	3%	0%	0%	$0.28	15	0.70
Water Heater - High Efficiency Circulation Pump	Water Heating	5%	4%	0%	23%	$0.11	10	1.19
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	0%	0%	$0.04	10	5.48
Water Heater - Thermostat Setback	Water Heating	4%	0%	0%	0%	$0.11	10	0.72
Water Heater - Hot Water Saver	Water Heating	5%	1%	0%	0%	$0.04	5	1.45
Refrigeration - Anti-Sweat Heater/Auto Door Closer	Refrigeration	5%	3%	10%	75%	$0.20	16	0.02
Refrigeration - Floating Head Pressure	Refrigeration	7%	4%	10%	38%	$0.35	16	0.34
Refrigeration - Door Gasket Replacement	Refrigeration	4%	2%	5%	75%	$0.10	8	0.13
Insulation - Bare Suction Lines	Refrigeration	3%	2%	5%	75%	$0.10	8	0.28
Refrigeration - Night Covers	Refrigeration	6%	3%	5%	75%	$0.05	8	0.29
Refrigeration - Strip Curtain	Refrigeration	4%	2%	5%	56%	$0.02	8	0.18
Retrocommissioning - Comprehensive	Cooling	12%	0%	40%	90%	$0.25	4	1.21
Retrocommissioning - Comprehensive	Space Heating	12%	9%	40%	90%	$0.25	4	1.21
Retrocommissioning - Comprehensive	Interior Lighting	12%	9%	40%	90%	$0.25	4	1.21
Office Equipment - Energy Star Power Supply	Office Equipment	1%	1%	10%	95%	$0.00	7	39.11
Vending Machine - Controller	Refrigeration	15%	11%	2%	10%	$0.27	10	1.12
LED Exit Lighting	Interior Lighting	2%	2%	9%	86%	$0.00	10	18.34
Retrocommissioning - Lighting	Interior Lighting	9%	6%	5%	90%	$0.05	5	2.54
Retrocommissioning - Lighting	Exterior Lighting	9%	6%	5%	90%	$0.05	5	2.54
Refrigeration - High Efficiency Case Lighting	Refrigeration	4%	2%	5%	75%	$0.20	8	0.04
Exterior Lighting - Cold Cathode Lighting	Exterior Lighting	1%	1%	5%	25%	$0.00	5	1.61
Exterior Lighting - Induction Lamps	Exterior Lighting	3%	3%	5%	56%	$0.00	5	6.95
Laundry - High Efficiency Clothes Washer	Miscellaneous	0%	0%	5%	10%	$0.00	10	20.31
Interior Lighting - Hotel Guestroom Controls	Interior Lighting	10%	5%	0%	0%	$0.14	8	0.47
Miscellaneous - Energy Star Water Cooler	Miscellaneous	0%	0%	5%	95%	$0.00	8	1.07
Industrial Process Improvements	Miscellaneous	10%	8%	0%	0%	$0.52	10	1.11
Custom Measures	Cooling	10%	0%	10%	45%	$0.67	15	1.09
Custom Measures	Space Heating	10%	8%	10%	45%	$0.67	15	1.09
Custom Measures	Interior Lighting	10%	8%	10%	45%	$0.67	15	1.09
Custom Measures	Food Preparation	10%	8%	10%	45%	$0.67	15	1.09
Custom Measures	Refrigeration	10%	8%	10%	45%	$0.67	15	1.09
Water Heater - Heat Pump	Water Heating	30%	15%	0%	41%	$0.80	15	1.28
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	0%	$4.00	15	1.00
Furnace - Convert to Gas	Space Heating	100%	100%	0%	0%	$4.00	15	1.66

Table D-13 Energy Efficiency Measure Data — Extra Large Industrial, Existing Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
Refrigeration - System Controls	Process	11%	8%	5%	34%	$0.40	10	18.09
Refrigeration - System Maintenance	Process	3%	2%	5%	34%	$0.00	10	2,067.93
Refrigeration - System Optimization	Process	15%	11%	5%	34%	$0.80	10	12.92
Motors - Variable Frequency Drive	Machine Drive	13%	9%	25%	38%	$0.10	10	3.38
Motors - Magnetic Adjustable Speed Drives	Machine Drive	13%	9%	25%	38%	$0.10	10	3.38
Compressed Air - System Controls	Machine Drive	9%	7%	5%	34%	$0.40	10	0.59
Compressed Air - System Optimization and Improvements	Machine Drive	13%	9%	5%	34%	$0.80	10	0.42
Compressed Air - System Maintenance	Machine Drive	3%	2%	5%	34%	$0.20	10	0.34
Compressed Air - Compressor Replacement	Machine Drive	5%	4%	5%	34%	$0.20	10	0.68
Fan System - Controls	Machine Drive	4%	3%	10%	38%	$0.35	10	0.11
Fan System - Controls	Machine Drive	4%	3%	10%	38%	$0.35	10	0.11
Fan System - Optimization	Machine Drive	6%	5%	10%	38%	$0.70	10	0.08
Fan System - Optimization	Machine Drive	6%	5%	10%	38%	$0.70	10	0.08
Fan System - Maintenance	Machine Drive	1%	1%	10%	38%	$0.15	10	0.07
Fan System - Maintenance	Machine Drive	1%	1%	10%	38%	$0.15	10	0.07
Pumping System - Controls	Machine Drive	5%	4%	5%	34%	$0.38	12	0.43
Pumping System - Optimization	Machine Drive	13%	9%	5%	34%	$0.75	12	0.54
Pumping System - Maintenance	Machine Drive	2%	1%	5%	34%	$0.19	10	0.27
RTU - Maintenance	Cooling	14%	0%	22%	90%	$0.06	4	3.18
Chiller - Chilled Water Reset	Cooling	14%	0%	30%	75%	$0.09	4	2.69
Chiller - Chilled Water Variable-Flow System	Cooling	5%	0%	30%	34%	$0.20	10	1.05
Chiller - Turbocor Compressor	Cooling	30%	0%	0%	67%	$0.90	20	2.48
Chiller - VSD	Cooling	26%	0%	15%	67%	$1.17	20	1.68
Chiller - High Efficiency Cooling Tower Fans	Cooling	0%	0%	25%	50%	$0.04	10	0.03
Chiller - Condenser Water Temprature Reset	Cooling	10%	0%	0%	75%	$0.20	14	2.72
Cooling - Economizer Installation	Cooling	6%	0%	29%	34%	$0.15	15	2.02
Heat Pump - Maintenance	Combined Heating/Cooling	7%	7%	2%	95%	$0.03	4	8.67
Insulation - Ducting	Space Heating	6%	6%	12%	50%	$0.41	20	1.01
Insulation - Ducting	Cooling	3%	0%	12%	50%	$0.41	20	1.01
Repair and Sealing - Ducting	Cooling	2%	0%	5%	25%	$0.38	15	0.63
Repair and Sealing - Ducting	Space Heating	2%	1%	5%	25%	$0.38	15	0.63
Energy Management System	Cooling	6%	0%	11%	90%	$0.35	14	1.09
Energy Management System	Space Heating	5%	3%	11%	90%	$0.35	14	1.09
Energy Management System	Interior Lighting	2%	1%	11%	90%	$0.35	14	1.09
Fans - Energy Efficient Motors	Ventilation	5%	5%	2%	90%	$0.14	10	2.94
Fans - Variable Speed Control	Ventilation	15%	5%	3%	90%	$0.20	10	5.29
Retrocommissioning - HVAC	Cooling	12%	0%	1%	70%	$0.25	4	1.54
Retrocommissioning - HVAC	Space Heating	12%	9%	1%	70%	$0.25	4	1.54
Retrocommissioning - HVAC	Ventilation	9%	6%	1%	70%	$0.25	4	1.54
Pumps - Variable Speed Control	Machine Drive	5%	4%	0%	34%	$0.44	10	0.31
Thermostat - Clock/Programmable	Cooling	5%	0%	59%	70%	$0.13	11	2.11
Thermostat - Clock/Programmable	Space Heating	5%	1%	59%	70%	$0.13	11	2.11
Interior Lighting - Central Lighting Controls	Interior Lighting	10%	5%	84%	90%	$0.65	8	0.17
Exterior Lighting - Daylighting Controls	Exterior Lighting	30%	0%	2%	27%	$0.08	8	0.46
Interior Fluorescent - Delamp and Install Reflectors	Interior Lighting	20%	10%	17%	38%	$0.50	11	0.31
Interior Fluorescent - High Bay Fixtures	Interior Lighting	50%	25%	10%	38%	$0.20	11	1.95
LED Exit Lighting	Interior Lighting	2%	2%	9%	86%	$0.00	10	4.00
Retrocommissioning - Lighting	Interior Lighting	9%	6%	9%	70%	$0.05	5	1.44
Retrocommissioning - Lighting	Exterior Lighting	9%	6%	9%	70%	$0.05	5	1.44
Interior Lighting - Occupancy Sensors	Interior Lighting	10%	5%	15%	45%	$0.20	8	0.55
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	75%	75%	5%	13%	$0.92	5	0.07
Interior Screw-in - Task Lighting	Interior Lighting	7%	4%	10%	75%	$0.24	5	0.03
Interior Lighting - Time Clocks and Timers	Interior Lighting	5%	3%	2%	56%	$0.20	8	0.27
Exterior Lighting - Cold Cathode Lighting	Exterior Lighting	1%	1%	5%	25%	$0.00	5	0.46
Custom Measures	Cooling	10%	0%	10%	45%	$1.60	15	1.63
Custom Measures	Space Heating	10%	8%	10%	45%	$1.60	15	1.63
Custom Measures	Interior Lighting	10%	8%	10%	45%	$1.60	15	1.63
Custom Measures	Machine Drive	10%	8%	10%	45%	$1.60	15	1.63
Furnace - Convert to Gas	Space Heating	100%	100%	0%	0%	$4.00	15	2.67

Table D-14 Energy Efficiency Measure Data — Small/Medium Commercial, New Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
RTU - Maintenance	Cooling	14%	0%	14%	90%	$0.08	4	0.82
RTU - Evaporative Precooler	Cooling	10%	0%	0%	0%	$0.88	15	0.18
Chiller - Chilled Water Reset	Cooling	11%	0%	0%	0%	$0.86	4	0.06
Chiller - Chilled Water Variable-Flow System	Cooling	4%	0%	0%	0%	$0.86	10	0.05
Chiller - Turbocor Compressor	Cooling	30%	0%	0%	0%	$0.90	20	0.63
Chiller - VSD	Cooling	26%	0%	0%	0%	$1.17	20	0.42
Chiller - High Efficiency Cooling Tower Fans	Cooling	0%	0%	0%	0%	$0.04	10	0.01
Chiller - Condenser Water Temprature Reset	Cooling	8%	0%	0%	0%	$0.87	14	0.13
Cooling - Economizer Installation	Cooling	6%	0%	45%	49%	$0.15	15	0.65
Heat Pump - Maintenance	Combined Heating/Cooling	7%	7%	10%	95%	$0.03	4	4.32
Insulation - Ducting	Cooling	5%	0%	9%	50%	$0.41	20	0.64
Insulation - Ducting	Space Heating	3%	1%	9%	50%	$0.41	20	0.64
Energy Management System	Cooling	5%	0%	24%	75%	$0.35	14	0.55
Energy Management System	Space Heating	2%	1%	24%	75%	$0.35	14	0.55
Energy Management System	Interior Lighting	2%	1%	24%	75%	$0.35	14	0.55
Cooking - Exhaust Hoods with Sensor Control	Ventilation	25%	13%	1%	15%	$0.04	10	7.04
Fans - Energy Efficient Motors	Ventilation	5%	5%	11%	90%	$0.05	10	1.32
Fans - Variable Speed Control	Ventilation	15%	5%	8%	90%	$0.20	10	0.85
Commissioning - HVAC	Cooling	5%	0%	40%	75%	$0.90	25	0.33
Commissioning - HVAC	Space Heating	5%	4%	40%	75%	$0.90	25	0.33
Commissioning - HVAC	Ventilation	5%	4%	40%	75%	$0.90	25	0.33
Pumps - Variable Speed Control	Miscellaneous	1%	0%	5%	34%	$0.44	10	1.01
Thermostat - Clock/Programmable	Cooling	5%	0%	34%	50%	$0.13	11	1.06
Thermostat - Clock/Programmable	Space Heating	5%	1%	34%	50%	$0.13	11	1.06
Insulation - Ceiling	Cooling	1%	0%	10%	81%	$0.16	20	1.60
Insulation - Ceiling	Space Heating	15%	4%	10%	81%	$0.16	20	1.60
Insulation - Radiant Barrier	Cooling	2%	0%	7%	13%	$0.26	20	0.76
Insulation - Radiant Barrier	Space Heating	6%	2%	7%	13%	$0.26	20	0.76
Roofs - High Reflectivity	Cooling	7%	0%	5%	95%	$0.09	15	1.25
Windows - High Efficiency	Cooling	5%	0%	61%	75%	$0.35	20	0.69
Windows - High Efficiency	Space Heating	3%	2%	61%	75%	$0.35	20	0.69
Interior Lighting - Central Lighting Controls	Interior Lighting	10%	5%	81%	90%	$0.65	8	0.31
Interior Lighting - Photocell Controlled T8 Dimming Ballasts	Interior Lighting	25%	13%	1%	45%	$0.38	8	1.07
Exterior Lighting - Daylighting Controls	Exterior Lighting	30%	0%	10%	75%	$0.09	8	1.50
Interior Fluorescent - Bi-Level Fixture w/Occupancy Sensor	Interior Lighting	10%	5%	10%	23%	$0.50	8	0.32
Interior Fluorescent - High Bay Fixtures	Interior Lighting	50%	25%	10%	23%	$0.70	11	1.56
Interior Lighting - Occupancy Sensors	Interior Lighting	10%	5%	7%	45%	$0.20	8	1.00
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	75%	75%	5%	13%	$0.92	5	0.24
Interior Screw-in - Task Lighting	Interior Lighting	7%	4%	25%	75%	$0.24	5	0.08
Interior Lighting - Time Clocks and Timers	Interior Lighting	5%	3%	9%	56%	$0.20	8	0.50
Water Heater - Faucet Aerators/Low Flow Nozzles	Water Heating	4%	1%	8%	90%	$0.01	9	4.22
Water Heater - Pipe Insulation	Water Heating	4%	2%	46%	50%	$0.28	15	0.24
Water Heater - High Efficiency Circulation Pump	Water Heating	5%	4%	0%	0%	$0.11	10	0.63
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	40%	50%	$0.02	10	5.80
Water Heater - Thermostat Setback	Water Heating	4%	0%	10%	75%	$0.11	10	0.38
Water Heater - Hot Water Saver	Water Heating	5%	1%	0%	0%	$0.02	5	1.53
Refrigeration - Anti-Sweat Heater/Auto Door Closer	Refrigeration	5%	3%	0%	75%	$0.20	16	1.09
Refrigeration - Floating Head Pressure	Refrigeration	7%	4%	18%	38%	$0.35	16	1.24
Refrigeration - Door Gasket Replacement	Refrigeration	4%	2%	5%	75%	$0.10	8	0.09
Insulation - Bare Suction Lines	Refrigeration	3%	2%	5%	75%	$0.10	8	0.20
Refrigeration - Night Covers	Refrigeration	6%	3%	5%	75%	$0.05	8	1.02
Refrigeration - Strip Curtain	Refrigeration	4%	2%	5%	56%	$0.02	8	0.00
Commissioning - Comprehensive	Cooling	10%	0%	40%	75%	$1.25	25	0.83
Commissioning - Comprehensive	Space Heating	10%	7%	40%	75%	$1.25	25	0.83
Commissioning - Comprehensive	Interior Lighting	10%	7%	40%	75%	$1.25	25	0.83
Office Equipment - Energy Star Power Supply	Office Equipment	1%	1%	10%	95%	$0.00	7	61.07
Vending Machine - Controller	Refrigeration	15%	11%	2%	10%	$0.27	10	1.08
LED Exit Lighting	Interior Lighting	2%	2%	85%	86%	$0.00	10	11.83
Commissioning - Lighting	Interior Lighting	5%	4%	30%	75%	$0.20	25	1.54
Commissioning - Lighting	Exterior Lighting	5%	4%	30%	75%	$0.20	25	1.54
Refrigeration - High Efficiency Case Lighting	Refrigeration	4%	2%	5%	75%	$0.20	8	0.00
Exterior Lighting - Cold Cathode Lighting	Exterior Lighting	1%	1%	5%	25%	$0.00	5	1.23
Exterior Lighting - Induction Lamps	Exterior Lighting	3%	3%	5%	56%	$0.00	5	7.30
Laundry - High Efficiency Clothes Washer	Miscellaneous	0%	0%	5%	10%	$0.00	10	36.95
Interior Lighting - Hotel Guestroom Controls	Interior Lighting	10%	5%	0%	0%	$0.14	8	0.30
Miscellaneous - Energy Star Water Cooler	Miscellaneous	0%	0%	5%	95%	$0.00	8	1.95
Advanced New Construction Designs	Cooling	40%	0%	5%	75%	$2.00	35	2.01
Advanced New Construction Designs	Space Heating	40%	30%	5%	75%	$2.00	35	2.01
Advanced New Construction Designs	Interior Lighting	25%	19%	5%	75%	$2.00	35	2.01
Insulation - Wall Cavity	Cooling	1%	0%	10%	68%	$0.34	20	0.72
Insulation - Wall Cavity	Space Heating	10%	2%	10%	68%	$0.34	20	0.72
Roofs - Green	Cooling	7%	0%	2%	11%	$1.00	30	0.26
Roofs - Green	Space Heating	4%	3%	2%	11%	$1.00	30	0.26
Industrial Process Improvements	Miscellaneous	10%	8%	0%	23%	$0.52	10	1.16
Custom Measures	Cooling	8%	0%	10%	45%	$1.50	15	0.45
Custom Measures	Space Heating	8%	6%	10%	45%	$1.50	15	0.45
Custom Measures	Interior Lighting	8%	6%	10%	45%	$1.50	15	0.45
Custom Measures	Food Preparation	8%	6%	10%	45%	$1.50	15	0.45
Custom Measures	Refrigeration	8%	6%	10%	45%	$1.50	15	0.45
Water Heater - Heat Pump	Water Heating	30%	15%	0%	19%	$0.80	15	0.68
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	50%	$4.00	15	0.53
Furnace - Convert to Gas	Space Heating	100%	100%	0%	47%	$8.04	15	1.01

Table D-15 Energy Efficiency Measure Data — Large Commercial, New Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
RTU - Maintenance	Cooling	14%	0%	27%	90%	$0.06	4	1.13
RTU - Evaporative Precooler	Cooling	10%	0%	0%	0%	$0.88	15	0.19
Chiller - Chilled Water Reset	Cooling	18%	0%	30%	75%	$0.18	4	0.42
Chiller - Chilled Water Variable-Flow System	Cooling	5%	0%	30%	34%	$0.18	10	0.28
Chiller - Turbocor Compressor	Cooling	30%	0%	0%	66%	$0.90	20	0.61
Chiller - VSD	Cooling	32%	0%	15%	66%	$1.17	20	0.50
Chiller - High Efficiency Cooling Tower Fans	Cooling	0%	0%	15%	41%	$0.04	10	0.01
Chiller - Condenser Water Temprature Reset	Cooling	8%	0%	25%	75%	$0.18	14	0.63
Cooling - Economizer Installation	Cooling	11%	0%	44%	49%	$0.15	15	1.19
Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	10%	95%	$0.06	4	2.72
Insulation - Ducting	Cooling	4%	0%	8%	50%	$0.41	20	0.56
Insulation - Ducting	Space Heating	3%	1%	8%	50%	$0.41	20	0.56
Energy Management System	Cooling	21%	0%	48%	90%	$0.35	14	2.10
Energy Management System	Space Heating	8%	5%	48%	90%	$0.35	14	2.10
Energy Management System	Interior Lighting	9%	6%	48%	90%	$0.35	14	2.10
Cooking - Exhaust Hoods with Sensor Control	Ventilation	13%	7%	1%	11%	$0.04	10	2.84
Fans - Energy Efficient Motors	Ventilation	5%	5%	11%	90%	$0.05	10	1.07
Fans - Variable Speed Control	Ventilation	15%	5%	2%	90%	$0.20	10	0.68
Commissioning - HVAC	Cooling	5%	0%	50%	75%	$0.85	25	0.30
Commissioning - HVAC	Space Heating	5%	4%	50%	75%	$0.85	25	0.30
Commissioning - HVAC	Ventilation	5%	4%	50%	75%	$0.85	25	0.30
Pumps - Variable Speed Control	Miscellaneous	1%	0%	5%	34%	$0.13	10	1.05
Thermostat - Clock/Programmable	Cooling	5%	0%	33%	50%	$0.13	11	0.97
Thermostat - Clock/Programmable	Space Heating	5%	1%	33%	50%	$0.13	11	0.97
Insulation - Ceiling	Cooling	1%	0%	75%	81%	$0.35	20	0.60
Insulation - Ceiling	Space Heating	10%	3%	75%	81%	$0.35	20	0.60
Insulation - Radiant Barrier	Cooling	1%	0%	7%	13%	$0.26	20	0.56
Insulation - Radiant Barrier	Space Heating	5%	2%	7%	13%	$0.26	20	0.56
Roofs - High Reflectivity	Cooling	4%	0%	5%	95%	$0.05	15	1.28
Windows - High Efficiency	Cooling	12%	0%	72%	75%	$0.88	20	0.72
Windows - High Efficiency	Space Heating	11%	8%	72%	75%	$0.88	20	0.72
Interior Lighting - Central Lighting Controls	Interior Lighting	10%	5%	86%	90%	$0.65	8	0.30
Interior Lighting - Photocell Controlled T8 Dimming Ballasts	Interior Lighting	25%	13%	1%	45%	$0.34	8	1.14
Exterior Lighting - Daylighting Controls	Exterior Lighting	30%	0%	10%	19%	$0.19	8	0.57
Interior Fluorescent - Bi-Level Fixture w/Occupancy Sensor	Interior Lighting	10%	5%	10%	23%	$0.40	8	0.39
Interior Fluorescent - High Bay Fixtures	Interior Lighting	50%	25%	10%	23%	$0.63	11	1.66
Interior Lighting - Occupancy Sensors	Interior Lighting	10%	5%	13%	45%	$0.20	8	0.99
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	75%	75%	5%	13%	$0.92	5	0.19
Interior Screw-in - Task Lighting	Interior Lighting	10%	5%	10%	75%	$0.24	5	0.11
Interior Lighting - Time Clocks and Timers	Interior Lighting	5%	3%	9%	56%	$0.20	8	0.49
Water Heater - Faucet Aerators/Low Flow Nozzles	Water Heating	4%	1%	3%	90%	$0.03	9	1.60
Water Heater - Pipe Insulation	Water Heating	4%	2%	0%	0%	$0.28	15	0.27
Water Heater - High Efficiency Circulation Pump	Water Heating	5%	4%	0%	23%	$0.11	10	0.69
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	0%	0%	$0.04	10	3.23
Water Heater - Thermostat Setback	Water Heating	4%	0%	0%	0%	$0.11	10	0.44
Water Heater - Hot Water Saver	Water Heating	5%	1%	0%	3%	$0.04	5	0.87
Refrigeration - Anti-Sweat Heater/Auto Door Closer	Refrigeration	5%	3%	0%	75%	$0.20	16	0.58
Refrigeration - Floating Head Pressure	Refrigeration	7%	4%	38%	45%	$0.35	16	0.94
Refrigeration - Door Gasket Replacement	Refrigeration	4%	2%	5%	75%	$0.10	8	0.63
Insulation - Bare Suction Lines	Refrigeration	3%	2%	5%	75%	$0.10	8	0.35
Refrigeration - Night Covers	Refrigeration	6%	3%	5%	75%	$0.05	8	0.65
Refrigeration - Strip Curtain	Refrigeration	4%	2%	5%	56%	$0.02	8	0.94
Commissioning - Comprehensive	Cooling	10%	0%	40%	75%	$1.00	25	0.96
Commissioning - Comprehensive	Space Heating	10%	7%	40%	75%	$1.00	25	0.96
Commissioning - Comprehensive	Interior Lighting	10%	7%	40%	75%	$1.00	25	0.96
Office Equipment - Energy Star Power Supply	Office Equipment	1%	1%	10%	95%	$0.00	7	67.83
Vending Machine - Controller	Refrigeration	15%	11%	2%	10%	$0.27	10	1.09
LED Exit Lighting	Interior Lighting	2%	2%	85%	86%	$0.00	10	11.13
Commissioning - Lighting	Interior Lighting	5%	4%	60%	75%	$0.15	25	1.99
Commissioning - Lighting	Exterior Lighting	5%	4%	60%	75%	$0.15	25	1.99
Refrigeration - High Efficiency Case Lighting	Refrigeration	4%	2%	5%	75%	$0.20	8	0.52
Exterior Lighting - Cold Cathode Lighting	Exterior Lighting	1%	1%	5%	25%	$0.00	5	1.03
Exterior Lighting - Induction Lamps	Exterior Lighting	3%	3%	5%	56%	$0.00	5	5.86
Laundry - High Efficiency Clothes Washer	Miscellaneous	0%	0%	5%	10%	$0.00	10	33.94
Interior Lighting - Hotel Guestroom Controls	Interior Lighting	10%	5%	1%	2%	$0.14	8	0.29
Miscellaneous - Energy Star Water Cooler	Miscellaneous	0%	0%	5%	95%	$0.00	8	1.78
Advanced New Construction Designs	Cooling	40%	0%	5%	75%	$2.00	35	1.84
Advanced New Construction Designs	Space Heating	40%	30%	5%	75%	$2.00	35	1.84
Advanced New Construction Designs	Interior Lighting	25%	19%	5%	75%	$2.00	35	1.84
Insulation - Wall Cavity	Cooling	1%	0%	9%	68%	$0.78	20	0.43
Insulation - Wall Cavity	Space Heating	10%	2%	9%	68%	$0.78	20	0.43
Roofs - Green	Cooling	4%	0%	2%	13%	$1.00	15	0.08
Roofs - Green	Space Heating	2%	2%	2%	13%	$1.00	15	0.08
Industrial Process Improvements	Miscellaneous	10%	8%	0%	5%	$0.52	10	1.18
Custom Measures	Cooling	8%	0%	10%	45%	$0.90	15	0.73
Custom Measures	Space Heating	8%	6%	10%	45%	$0.90	15	0.73
Custom Measures	Interior Lighting	8%	6%	10%	45%	$0.90	15	0.73
Custom Measures	Food Preparation	8%	6%	10%	45%	$0.90	15	0.73
Custom Measures	Refrigeration	8%	6%	10%	45%	$0.90	15	0.73
Water Heater - Heat Pump	Water Heating	30%	15%	0%	28%	$0.80	15	0.76
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	0%	$4.00	15	0.58
Furnace - Convert to Gas	Space Heating	100%	100%	0%	0%	$6.00	15	0.98

Table D-16 Energy Efficiency Measure Data — Extra Large Commercial, New Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
RTU - Maintenance	Cooling	14%	0%	47%	90%	$0.06	4	1.02
RTU - Evaporative Precooler	Cooling	10%	0%	0%	0%	$0.88	15	0.17
Chiller - Chilled Water Reset	Cooling	12%	0%	60%	75%	$0.09	4	0.61
Chiller - Chilled Water Variable-Flow System	Cooling	8%	0%	30%	34%	$0.09	10	0.95
Chiller - Turbocor Compressor	Cooling	30%	0%	0%	75%	$0.90	20	0.64
Chiller - VSD	Cooling	28%	0%	3%	75%	$1.17	20	0.45
Chiller - High Efficiency Cooling Tower Fans	Cooling	0%	0%	25%	37%	$0.04	10	0.01
Chiller - Condenser Water Temprature Reset	Cooling	8%	0%	25%	75%	$0.09	14	1.28
Cooling - Economizer Installation	Cooling	11%	0%	73%	81%	$0.15	15	1.14
Heat Pump - Maintenance	Combined Heating/Cooling	10%	10%	5%	95%	$0.06	4	2.61
Insulation - Ducting	Cooling	7%	0%	2%	50%	$0.41	20	0.71
Insulation - Ducting	Space Heating	3%	1%	2%	50%	$0.41	20	0.71
Energy Management System	Cooling	11%	0%	80%	90%	$0.35	14	0.94
Energy Management System	Space Heating	4%	2%	80%	90%	$0.35	14	0.94
Energy Management System	Interior Lighting	5%	3%	80%	90%	$0.35	14	0.94
Cooking - Exhaust Hoods with Sensor Control	Ventilation	13%	7%	1%	8%	$0.04	10	3.31
Fans - Energy Efficient Motors	Ventilation	5%	5%	11%	90%	$0.05	10	1.24
Fans - Variable Speed Control	Ventilation	15%	5%	2%	90%	$0.20	10	0.80
Commissioning - HVAC	Cooling	5%	0%	50%	75%	$0.70	25	0.42
Commissioning - HVAC	Space Heating	5%	4%	50%	75%	$0.70	25	0.42
Commissioning - HVAC	Ventilation	5%	4%	50%	75%	$0.70	25	0.42
Pumps - Variable Speed Control	Miscellaneous	1%	0%	1%	34%	$0.44	10	1.01
Thermostat - Clock/Programmable	Cooling	3%	0%	25%	50%	$0.13	11	0.67
Thermostat - Clock/Programmable	Space Heating	3%	1%	25%	50%	$0.13	11	0.67
Insulation - Ceiling	Cooling	1%	0%	2%	81%	$0.35	20	0.68
Insulation - Ceiling	Space Heating	10%	3%	2%	81%	$0.35	20	0.68
Insulation - Radiant Barrier	Cooling	1%	0%	2%	13%	$0.26	20	0.47
Insulation - Radiant Barrier	Space Heating	2%	1%	2%	13%	$0.26	20	0.47
Roofs - High Reflectivity	Cooling	10%	0%	5%	95%	$0.18	15	0.85
Windows - High Efficiency	Cooling	6%	0%	95%	100%	$1.69	20	0.38
Windows - High Efficiency	Space Heating	2%	2%	95%	100%	$1.69	20	0.38
Interior Lighting - Central Lighting Controls	Interior Lighting	10%	5%	78%	90%	$0.65	8	0.23
Interior Lighting - Photocell Controlled T8 Dimming Ballasts	Interior Lighting	25%	13%	3%	45%	$0.30	8	0.86
Exterior Lighting - Daylighting Controls	Exterior Lighting	30%	0%	10%	15%	$0.19	8	0.61
Interior Fluorescent - Bi-Level Fixture w/Occupancy Sensor	Interior Lighting	10%	5%	10%	23%	$0.20	8	0.52
Interior Fluorescent - High Bay Fixtures	Interior Lighting	50%	25%	10%	23%	$0.56	11	1.24
Interior Lighting - Occupancy Sensors	Interior Lighting	10%	5%	42%	45%	$0.20	8	0.76
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	75%	75%	5%	13%	$0.92	5	0.20
Interior Screw-in - Task Lighting	Interior Lighting	10%	5%	25%	75%	$0.24	5	0.16
Interior Lighting - Time Clocks and Timers	Interior Lighting	5%	3%	12%	56%	$0.20	8	0.38
Water Heater - Faucet Aerators/Low Flow Nozzles	Water Heating	4%	1%	2%	90%	$0.03	9	2.63
Water Heater - Pipe Insulation	Water Heating	6%	3%	0%	0%	$0.28	15	0.69
Water Heater - High Efficiency Circulation Pump	Water Heating	5%	4%	0%	23%	$0.11	10	1.18
Water Heater - Tank Blanket/Insulation	Water Heating	9%	5%	0%	0%	$0.04	10	5.43
Water Heater - Thermostat Setback	Water Heating	4%	0%	0%	0%	$0.11	10	0.71
Water Heater - Hot Water Saver	Water Heating	5%	1%	0%	0%	$0.04	5	1.43
Refrigeration - Anti-Sweat Heater/Auto Door Closer	Refrigeration	5%	3%	10%	75%	$0.20	16	0.02
Refrigeration - Floating Head Pressure	Refrigeration	7%	4%	10%	38%	$0.35	16	0.32
Refrigeration - Door Gasket Replacement	Refrigeration	4%	2%	5%	75%	$0.10	8	0.12
Insulation - Bare Suction Lines	Refrigeration	3%	2%	5%	75%	$0.10	8	0.26
Refrigeration - Night Covers	Refrigeration	6%	3%	5%	75%	$0.05	8	0.27
Refrigeration - Strip Curtain	Refrigeration	4%	2%	5%	56%	$0.02	8	0.17
Commissioning - Comprehensive	Cooling	10%	0%	40%	75%	$0.80	25	1.05
Commissioning - Comprehensive	Space Heating	10%	7%	40%	75%	$0.80	25	1.05
Commissioning - Comprehensive	Interior Lighting	10%	7%	40%	75%	$0.80	25	1.05
Office Equipment - Energy Star Power Supply	Office Equipment	1%	1%	10%	95%	$0.00	7	38.86
Vending Machine - Controller	Refrigeration	15%	11%	2%	10%	$0.27	10	1.10
LED Exit Lighting	Interior Lighting	2%	2%	85%	86%	$0.00	10	16.52
Commissioning - Lighting	Interior Lighting	5%	4%	60%	75%	$0.10	25	2.47
Commissioning - Lighting	Exterior Lighting	5%	4%	60%	75%	$0.10	25	2.47
Refrigeration - High Efficiency Case Lighting	Refrigeration	4%	2%	5%	75%	$0.20	8	0.04
Exterior Lighting - Cold Cathode Lighting	Exterior Lighting	1%	1%	5%	25%	$0.00	5	1.45
Exterior Lighting - Induction Lamps	Exterior Lighting	3%	3%	5%	56%	$0.00	5	6.26
Laundry - High Efficiency Clothes Washer	Miscellaneous	0%	0%	5%	10%	$0.00	10	20.31
Interior Lighting - Hotel Guestroom Controls	Interior Lighting	10%	5%	0%	0%	$0.14	8	0.42
Miscellaneous - Energy Star Water Cooler	Miscellaneous	0%	0%	5%	95%	$0.00	8	1.07
Advanced New Construction Designs	Cooling	40%	0%	5%	75%	$2.00	35	1.67
Advanced New Construction Designs	Space Heating	40%	30%	5%	75%	$2.00	35	1.67
Advanced New Construction Designs	Interior Lighting	25%	19%	5%	75%	$2.00	35	1.67
Insulation - Wall Cavity	Cooling	1%	0%	2%	68%	$0.09	20	1.73
Insulation - Wall Cavity	Space Heating	10%	2%	2%	68%	$0.09	20	1.73
Roofs - Green	Cooling	10%	0%	2%	13%	$1.00	15	0.20
Roofs - Green	Space Heating	5%	3%	2%	13%	$1.00	15	0.20
Industrial Process Improvements	Miscellaneous	10%	8%	0%	0%	$0.52	10	1.11
Custom Measures	Cooling	8%	0%	10%	45%	$0.67	15	0.81
Custom Measures	Space Heating	8%	6%	10%	45%	$0.67	15	0.81
Custom Measures	Interior Lighting	8%	6%	10%	45%	$0.67	15	0.81
Custom Measures	Food Preparation	8%	6%	10%	45%	$0.67	15	0.81
Custom Measures	Refrigeration	8%	6%	10%	45%	$0.67	15	0.81
Water Heater - Heat Pump	Water Heating	30%	15%	0%	41%	$0.80	15	1.27
Water Heater - Convert to Gas	Water Heating	100%	100%	0%	0%	$4.00	15	1.00
Furnace - Convert to Gas	Space Heating	100%	100%	0%	0%	$4.00	15	1.57

Table D-17 Energy Efficiency Measure Data — Extra Large Industrial, New Vintage

Measure	Enduse	Energy Savings	Demand Savings	Base Saturation	Appl./ Feas.	Cost	Lifetime	BC Ratio
Refrigeration - System Controls	Process	11%	8%	5%	34%	$0.40	10	18.09
Refrigeration - System Maintenance	Process	3%	2%	5%	34%	$0.00	10	2,067.93
Refrigeration - System Optimization	Process	15%	11%	5%	34%	$0.80	10	12.92
Motors - Variable Frequency Drive	Machine Drive	13%	9%	25%	38%	$0.10	10	3.38
Motors - Magnetic Adjustable Speed Drives	Machine Drive	13%	9%	25%	38%	$0.10	10	3.38
Compressed Air - System Controls	Machine Drive	9%	7%	5%	34%	$0.40	10	0.59
Compressed Air - System Optimization and Improvements	Machine Drive	13%	9%	5%	34%	$0.80	10	0.42
Compressed Air - System Maintenance	Machine Drive	3%	2%	5%	34%	$0.20	10	0.34
Compressed Air - Compressor Replacement	Machine Drive	5%	4%	5%	34%	$0.20	10	0.68
Fan System - Controls	Machine Drive	4%	3%	10%	38%	$0.35	10	0.11
Fan System - Controls	Machine Drive	4%	3%	10%	38%	$0.35	10	0.11
Fan System - Optimization	Machine Drive	6%	5%	10%	38%	$0.70	10	0.08
Fan System - Optimization	Machine Drive	6%	5%	10%	38%	$0.70	10	0.08
Fan System - Maintenance	Machine Drive	1%	1%	10%	38%	$0.15	10	0.07
Fan System - Maintenance	Machine Drive	1%	1%	10%	38%	$0.15	10	0.07
Pumping System - Controls	Machine Drive	5%	4%	5%	34%	$0.38	12	0.42
Pumping System - Optimization	Machine Drive	13%	9%	5%	34%	$0.75	12	0.54
Pumping System - Maintenance	Machine Drive	2%	1%	5%	34%	$0.19	10	0.27
RTU - Maintenance	Cooling	14%	0%	22%	90%	$0.06	4	2.82
Chiller - Chilled Water Reset	Cooling	14%	0%	60%	75%	$0.09	4	2.53
Chiller - Chilled Water Variable-Flow System	Cooling	4%	0%	30%	34%	$0.20	10	0.80
Chiller - Turbocor Compressor	Cooling	30%	0%	0%	67%	$0.90	20	2.40
Chiller - VSD	Cooling	27%	0%	25%	67%	$1.17	20	1.63
Chiller - High Efficiency Cooling Tower Fans	Cooling	0%	0%	25%	50%	$0.04	10	0.04
Chiller - Condenser Water Temprature Reset	Cooling	10%	0%	5%	75%	$0.20	14	2.60
Cooling - Economizer Installation	Cooling	6%	0%	29%	34%	$0.15	15	1.92
Heat Pump - Maintenance	Combined Heating/Cooling	7%	7%	2%	95%	$0.03	4	7.76
Insulation - Ducting	Space Heating	5%	5%	12%	50%	$0.41	20	0.95
Insulation - Ducting	Cooling	3%	0%	12%	50%	$0.41	20	0.95
Energy Management System	Cooling	5%	0%	11%	90%	$0.35	14	0.88
Energy Management System	Space Heating	2%	1%	11%	90%	$0.35	14	0.88
Energy Management System	Interior Lighting	2%	1%	11%	90%	$0.35	14	0.88
Fans - Energy Efficient Motors	Ventilation	5%	5%	2%	90%	$0.14	10	2.81
Fans - Variable Speed Control	Ventilation	15%	5%	3%	90%	$0.34	10	2.97
Commissioning - HVAC	Cooling	5%	0%	60%	75%	$0.70	25	0.92
Commissioning - HVAC	Space Heating	5%	4%	60%	75%	$0.70	25	0.92
Commissioning - HVAC	Ventilation	5%	4%	60%	75%	$0.70	25	0.92
Pumps - Variable Speed Control	Machine Drive	5%	4%	0%	34%	$0.44	10	0.31
Thermostat - Clock/Programmable	Cooling	5%	0%	59%	70%	$0.13	11	2.02
Thermostat - Clock/Programmable	Space Heating	5%	1%	59%	70%	$0.13	11	2.02
Interior Lighting - Central Lighting Controls	Interior Lighting	10%	5%	84%	90%	$0.65	8	0.15
Exterior Lighting - Daylighting Controls	Exterior Lighting	30%	0%	10%	40%	$0.08	8	0.42
Interior Fluorescent - High Bay Fixtures	Interior Lighting	50%	25%	10%	38%	$0.20	11	1.76
LED Exit Lighting	Interior Lighting	2%	2%	85%	86%	$0.00	10	3.72
Commissioning - Lighting	Interior Lighting	5%	4%	60%	75%	$0.10	25	1.41
Commissioning - Lighting	Exterior Lighting	5%	4%	60%	75%	$0.10	25	1.41
Interior Lighting - Occupancy Sensors	Interior Lighting	10%	5%	15%	45%	$0.20	8	0.50
Exterior Lighting - Photovoltaic Installation	Exterior Lighting	75%	75%	5%	13%	$0.92	5	0.06
Interior Screw-in - Task Lighting	Interior Lighting	7%	4%	10%	75%	$0.24	5	0.03
Interior Lighting - Time Clocks and Timers	Interior Lighting	5%	3%	2%	56%	$0.20	8	0.25
Exterior Lighting - Cold Cathode Lighting	Exterior Lighting	1%	1%	5%	25%	$0.00	5	0.41
Advanced New Construction Designs	Cooling	40%	0%	5%	75%	$2.00	35	2.67
Advanced New Construction Designs	Space Heating	40%	30%	5%	75%	$2.00	35	2.67
Advanced New Construction Designs	Interior Lighting	25%	19%	5%	75%	$2.00	35	2.67
Custom Measures	Cooling	8%	0%	10%	45%	$1.60	15	1.28
Custom Measures	Space Heating	8%	6%	10%	45%	$1.60	15	1.28
Custom Measures	Interior Lighting	8%	6%	10%	45%	$1.60	15	1.28
Custom Measures	Machine Drive	8%	6%	10%	45%	$1.60	15	1.28
Furnace - Convert to Gas	Space Heating	100%	100%	0%	0%	$4.00	15	2.51

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