



## Appendix 1

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# Energy Efficiency Cost Effectiveness

Pacific Power



Navigant estimated the cost-effectiveness for the overall energy efficiency portfolio and component sectors, based on 2016 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall energy efficiency portfolio and the two sector components.

The program passes the cost-effectiveness for all the tests except the RIM test. The memo consists of the following tables.

Table 1 - Utility Inputs

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Table 15 – Home Energy Savings Non-Energy Benefits (2016)

**Table 1 - Utility Inputs**

Parameter	Value
Discount Rate	6.66%
Residential Line Loss	9.67%
Commercial Line Loss	9.53%
Industrial Line Loss	8.16%
Irrigation Line Loss	9.67%
Residential Energy Rate (\$/kWh)	\$0.0836
Commercial Energy Rate (\$/kWh)	\$0.0717
Industrial Energy Rate (\$/kWh)	\$0.0887
Irrigation Energy Rate (\$/kWh)	\$0.1327
Inflation Rate <sup>1</sup>	1.9%

<sup>1</sup> Future rates determined using a 1.9% annual escalator.

**Table 2 – Portfolio Level Costs 2016**

Expense	Cost
School Energy Education	\$62,794
Outreach and Communication	\$184,227
Portfolio Level Expenditures	\$538,498
<b>Total Costs</b>	<b>\$785,519</b>

**Table 3 – NEEA Inputs 2016**

Sector	Savings at Meter (kWh)	NEEA Expenses (\$)
Residential	2,483,827	\$607,047
Industrial	1,033,292	\$252,216
Commercial	44,349	\$10,690
<b>Total</b>	<b>3,561,468</b>	<b>\$869,953</b>

**Table 4 - Benefit/Cost Ratios by Portfolio Type**

Measure Group	PTRC	TRC	UCT	RIM	PCT
Total Portfolio	1.73	1.57	2.61	0.65	3.02
Total Portfolio (Including NEEA)	1.71	1.56	2.50	0.63	3.16
Total Portfolio (Including NEBs)	1.89	1.73	2.61	0.65	3.05
Total Portfolio (Including NEEA & NEBs)	1.86	1.70	2.50	0.63	3.18
C&I Programs	1.95	1.77	3.21	0.68	3.06
C&I Programs (Including NEEA)	1.94	1.76	3.14	0.68	3.12
Residential Programs	1.42	1.29	1.91	0.58	2.88
Residential Programs (Including NEEA)	1.40	1.27	1.77	0.55	3.29
Residential Programs (Including NEBs)	2.06	1.94	1.91	0.58	3.00
Residential Programs (Including NEEA & NEBs)	1.96	1.83	1.77	0.55	3.42

\*Portfolio and Residential results exclude the Low Income Program from the analysis.

**Table 5 – 2016 Total Portfolio Cost-Effectiveness Results**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0475	\$17,199,783	\$29,773,599	\$12,573,816	1.73
Total Resource Cost Test (TRC) No Adder	\$0.0475	\$17,199,783	\$27,066,909	\$9,867,125	1.57
Utility Cost Test (UCT)	\$0.0286	\$10,355,926	\$27,066,909	\$16,710,983	2.61
Rate Impact Test (RIM)		\$41,774,897	\$27,066,909	-\$14,707,989	0.65
Participant Cost Test (PCT)		\$12,168,394	\$36,743,530	\$24,575,135	3.02
Lifecycle Revenue Impacts (\$/kWh)					\$0.0003049141

**Table 6 – 2016 Total Portfolio Cost-Effectiveness Results (Including NEEA)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0475	\$18,069,736	\$30,932,651	\$12,862,914	1.71
Total Resource Cost Test (TRC) No Adder	\$0.0475	\$18,069,736	\$28,120,592	\$10,050,855	1.56
Utility Cost Test (UCT)	\$0.0295	\$11,225,879	\$28,120,592	\$16,894,713	2.50
Rate Impact Test (RIM)		\$44,299,759	\$28,120,592	-\$16,179,167	0.63
Participant Cost Test (PCT)		\$12,168,394	\$38,398,438	\$26,230,044	3.16
Lifecycle Revenue Impacts (\$/kWh)					\$0.0003659049

**Table 7 – 2016 Total Portfolio Cost-Effectiveness Results (Including NEBs)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0475	\$17,199,783	\$32,428,186	\$15,228,403	1.89
Total Resource Cost Test (TRC) No Adder	\$0.0475	\$17,199,783	\$29,721,495	\$12,521,712	1.73
Utility Cost Test (UCT)	\$0.0286	\$10,355,926	\$27,066,909	\$16,710,983	2.61
Rate Impact Test (RIM)		\$41,774,897	\$27,066,909	-\$14,707,989	0.65
Participant Cost Test (PCT)		\$12,168,394	\$37,089,055	\$24,920,660	3.05
Lifecycle Revenue Impacts (\$/kWh)					\$0.0003049141

**Table 8 – 2016 Total Portfolio Cost-Effectiveness Results (Including NEEA and NEBs)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0475	\$18,069,736	\$33,587,237	\$15,517,501	1.86
Total Resource Cost Test (TRC) No Adder	\$0.0475	\$18,069,736	\$30,775,178	\$12,705,442	1.70
Utility Cost Test (UCT)	\$0.0295	\$11,225,879	\$28,120,592	\$16,894,713	2.50
Rate Impact Test (RIM)		\$44,299,759	\$28,120,592	-\$16,179,167	0.63
Participant Cost Test (PCT)		\$12,168,394	\$38,743,963	\$26,575,568	3.18
Lifecycle Revenue Impacts (\$/kWh)					\$0.0003659049

**Table 9 – 2016 C&I Energy Efficiency Portfolio Cost-Effectiveness Results**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0423	\$12,288,719	\$23,910,899	\$11,622,179	1.95
Total Resource Cost Test (TRC) No Adder	\$0.0423	\$12,288,719	\$21,737,181	\$9,448,461	1.77
Utility Cost Test (UCT)	\$0.0233	\$6,774,176	\$21,737,181	\$14,963,005	3.21
Rate Impact Test (RIM)		\$31,779,478	\$21,737,181	-\$10,042,297	0.68
Participant Cost Test (PCT)		\$9,457,179	\$28,947,938	\$19,490,759	3.06
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001783812

**Table 10 – 2016 C&I Energy Efficiency Portfolio Cost-Effectiveness Results (Including NEEA)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0424	\$12,551,625	\$24,314,058	\$11,762,432	1.94
Total Resource Cost Test (TRC) No Adder	\$0.0424	\$12,551,625	\$22,103,689	\$9,552,063	1.76
Utility Cost Test (UCT)	\$0.0238	\$7,037,082	\$22,103,689	\$15,066,607	3.14
Rate Impact Test (RIM)		\$32,561,226	\$22,103,689	-\$10,457,537	0.68
Participant Cost Test (PCT)		\$9,457,179	\$29,466,779	\$20,009,600	3.12
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001857571

**Table 11 – 2016 Residential Energy Efficiency Portfolio Cost-Effectiveness Results**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0576	\$4,125,545	\$5,862,701	\$1,737,155	1.42
Total Resource Cost Test (TRC) No Adder	\$0.0576	\$4,125,545	\$5,329,728	\$1,204,182	1.29
Utility Cost Test (UCT)	\$0.0391	\$2,796,231	\$5,329,728	\$2,533,497	1.91
Rate Impact Test (RIM)		\$9,209,901	\$5,329,728	-\$3,880,173	0.58
Participant Cost Test (PCT)		\$2,711,215	\$7,795,592	\$5,084,377	2.88
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001378696

**Table 12 – 2016 Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEEA)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0562	\$4,732,592	\$6,618,593	\$1,886,001	1.40
Total Resource Cost Test (TRC) No Adder	\$0.0562	\$4,732,592	\$6,016,903	\$1,284,311	1.27
Utility Cost Test (UCT)	\$0.0404	\$3,403,278	\$6,016,903	\$2,613,625	1.77
Rate Impact Test (RIM)		\$10,953,014	\$6,016,903	-\$4,936,111	0.55
Participant Cost Test (PCT)		\$2,711,215	\$8,931,659	\$6,220,443	3.29
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001753890

**Table 13 – 2016 Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEBs)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0576	\$4,125,545	\$8,517,287	\$4,391,742	2.06
Total Resource Cost Test (TRC) No Adder	\$0.0576	\$4,125,545	\$7,984,314	\$3,858,769	1.94
Utility Cost Test (UCT)	\$0.0391	\$2,796,231	\$5,329,728	\$2,533,497	1.91
Rate Impact Test (RIM)		\$9,209,901	\$5,329,728	-\$3,880,173	0.58
Participant Cost Test (PCT)		\$2,711,215	\$8,141,117	\$5,429,901	3.00
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001378696

**Table 14 – 2016 Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEEA and NEBs)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0562	\$4,732,592	\$9,273,180	\$4,540,587	1.96
Total Resource Cost Test (TRC) No Adder	\$0.0562	\$4,732,592	\$8,671,489	\$3,938,897	1.83
Utility Cost Test (UCT)	\$0.0404	\$3,403,278	\$6,016,903	\$2,613,625	1.77
Rate Impact Test (RIM)		\$10,953,014	\$6,016,903	-\$4,936,111	0.55
Participant Cost Test (PCT)		\$2,711,215	\$9,277,183	\$6,565,968	3.42
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001753890

The table below summarizes the non-energy benefits for the Home Energy Savings program.

**Table 15 – Home Energy Savings Non-Energy Benefits (2016)**

Non-Energy Benefits	Non-Energy Benefits Water (\$/yr)	Non-Energy Benefits Other (\$/yr)	Measure Life	Quantity	Total Present Value Benefits
Appliances with NEBs	\$3,823.70	\$482.20	14	171	\$41,013
Energy Kits - DHW with NEBs	\$80,166.42	\$8,738.88	9	2,963	\$641,176
Energy Kits - Lighting with NEBs	\$2,323.12	\$253.24	9	2,963	\$18,580
HVAC with NEBs	\$0.00	\$12,501.27	17	672	\$132,131
Lighting with NEBs	\$0.00	\$237,235.90	10	250,632	\$1,821,686
<b>Total HES NEBs</b>	<b>\$86,313.24</b>	<b>\$259,211.49</b>	<b>12</b>	<b>257,401</b>	<b>\$2,654,587</b>



Navigant estimated the cost-effectiveness results for the Washington Home Energy Savings Program, based on 2016 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program and for the 9 measure categories.

Cost-effectiveness was tested using the 2015 IRP west residential heating 17%, west residential lighting 48%, west residential water heating 53%, west plug loads 61%, and west residential whole house load factor decrements. The program passes the cost-effectiveness for all the tests except the RIM test. The memo consists of the following tables.

- Table 1 - Home Energy Savings Inputs
- Table 2 – Home Energy Savings Annual Program Costs
- Table 3 – Home Energy Savings – Savings by Measure Category
- Table 4 - Benefit/Cost Ratios by Measure Category
- Table 5 – Home Energy Savings Program Level Cost-Effectiveness Results
- Table 6 - Home Energy Savings Appliance Cost-Effectiveness Results
- Table 7 - Home Energy Savings Building Shell Cost-Effectiveness Results
- Table 8 - Home Energy Savings Electronics Cost-Effectiveness Results
- Table 9 - Home Energy Savings Energy Kits - DHW Cost-Effectiveness Results
- Table 10 - Home Energy Savings Energy Kits - Lighting Cost-Effectiveness Results
- Table 11 - Home Energy Savings HVAC Cost-Effectiveness Results
- Table 12 - Home Energy Savings Lighting Cost-Effectiveness Results
- Table 13 - Home Energy Savings Water Heating Cost-Effectiveness Results
- Table 14 - Home Energy Savings Whole Home Cost-Effectiveness Results
- Table 15 - Home Energy Savings Non-Energy Benefits by Measure
- Table 16 - Home Energy Savings Program (with NEBs) Cost-Effectiveness Results
- Table 17 - Home Energy Savings Appliance (with NEBs) Cost-Effectiveness Results
- Table 18 - Home Energy Savings Energy Kits - DHW (with NEBs) Cost-Effectiveness Results
- Table 19 - Home Energy Savings Energy Kits – Lighting (with NEBs) Cost-Effectiveness Results
- Table 20 - Home Energy Savings HVAC (with NEBs) Cost-Effectiveness Results
- Table 21 - Home Energy Savings Lighting (with NEBs) Cost-Effectiveness Results



**Table 1 - Home Energy Savings Inputs**

Parameter	Value
Discount Rate	6.66%
Residential Line Loss	9.67%
Residential Energy Rate (\$/kWh)	\$0.0836
Inflation Rate <sup>1</sup>	1.9%

<sup>1</sup> Future rates determined using a 1.9% annual escalator.

**Table 2 – Home Energy Savings Annual Program Costs**

Measure Group	Engineering Costs	Utility Admin	Program Dev.	Program Delivery	Incentives	Total Utility Costs	Gross Customer Costs
Appliances	\$0	\$174	\$121	\$7,742	\$8,630	\$16,667	\$24,369
Building Shell	\$0	\$929	\$645	\$41,423	\$59,109	\$102,106	\$185,004
Electronics	\$0	\$206	\$143	\$9,173	\$5,160	\$14,682	\$3,775
Energy Kits - DHW	\$0	\$7,725	\$5,369	\$64,114	\$40,619	\$117,827	\$41,862
Energy Kits - Lighting	\$0	\$224	\$156	\$1,858	\$3,106	\$5,343	\$3,295
HVAC	\$0	\$15,087	\$10,484	\$672,911	\$658,216	\$1,356,698	\$1,534,060
Lighting	\$0	\$30,773	\$21,385	\$143,061	\$548,828	\$744,047	\$825,692
Water Heating	\$0	\$686	\$477	\$30,590	\$40,233	\$71,985	\$58,537
Whole Home	\$0	\$245	\$170	\$10,908	\$18,000	\$29,323	\$34,620
<b>Total</b>	<b>\$0</b>	<b>\$56,048</b>	<b>\$38,949</b>	<b>\$981,781</b>	<b>\$1,381,901</b>	<b>\$2,458,678</b>	<b>\$2,711,215</b>

**Table 3 – Home Energy Savings – Savings by Measure Category**

Measure Group	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
Appliances	21,776	100%	21,776	100%	21,776	14
Building Shell	116,503	100%	116,503	100%	116,503	45
Electronics	25,800	100%	25,800	100%	25,800	5
Energy Kits - DHW	969,096	100%	969,096	100%	969,096	9
Energy Kits - Lighting	28,083	100%	28,083	100%	28,083	6
HVAC	1,892,584	100%	1,892,584	100%	1,892,584	17
Lighting	3,860,253	100%	3,860,253	100%	3,860,253	10
Water Heating	86,034	100%	86,034	100%	86,034	14
Whole Home	30,680	100%	30,680	100%	30,680	27
<b>Total</b>	<b>7,030,808</b>	<b>100%</b>	<b>7,030,808</b>	<b>100%</b>	<b>7,030,808</b>	<b>12</b>

**Table 4 - Benefit/Cost Ratios by Measure Category**

Measure Group	PTRC	TRC	UCT	RIM	PCT
Appliances	0.54	0.49	0.96	0.44	1.16
Appliances with NEBs	1.81	1.76	0.96	0.44	1.34
Building Shell	0.97	0.88	1.96	0.68	1.37
Electronics	0.56	0.51	0.46	0.27	4.03
Energy Kits - DHW	4.47	4.06	4.11	0.65	15.86
Energy Kits - DHW with NEBs	9.85	9.45	4.11	0.65	17.83
Energy Kits - Lighting	1.95	1.77	1.83	0.54	4.84
Energy Kits - Lighting with NEBs	5.30	5.13	1.83	0.54	7.57
HVAC	0.96	0.87	1.44	0.59	1.70
HVAC with NEBs	1.02	0.93	1.44	0.59	1.71
Lighting	2.29	2.09	2.86	0.62	3.94
Lighting with NEBs	4.08	3.87	2.86	0.62	4.22
Water Heating	0.77	0.70	0.88	0.42	2.01
Whole Home	0.74	0.67	1.05	0.44	1.72
<b>Total</b>	<b>1.42</b>	<b>1.29</b>	<b>1.99</b>	<b>0.60</b>	<b>2.59</b>
<b>Total (with NEBs)</b>	<b>2.12</b>	<b>1.99</b>	<b>1.99</b>	<b>0.60</b>	<b>2.71</b>

**Table 5 – Home Energy Savings Program Level Cost-Effectiveness Results**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0603	\$3,787,992	\$5,380,244	\$1,592,252	1.42
Total Resource Cost Test (TRC) No Adder	\$0.0603	\$3,787,992	\$4,891,131	\$1,103,139	1.29
Utility Cost Test (UCT)	\$0.0392	\$2,458,678	\$4,891,131	\$2,432,453	1.99
Rate Impact Test (RIM)		\$8,088,460	\$4,891,131	-\$3,197,329	0.60
Participant Cost Test (PCT)		\$2,711,215	\$7,011,683	\$4,300,468	2.59
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000611823
Discounted Participant Payback (years)					2.29

Table 6 through Table 21 provides cost-effectiveness results for all 9 measures.

**Table 6 - Home Energy Savings Appliance Cost-Effectiveness Results  
(Decrement - West Residential Water Heating - 53%, Load Shape – Residential Water Heating)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1480	\$32,406	\$17,640	-\$14,766	0.54
Total Resource Cost Test (TRC) No Adder	\$0.1480	\$32,406	\$16,036	-\$16,370	0.49
Utility Cost Test (UCT)	\$0.0761	\$16,667	\$16,036	-\$631	0.96
Rate Impact Test (RIM)		\$36,297	\$16,036	-\$20,261	0.44
Participant Cost Test (PCT)		\$24,369	\$28,260	\$3,891	1.16
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000003358
Discounted Participant Payback (years)					10.44

**Table 7 - Home Energy Savings Building Shell Cost-Effectiveness Results  
(Decrement - West Residential Heating - 17%, Load Shape – Heating)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1063	\$228,001	\$220,159	-\$7,842	0.97
Total Resource Cost Test (TRC) No Adder	\$0.1063	\$228,001	\$200,145	-\$27,856	0.88
Utility Cost Test (UCT)	\$0.0476	\$102,106	\$200,145	\$98,039	1.96
Rate Impact Test (RIM)		\$295,993	\$200,145	-\$95,848	0.68
Participant Cost Test (PCT)		\$185,004	\$252,996	\$67,992	1.37
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000005157
Discounted Participant Payback (years)					18.30

**Table 8 - Home Energy Savings Electronics Cost-Effectiveness Results  
(Decrement - West Plug Loads - 61%, Load Shape – Plug Loads)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1183	\$13,297	\$7,456	-\$5,841	0.56
Total Resource Cost Test (TRC) No Adder	\$0.1183	\$13,297	\$6,778	-\$6,519	0.51
Utility Cost Test (UCT)	\$0.1306	\$14,682	\$6,778	-\$7,904	0.46
Rate Impact Test (RIM)		\$24,733	\$6,778	-\$17,955	0.27
Participant Cost Test (PCT)		\$3,775	\$15,211	\$11,436	4.03
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000007441
Discounted Participant Payback (years)					n/a

**Table 9 - Home Energy Savings Energy Kits - DHW Cost-Effectiveness Results  
(Decrement - West Residential Water Heating - 53%, Load Shape – Residential Water Heating)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0171	\$119,069	\$532,188	\$413,118	4.47
Total Resource Cost Test (TRC) No Adder	\$0.0171	\$119,069	\$483,807	\$364,737	4.06
Utility Cost Test (UCT)	\$0.0169	\$117,827	\$483,807	\$365,980	4.11
Rate Impact Test (RIM)		\$741,121	\$483,807	-\$257,314	0.65
Participant Cost Test (PCT)		\$41,862	\$663,914	\$622,052	15.86
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000064010
Discounted Participant Payback (years)					0.02

**Table 10 - Home Energy Savings Energy Kits - Lighting Cost-Effectiveness Results  
(Decrement - West Residential Lighting - 48%, Load Shape – Lighting)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0385	\$5,533	\$10,763	\$5,230	1.95
Total Resource Cost Test (TRC) No Adder	\$0.0385	\$5,533	\$9,785	\$4,252	1.77
Utility Cost Test (UCT)	\$0.0372	\$5,343	\$9,785	\$4,441	1.83
Rate Impact Test (RIM)		\$18,188	\$9,785	-\$8,403	0.54
Participant Cost Test (PCT)		\$3,295	\$15,951	\$12,655	4.84
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000002986
Discounted Participant Payback (years)					0.08

**Table 11 - Home Energy Savings HVAC Cost-Effectiveness Results  
(Decrement - West Residential Heating - 17%, Load Shape – Heating)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1028	\$2,232,543	\$2,146,619	-\$85,924	0.96
Total Resource Cost Test (TRC) No Adder	\$0.1028	\$2,232,543	\$1,951,472	-\$281,071	0.87
Utility Cost Test (UCT)	\$0.0624	\$1,356,698	\$1,951,472	\$594,774	1.44
Rate Impact Test (RIM)		\$3,306,873	\$1,951,472	-\$1,355,401	0.59
Participant Cost Test (PCT)		\$1,534,060	\$2,608,391	\$1,074,330	1.70
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000187082
Discounted Participant Payback (years)					6.10

**Table 12 - Home Energy Savings Lighting Cost-Effectiveness Results  
(Decrement - West Residential Lighting - 48%, Load Shape – Lighting)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0339	\$1,020,911	\$2,341,706	\$1,320,795	2.29
Total Resource Cost Test (TRC) No Adder	\$0.0339	\$1,020,911	\$2,128,824	\$1,107,913	2.09
Utility Cost Test (UCT)	\$0.0247	\$744,047	\$2,128,824	\$1,384,777	2.86
Rate Impact Test (RIM)		\$3,444,896	\$2,128,824	-\$1,316,073	0.62
Participant Cost Test (PCT)		\$825,692	\$3,249,677	\$2,423,986	3.94
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000297640
Discounted Participant Payback (years)					0.84

**Table 13 - Home Energy Savings Water Heating Cost-Effectiveness Results  
(Decrement - West Water Heating - 53%, Load Shape – Residential Water Heating)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1044	\$90,289	\$69,693	-\$20,596	0.77
Total Resource Cost Test (TRC) No Adder	\$0.1044	\$90,289	\$63,357	-\$26,932	0.70
Utility Cost Test (UCT)	\$0.0832	\$71,985	\$63,357	-\$8,628	0.88
Rate Impact Test (RIM)		\$149,544	\$63,357	-\$86,187	0.42
Participant Cost Test (PCT)		\$58,537	\$117,792	\$59,255	2.01
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000014286
Discounted Participant Payback (years)					2.60

**Table 14 - Home Energy Savings Whole Home Cost-Effectiveness Results  
(Decrement - West Residential Whole House - 49%, Load Shape – Residential Whole House)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0997	\$45,943	\$34,021	-\$11,922	0.74
Total Resource Cost Test (TRC) No Adder	\$0.0997	\$45,943	\$30,928	-\$15,015	0.67
Utility Cost Test (UCT)	\$0.0636	\$29,323	\$30,928	\$1,605	1.05
Rate Impact Test (RIM)		\$70,815	\$30,928	-\$39,887	0.44
Participant Cost Test (PCT)		\$34,620	\$59,492	\$24,872	1.72
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000003531
Discounted Participant Payback (years)					7.32

In addition to the energy benefits reported above, appliances, energy savings kits, HVAC and lighting in the Home Energy Savings program offer significant non-energy benefits (NEBs). Table 15 through Table 21 detail the non-energy benefits and the cost-effectiveness results.

**Table 15 - Home Energy Savings Non-Energy Benefits by Measure**

Measure Name	Non-Energy Benefits Water (\$/yr)	Non-Energy Benefits Other (\$/yr)	Quantity	Measure Life	Total NEBs (\$/yr)	Discount Rate	Total Net Present Value Benefits
Appliances	\$3,824	\$482	171	14.0	\$4,306	6.66%	\$41,013.22
Energy Kits - DHW	\$80,166	\$8,739	2,963	9.3	\$88,905	6.66%	\$641,176.04
Energy Kits - Lighting	\$2,323	\$253	2,963	9.3	\$2,576	6.66%	\$18,580.44
HVAC	\$0	\$12,501	672	16.7	\$12,501	6.66%	\$132,131.13
Lighting	\$0	\$237,236	250,632	10.1	\$237,236	6.66%	\$1,821,685.70

The following tables provide the cost-effectiveness results after adding in the non-energy benefits detailed above beginning with the overall program results.

**Table 16 - Home Energy Savings Program (with NEBs) Cost-Effectiveness Results**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0603	\$3,787,992	\$8,034,831	\$4,246,838	2.12
Total Resource Cost Test (TRC) No Adder	\$0.0603	\$3,787,992	\$7,545,718	\$3,757,725	1.99
Utility Cost Test (UCT)	\$0.0392	\$2,458,678	\$4,891,131	\$2,432,453	1.99
Rate Impact Test (RIM)		\$8,088,460	\$4,891,131	-\$3,197,329	0.60
Participant Cost Test (PCT)		\$2,711,215	\$7,357,208	\$4,645,993	2.71
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000611823
Discounted Participant Payback (years)					2.38

**Table 17 - Home Energy Savings Appliance (with NEBs) Cost-Effectiveness Results  
 (Decrement - West Residential Water Heating - 53%, Load Shape – Residential Water Heating)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1480	\$32,406	\$58,653	\$26,247	1.81
Total Resource Cost Test (TRC) No Adder	\$0.1480	\$32,406	\$57,049	\$24,643	1.76
Utility Cost Test (UCT)	\$0.0761	\$16,667	\$16,036	-\$631	0.96
Rate Impact Test (RIM)		\$36,297	\$16,036	-\$20,261	0.44
Participant Cost Test (PCT)		\$24,369	\$32,566	\$8,197	1.34
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000003358
Discounted Participant Payback (years)					10.44

**Table 18 - Home Energy Savings Energy Kits - DHW (with NEBs) Cost-Effectiveness Results  
 (Decrement - West Residential Water Heating -53%, Load Shape – Residential Water Heating)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0171	\$119,069	\$1,173,364	\$1,054,294	9.85
Total Resource Cost Test (TRC) No Adder	\$0.0171	\$119,069	\$1,124,983	\$1,005,914	9.45
Utility Cost Test (UCT)	\$0.0169	\$117,827	\$483,807	\$365,980	4.11
Rate Impact Test (RIM)		\$741,121	\$483,807	-\$257,314	0.65
Participant Cost Test (PCT)		\$41,862	\$746,403	\$704,541	17.83
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000064010
Discounted Participant Payback (years)					0.02

**Table 19 - Home Energy Savings Energy Kits – Lighting (with NEBs) Cost-Effectiveness Results**

**(Decrement - West Residential Lighting - 48%, Load Shape – Lighting)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0385	\$5,533	\$29,344	\$23,811	5.30
Total Resource Cost Test (TRC) No Adder	\$0.0385	\$5,533	\$28,365	\$22,832	5.13
Utility Cost Test (UCT)	\$0.0372	\$5,343	\$9,785	\$4,441	1.83
Rate Impact Test (RIM)		\$18,188	\$9,785	-\$8,403	0.54
Participant Cost Test (PCT)		\$3,295	\$24,943	\$21,647	7.57
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000002986
Discounted Participant Payback (years)					0.08

**Table 20 - Home Energy Savings HVAC (with NEBs) Cost-Effectiveness Results**  
**(Decrement - West Residential Heating - 17%, Load Shape – Heating))**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1028	\$2,232,543	\$2,278,750	\$46,207	1.02
Total Resource Cost Test (TRC) No Adder	\$0.1028	\$2,232,543	\$2,083,603	-\$148,940	0.93
Utility Cost Test (UCT)	\$0.0624	\$1,356,698	\$1,951,472	\$594,774	1.44
Rate Impact Test (RIM)		\$3,306,873	\$1,951,472	-\$1,355,401	0.59
Participant Cost Test (PCT)		\$1,534,060	\$2,620,892	\$1,086,832	1.71
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000187082
Discounted Participant Payback (years)					6.10



**Table 21 - Home Energy Savings Lighting (with NEBs) Cost-Effectiveness Results  
(Decrement - West Residential Lighting - 48%, Load Shape – Lighting)**

<b>Cost-Effectiveness Test</b>	<b>Levelized \$/kWh</b>	<b>Costs</b>	<b>Benefits</b>	<b>Net Benefits</b>	<b>Benefit/Cost Ratio</b>
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0339	\$1,020,911	\$4,163,392	\$3,142,481	4.08
Total Resource Cost Test (TRC) No Adder	\$0.0339	\$1,020,911	\$3,950,509	\$2,929,599	3.87
Utility Cost Test (UCT)	\$0.0247	\$744,047	\$2,128,824	\$1,384,777	2.86
Rate Impact Test (RIM)		\$3,444,896	\$2,128,824	-\$1,316,073	0.62
Participant Cost Test (PCT)		\$825,692	\$3,486,913	\$2,661,221	4.22
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000297640
Discounted Participant Payback (years)					0.84



Navigant estimated the cost-effectiveness results for the Washington Home Energy Reporting Program, based on 2016 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program and for Legacy/Refill and Expansion options.

Cost-effectiveness was tested using the 2015 IRP west residential whole house 49% load factor decrement. The program passes the PTRC, TRC and UCT cost-effectiveness tests.

Table 1 - Home Energy Reporting Inputs

Table 2 – Home Energy Reporting Annual Program Costs

Table 3 – Home Energy Reporting Savings by Measure Category

Table 4 - Benefit/Cost Ratios by Measure Category

Table 5 – Home Energy Reporting Program Level Cost-Effectiveness Results

Table 6 - Home Energy Reporting Legacy and Refill Cost-Effectiveness Results

Table 7 - Home Energy Reporting Expansion Cost-Effectiveness Results

**Table 1 - Home Energy Reporting Inputs**

Parameter	Value
Discount Rate	6.66%
Residential Line Loss	9.67%
Residential Energy Rate (\$/kWh)	\$0.0836
Inflation Rate <sup>1</sup>	1.9%

<sup>1</sup> Future rates determined using a 1.9% annual escalator.

**Table 2 – Home Energy Reporting Annual Program Costs**

Measure Group	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Incentives	Total Utility Costs	Gross Customer Costs
HER Legacy	\$0	\$1,237	\$130,776	\$4,171	\$0	\$136,183	\$0
HER Expansion	\$0	\$3,519	\$187,131	\$11,870	\$0	\$202,520	\$0
<b>Total</b>	<b>\$0</b>	<b>\$4,756</b>	<b>\$317,907</b>	<b>\$16,041</b>	<b>\$0</b>	<b>\$338,703</b>	<b>\$0</b>

**Table 3 – Home Energy Reporting Savings by Measure Category**

Measure Group	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
HER Legacy	4,697,777	100%	4,697,777	100%	4,697,777	1
HER Expansion	4,466,390	100%	4,466,390	100%	4,466,390	1
<b>Total</b>	<b>9,164,167</b>	<b>100%</b>	<b>9,164,167</b>	<b>100%</b>	<b>9,164,167</b>	<b>1</b>

**Table 4 - Benefit/Cost Ratios by Measure Category**

Measure Group	PTRC	TRC	UCT	RIM	PCT
HER Legacy	1.81	1.64	1.64	0.42	0.00
HER Expansion	1.16	1.05	1.05	0.37	0.00
<b>Total</b>	<b>1.42</b>	<b>1.29</b>	<b>1.29</b>	<b>0.39</b>	<b>0.00</b>

**Table 5 – Home Energy Reporting Program Level Cost-Effectiveness Results**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0387	\$338,703	\$480,302	\$141,599	1.42
Total Resource Cost Test (TRC) No Adder	\$0.0387	\$338,703	\$436,638	\$97,935	1.29
Utility Cost Test (UCT)	\$0.0387	\$338,703	\$436,638	\$97,935	1.29
Rate Impact Test (RIM)		\$1,119,384	\$436,638	-\$682,746	0.39
Participant Cost Test (PCT)		\$0	\$780,681	\$780,681	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000848807
Discounted Participant Payback (years)					n/a

**Table 6 - Home Energy Reporting Legacy and Refill Cost-Effectiveness Results (Decrement - West Residential Whole House - 49%, Load Shape – Whole House)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0304	\$136,183	\$246,215	\$110,032	1.81
Total Resource Cost Test (TRC) No Adder	\$0.0304	\$136,183	\$223,831	\$87,648	1.64
Utility Cost Test (UCT)	\$0.0304	\$136,183	\$223,831	\$87,648	1.64
Rate Impact Test (RIM)		\$536,379	\$223,831	-\$312,548	0.42
Participant Cost Test (PCT)		\$0	\$400,196	\$400,196	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000388567
Discounted Participant Payback (years)					0.00

**Table 7 - Home Energy Reporting Expansion Cost-Effectiveness Results (Decrement - West Residential Whole House - 49%, Load Shape – Whole House)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0475	\$202,520	\$234,087	\$31,567	1.16
Total Resource Cost Test (TRC) No Adder	\$0.0475	\$202,520	\$212,807	\$10,286	1.05
Utility Cost Test (UCT)	\$0.0475	\$202,520	\$212,807	\$10,286	1.05
Rate Impact Test (RIM)		\$583,005	\$212,807	-\$370,198	0.37
Participant Cost Test (PCT)		\$0	\$380,485	\$380,485	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000460240
Discounted Participant Payback (years)					0.00



Navigant estimated the cost-effectiveness results for the Washington Low Income Weatherization Program, based on 2016 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program.

Cost-effectiveness was tested using the 2015 IRP west residential whole house 49% load factor decrement. The program does not pass any of the cost-effectiveness tests.

Table 1 - Home Energy Savings Inputs

Table 2 - Low Income Weatherization Annual Program Costs

Table 3 - Low Income Weatherization Savings by Measure Category

Table 4 - Low Income Weatherization Program Level Cost-Effectiveness Results

Table 5 - Low Income Weatherization Non-Energy Benefits

Table 6 - Low Income Weatherization Program (with NEBs) Level Cost-Effectiveness Results

**Table 1 - Home Energy Savings Inputs**

Parameter	Value
Discount Rate	6.66%
Residential Line Loss	9.67%
Residential Energy Rate (\$/kWh)	\$0.0836
Inflation Rate <sup>1</sup>	1.9%

<sup>1</sup> Future rates determined using a 1.9% annual escalator.

**Table 2 - Low Income Weatherization Annual Program Costs**

Measure Group	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Incentives	Total Utility Costs	Gross Customer Costs
Low Income	\$0	\$32,243	\$91,495	\$607	\$654,175	\$778,519	\$0
<b>Total</b>	<b>\$0</b>	<b>\$32,243</b>	<b>\$91,495</b>	<b>\$607</b>	<b>\$654,175</b>	<b>\$778,519</b>	<b>\$0</b>

**Table 3 - Low Income Weatherization Savings by Measure Category**

Measure Group	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
Low Income	294,462	100%	294,462	100%	294,462	30
<b>Total</b>	<b>294,462</b>	<b>100%</b>	<b>294,462</b>	<b>100%</b>	<b>294,462</b>	<b>30</b>

**Table 4 - Low Income Weatherization Program Level Cost-Effectiveness Results  
 (Decrement - West Residential Whole House - 49%, Load Shape – Cooling)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1673	\$778,519	\$463,755	-\$314,764	0.60
Total Resource Cost Test (TRC) No Adder	\$0.1673	\$778,519	\$421,595	-\$356,924	0.54
Utility Cost Test (UCT)	\$0.1673	\$778,519	\$421,595	-\$356,924	0.54
Rate Impact Test (RIM)		\$1,197,724	\$421,595	-\$776,128	0.35
Participant Cost Test (PCT)		\$0	\$1,073,380	\$1,073,380	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000062041
Discounted Participant Payback (years)					n/a

In addition to the energy benefits reported above, the Low Income program offers significant non-energy benefits (NEBs). Table 5 details the non-energy benefits and Table 6 provides the cost-effectiveness results.

**Table 5 - Low Income Weatherization Non-Energy Benefits**

Non-Energy Benefit	Program Impact	Perspective Adjusted
External Payment Reduction	\$25,725	PTRC, TRC, UCT, RIM
Home Repair Costs	\$30,817	PTRC, TRC, PCT
Economic Impact	\$303,506	PTRC, TRC
<b>Total</b>	<b>\$360,048</b>	-

**Table 6 - Low Income Weatherization Program (with NEBs) Level Cost-Effectiveness Results  
 (Decrement - West Residential Whole House - 49%, Load Shape – Cooling)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1673	\$778,519	\$823,803	\$45,284	1.06
Total Resource Cost Test (TRC) No Adder	\$0.1673	\$778,519	\$781,643	\$3,124	1.00
Utility Cost Test (UCT)	\$0.1673	\$778,519	\$447,320	-\$331,199	0.57
Rate Impact Test (RIM)		\$1,197,724	\$447,320	-\$750,403	0.37
Participant Cost Test (PCT)		\$0	\$1,104,197	\$1,104,197	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000059985
Discounted Participant Payback (years)					n/a



Navigant estimated the cost-effectiveness results for the Washington Wattsmart Business Program, based on 2016 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program and for the 11 measure categories.

Cost-effectiveness was tested using the 2015 IRP west industrial 44%, west plug loads 61%, west commercial lighting 46% and west commercial cooling 13% load factor decrements. The program passes the cost-effectiveness for all the tests except the RIM test. The memo consists of the following tables.

- Table 1 - Utility Inputs
- Table 2 – Annual Wattsmart Business Program Costs by Measure Category
- Table 3 – Annual Wattsmart Business Program Savings by Measure Category
- Table 4 - Benefit/Cost Ratios by Measure Category
- Table 5 – Wattsmart Business Program Level Cost-Effectiveness Results
- Table 6 - Wattsmart Business Building Shell Cost-Effectiveness Results
- Table 7 - Wattsmart Business Compressed Air Cost-Effectiveness Results
- Table 8 - Wattsmart Business Energy Management Cost-Effectiveness Results
- Table 9 - Wattsmart Business Farm & Dairy Cost-Effectiveness Results
- Table 10 - Wattsmart Business Food Service Equipment Cost-Effectiveness Results
- Table 11 - Wattsmart Business HVAC Cost-Effectiveness Results
- Table 12 - Wattsmart Business Irrigation Cost-Effectiveness Results
- Table 13 - Wattsmart Business Lighting Cost-Effectiveness Results
- Table 14 - Wattsmart Business Motors Cost-Effectiveness Results
- Table 15 - Wattsmart Business Refrigeration Cost-Effectiveness Results
- Table 16 - Wattsmart Business Wastewater Cost-Effectiveness Results



**Table 1 - Utility Inputs**

Parameter	Value
Discount Rate	6.66%
Residential Line Loss	9.67%
Commercial Line Loss	9.53%
Industrial Line Loss	8.16%
Irrigation Line Loss	9.67%
Residential Energy Rate (\$/kWh)	\$0.0836
Commercial Energy Rate (\$/kWh)	\$0.0717
Industrial Energy Rate (\$/kWh)	\$0.0887
Irrigation Energy Rate (\$/kWh)	\$0.1327
Inflation Rate <sup>1</sup>	1.9%

<sup>1</sup> Future rates determined using a 1.9% annual escalator.

**Table 2 – Annual Wattsmart Business Program Costs by Measure Category**

Measure Group	Engineering Costs	Utility Admin	Program Admin	Program Dev.	Incentives	Total Utility Costs	Gross Customer Costs
Building Shell	\$996	\$751	\$65,771	\$271	\$35,776	\$103,565	\$166,363
Compressed Air	\$24,968	\$18,827	\$53,681	\$6,799	\$169,460	\$273,735	\$354,368
Energy Management	\$26,914	\$20,294	\$94,207	\$7,329	\$31,429	\$180,173	\$44,925
Farm & Dairy	\$1,768	\$1,333	\$11,500	\$482	\$9,165	\$24,248	\$32,531
Food Service Equipment	\$2,685	\$2,025	\$207,110	\$731	\$10,000	\$222,551	\$16,850
HVAC	\$16,485	\$12,430	\$791,965	\$4,489	\$125,527	\$950,897	\$578,488
Irrigation	\$0	\$10,064	\$74,517	\$3,210	\$90,240	\$178,031	\$290,507
Lighting	\$305,355	\$230,249	\$101,959	\$267,436	\$2,380,026	\$3,285,025	\$5,578,641
Motors	\$1,675	\$1,263	\$54,073	\$456	\$12,732	\$70,199	\$25,317
Refrigeration	\$95,962	\$72,359	\$146,248	\$26,131	\$798,659	\$1,139,359	\$1,695,890
Wastewater	\$32,952	\$24,847	\$0	\$8,973	\$279,621	\$346,394	\$673,298
<b>Total</b>	<b>\$509,761</b>	<b>\$394,442</b>	<b>\$1,601,031</b>	<b>\$326,307</b>	<b>\$3,942,636</b>	<b>\$6,774,176</b>	<b>\$9,457,179</b>

**Table 3 – Annual Wattsmart Business Program Savings by Measure Category**

Measure Group	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
Building Shell	58,143	100%	58,143	100%	58,143	16
Compressed Air	1,457,871	100%	1,457,871	100%	1,457,871	14
Energy Management	1,571,461	100%	1,571,461	100%	1,571,461	3
Farm & Dairy	103,251	100%	103,251	100%	103,251	14
Food Service Equipment	156,774	100%	156,774	100%	156,774	9
HVAC	962,554	100%	962,554	100%	962,554	16
Irrigation	779,279	100%	779,279	100%	779,279	12
Lighting	17,829,274	100%	17,829,274	100%	17,829,274	13
Motors	97,810	100%	97,810	100%	97,810	13
Refrigeration	5,603,090	100%	5,603,090	100%	5,603,090	15
Wastewater	1,924,052	100%	1,924,052	100%	1,924,052	16
<b>Total</b>	<b>30,543,559</b>	<b>100%</b>	<b>30,543,559</b>	<b>100%</b>	<b>30,543,559</b>	<b>13</b>

**Table 4 - Benefit/Cost Ratios by Measure Category**

Measure Group	PTRC	TRC	UCT	RIM	PCT
Building Shell	0.41	0.37	0.83	0.56	0.51
Compressed Air	2.53	2.30	3.85	0.65	4.30
Energy Management	1.56	1.42	1.52	0.47	9.69
Farm & Dairy	1.63	1.48	2.91	0.68	2.74
Food Service Equipment	0.40	0.36	0.37	0.27	5.73
HVAC	0.65	0.59	0.87	0.47	1.63
Irrigation	2.78	2.53	5.38	0.87	3.49
Lighting	2.10	1.91	3.77	0.72	2.90
Motors	0.89	0.81	0.95	0.44	3.75
Refrigeration	2.37	2.16	3.86	0.68	3.64
Wastewater	2.29	2.08	4.45	0.65	3.42
<b>Total</b>	<b>1.95</b>	<b>1.77</b>	<b>3.21</b>	<b>0.68</b>	<b>3.06</b>

**Table 5 – Wattsmart Business Program Level Cost-Effectiveness Results**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0423	\$12,288,719	\$23,910,899	\$11,622,179	1.95
Total Resource Cost Test (TRC) No Adder	\$0.0423	\$12,288,719	\$21,737,181	\$9,448,461	1.77
Utility Cost Test (UCT)	\$0.0233	\$6,774,176	\$21,737,181	\$14,963,005	3.21
Rate Impact Test (RIM)		\$31,779,478	\$21,737,181	-\$10,042,297	0.68
Participant Cost Test (PCT)		\$9,457,179	\$28,947,938	\$19,490,759	3.06
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001783812

Table 6 through Table 16 provide cost-effectiveness results for all 11 measures.

**Table 6 - Wattsmart Business Building Shell Cost-Effectiveness Results (Decrement - West Commercial Cooling - 13%, Load Shape – HVAC)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.3653	\$234,152	\$94,971	-\$139,181	0.41
Total Resource Cost Test (TRC) No Adder	\$0.3653	\$234,152	\$86,338	-\$147,814	0.37
Utility Cost Test (UCT)	\$0.1616	\$103,565	\$86,338	-\$17,228	0.83
Rate Impact Test (RIM)		\$152,903	\$86,338	-\$66,565	0.56
Participant Cost Test (PCT)		\$166,363	\$85,114	-\$81,249	0.51
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000009732
Discounted Participant Payback (years)					n/a

**Table 7 - Wattsmart Business Compressed Air Cost-Effectiveness Results (Decrement - West Industrial - 44%, Load Shape – Machinery General)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0313	\$458,643	\$1,160,149	\$701,505	2.53
Total Resource Cost Test (TRC) No Adder	\$0.0313	\$458,643	\$1,054,681	\$596,037	2.30
Utility Cost Test (UCT)	\$0.0187	\$273,735	\$1,054,681	\$780,946	3.85
Rate Impact Test (RIM)		\$1,628,464	\$1,054,681	-\$573,784	0.65
Participant Cost Test (PCT)		\$354,368	\$1,524,189	\$1,169,821	4.30
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000095111
Discounted Participant Payback (years)					1.47

**Table 8 - Wattsmart Business Energy Management Cost-Effectiveness Results  
 (Decrement - West Plug Loads - 61%, Load Shape - Plug Loads)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0451	\$193,668	\$301,703	\$108,035	1.56
Total Resource Cost Test (TRC) No Adder	\$0.0451	\$193,668	\$274,276	\$80,607	1.42
Utility Cost Test (UCT)	\$0.0419	\$180,173	\$274,276	\$94,103	1.52
Rate Impact Test (RIM)		\$584,007	\$274,276	-\$309,732	0.47
Participant Cost Test (PCT)		\$44,925	\$435,264	\$390,339	9.69
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000192621
Discounted Participant Payback (years)					0.10

**Table 9 - Wattsmart Business Farm & Dairy Cost-Effectiveness Results  
 (Decrement - West Plug Loads - 61%, Load Shape - Plug Loads)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0459	\$47,614	\$77,532	\$29,918	1.63
Total Resource Cost Test (TRC) No Adder	\$0.0459	\$47,614	\$70,483	\$22,870	1.48
Utility Cost Test (UCT)	\$0.0234	\$24,248	\$70,483	\$46,235	2.91
Rate Impact Test (RIM)		\$104,078	\$70,483	-\$33,595	0.68
Participant Cost Test (PCT)		\$32,531	\$88,995	\$56,464	2.74
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000005569
Discounted Participant Payback (years)					3.26

**Table 10 - Wattsmart Business Food Service Equipment Cost-Effectiveness Results  
 (Decrement - West Industrial - 44%, Load Shape – HVAC)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2037	\$229,401	\$91,747	-\$137,654	0.40
Total Resource Cost Test (TRC) No Adder	\$0.2037	\$229,401	\$83,406	-\$145,995	0.36
Utility Cost Test (UCT)	\$0.1976	\$222,551	\$83,406	-\$139,145	0.37
Rate Impact Test (RIM)		\$309,030	\$83,406	-\$225,624	0.27
Participant Cost Test (PCT)		\$16,850	\$96,480	\$79,629	5.73
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000056126
Discounted Participant Payback (years)					0.60

**Table 11 - Wattsmart Business HVAC Cost-Effectiveness Results  
 (Decrement - West Industrial - 44%, Load Shape - HVAC)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1323	\$1,403,858	\$911,645	-\$492,213	0.65
Total Resource Cost Test (TRC) No Adder	\$0.1323	\$1,403,858	\$828,768	-\$575,090	0.59
Utility Cost Test (UCT)	\$0.0896	\$950,897	\$828,768	-\$122,129	0.87
Rate Impact Test (RIM)		\$1,767,683	\$828,768	-\$938,915	0.47
Participant Cost Test (PCT)		\$578,488	\$942,313	\$363,825	1.63
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000137269
Discounted Participant Payback (years)					7.44

**Table 12 - Wattsmart Business Irrigation Cost-Effectiveness Results  
 (Decrement - West Commercial Cooling - 13%, Load Shape – Irrigation)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0540	\$378,298	\$1,052,658	\$674,360	2.78
Total Resource Cost Test (TRC) No Adder	\$0.0540	\$378,298	\$956,962	\$578,663	2.53
Utility Cost Test (UCT)	\$0.0254	\$178,031	\$956,962	\$778,931	5.38
Rate Impact Test (RIM)		\$1,101,316	\$956,962	-\$144,355	0.87
Participant Cost Test (PCT)		\$290,507	\$1,013,525	\$723,018	3.49
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000027623
Discounted Participant Payback (years)					2.10

**Table 13 - Wattsmart Business Lighting Cost-Effectiveness Results  
 (Decrement - West Commercial Lighting - 46%, Load Shape - Lighting)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0382	\$6,483,639	\$13,617,079	\$7,133,440	2.10
Total Resource Cost Test (TRC) No Adder	\$0.0382	\$6,483,639	\$12,379,163	\$5,895,524	1.91
Utility Cost Test (UCT)	\$0.0193	\$3,285,025	\$12,379,163	\$9,094,138	3.77
Rate Impact Test (RIM)		\$17,107,735	\$12,379,163	-\$4,728,572	0.72
Participant Cost Test (PCT)		\$5,578,641	\$16,202,736	\$10,624,096	2.90
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000839935
Discounted Participant Payback (years)					2.40

**Table 14 - Wattsmart Business Motors Cost-Effectiveness Results  
 (Decrement - West Industrial - 44%, Load Shape – Machinery General)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0888	\$82,784	\$73,462	-\$9,323	0.89
Total Resource Cost Test (TRC) No Adder	\$0.0888	\$82,784	\$66,783	-\$16,001	0.81
Utility Cost Test (UCT)	\$0.0753	\$70,199	\$66,783	-\$3,416	0.95
Rate Impact Test (RIM)		\$152,406	\$66,783	-\$85,623	0.44
Participant Cost Test (PCT)		\$25,317	\$94,939	\$69,622	3.75
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000015209
Discounted Participant Payback (years)					1.56

**Table 15 - Wattsmart Business Refrigeration Cost-Effectiveness Results  
 (Decrement – West Industrial - 44%, Load Shape - Refrigeration)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0345	\$2,036,590	\$4,835,086	\$2,798,497	2.37
Total Resource Cost Test (TRC) No Adder	\$0.0345	\$2,036,590	\$4,395,533	\$2,358,943	2.16
Utility Cost Test (UCT)	\$0.0193	\$1,139,359	\$4,395,533	\$3,256,174	3.86
Rate Impact Test (RIM)		\$6,505,680	\$4,395,533	-\$2,110,147	0.68
Participant Cost Test (PCT)		\$1,695,890	\$6,164,980	\$4,469,090	3.64
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000327852
Discounted Participant Payback (years)					0.68

**Table 16 - Wattsmart Business Wastewater Cost-Effectiveness Results  
 (Decrement - West Industrial - 44%, Load Shape – Machinery General)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0349	\$740,071	\$1,694,866	\$954,795	2.29
Total Resource Cost Test (TRC) No Adder	\$0.0349	\$740,071	\$1,540,788	\$800,717	2.08
Utility Cost Test (UCT)	\$0.0163	\$346,394	\$1,540,788	\$1,194,394	4.45
Rate Impact Test (RIM)		\$2,366,175	\$1,540,788	-\$825,387	0.65
Participant Cost Test (PCT)		\$673,298	\$2,299,402	\$1,626,104	3.42
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000120671
Discounted Participant Payback (years)					2.34