

# **Appendix A**

## APPENDIX

### Appendix A: Cost-effectiveness Results<sup>1</sup>

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<sup>1</sup> Cost-effectiveness results were generated by Applied Energy Group (AEG) using the approved Cost-effectiveness methodologies.



## MEMORANDUM

To: Alesha Mander, PacifiCorp  
From: Eli Morris, Andy Hudson, Julian Graybill Brubaker, Elizabeth Applegate, AEG  
Date: May 24, 2024  
Re: PacifiCorp Washington Portfolio and Sector Level Cost-Effectiveness Results – PY2023

AEG estimated the cost-effectiveness of PacifiCorp’s overall energy efficiency portfolio in the state of Washington based on Program Year (PY) 2023 costs and savings<sup>1</sup> estimates provided by PacifiCorp. This memo provides cost-effectiveness results at the portfolio and sector levels. The portfolio passes the following cost effectiveness tests: Total Resource Cost Test (TRC), the PacifiCorp Total Resource Cost Test (PTRC), the Utility Cost Test (UCT), and the Participant Cost Test (PCT).

This memo provides analysis inputs and results in the following tables:

- Table 1: Cost-Effectiveness Analysis Inputs
- Table 2: Portfolio Level Costs, Nominal - PY2023
- Table 3: NEEA Inputs - PY2023
- Table 4: Benefit/Cost Ratios by Portfolio Type
- Table 5: 2023 Total Portfolio Cost-Effectiveness Results
- Table 6: 2023 Total Portfolio Cost-Effectiveness Results (Including NEEA)
- Table 7: 2023 Total Portfolio Cost-Effectiveness Results (Including NEIs)
- Table 8: 2023 Total Portfolio Cost-Effectiveness Results (Including NEEA & NEIs)
- Table 9: 2023 Wattsmart Business Energy Efficiency Sector Cost-Effectiveness Results
- Table 10: 2023 Wattsmart Business Energy Efficiency Sector Cost-Effectiveness Results (Including NEIs)
- Table 11: 2023 Residential Energy Efficiency Sector Cost-Effectiveness Results
- Table 12: 2023 Residential Energy Efficiency Sector Cost-Effectiveness Results (Including NEIs)
- Table 13: 2023 Residential Non-Energy Impacts by Measure Category

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<sup>1</sup> The commercial line loss factor was used for all Wattsmart Business savings; commercial sector savings represent approximately 74% of total program savings.



- Table 14: 2023 Wattsmart Business Non-Energy Impacts by Measure

The following assumptions were utilized in the analysis:

- **Avoided Costs:** derived from PacifiCorp’s 2021 Integrated Resource Plan (IRP) Preferred Portfolio “P02-MM-CETA”, converted into annual values using load shapes from the same IRP.
- **Modeling Inputs:** measure savings, costs, non-energy impacts (NEIs), measure lives, incentive levels, program delivery, and portfolio costs were based on estimates provided by PacifiCorp.
- **Net-to-Gross (NTG):** ratios are assumed to be 1.0, consistent with condition (8)(a) to Order 01 in Docket UE-152072.
- **Retail Rates:** 2023 rates provided by PacifiCorp and escalated by inflation for future years.

Tables 1 and 2 below summarize cost-effectiveness assumptions for the PacifiCorp Washington energy efficiency portfolio. All costs and impacts are presented at the portfolio level. Table 3 provides the savings and costs assumptions for NEEA.

*Table 1: Cost-Effectiveness Analysis Inputs*

<b>Parameter</b>	<b>PY2023</b>
Discount Rate	6.77%
Residential Line Loss	7.68%
Commercial Line Loss	7.60%
Industrial Line Loss	6.82%
Irrigation Line Loss	7.68%
Residential Energy Rate (\$/kWh)	\$0.107
Commercial Energy Rate (\$/kWh)	\$0.100
Industrial Energy Rate (\$/kWh)	\$0.088
Irrigation Energy Rate (\$/kWh)	\$0.093
Inflation Rate	2.27%

*Table 2: Portfolio Level Costs, Nominal - PY2023<sup>2</sup>*

<b>Portfolio Level Expense</b>	<b>Cost</b>
Be Wattsmart, Begin at Home	\$51,135
Outreach and Communication	\$170,587
Program Evaluations	\$162,487
Potential Study	\$49,695
System Support	\$73,183
End Use Load Research	\$36,119
<b>Total</b>	<b>\$543,205</b>

<sup>2</sup> To align with annual budget expectations, cost-effectiveness inputs are presented in nominal dollars.



Table 3: NEEA Inputs - PY2023

Sector	Savings at Meter (kWh)	Expenses (\$)
Residential	2,731,819	\$763,408
Commercial	639,633	\$178,746
Industrial	44,170	\$12,343
<b>Total</b>	<b>3,415,622</b>	<b>\$954,497</b>

Tables 4 through 16 present the cost-effectiveness results at the portfolio and sector levels. Tables 17 and 18 present the NEI impacts for the residential and commercial sectors by measure category.

Table 4: Benefit/Cost Ratios by Portfolio Type<sup>3</sup>

Program	PTRC	TRC	UCT	PCT	RIM
Total Portfolio	1.91	1.73	2.09	3.52	0.67
Total Portfolio with NEEA	2.01	1.83	2.19	3.81	0.67
Total Portfolio with NEIs	2.23	2.06	2.09	4.03	0.67
Total Portfolio with NEEA and NEIs	2.32	2.14	2.19	4.32	0.67
Wattsmart Business	2.78	2.52	2.90	4.61	0.73
Wattsmart Business with NEEA	2.80	2.55	2.92	4.71	0.73
Wattsmart Business with NEIs	3.24	2.99	2.90	5.29	0.73
Wattsmart Business with NEEA and NEIs	3.26	3.01	2.92	5.39	0.73
Residential	0.79	0.71	0.94	1.77	0.49
Residential with NEEA	1.07	0.97	1.25	2.37	0.55
Residential with NEIs	0.94	0.87	0.94	2.02	0.49
Residential with NEEA and NEIs	1.21	1.11	1.25	2.62	0.55

Table 5: 2023 Total Portfolio Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0601	\$21,650,635	\$41,268,958	\$19,618,322	1.91
Total Resource Cost Test (TRC) No Adder	\$0.0601	\$21,650,635	\$37,517,234	\$15,866,599	1.73
Utility Cost Test (UCT)	\$0.0498	\$17,951,639	\$37,517,234	\$19,565,595	2.09
Participant Cost Test (PCT)		\$13,745,965	\$48,378,098	\$34,632,133	3.52
Rate Impact Test (RIM)		\$56,282,768	\$37,517,234	(\$18,765,534)	0.67
Lifecycle Revenue Impacts (\$/kWh)					0.00085
Discounted Participant Payback (years)					2.50

<sup>3</sup> Portfolio and Residential results exclude the Low Income Program from the analysis.



Table 6: 2023 Total Portfolio Cost-Effectiveness Results (Including NEEA)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.057	\$22,605,133	\$45,453,037	\$22,847,904	2.01
Total Resource Cost Test (TRC) No Adder	\$0.057	\$22,605,133	\$41,320,942	\$18,715,810	1.83
Utility Cost Test (UCT)	\$0.048	\$18,906,136	\$41,320,942	\$22,414,806	2.19
Participant Cost Test (PCT)		\$13,745,965	\$52,376,890	\$38,630,925	3.81
Rate Impact Test (RIM)		\$61,236,058	\$41,320,942	(\$19,915,115)	0.67
Lifecycle Revenue Impacts (\$/kWh)					0.00092
Discounted Participant Payback (years)					2.38

Table 7: 2023 Total Portfolio Cost-Effectiveness Results (Including NEIs)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0601	\$21,650,635	\$48,330,772	\$26,680,136	2.23
Total Resource Cost Test (TRC) No Adder	\$0.0601	\$21,650,635	\$44,579,048	\$22,928,413	2.06
Utility Cost Test (UCT)	\$0.0498	\$17,951,639	\$37,517,234	\$19,565,595	2.09
Participant Cost Test (PCT)		\$13,745,965	\$55,439,912	\$41,693,947	4.03
Rate Impact Test (RIM)		\$56,282,768	\$37,517,234	(\$18,765,534)	0.67
Lifecycle Revenue Impacts (\$/kWh)					0.00085
Discounted Participant Payback (years)					2.50



Table 8: 2023 Total Portfolio Cost-Effectiveness Results (Including NEEA & NEIs)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.057	\$22,605,133	\$52,514,851	\$29,909,718	2.32
Total Resource Cost Test (TRC) No Adder	\$0.057	\$22,605,133	\$48,382,756	\$25,777,623	2.14
Utility Cost Test (UCT)	\$0.048	\$18,906,136	\$41,320,942	\$22,414,806	2.19
Participant Cost Test (PCT)		\$13,745,965	\$59,438,704	\$45,692,739	4.32
Rate Impact Test (RIM)		\$61,236,058	\$41,320,942	(\$19,915,115)	0.67
Lifecycle Revenue Impacts (\$/kWh)					0.00092
Discounted Participant Payback (years)					2.38

Table 9: 2023 Wattsmart Business Energy Efficiency Sector Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0405	\$12,391,884	\$34,418,434	\$22,026,550	2.78
Total Resource Cost Test (TRC) No Adder	\$0.0405	\$12,391,884	\$31,289,485	\$18,897,601	2.52
Utility Cost Test (UCT)	\$0.0353	\$10,785,471	\$31,289,485	\$20,504,014	2.90
Participant Cost Test (PCT)		\$8,457,696	\$38,993,068	\$30,535,372	4.61
Rate Impact Test (RIM)		\$42,927,256	\$31,289,485	(\$11,637,771)	0.73
Lifecycle Revenue Impacts (\$/kWh)					0.00086
Discounted Participant Payback (years)					1.95



Table 10: 2023 Wattsmart Business Energy Efficiency Sector Cost-Effectiveness Results (Including NEIs)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0405	\$12,391,884	\$40,160,934	\$27,769,050	3.24
Total Resource Cost Test (TRC) No Adder	\$0.0405	\$12,391,884	\$37,031,985	\$24,640,101	2.99
Utility Cost Test (UCT)	\$0.0353	\$10,785,471	\$31,289,485	\$20,504,014	2.90
Participant Cost Test (PCT)		\$8,457,696	\$44,735,568	\$36,277,872	5.29
Rate Impact Test (RIM)		\$42,927,256	\$31,289,485	(\$11,637,771)	0.73
Lifecycle Revenue Impacts (\$/kWh)					0.00086
Discounted Participant Payback (years)					1.95

Table 11: 2023 Residential Energy Efficiency Sector Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1608	\$8,715,547	\$6,850,524	(\$1,865,023)	0.79
Total Resource Cost Test (TRC) No Adder	\$0.1608	\$8,715,547	\$6,227,749	(\$2,487,797)	0.71
Utility Cost Test (UCT)	\$0.1222	\$6,622,963	\$6,227,749	(\$395,214)	0.94
Participant Cost Test (PCT)		\$5,288,270	\$9,385,030	\$4,096,761	1.77
Rate Impact Test (RIM)		\$12,812,307	\$6,227,749	(\$6,584,558)	0.49
Lifecycle Revenue Impacts (\$/kWh)					0.00019
Discounted Participant Payback (years)					4.51





Table 12: 2023 Residential Energy Efficiency Sector Cost-Effectiveness Results (Including NEIs)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1608	\$8,715,547	\$8,169,838	(\$545,709)	0.94
Total Resource Cost Test (TRC) No Adder	\$0.1608	\$8,715,547	\$7,547,063	(\$1,168,484)	0.87
Utility Cost Test (UCT)	\$0.1222	\$6,622,963	\$6,227,749	(\$395,214)	0.94
Participant Cost Test (PCT)		\$5,288,270	\$10,704,344	\$5,416,074	2.02
Rate Impact Test (RIM)		\$12,812,307	\$6,227,749	(\$6,584,558)	0.49
Lifecycle Revenue Impacts (\$/kWh)					0.00052
Discounted Participant Payback (years)					4.51

Table 13: 2023 Residential Non-Energy Impacts by Measure Category

Measure	Annual NEIs	Quantity	Measure Life	Total Present Value NEIs
Appliances	\$1,223	71	13	\$11,578
Building Shell	\$479	173,244	45	\$7,156
HVAC	\$112,148	3,727	16	\$1,187,910
Lighting	\$6,112	26,250	3	\$17,198
Water Heating	\$159	46	13	\$1,436
Whole Home	\$47	10	33	\$665
Electronics	\$13,291	4,288	9	\$93,370
<b>Total</b>	<b>\$133,460</b>	<b>207,636</b>	<b>15</b>	<b>\$1,319,314</b>

Table 14: 2023 Wattsmart Business Non-Energy Impacts by Measure

Measure	Annual Non-Energy Impacts	Quantity	Measure Life	Total Present Value NEIs
Additional Measures	\$10	6	15	\$95
Compressed Air	\$1,306	3	14	\$12,368
Energy Management	\$246,676	35	3	\$694,097
HVAC	\$1,539	301	14	\$14,567
Irrigation	\$9,777	4,874	11	\$83,938
Lighting	\$296,064	31,579	10	\$2,397,785
Motors	\$19,810	15	15	\$202,884
Refrigeration	\$240,816	55	15	\$2,376,219
Wastewater	(\$3,998)	1	15	-\$39,452
<b>Total</b>	<b>\$811,999</b>	<b>\$36,884</b>	<b>11</b>	<b>\$5,021,374</b>



## MEMORANDUM

To: Alesha Mander, PacifiCorp  
From: Eli Morris, Andy Hudson, Julian Graybill Brubaker, Elizabeth Applegate, AEG  
Date: April 26, 2024  
Re: PacifiCorp Washington Home Energy Savings Cost-Effectiveness Results – PY2023

AEG estimated the cost-effectiveness of PacifiCorp’s overall energy efficiency portfolio in the state of Washington based on Program Year (PY) 2023 costs and savings estimates provided by PacifiCorp. This memo provides cost-effectiveness results for the Home Energy Savings (HES) program. The program passes the Participant Cost Test (PCT).

This memo provides analysis inputs and results in the following tables:

- Table 1: Cost-Effectiveness Analysis Inputs
- Table 2: Annual Program Level Costs, Nominal - PY2023
- Table 3: Annual Savings - PY2023
- Table 4: 2023 Benefit/Cost Ratios by Measure Category
- Table 5: 2023 Home Energy Savings Program Cost-Effectiveness Results
- Table 6: 2023 Home Energy Savings Appliances Cost-Effectiveness Results (Load Shape - Residential\_ERWH\_7P)
- Table 7: 2023 Home Energy Savings Building Shell Cost-Effectiveness Results (Load Shape - WA\_Single\_Family\_Heat\_pump)
- Table 8: 2023 Home Energy Savings HVAC Cost-Effectiveness Results (Load Shape - WA\_Single\_Family\_Heat\_pump)
- Table 9: 2023 Home Energy Savings Lighting Cost-Effectiveness Results (Load Shape - Residential\_LIGHTING\_7P)
- Table 10: 2023 Home Energy Savings Water Heating Cost-Effectiveness Results (Load Shape - Residential\_HPWH\_7P)
- Table 11: 2023 Home Energy Savings Whole Home Cost-Effectiveness Results (Load Shape - WA\_Single\_Family\_Heat\_pump)
- Table 12: 2023 Home Energy Savings Electronics Cost-Effectiveness Results (Load Shape - WA\_Single\_Family\_Plug)



- Table 13: 2023 Home Energy Savings Non-Energy Impacts by Measure Category
- Table 14: 2023 Home Energy Savings Program Cost-Effectiveness Results (Including NEIs)
- Table 15: 2023 Home Energy Savings Appliances Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential\_ERWH\_7P)
- Table 16: 2023 Home Energy Savings Building Shell Cost-Effectiveness Results (Including NEIs) (Load Shape - WA\_Single\_Family\_Heat\_pump)
- Table 17: 2023 Home Energy Savings HVAC Cost-Effectiveness Results (Including NEIs) (Load Shape - WA\_Single\_Family\_Heat\_pump)
- Table 18: 2023 Home Energy Savings Lighting Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential\_LIGHTING\_7P)
- Table 19: 2023 Home Energy Savings Water Heating Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential\_HPWH\_7P)
- Table 20: 2023 Home Energy Savings Whole Home Cost-Effectiveness Results (Including NEIs) (Load Shape - WA\_Single\_Family\_Heat\_pump)
- Table 21: 2023 Home Energy Savings Electronics Cost-Effectiveness Results (Including NEIs) (Load Shape - WA\_Single\_Family\_Plug)

The following assumptions were utilized in the analysis:

- **Avoided Costs:** derived from PacifiCorp's 2021 Integrated Resource Plan (IRP) Preferred Portfolio "P02-MM-CETA", converted into annual values using load shapes from the same IRP.
- **Modeling Inputs:** measure savings, costs, non-energy impacts (NEIs), measure lives, incentive levels, program delivery, and portfolio costs were based on estimates provided by PacifiCorp.
- **Net-to-Gross (NTG):** ratios are assumed to be 1.0, consistent with condition (8)(a) to Order 01 in Docket UE-152072.
- **Retail Rates:** 2023 rates provided by PacifiCorp and escalated by inflation for future years.

Tables 1 and 2 below summarize cost-effectiveness assumptions for the PacifiCorp Washington Home Energy Savings program. All costs and impacts are presented at the program level. Table 3 provides the annual savings for the program.



Table 1: Cost-Effectiveness Analysis Inputs<sup>1</sup>

Parameter	PY2023
Discount Rate	6.77%
Residential Line Loss	7.68%
Residential Energy Rate (\$/kWh)	\$0.1071
Inflation Rate	2.27%
Net-to-Gross	100%
Realization Rate	100%

Table 2: Annual Program Level Costs, Nominal - PY2023<sup>2</sup>

Program Level Expense	Program Delivery	Utility Admin	Program Development	Incentives	Total Utility Budget	Gross Customer Costs
Appliances	\$7,801	\$307	\$240	\$11,919	\$20,268	\$8,843
Building Shell	\$70,863	\$2,788	\$2,183	\$161,104	\$236,938	\$410,677
HVAC	\$2,185,893	\$85,993	\$67,350	\$2,771,537	\$5,110,774	\$4,574,820
Lighting	\$152,601	\$6,003	\$4,702	\$52,457	\$215,763	\$37,907
Water Heating	\$38,098	\$1,499	\$1,174	\$41,029	\$81,800	\$40,460
Whole Home	\$14,927	\$587	\$460	\$29,000	\$44,974	\$39,526
Electronics	\$325,844	\$12,819	\$10,040	\$128,640	\$477,342	\$176,038
<b>Total</b>	<b>\$2,796,027</b>	<b>\$109,996</b>	<b>\$86,149</b>	<b>\$3,195,686</b>	<b>\$6,187,859</b>	<b>\$5,288,270</b>

Table 3: Annual Savings - PY2023

Measure Category	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	NTG Ratio	Net kWh Savings at Site	Measure Life
Appliances	13,934	100%	13,934	100%	13,934	13
Building Shell	126,570	91%	115,178	100%	115,178	45
HVAC	3,904,269	94%	3,671,589	100%	3,671,589	16
Lighting	272,564	85%	231,680	100%	231,680	3
Water Heating	68,048	100%	68,048	100%	68,048	13
Whole Home	26,661	91%	24,261	100%	24,261	33
Electronics	581,996	86%	500,517	100%	500,517	9
<b>Total</b>	<b>4,994,042</b>	<b>93%</b>	<b>4,625,207</b>	<b>100%</b>	<b>4,625,207</b>	<b>15</b>

Tables 4 through 12 present the cost-effectiveness results at the program and measure category levels.

<sup>1</sup> Future inflation rates determined using a 2.27% annual escalator.

<sup>2</sup> To align with annual budget expectations, cost-effectiveness inputs are presented in nominal dollars.



Table 4: 2023 Benefit/Cost Ratios by Measure Category

Program	PTRC	TRC	UCT	PCT	RIM
Appliances	0.92	0.83	0.71	3.16	0.39
Appliances (with NEIs)	1.59	1.51	0.71	4.47	0.39
Building Shell	0.64	0.58	1.19	1.00	0.58
Building Shell (with NEIs)	0.65	0.60	1.19	1.02	0.58
HVAC	0.75	0.68	0.92	1.66	0.47
HVAC (with NEIs)	0.92	0.85	0.92	1.92	0.47
Lighting	0.43	0.39	0.36	3.27	0.27
Lighting (with NEIs)	0.52	0.48	0.36	3.72	0.27
Water Heating	0.85	0.77	0.77	2.85	0.40
Water Heating (with NEIs)	0.87	0.79	0.77	2.88	0.40
Whole Home	1.07	0.97	1.20	1.93	0.58
Whole Home (with NEIs)	1.08	0.98	1.20	1.95	0.58
Electronics	0.81	0.74	0.81	3.05	0.44
Electronics (with NEIs)	0.99	0.92	0.81	3.58	0.44
<b>Total</b>	<b>0.74</b>	<b>0.67</b>	<b>0.90</b>	<b>1.68</b>	<b>0.47</b>
<b>Total (with NEIs)</b>	<b>0.90</b>	<b>0.83</b>	<b>0.90</b>	<b>1.93</b>	<b>0.47</b>

Table 5: 2023 Home Energy Savings Program Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1677	\$8,280,442	\$6,143,247	(\$2,137,195)	0.74
Total Resource Cost Test (TRC) No Adder	\$0.1677	\$8,280,442	\$5,584,770	(\$2,695,672)	0.67
Utility Cost Test (UCT)	\$0.1253	\$6,187,859	\$5,584,770	(\$603,088)	0.90
Participant Cost Test (PCT)		\$5,288,270	\$8,906,627	\$3,618,358	1.68
Rate Impact Test (RIM)		\$11,898,800	\$5,584,770	(\$6,314,029)	0.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001793
Discounted Participant Payback (years)					7.63



Table 6: 2023 Home Energy Savings Appliances Cost-Effectiveness Results (Load Shape - Residential\_ERWH\_7P)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1210	\$17,191	\$15,752	(\$1,439)	0.92
Total Resource Cost Test (TRC) No Adder	\$0.1210	\$17,191	\$14,320	(\$2,871)	0.83
Utility Cost Test (UCT)	\$0.1427	\$20,268	\$14,320	(\$5,947)	0.71
Participant Cost Test (PCT)		\$8,843	\$27,950	\$19,107	3.16
Rate Impact Test (RIM)		\$36,299	\$14,320	(\$21,978)	0.39
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000009
Discounted Participant Payback (years)					3.01

Table 7: 2023 Home Energy Savings Building Shell Cost-Effectiveness Results (Load Shape - WA\_Single\_Family\_Heat\_pump)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2625	\$486,511	\$310,693	(\$175,819)	0.64
Total Resource Cost Test (TRC) No Adder	\$0.2625	\$486,511	\$282,448	(\$204,063)	0.58
Utility Cost Test (UCT)	\$0.1278	\$236,938	\$282,448	\$45,509	1.19
Participant Cost Test (PCT)		\$410,677	\$411,632	\$955	1.00
Rate Impact Test (RIM)		\$487,466	\$282,448	(\$205,018)	0.58
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000073
Discounted Participant Payback (years)					44.11



Table 8: 2023 Home Energy Savings HVAC Cost-Effectiveness Results (Load Shape - WA\_Single\_Family\_Heat\_pump)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1651	\$6,914,057	\$5,175,071	(\$1,738,985)	0.75
Total Resource Cost Test (TRC) No Adder	\$0.1651	\$6,914,057	\$4,704,610	(\$2,209,446)	0.68
Utility Cost Test (UCT)	\$0.1220	\$5,110,774	\$4,704,610	(\$406,163)	0.92
Participant Cost Test (PCT)		\$4,574,820	\$7,614,430	\$3,039,610	1.66
Rate Impact Test (RIM)		\$9,953,667	\$4,704,610	(\$5,249,057)	0.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.0002181
Discounted Participant Payback (years)					8.38

Table 9: 2023 Home Energy Savings Lighting Cost-Effectiveness Results (Load Shape - Residential\_LIGHTING\_7P)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2867	\$201,213	\$86,508	(\$114,705)	0.43
Total Resource Cost Test (TRC) No Adder	\$0.2867	\$201,213	\$78,644	(\$122,569)	0.39
Utility Cost Test (UCT)	\$0.3074	\$215,763	\$78,644	(\$137,120)	0.36
Participant Cost Test (PCT)		\$37,907	\$123,802	\$85,896	3.27
Rate Impact Test (RIM)		\$287,109	\$78,644	(\$208,465)	0.27
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000244
Discounted Participant Payback (years)					0.70



Table 10: 2023 Home Energy Savings Water Heating Cost-Effectiveness Results (Load Shape - Residential\_HPWH\_7P)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1226	\$81,231	\$69,003	(\$12,228)	0.85
Total Resource Cost Test (TRC) No Adder	\$0.1226	\$81,231	\$62,730	(\$18,501)	0.77
Utility Cost Test (UCT)	\$0.1235	\$81,800	\$62,730	(\$19,070)	0.77
Participant Cost Test (PCT)		\$40,460	\$115,154	\$74,694	2.85
Rate Impact Test (RIM)		\$155,925	\$62,730	(\$93,196)	0.40
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000040
Discounted Participant Payback (years)					4.51

Table 11: 2023 Home Energy Savings Whole Home Cost-Effectiveness Results (Load Shape - WA\_Single\_Family\_Heat\_pump)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1510	\$55,500	\$59,173	\$3,673	1.07
Total Resource Cost Test (TRC) No Adder	\$0.1510	\$55,500	\$53,794	(\$1,706)	0.97
Utility Cost Test (UCT)	\$0.1224	\$44,974	\$53,794	\$8,820	1.20
Participant Cost Test (PCT)		\$39,526	\$76,391	\$36,865	1.93
Rate Impact Test (RIM)		\$92,365	\$53,794	(\$38,571)	0.58
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000015
Discounted Participant Payback (years)					17.15





Table 12: 2023 Home Energy Savings Electronics Cost-Effectiveness Results (Load Shape - WA\_Single\_Family\_Plug)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1386	\$524,740	\$427,047	(\$97,692)	0.81
Total Resource Cost Test (TRC) No Adder	\$0.1386	\$524,740	\$388,225	(\$136,515)	0.74
Utility Cost Test (UCT)	\$0.1261	\$477,342	\$388,225	(\$89,117)	0.81
Participant Cost Test (PCT)		\$176,038	\$537,267	\$361,230	3.05
Rate Impact Test (RIM)		\$885,969	\$388,225	(\$497,745)	0.44
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000297
Discounted Participant Payback (years)					2.51

Tables 13 through 20 present the NEI impacts for the program and the cost-effectiveness results with NEIs at the program and measure category levels.

Table 13: 2023 Home Energy Savings Non-Energy Impacts by Measure Category

Measure	Annual NEIs	Quantity	Measure Life	Total Present Value NEIs
Appliances	\$1,223	71	13	\$11,578
Building Shell	\$479	173,244	45	\$7,156
HVAC	\$112,148	3,727	16	\$1,187,910
Lighting	\$6,112	26,250	3	\$17,198
Water Heating	\$159	46	13	\$1,436
Whole Home	\$47	10	33	\$665
Electronics	\$13,291	4,288	9	\$93,370
<b>Total</b>	<b>\$133,460</b>	<b>\$207,636</b>	<b>15</b>	<b>\$1,319,314</b>



Table 14: 2023 Home Energy Savings Program Cost-Effectiveness Results (Including NEIs)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1677	\$8,280,442	\$7,462,561	(\$817,881)	0.90
Total Resource Cost Test (TRC) No Adder	\$0.1677	\$8,280,442	\$6,904,084	(\$1,376,358)	0.83
Utility Cost Test (UCT)	\$0.1253	\$6,187,859	\$5,584,770	(\$603,088)	0.90
Participant Cost Test (PCT)		\$5,288,270	\$10,225,941	\$4,937,671	1.93
Rate Impact Test (RIM)		\$11,898,800	\$5,584,770	(\$6,314,029)	0.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001793
Discounted Participant Payback (years)					7.63

Table 15: 2023 Home Energy Savings Appliances Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential\_ERWH\_7P)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1210	\$17,191	\$27,330	\$10,139	1.59
Total Resource Cost Test (TRC) No Adder	\$0.1210	\$17,191	\$25,898	\$8,707	1.51
Utility Cost Test (UCT)	\$0.1427	\$20,268	\$14,320	(\$5,947)	0.71
Participant Cost Test (PCT)		\$8,843	\$39,528	\$30,686	4.47
Rate Impact Test (RIM)		\$36,299	\$14,320	(\$21,978)	0.39
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000009
Discounted Participant Payback (years)					3.01



Table 16: 2023 Home Energy Savings Building Shell Cost-Effectiveness Results (Including NEIs)  
(Load Shape - WA\_Single\_Family\_Heat\_pump)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2625	\$486,511	\$317,849	(\$168,663)	0.65
Total Resource Cost Test (TRC) No Adder	\$0.2625	\$486,511	\$289,604	(\$196,907)	0.60
Utility Cost Test (UCT)	\$0.1278	\$236,938	\$282,448	\$45,509	1.19
Participant Cost Test (PCT)		\$410,677	\$418,788	\$8,111	1.02
Rate Impact Test (RIM)		\$487,466	\$282,448	(\$205,018)	0.58
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000073
Discounted Participant Payback (years)					44.11

Table 17: 2023 Home Energy Savings HVAC Cost-Effectiveness Results (Including NEIs) (Load Shape - WA\_Single\_Family\_Heat\_pump)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1651	\$6,914,057	\$6,362,981	(\$551,076)	0.92
Total Resource Cost Test (TRC) No Adder	\$0.1651	\$6,914,057	\$5,892,520	(\$1,021,537)	0.85
Utility Cost Test (UCT)	\$0.1220	\$5,110,774	\$4,704,610	(\$406,163)	0.92
Participant Cost Test (PCT)		\$4,574,820	\$8,802,340	\$4,227,520	1.92
Rate Impact Test (RIM)		\$9,953,667	\$4,704,610	(\$5,249,057)	0.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.0002181
Discounted Participant Payback (years)					8.38



Table 18: 2023 Home Energy Savings Lighting Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential\_LIGHTING\_7P)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2867	\$201,213	\$103,707	(\$97,506)	0.52
Total Resource Cost Test (TRC) No Adder	\$0.2867	\$201,213	\$95,842	(\$105,371)	0.48
Utility Cost Test (UCT)	\$0.3074	\$215,763	\$78,644	(\$137,120)	0.36
Participant Cost Test (PCT)		\$37,907	\$141,001	\$103,094	3.72
Rate Impact Test (RIM)		\$287,109	\$78,644	(\$208,465)	0.27
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000244
Discounted Participant Payback (years)					0.70

Table 19: 2023 Home Energy Savings Water Heating Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential\_HPWH\_7P)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1226	\$81,231	\$70,438	(\$10,792)	0.87
Total Resource Cost Test (TRC) No Adder	\$0.1226	\$81,231	\$64,166	(\$17,065)	0.79
Utility Cost Test (UCT)	\$0.1235	\$81,800	\$62,730	(\$19,070)	0.77
Participant Cost Test (PCT)		\$40,460	\$116,590	\$76,130	2.88
Rate Impact Test (RIM)		\$155,925	\$62,730	(\$93,196)	0.40
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000040
Discounted Participant Payback (years)					4.51



Table 20: 2023 Home Energy Savings Whole Home Cost-Effectiveness Results (Including NEIs)  
(Load Shape - WA\_Single\_Family\_Heat\_pump)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1510	\$55,500	\$59,838	\$4,339	1.08
Total Resource Cost Test (TRC) No Adder	\$0.1510	\$55,500	\$54,459	(\$1,041)	0.98
Utility Cost Test (UCT)	\$0.1224	\$44,974	\$53,794	\$8,820	1.20
Participant Cost Test (PCT)		\$39,526	\$77,056	\$37,530	1.95
Rate Impact Test (RIM)		\$92,365	\$53,794	(\$38,571)	0.58
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000015
Discounted Participant Payback (years)					17.15

Table 21: 2023 Home Energy Savings Electronics Cost-Effectiveness Results (Including NEIs) (Load Shape - WA\_Single\_Family\_Heat\_pump)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1386	\$524,740	\$520,417	(\$4,322)	0.99
Total Resource Cost Test (TRC) No Adder	\$0.1386	\$524,740	\$481,595	(\$43,145)	0.92
Utility Cost Test (UCT)	\$0.1261	\$477,342	\$388,225	(\$89,117)	0.81
Participant Cost Test (PCT)		\$176,038	\$630,637	\$454,600	3.58
Rate Impact Test (RIM)		\$885,969	\$388,225	(\$497,745)	0.44
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000297
Discounted Participant Payback (years)					2.51



## MEMORANDUM

To: Alesha Mander, PacifiCorp

From: Eli Morris, Andy Hudson, Julian Graybill Brubaker, Elizabeth Applegate, AEG

Date: May 23, 2024

Re: PacifiCorp Washington Home Energy Reports Program Cost-Effectiveness Results – PY2023

AEG estimated the cost-effectiveness of PacifiCorp’s overall energy efficiency portfolio in the state of Washington based on Program Year (PY) 2023 costs and savings estimates provided by PacifiCorp. This memo provides cost-effectiveness results for the Home Energy Reports program. The program passes the Total Resource Cost Test (TRC), the PacifiCorp Total Resource Cost Test (PTRC), the Utility Cost Test (UCT), and the Rate Impact Measure (RIM) test. The Participant Cost Test (PCT) passes but cannot be calculated as there are no costs to the participant, returning a divide by zero error.

This memo provides analysis inputs and results in the following tables:

- Table 1: Cost-Effectiveness Analysis Inputs
- Table 2: Annual Program Level Costs, Nominal - PY2023
- Table 3: Annual Savings - PY2023
- Table 4: 2023 Home Energy Reports Cost-Effectiveness Results (Load Shape - WA\_Single\_Family\_Heat\_pump)

The following assumptions were utilized in the analysis:

- **Avoided Costs:** derived from PacifiCorp’s 2021 Integrated Resource Plan (IRP) Preferred Portfolio “P02-MM-CETA”, converted into annual values using load shapes from the same IRP.
- **Modeling Inputs:** measure savings, costs, non-energy impacts (NEIs), measure lives, incentive levels, program delivery, and portfolio costs were based on estimates provided by PacifiCorp.
- **Net-to-Gross (NTG):** ratios are assumed to be 1.0, consistent with condition (8)(a) to Order 01 in Docket UE-152072.
- **Retail Rates:** 2023 rates provided by PacifiCorp and escalated by inflation for future years.

Tables 1 and 2 below summarize cost-effectiveness assumptions for the PacifiCorp Washington Home Energy Reports program. All costs and impacts are presented at the program level.



Table 1: Cost-Effectiveness Analysis Inputs

Parameter	PY2023
Discount Rate	6.77%
Residential Line Loss	7.68%
Residential Energy Rate (\$/kWh)	\$0.11
Inflation Rate	2.27%
Measure Life	1.00
Net to Gross Factor	100%
Realization Rate	100%

Table 2: Annual Program Level Costs, Nominal - PY2023<sup>1</sup>

Program Year	Program Delivery	Utility Admin	Program Development	Incentives	Total Utility Budget
2023	\$375,498	\$59,414	\$192	\$0	\$435,105
<b>Total</b>	<b>\$375,498</b>	<b>\$59,414</b>	<b>\$192</b>	<b>\$0</b>	<b>\$435,105</b>

Tables 3 and 4 provide the annual savings and cost effectiveness for the program.

Table 3: Annual Savings - PY2023

Program Year	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	NTG Ratio	Net kWh Savings at Site	Measure Life
2023	4,466,880	100%	4,466,880	100%	4,466,880	1
<b>Total Program</b>	<b>4,466,880</b>	<b>100%</b>	<b>4,466,880</b>	<b>100%</b>	<b>4,466,880</b>	<b>1</b>

<sup>1</sup>Applied Energy Group, Inc. is a registered provider of continuing education for the State of California. This program is approved for 1.0 CEU.



Table 4: 2023 Home Energy Reports Cost-Effectiveness Results (Load Shape - WA\_Single\_Family\_Heat\_pump)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.09	\$435,105	\$707,277	\$272,172	1.63
Total Resource Cost Test (TRC) No Adder	\$0.09	\$435,105	\$642,979	\$207,874	1.48
Utility Cost Test (UCT)	\$0.09	\$435,105	\$642,979	\$207,874	1.48
Participant Cost Test (PCT)		\$0	\$478,403	\$478,403	Pass <sup>2</sup>
Rate Impact Test (RIM)		\$913,508	\$642,979	(\$270,529)	0.70
Lifecycle Revenue Impacts (\$/kWh)					0.00022
Discounted Participant Payback (years)					0.00

<sup>2</sup>appliedenergygroup.com. See the attached spreadsheet for more details. The results are based on the assumptions provided in the spreadsheet and are not intended to be used for any other purpose.





## MEMORANDUM

To: Alesha Mander, PacifiCorp  
From: Eli Morris, Andy Hudson, Julian Graybill Brubaker, Elizabeth Applegate, AEG  
Date: April 26, 2024  
Re: PacifiCorp Washington Low Income Weatherization Program Cost-Effectiveness Results – PY2023

AEG estimated the cost-effectiveness of PacifiCorp’s overall energy efficiency portfolio in the state of Washington based on Program Year (PY) 2023 costs and savings estimates provided by PacifiCorp. This memo provides cost-effectiveness results for the Low Income Weatherization program. The program does not pass any of the cost-effectiveness tests.

This memo provides analysis inputs and results in the following tables:

- Table 1: Cost-Effectiveness Analysis Inputs
- Table 2: Annual Program Level Costs, Nominal - PY2023
- Table 3: Annual Savings - PY2023
- Table 4: 2023 Low Income Weatherization Program Cost-Effectiveness Results
- Table 5: 2023 Low Income Weatherization Program Non-Energy Impacts
- Table 6: 2023 Low Income Weatherization Program Cost-Effectiveness Results (Including NEIs)

The following assumptions were utilized in the analysis:

- **Avoided Costs:** derived from PacifiCorp’s 2021 Integrated Resource Plan (IRP) Preferred Portfolio “P02-MM-CETA”, converted into annual values using load shapes from the same IRP.
- **Modeling Inputs:** measure savings, costs, non-energy impacts (NEIs), measure lives, incentive levels, program delivery, and portfolio costs were based on estimates provided by PacifiCorp.
- **Net-to-Gross (NTG):** ratios are assumed to be 1.0, consistent with condition (8)(a) to Order 01 in Docket UE-152072.
- **Retail Rates:** 2023 rates provided by PacifiCorp and escalated by inflation for future years.



Tables 1 and 2 below summarize cost-effectiveness assumptions for the PacifiCorp Washington Low Income Weatherization program. All costs and impacts are presented at the program level. Table 3 provides the annual savings for the program.

*Table 1: Cost-Effectiveness Analysis Inputs*

Parameter	PY2023
Discount Rate	6.77%
Residential Line Loss	7.68%
Residential Energy Rate (\$/kWh)	\$0.107
Inflation Rate <sup>1</sup>	2.27%
Net-to-Gross	100%
Realization Rate	58%

*Table 2: Annual Program Level Costs, Nominal - PY2023<sup>1</sup>*

Program Year	Program Delivery	Utility Admin	Engineering Costs	Program Development	Inspection Costs	Incentives	Total Utility Budget
2023	\$140,832	\$11,131	\$0	\$0	\$6,543	\$963,969	\$1,122,473
<b>Total</b>	<b>\$140,832</b>	<b>\$11,131</b>	<b>\$0</b>	<b>\$0</b>	<b>\$6,543</b>	<b>\$963,969</b>	<b>\$1,122,473</b>

*Table 3: Annual Savings - PY2023*

Program Year	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	NTG Ratio	Net kWh Savings at Site	Measure Life
2023	154,807	58%	89,788	100%	89,788	27
<b>Total Program</b>	<b>154,807</b>	<b>58%</b>	<b>89,788</b>	<b>100%</b>	<b>89,788</b>	<b>27</b>

Table 4 below presents the cost-effectiveness results at the program level.

<sup>1</sup> To align with annual budget expectations, cost-effectiveness inputs are presented in nominal dollars.



Table 4: 2023 Low Income Weatherization Program Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.8875	\$1,122,473	\$192,701	(\$929,773)	0.17
Total Resource Cost Test (TRC) No Adder	\$0.8875	\$1,122,473	\$175,182	(\$947,291)	0.16
Utility Cost Test (UCT)	\$0.8875	\$1,122,473	\$197,039	(\$925,434)	0.18
Participant Cost Test (PCT)		\$0	\$1,120,794	\$1,120,794	Pass <sup>2</sup>
Rate Impact Test (RIM)		\$1,279,299	\$197,039	(\$1,082,260)	0.15
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000224
Discounted Participant Payback (years)					0.00

Tables 5 and 6 present the NEI impacts for the program and the cost-effectiveness results with NEIs at the program level.

Table 5: 2023 Low Income Weatherization Program Non-Energy Impacts

Non-Energy Impact	Program Impact	Perspective Adjusted
Home Repair Costs paid by Company	\$25,092	PTRC, TRC
Economic Benefit	\$461,181	PTRC, TRC
Arrearage	\$21,856	PTRC, TRC, UCT, RIM
Payment Assistance	\$60,506	PTRC, TRC
<b>Total</b>	<b>\$568,636</b>	<b>N/A</b>

Table 6: 2023 Low Income Weatherization Program Cost-Effectiveness Results (Including NEIs)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.89	\$1,122,473	\$761,336	(\$361,137)	0.68
Total Resource Cost Test (TRC) No Adder	\$0.89	\$1,122,473	\$743,818	(\$378,655)	0.66
Utility Cost Test (UCT)	\$0.89	\$1,122,473	\$197,039	(\$925,434)	0.18
Participant Cost Test (PCT)		\$0	\$1,120,794	\$1,120,794	n/a
Rate Impact Test (RIM)		\$1,279,299	\$197,039	(\$1,082,260)	0.15
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000224
Discounted Participant Payback (years)					0.00

<sup>2</sup>appliedenergygroup.com. See also the “Cost Effectiveness” section of the “2023 Low Income Weatherization Program Cost-Effectiveness Results” report.





## MEMORANDUM

To: Alesha Mander, PacifiCorp  
From: Eli Morris, Andy Hudson, Julian Graybill Brubaker, Elizabeth Applegate, AEG  
Date: April 26, 2024  
Re: PacifiCorp Washington Wattsmart Business Program Cost-Effectiveness Results – PY2023

AEG estimated the cost-effectiveness of PacifiCorp’s overall energy efficiency portfolio in the state of Washington based on Program Year (PY) 2023 costs and savings<sup>1</sup> estimates provided by PacifiCorp. This memo provides cost-effectiveness results for the Wattsmart Business program. The program passes the following cost effectiveness tests: Total Resource Cost Test (TRC), the PacifiCorp Total Resource Cost Test (PTRC), the Utility Cost Test (UCT), and the Participant Cost Test (PCT).

This memo provides analysis inputs and results in the following tables:

- Table 1: Cost-Effectiveness Analysis Inputs
- Table 2: Annual Program Level Costs, Nominal - PY2023
- Table 3: Annual Savings - PY2023
- Table 4: 2023 Benefit/Cost Ratios by Measure Category
- Table 5: 2023 Wattsmart Business Program Cost-Effectiveness Results
- Table 6: 2023 Wattsmart Business Additional Measures Cost-Effectiveness Results (Load Shape - WA\_Industrial\_Machinery\_General)
- Table 7: 2023 Wattsmart Business Compressed Air Cost-Effectiveness Results (Load Shape - WA\_Industrial\_Machinery\_General)
- Table 8: 2023 Wattsmart Business Energy Management Cost-Effectiveness Results (Load Shape - WA\_Miscellaneous\_Mfg\_General)
- Table 9: 2023 Wattsmart Business Food Service Equipment Cost-Effectiveness Results (Load Shape - WA\_School\_Cooking)
- Table 10: 2023 Wattsmart Business HVAC Cost-Effectiveness Results (Load Shape - WA\_Miscellaneous\_Heat\_Pump)

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<sup>1</sup> The commercial line loss factor was used for all Wattsmart Business savings; commercial sector savings represent approximately 74% of total program savings.



- Table 11: 2023 Wattsmart Business Irrigation Cost-Effectiveness Results (Load Shape - WA\_Irrigation\_General)
- Table 12: 2023 Wattsmart Business Lighting Cost-Effectiveness Results (Load Shape - WA\_Miscellaneous\_Lighting)
- Table 13: 2023 Wattsmart Business Motors Cost-Effectiveness Results (Load Shape - WA\_Miscellaneous\_Mfg\_General)
- Table 14: 2023 Wattsmart Business Refrigeration Cost-Effectiveness Results (Load Shape - WA\_Warehouse\_Refrigeration)
- Table 15: 2023 Wattsmart Business Building Shell Cost-Effectiveness Results (Load Shape - WA\_Miscellaneous\_Space\_Cool)
- Table 16: 2023 Wattsmart Business Wastewater Cost-Effectiveness Results (Load Shape - WA\_Wastewater\_General)
- Table 17: 2023 Wattsmart Business Farm & Dairy Cost-Effectiveness Results (Load Shape - WA\_Warehouse\_HVAC\_Aux)
- Table 18: 2023 Wattsmart Business Non-Energy Impacts by Measure Category
- Table 19: 2023 Wattsmart Business Program Cost-Effectiveness Results (Including NEIs) - PY2023
- Table 20: 2023 Wattsmart Business Additional Measures (with NEIs) Cost-Effectiveness Results - PY2023
- Table 21: 2023 Wattsmart Business Compressed Air (with NEIs) Cost-Effectiveness Results - PY2023
- Table 22: 2023 Wattsmart Business Energy Management (with NEIs) Cost-Effectiveness Results - PY2023
- Table 23: 2023 Wattsmart Business HVAC (with NEIs) Cost-Effectiveness Results - PY2023
- Table 24: 2023 Wattsmart Business Irrigation (with NEIs) Cost-Effectiveness Results - PY2023
- Table 25: 2023 Wattsmart Business Lighting (with NEIs) Cost-Effectiveness Results - PY2023
- Table 26: 2023 Wattsmart Business Motors (with NEIs) Cost-Effectiveness Results - PY2023
- Table 27: 2023 Wattsmart Business Refrigeration (with NEIs) Cost-Effectiveness Results - PY2023
- Table 28: 2023 Wattsmart Business Wastewater (with NEIs) Cost-Effectiveness Results - PY2023

The following assumptions were utilized in the analysis:

- **Avoided Costs:** derived from PacifiCorp's 2021 Integrated Resource Plan (IRP) Preferred Portfolio "P02-MM-CETA", converted into annual values using load shapes from the same IRP.
- **Modeling Inputs:** measure savings, costs, non-energy impacts (NEIs), measure lives, incentive levels, program delivery, and portfolio costs were based on estimates provided by PacifiCorp.
- **Net-to-Gross (NTG):** ratios are assumed to be 1.0, consistent with condition (8)(a) to Order 01 in Docket UE-152072.



- Retail Rates: 2023 rates provided by PacifiCorp and escalated by inflation for future years.

Tables 1 and 2 below summarize cost-effectiveness assumptions for the PacifiCorp Washington Wattsmart Business program. All costs and impacts are presented at the program level. Table 3 provides the annual savings for the program.

*Table 1: Cost-Effectiveness Analysis Inputs<sup>2</sup>*

Parameter	PY2023
Discount Rate	6.77%
Commercial Line Loss	7.60%
Industrial Line Loss	6.82%
Irrigation Line Loss	7.68%
Commercial Energy Rate (\$/kWh)	\$0.10
Industrial Energy Rate (\$/kWh)	\$0.09
Irrigation Energy Rate (\$/kWh)	\$0.09
Inflation Rate	2.27%

*Table 2: Annual Program Level Costs, Nominal - PY2023<sup>3</sup>*

Measure Category	Program Delivery	Utility Admin	Engineering Costs	Program Development	Incentives
Additional Measures	\$10,454	\$18,301	\$79	\$3,313	\$216,507
Compressed Air	\$72,460	\$2,428	\$5,375	\$1,379	\$32,754
Energy Management	\$100,704	\$24,822	\$134,757	\$20,179	\$151,317
Food Service Equipment	\$1,818	\$81	\$0	\$33	\$1,250
HVAC	\$107,088	\$6,397	\$8,451	\$3,322	\$178,373
Irrigation	\$138,431	\$9,728	\$0	\$1,919	\$124,067
Lighting	\$2,074,038	\$233,550	\$0	\$45,047	\$4,178,360
Motors	\$41,304	\$52,191	\$6,341	\$5,355	\$370,856
Refrigeration	\$467,571	\$50,862	\$235,389	\$37,940	\$1,441,490
Building Shell	\$5,472	\$244	\$0	\$99	\$8,878
Wastewater	\$261	\$4,876	\$0	\$2,078	\$146,964
Farm & Dairy	\$2	\$35	\$0	\$15	\$468
<b>Total:</b>	<b>\$3,019,602</b>	<b>\$403,516</b>	<b>\$390,392</b>	<b>\$120,679</b>	<b>\$6,851,283</b>

<sup>2</sup> Future rates determined using a 2.27% annual escalator.

<sup>3</sup> To align with annual budget expectations, cost-effectiveness inputs are presented in nominal dollars.



Table 3: Annual Savings - PY2023

Measure Category	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	NTG Ratio	Net kWh Savings at Site	Measure Life
Additional Measures	993,790	84%	830,808	100%	830,808	15
Compressed Air	413,606	98%	406,575	100%	406,575	14
Energy Management	6,052,657	100%	6,052,657	100%	6,052,657	3
Food Service Equipment	9,822	84%	8,211	100%	8,211	19
HVAC	996,546	88%	878,954	100%	878,954	14
Irrigation	575,539	100%	575,539	100%	575,539	11
Lighting	13,511,898	100%	13,511,898	100%	13,511,898	10
Motors	1,606,357	84%	1,342,915	100%	1,342,915	15
Refrigeration	11,379,956	100%	11,379,956	100%	11,379,956	15
Building Shell	29,558	84%	24,710	100%	24,710	15
Wastewater	623,163	100%	623,163	100%	623,163	15
Farm & Dairy	4,500	84%	3,762	100%	3,762	10
<b>Total:</b>	<b>36,197,392</b>	<b>98%</b>	<b>35,639,148</b>	<b>100%</b>	<b>35,639,148</b>	<b>11</b>

Tables 4 through 16 present the cost-effectiveness results at the program and measure category levels. Tables 17 through 19 present the NEI impacts for the program and the cost-effectiveness results with NEIs at the program and measure category levels.

Table 4: 2023 Benefit/Cost Ratios by Measure Category

Program	PTRC	TRC	UCT	PCT	RIM
Additional Measures	2.33	2.12	3.63	2.95	0.76
Compressed Air	3.15	2.87	3.68	7.25	0.76
Energy Management	4.82	4.38	4.54	11.45	0.90
Food Service Equipment	2.38	2.16	2.87	5.49	0.63
HVAC	2.25	2.04	3.44	2.93	0.83
Irrigation	1.66	1.51	2.42	2.34	0.80
Lighting	2.01	1.82	1.70	4.37	0.59
Motors	2.34	2.13	3.17	3.27	0.73
Refrigeration	4.26	3.88	5.80	5.65	0.85
Building Shell	0.73	0.66	2.46	0.79	0.82
Wastewater	3.39	3.08	4.34	4.08	0.78
Farm & Dairy	7.27	6.61	8.86	5.61	1.26
<b>Total Program</b>	<b>2.78</b>	<b>2.52</b>	<b>2.90</b>	<b>4.61</b>	<b>0.73</b>
<b>Total Program (with NEIs)</b>	<b>3.24</b>	<b>2.99</b>	<b>2.90</b>	<b>5.29</b>	<b>0.73</b>





Table 5: 2023 Wattsmart Business Program Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0405	\$12,391,884	\$34,418,434	\$22,026,550	2.78
Total Resource Cost Test (TRC) No Adder	\$0.0405	\$12,391,884	\$31,289,485	\$18,897,601	2.52
Utility Cost Test (UCT)	\$0.0353	\$10,785,471	\$31,289,485	\$20,504,014	2.90
Participant Cost Test (PCT)		\$8,457,696	\$38,993,068	\$30,535,372	4.61
Rate Impact Test (RIM)		\$42,927,256	\$31,289,485	(\$11,637,771)	0.73
Lifecycle Revenue Impacts (\$/kWh)					\$0.0008610
Discounted Participant Payback (years)					1.95

Table 6: 2023 Wattsmart Business Additional Measures Cost-Effectiveness Results (Load Shape - WA\_Industrial\_Machinery\_General)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0483	\$426,401	\$992,348	\$565,947	2.33
Total Resource Cost Test (TRC) No Adder	\$0.0483	\$426,401	\$902,134	\$475,734	2.12
Utility Cost Test (UCT)	\$0.0282	\$248,654	\$902,134	\$653,480	3.63
Participant Cost Test (PCT)		\$394,254	\$1,161,951	\$767,697	2.95
Rate Impact Test (RIM)		\$1,194,098	\$902,134	(\$291,964)	0.76
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000282
Discounted Participant Payback (years)					5.09



Table 7: 2023 Wattsmart Business Compressed Air Cost-Effectiveness Results (Load Shape - WA\_Industrial\_Machinery\_General)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0355	\$146,865	\$463,282	\$316,417	3.15
Total Resource Cost Test (TRC) No Adder	\$0.0355	\$146,865	\$421,166	\$274,300	2.87
Utility Cost Test (UCT)	\$0.0276	\$114,395	\$421,166	\$306,771	3.68
Participant Cost Test (PCT)		\$65,224	\$473,000	\$407,776	7.25
Rate Impact Test (RIM)		\$554,641	\$421,166	(\$133,475)	0.76
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000137
Discounted Participant Payback (years)					1.83

Table 8: 2023 Wattsmart Business Energy Management Cost-Effectiveness Results (Load Shape - WA\_Miscellaneous\_Mfg\_General)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0244	\$446,910	\$2,155,176	\$1,708,266	4.82
Total Resource Cost Test (TRC) No Adder	\$0.0244	\$446,910	\$1,959,251	\$1,512,341	4.38
Utility Cost Test (UCT)	\$0.0236	\$431,778	\$1,959,251	\$1,527,473	4.54
Participant Cost Test (PCT)		\$166,448	\$1,905,582	\$1,739,134	11.45
Rate Impact Test (RIM)		\$2,186,043	\$1,959,251	(\$226,793)	0.90
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001855
Discounted Participant Payback (years)					0.19



Table 9: 2023 Wattsmart Business Food Service Equipment Cost-Effectiveness Results (Load Shape - WA\_School\_Cooking)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0415	\$4,226	\$10,052	\$5,826	2.38
Total Resource Cost Test (TRC) No Adder	\$0.0415	\$4,226	\$9,138	\$4,912	2.16
Utility Cost Test (UCT)	\$0.0313	\$3,182	\$9,138	\$5,956	2.87
Participant Cost Test (PCT)		\$2,294	\$12,588	\$10,294	5.49
Rate Impact Test (RIM)		\$14,520	\$9,138	(\$5,382)	0.63
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000003
Discounted Participant Payback (years)					3.53

Table 10: 2023 Wattsmart Business HVAC Cost-Effectiveness Results (Load Shape - WA\_Miscellaneous\_Heat\_Pump)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0571	\$511,359	\$1,149,925	\$638,567	2.25
Total Resource Cost Test (TRC) No Adder	\$0.0571	\$511,359	\$1,045,387	\$534,028	2.04
Utility Cost Test (UCT)	\$0.0339	\$303,631	\$1,045,387	\$741,755	3.44
Participant Cost Test (PCT)		\$386,100	\$1,130,119	\$744,019	2.93
Rate Impact Test (RIM)		\$1,255,377	\$1,045,387	(\$209,991)	0.83
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000309
Discounted Participant Payback (years)					4.71



Table 11: 2023 Wattsmart Business Irrigation Cost-Effectiveness Results (Load Shape - WA\_Irrigation\_General)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0829	\$440,564	\$729,650	\$289,086	1.66
Total Resource Cost Test (TRC) No Adder	\$0.0829	\$440,564	\$663,319	\$222,754	1.51
Utility Cost Test (UCT)	\$0.0516	\$274,144	\$663,319	\$389,174	2.42
Participant Cost Test (PCT)		\$290,487	\$679,521	\$389,034	2.34
Rate Impact Test (RIM)		\$829,599	\$663,319	(\$166,280)	0.80
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000226
Discounted Participant Payback (years)					4.21

Table 12: 2023 Wattsmart Business Lighting Cost-Effectiveness Results (Load Shape - WA\_Miscellaneous\_Lighting)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0518	\$6,095,685	\$12,236,924	\$6,141,239	2.01
Total Resource Cost Test (TRC) No Adder	\$0.0518	\$6,095,685	\$11,124,477	\$5,028,791	1.82
Utility Cost Test (UCT)	\$0.0555	\$6,530,996	\$11,124,477	\$4,593,481	1.70
Participant Cost Test (PCT)		\$3,743,050	\$16,370,598	\$12,627,549	4.37
Rate Impact Test (RIM)		\$18,723,234	\$11,124,477	(\$7,598,758)	0.59
Lifecycle Revenue Impacts (\$/kWh)					\$0.0005423
Discounted Participant Payback (years)					2.01



Table 13: 2023 Wattsmart Business Motors Cost-Effectiveness Results (Load Shape - WA\_Miscellaneous\_Mfg\_General)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0479	\$708,405	\$1,659,854	\$951,449	2.34
Total Resource Cost Test (TRC) No Adder	\$0.0479	\$708,405	\$1,508,959	\$800,554	2.13
Utility Cost Test (UCT)	\$0.0322	\$476,047	\$1,508,959	\$1,032,912	3.17
Participant Cost Test (PCT)		\$603,214	\$1,970,023	\$1,366,809	3.27
Rate Impact Test (RIM)		\$2,075,214	\$1,508,959	(\$566,256)	0.73
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000471
Discounted Participant Payback (years)					4.17

Table 14: 2023 Wattsmart Business Refrigeration Cost-Effectiveness Results (Load Shape - WA\_Warehouse\_Refrigeration)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0276	\$3,339,153	\$14,239,672	\$10,900,519	4.26
Total Resource Cost Test (TRC) No Adder	\$0.0276	\$3,339,153	\$12,945,156	\$9,606,003	3.88
Utility Cost Test (UCT)	\$0.0185	\$2,233,252	\$12,945,156	\$10,711,904	5.80
Participant Cost Test (PCT)		\$2,547,391	\$14,391,655	\$11,844,264	5.65
Rate Impact Test (RIM)		\$15,183,417	\$12,945,156	(\$2,238,261)	0.85
Lifecycle Revenue Impacts (\$/kWh)					\$0.0003583
Discounted Participant Payback (years)					2.25



Table 15: 2023 Wattsmart Business Building Shell Cost-Effectiveness Results (Load Shape - WA\_Miscellaneous\_Space\_Cool)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2000	\$54,455	\$39,823	(\$14,633)	0.73
Total Resource Cost Test (TRC) No Adder	\$0.2000	\$54,455	\$36,202	(\$18,253)	0.66
Utility Cost Test (UCT)	\$0.0540	\$14,692	\$36,202	\$21,510	2.46
Participant Cost Test (PCT)		\$48,641	\$38,303	(\$10,338)	0.79
Rate Impact Test (RIM)		\$44,118	\$36,202	(\$7,915)	0.82
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000010
Discounted Participant Payback (years)					19.32

Table 16: 2023 Wattsmart Business Wastewater Cost-Effectiveness Results (Load Shape - WA\_Wastewater\_General)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0328	\$217,164	\$736,656	\$519,492	3.39
Total Resource Cost Test (TRC) No Adder	\$0.0328	\$217,164	\$669,687	\$452,523	3.08
Utility Cost Test (UCT)	\$0.0233	\$154,179	\$669,687	\$515,508	4.34
Participant Cost Test (PCT)		\$209,949	\$856,111	\$646,162	4.08
Rate Impact Test (RIM)		\$863,326	\$669,687	(\$193,639)	0.78
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000204
Discounted Participant Payback (years)					3.86



Table 17: 2023 Wattsmart Business Farm & Dairy Cost-Effectiveness Results (Load Shape - WA\_Warehouse\_HVAC\_Aux)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0227	\$697	\$5,071	\$4,374	7.27
Total Resource Cost Test (TRC) No Adder	\$0.0227	\$697	\$4,610	\$3,913	6.61
Utility Cost Test (UCT)	\$0.0170	\$520	\$4,610	\$4,090	8.86
Participant Cost Test (PCT)		\$645	\$3,616	\$2,971	5.61
Rate Impact Test (RIM)		\$3,668	\$4,610	\$942	1.26
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000001
Discounted Participant Payback (years)					1.78

Table 18: 2023 Wattsmart Business Non-Energy Impacts by Measure Category

Measure	Annual Non-Energy Impacts	Quantity	Measure Life	Total Present Value NEIs
Additional Measures	\$10	6	15	\$95
Compressed Air	\$1,306	3	14	\$12,368
Energy Management	\$246,676	35	3	\$694,097
Food Service Equipment	\$0	3	19	\$0
HVAC	\$1,539	301	14	\$14,567
Irrigation	\$9,777	4,874	11	\$83,938
Lighting	\$296,064	31,579	10	\$2,397,785
Motors	\$19,810	15	15	\$202,884
Refrigeration	\$240,816	55	15	\$2,376,219
Building Shell	\$0	9	15	\$0
Wastewater	(\$3,998)	1	15	(\$39,452)
Farm & Dairy	\$0	3	10	\$0
<b>Total</b>	<b>\$811,999</b>	<b>\$36,884</b>	<b>11</b>	<b>\$5,742,500</b>



Table 19: 2023 Wattsmart Business Program Cost-Effectiveness Results (Including NEIs)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0405	\$12,391,884	\$40,160,934	\$27,769,050	3.24
Total Resource Cost Test (TRC) No Adder	\$0.0405	\$12,391,884	\$37,031,985	\$24,640,101	2.99
Utility Cost Test (UCT)	\$0.0353	\$10,785,471	\$31,289,485	\$20,504,014	2.90
Participant Cost Test (PCT)		\$8,457,696	\$44,735,568	\$36,277,872	5.29
Rate Impact Test (RIM)		\$42,927,256	\$31,289,485	(\$11,637,771)	0.73
Lifecycle Revenue Impacts (\$/kWh)					\$0.0008610
Discounted Participant Payback (years)					1.95

Table 20: 2023 Wattsmart Business Additional Measures (with NEIs) Cost-Effectiveness Results - PY2023

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0483	\$426,401	\$992,442	\$566,042	2.33
Total Resource Cost Test (TRC) No Adder	\$0.0483	\$426,401	\$902,229	\$475,828	2.12
Utility Cost Test (UCT)	\$0.0282	\$248,654	\$902,134	\$653,480	3.63
Participant Cost Test (PCT)		\$394,254	\$1,162,046	\$767,792	2.95
Rate Impact Test (RIM)		\$1,194,098	\$902,134	(\$291,964)	0.76
Lifecycle Revenue Impacts (\$/kWh)					0.00
Discounted Participant Payback (years)					5.09

Table 21: 2023 Wattsmart Business Compressed Air (with NEIs) Cost-Effectiveness Results - PY2023

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0355	\$146,865	\$475,651	\$328,785	3.24
Total Resource Cost Test (TRC) No Adder	\$0.0355	\$146,865	\$433,534	\$286,669	2.95
Utility Cost Test (UCT)	\$0.0276	\$114,395	\$421,166	\$306,771	3.68
Participant Cost Test (PCT)		\$65,224	\$485,368	\$420,144	7.44
Rate Impact Test (RIM)		\$554,641	\$421,166	(\$133,475)	0.76
Lifecycle Revenue Impacts (\$/kWh)					0.00
Discounted Participant Payback (years)					1.83





Table 22: 2023 Wattsmart Business Energy Management (with NEIs) Cost-Effectiveness Results - PY2023

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0244	\$446,910	\$2,849,272	\$2,402,363	6.38
Total Resource Cost Test (TRC) No Adder	\$0.0244	\$446,910	\$2,653,347	\$2,206,438	5.94
Utility Cost Test (UCT)	\$0.0236	\$431,778	\$1,959,251	\$1,527,473	4.54
Participant Cost Test (PCT)		\$166,448	\$2,599,678	\$2,433,230	15.62
Rate Impact Test (RIM)		\$2,186,043	\$1,959,251	(\$226,793)	0.90
Lifecycle Revenue Impacts (\$/kWh)					0.00
Discounted Participant Payback (years)					0.19

Table 23: 2023 Wattsmart Business HVAC (with NEIs) Cost-Effectiveness Results - PY2023

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0571	\$511,359	\$1,164,492	\$653,134	2.28
Total Resource Cost Test (TRC) No Adder	\$0.0571	\$511,359	\$1,059,954	\$548,595	2.07
Utility Cost Test (UCT)	\$0.0339	\$303,631	\$1,045,387	\$741,755	3.44
Participant Cost Test (PCT)		\$386,100	\$1,144,686	\$758,586	2.96
Rate Impact Test (RIM)		\$1,255,377	\$1,045,387	(\$209,991)	0.83
Lifecycle Revenue Impacts (\$/kWh)					0.00
Discounted Participant Payback (years)					4.71

Table 24: 2023 Wattsmart Business Irrigation (with NEIs) Cost-Effectiveness Results - PY2023

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0829	\$440,564	\$813,588	\$373,024	1.85
Total Resource Cost Test (TRC) No Adder	\$0.0829	\$440,564	\$747,256	\$306,692	1.70
Utility Cost Test (UCT)	\$0.0516	\$274,144	\$663,319	\$389,174	2.42
Participant Cost Test (PCT)		\$290,487	\$763,459	\$472,972	2.63
Rate Impact Test (RIM)		\$829,599	\$663,319	(\$166,280)	0.80
Lifecycle Revenue Impacts (\$/kWh)					0.00
Discounted Participant Payback (years)					4.21



Table 25: 2023 Wattsmart Business Lighting (with NEIs) Cost-Effectiveness Results - PY2023

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0518	\$6,095,685	\$14,634,709	\$8,539,024	2.40
Total Resource Cost Test (TRC) No Adder	\$0.0518	\$6,095,685	\$13,522,262	\$7,426,576	2.22
Utility Cost Test (UCT)	\$0.0555	\$6,530,996	\$11,124,477	\$4,593,481	1.70
Participant Cost Test (PCT)		\$3,743,050	\$18,768,384	\$15,025,334	5.01
Rate Impact Test (RIM)		\$18,723,234	\$11,124,477	(\$7,598,758)	0.59
Lifecycle Revenue Impacts (\$/kWh)					0.00
Discounted Participant Payback (years)					2.01

Table 26: 2023 Wattsmart Business Motors (with NEIs) Cost-Effectiveness Results - PY2023

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0479	\$708,405	\$1,862,739	\$1,154,334	2.63
Total Resource Cost Test (TRC) No Adder	\$0.0479	\$708,405	\$1,711,843	\$1,003,438	2.42
Utility Cost Test (UCT)	\$0.0322	\$476,047	\$1,508,959	\$1,032,912	3.17
Participant Cost Test (PCT)		\$603,214	\$2,172,907	\$1,569,693	3.60
Rate Impact Test (RIM)		\$2,075,214	\$1,508,959	(\$566,256)	0.73
Lifecycle Revenue Impacts (\$/kWh)					0.00
Discounted Participant Payback (years)					4.17

Table 27: 2023 Wattsmart Business Refrigeration (with NEIs) Cost-Effectiveness Results - PY2023

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0276	\$3,339,153	\$16,615,890	\$13,276,738	4.98
Total Resource Cost Test (TRC) No Adder	\$0.0276	\$3,339,153	\$15,321,375	\$11,982,222	4.59
Utility Cost Test (UCT)	\$0.0185	\$2,233,252	\$12,945,156	\$10,711,904	5.80
Participant Cost Test (PCT)		\$2,547,391	\$16,767,874	\$14,220,483	6.58
Rate Impact Test (RIM)		\$15,183,417	\$12,945,156	(\$2,238,261)	0.85
Lifecycle Revenue Impacts (\$/kWh)					0.00
Discounted Participant Payback (years)					2.25



Table 28: 2023 Wattsmart Business Wastewater (with NEIs) Cost-Effectiveness Results - PY2023

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0328	\$217,164	\$697,204	\$480,040	3.21
Total Resource Cost Test (TRC) No Adder	\$0.0328	\$217,164	\$630,235	\$413,071	2.90
Utility Cost Test (UCT)	\$0.0233	\$154,179	\$669,687	\$515,508	4.34
Participant Cost Test (PCT)		\$209,949	\$816,660	\$606,711	3.89
Rate Impact Test (RIM)		\$863,326	\$669,687	(\$193,639)	0.78
Lifecycle Revenue Impacts (\$/kWh)					0.00
Discounted Participant Payback (years)					3.86