

APPENDIX

Appendix A: Cost-effectiveness Results¹

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



MEMORANDUM

To: Alesha Mander, PacifiCorp
From: Andrew Cottrell, Andy Hudson, Stephanie Chen, Elizabeth Applegate AEG
Date: May 31, 2023
Re: PacifiCorp Washington Portfolio and Sector Level Cost-Effectiveness Results – PY2022

AEG estimated the cost-effectiveness of PacifiCorp's overall energy efficiency portfolio in the state of Washington based on Program Year (PY) 2022 costs and savings¹ 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 - PY2022
- Table 3: Annual Program Costs, Nominal - PY2022
- Table 4: Annual Savings and NEIs by Program - PY2022
- Table 5: Benefit/Cost Ratios by Portfolio Type
- Table 6: 2022 Total Portfolio Cost-Effectiveness Results
- Table 7: 2022 Total Portfolio Cost-Effectiveness Results (Including NEEA)
- Table 8: 2022 Total Portfolio Cost-Effectiveness Results (Including NEIs)
- Table 9: 2022 Total Portfolio Cost-Effectiveness Results (Including NEEA & NEIs)
- Table 10: Benefit/Cost Ratios by Program - PY2022 and PY2023
- Table 11: 2022 Wattsmart Business Energy Efficiency Sector Cost-Effectiveness Results
- Table 12: 2022 Wattsmart Business Energy Efficiency Sector Cost-Effectiveness Results (Including NEIs)
- Table 13: 2022 Residential Energy Efficiency Sector Cost-Effectiveness Results

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



- Table 14: 2022 Residential Energy Efficiency Sector Cost-Effectiveness Results (Including NEIs)
- Table 15: 2022 Residential Non-Energy Impacts by Measure Category
- Table 16: 2022 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:** 2021 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

Parameter	PY2022
Discount Rate	6.88%
Residential Line Loss	7.68%
Commercial Line Loss	7.60%
Industrial Line Loss	6.82%
Irrigation Line Loss	7.68%
Residential Energy Rate (\$/kWh)	\$0.09
Commercial Energy Rate (\$/kWh)	\$0.08
Industrial Energy Rate (\$/kWh)	\$0.07
Irrigation Energy Rate (\$/kWh)	\$0.07
Inflation Rate	2.16%



Table 2: Portfolio Level Costs, Nominal - PY2022

Category	PY2022
Be Wattsmart, Begin at Home	\$64,523
Outreach and Communication	\$217,121
Program Evaluations	\$276,541
Potential Study	\$117,239
System Support	\$70,863
End Use Research	\$58,090
Total	\$804,378

Table 3: Annual Program Costs, Nominal - PY2022

Program	Program Delivery	Utility Admin	Eval, Marketing, Program Development	Engineering Costs	Incentives	Total Utility Budget	Gross Customer Costs
Home Energy Savings	\$1,904,039	\$26,299	\$7,227	\$0	\$1,692,287	\$3,629,851	\$3,354,823
Home Energy Reports	\$134,668	\$3,127	\$195	\$0	\$0	\$137,990	\$0
Wattsmart Business	\$2,218,863	\$482,387	\$115,022	\$339,982	\$5,283,169	\$8,439,423	\$6,160,943
NEEA	\$905,984	\$0	\$0	\$0	\$0	\$905,984	\$0
Total (excluding Portfolio-Level)	\$5,163,554	\$511,812	\$122,444	\$339,982	\$6,975,456	\$13,113,248	\$9,515,766

Table 4: Annual Savings and NEIs by Program - PY2022

Program	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	Net to Gross Ratio	Net kWh Savings at Site	NEIs	Measure Life
Home Energy Savings	2,625,379	92%	2,421,101	100%	2,421,101	\$76,052	15
Home Energy Reports	4,289,670	100%	4,289,670	100%	4,289,670	\$0	1
Wattsmart Business	26,850,318	99%	26,534,508	100%	26,534,508	\$444,307	11
NEEA	3,328,800	100%	3,328,800	100%	3,328,800	\$0	18
Total Program	37,094,167	99%	36,574,079	100%	36,574,079	\$520,359	11



Tables 5 through 14 present the cost-effectiveness results at the portfolio and sector levels. Tables 15 and 16 present the NEI impacts for the residential and commercial sectors by measure category.

Table 5: Benefit/Cost Ratios by Portfolio Type

Program	PTRC	TRC	UCT	PCT	RIM
Total Portfolio	1.86	1.69	2.02	3.01	0.76
Total Portfolio with NEEA	2.06	1.87	2.22	3.38	0.79
Total Portfolio with NEIs	2.10	1.93	2.02	3.40	0.76
Total Portfolio with NEEA and NEIs	2.29	2.10	2.22	3.78	0.79

Table 6: 2022 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	\$0.06	\$15,493,861	\$28,803,258	\$13,309,397	1.86
Total Resource Cost Test (TRC) No Adder	\$0.06	\$15,493,861	\$26,184,780	\$10,690,919	1.69
Utility Cost Test (UCT)	\$0.05	\$12,953,552	\$26,184,780	\$13,231,228	2.02
Participant Cost Test (PCT)		\$9,515,766	\$28,595,772	\$19,080,007	3.01
Rate Impact Test (RIM)		\$34,573,868	\$26,184,780	(\$8,389,088)	0.76
Lifecycle Revenue Impacts (\$/kWh)					0.00053
Discounted Participant Payback (years)					2.82

Table 7: 2022 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	\$0.06	\$16,399,845	\$33,796,189	\$17,396,344	2.06
Total Resource Cost Test (TRC) No Adder	\$0.06	\$16,399,845	\$30,723,808	\$14,323,963	1.87
Utility Cost Test (UCT)	\$0.05	\$13,859,535	\$30,723,808	\$16,864,273	2.22
Participant Cost Test (PCT)		\$9,515,766	\$32,209,024	\$22,693,258	3.38
Rate Impact Test (RIM)		\$39,093,103	\$30,723,808	(\$8,369,295)	0.79
Lifecycle Revenue Impacts (\$/kWh)					0.00060
Discounted Participant Payback (years)					2.66



Table 8: 2022 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	\$0.06	\$15,493,861	\$32,567,815	\$17,073,954	2.10
Total Resource Cost Test (TRC) No Adder	\$0.06	\$15,493,861	\$29,949,337	\$14,455,476	1.93
Utility Cost Test (UCT)	\$0.05	\$12,953,552	\$26,184,780	\$13,231,228	2.02
Participant Cost Test (PCT)		\$9,515,766	\$32,360,330	\$22,844,564	3.40
Rate Impact Test (RIM)		\$34,573,868	\$26,184,780	(\$8,389,088)	0.76
Lifecycle Revenue Impacts (\$/kWh)					0.00053
Discounted Participant Payback (years)					2.82

Table 9: 2022 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	\$0.06	\$16,399,845	\$37,560,746	\$21,160,901	2.29
Total Resource Cost Test (TRC) No Adder	\$0.06	\$16,399,845	\$34,488,365	\$18,088,520	2.10
Utility Cost Test (UCT)	\$0.05	\$13,859,535	\$30,723,808	\$16,864,273	2.22
Participant Cost Test (PCT)		\$9,515,766	\$35,973,581	\$26,457,816	3.78
Rate Impact Test (RIM)		\$39,093,103	\$30,723,808	(\$8,369,295)	0.79
Lifecycle Revenue Impacts (\$/kWh)					0.00060
Discounted Participant Payback (years)					2.66

Table 10: Benefit/Cost Ratios by Program - PY2022 and PY2023

Program	PTRC	UCT	PCT	RIM
Wattsmart Business	2.69	2.70	3.92	0.83
Wattsmart Business with NEEA	2.71	2.71	4.00	0.84
Wattsmart Business with NEIs	3.02	2.70	4.42	0.83
Wattsmart Business with NEEA and NEIs	3.03	2.71	4.50	0.84
Residential	0.69	0.91	1.32	0.53
Residential with NEEA	1.31	1.63	2.25	0.71
Residential with NEIs	0.82	0.91	1.53	0.53
Residential with NEEA and NEIs	1.43	1.63	2.46	0.71



Table 11: 2022 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	\$0.04	\$9,317,197	\$25,048,567	\$15,731,370	2.69
Total Resource Cost Test (TRC) No Adder	\$0.04	\$9,317,197	\$22,771,425	\$13,454,228	2.44
Utility Cost Test (UCT)	\$0.04	\$8,439,423	\$22,771,425	\$14,332,001	2.70
Participant Cost Test (PCT)		\$6,160,943	\$24,171,678	\$18,010,735	3.92
Rate Impact Test (RIM)		\$27,327,932	\$22,771,425	(\$4,556,507)	0.83
Lifecycle Revenue Impacts (\$/kWh)					0.00060
Discounted Participant Payback (years)					2.32

Table 12: 2022 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	\$0.04	\$9,317,197	\$28,095,816	\$18,778,619	3.02
Total Resource Cost Test (TRC) No Adder	\$0.04	\$9,317,197	\$25,818,674	\$16,501,477	2.77
Utility Cost Test (UCT)	\$0.04	\$8,439,423	\$22,771,425	\$14,332,001	2.70
Participant Cost Test (PCT)		\$6,160,943	\$27,218,927	\$21,057,984	4.42
Rate Impact Test (RIM)		\$27,327,932	\$22,771,425	(\$4,556,507)	0.83
Lifecycle Revenue Impacts (\$/kWh)					0.00060
Discounted Participant Payback (years)					2.32

Table 13: 2022 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	\$0.18	\$5,430,376	\$3,754,691	(\$1,675,686)	0.69
Total Resource Cost Test (TRC) No Adder	\$0.18	\$5,430,376	\$3,413,355	(\$2,017,021)	0.63
Utility Cost Test (UCT)	\$0.13	\$3,767,841	\$3,413,355	(\$354,486)	0.91
Participant Cost Test (PCT)		\$3,354,823	\$4,424,094	\$1,069,272	1.32
Rate Impact Test (RIM)		\$6,499,648	\$3,413,355	(\$3,086,293)	0.53
Lifecycle Revenue Impacts (\$/kWh)					0.00010
Discounted Participant Payback (years)					4.69



Table 14: 2022 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	\$0.18	\$5,430,376	\$4,471,999	(\$958,377)	0.82
Total Resource Cost Test (TRC) No Adder	\$0.18	\$5,430,376	\$4,130,663	(\$1,299,713)	0.76
Utility Cost Test (UCT)	\$0.13	\$3,767,841	\$3,413,355	(\$354,486)	0.91
Participant Cost Test (PCT)		\$3,354,823	\$5,141,403	\$1,786,580	1.53
Rate Impact Test (RIM)		\$6,499,648	\$3,413,355	(\$3,086,293)	0.53
Lifecycle Revenue Impacts (\$/kWh)					0.00030
Discounted Participant Payback (years)					4.69

Table 15: 2022 Residential Non-Energy Impacts by Measure Category

Measure	Annual Non-Energy Impacts	Quantity	Measure Life	Total Present Value NEIs
Appliances	\$1,243	68	13	\$11,707
Building Shell	\$183	95,653	45	\$2,700
HVAC	\$69,154	2,307	15	\$678,316
Lighting	\$5,375	49,708	5	\$23,632
Water Heating	\$79	25	13	\$707
Whole Home	\$18	7	35	\$248
Coupons	\$0	0	0	\$0
Total	\$76,052	147,768	15	\$717,308

Table 16: 2022 Wattsmart Business Non-Energy Impacts by Measure

Measure	Annual Non-Energy Impacts	Quantity	Measure Life	Total Present Value NEIs
Additional Measures	\$458	3	15	\$4,490
Compressed Air	\$2,620	12	14	\$25,703
Energy Management	\$139,579	141,152	3	\$392,359
HVAC	\$139	91	16	\$0
Irrigation	\$7,456	2,413	9	\$1,465
Lighting	\$236,616	22,732	11	\$56,281
Motors	\$11,665	5	15	\$2,021,577
Refrigeration	\$45,775	36	13	\$114,416
Total	\$444,307	166,444	11	\$2,616,291



MEMORANDUM

To: Alesha Mander, PacifiCorp
From: Andrew Cottrell, Andy Hudson, Stephanie Chen, Elizabeth Applegate AEG
Date: May 30, 2023
Re: PacifiCorp Washington Home Energy Savings Cost-Effectiveness Results – PY2022

AEG estimated the cost-effectiveness of PacifiCorp’s overall energy efficiency portfolio in the state of Washington based on Program Year (PY) 2022 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 - PY2022
- Table 3: Annual Savings - PY2022
- Table 4: 2022 Benefit/Cost Ratios by Measure Category
- Table 5: 2022 Home Energy Savings Program Cost-Effectiveness Results
- Table 6: 2022 Home Energy Savings Appliances Cost-Effectiveness Results (Load Shape - Residential_ERWH_7P)
- Table 7: 2022 Home Energy Savings Building Shell Cost-Effectiveness Results (Load Shape - WA_Single_Family_Heat_pump)
- Table 8: 2022 Home Energy Savings HVAC Cost-Effectiveness Results (Load Shape - WA_Single_Family_Heat_pump)
- Table 9: 2022 Home Energy Savings Lighting Cost-Effectiveness Results (Load Shape - Residential_LIGHTING_7P)
- Table 10: 2022 Home Energy Savings Water Heating Cost-Effectiveness Results (Load Shape - Residential_HPWH_7P)
- Table 11: 2022 Home Energy Savings Whole Home Cost-Effectiveness Results (Load Shape - WA_Single_Family_Heat_pump)
- Table 12: 2022 Home Energy Savings Non-Energy Impacts by Measure Category
- Table 13: 2022 Home Energy Savings Program Cost-Effectiveness Results (Including NEIs)
- Table 14: 2022 Home Energy Savings Appliances Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential_ERWH_7P)



- Table 15: 2022 Home Energy Savings Building Shell Cost-Effectiveness Results (Including NEIs) (Load Shape - WA_Single_Family_Heat_pump)
- Table 16: 2022 Home Energy Savings HVAC Cost-Effectiveness Results (Including NEIs) (Load Shape - WA_Single_Family_Heat_pump)
- Table 17: 2022 Home Energy Savings Lighting Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential_LIGHTING_7P)
- Table 18: 2022 Home Energy Savings Water Heating Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential_HPWH_7P)
- Table 19: 2022 Home Energy Savings Whole Home Cost-Effectiveness Results (Including NEIs) (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:** 2021 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

Parameter	PY2022
Discount Rate	6.88%
Residential Line Loss	7.68%
Residential Energy Rate (\$/kWh)	\$0.0881
Inflation Rate	2.16%
Net-to-Gross	100%
Realization Rate	100%

Table 2: Annual Program Level Costs, Nominal - PY2022¹

Measure Category	Program Delivery	Utility Admin	Program Development	Incentives	Total Utility Budget	Gross Customer Costs
Appliances	\$9,633	\$133	\$37	\$9,720	\$19,522	\$7,562
Building Shell	\$18,599	\$257	\$71	\$32,497	\$51,423	\$144,561

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



HVAC	\$1,748,758	\$24,154	\$6,638	\$1,532,927	\$3,312,476	\$3,138,112
Lighting	\$83,888	\$1,159	\$318	\$75,343	\$160,709	\$16,588
Water Heating	\$25,064	\$346	\$95	\$22,350	\$47,855	\$21,499
Whole Home	\$18,098	\$250	\$69	\$19,450	\$37,866	\$26,500
Coupons	\$0	\$0	\$0	\$0	\$0	\$0
Total Program	\$1,904,039	\$26,299	\$7,227	\$1,692,287	\$3,629,851	\$3,354,823

Table 3: Annual Savings - PY2022

Measure Category	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	Net to Gross Ratio	Net kWh Savings at Site	Measure Life
Appliances	13,282	100%	13,282	100%	13,282	13
Building Shell	25,645	88%	22,657	100%	22,657	45
HVAC	2,411,270	93%	2,237,724	100%	2,237,724	15
Lighting	115,669	76%	87,926	100%	87,926	5
Water Heating	34,559	100%	34,559	100%	34,559	13
Whole Home	24,954	100%	24,954	100%	24,954	35
Coupons	0	0%	0	0%	0	0
Total Program	2,625,379	92%	2,421,101	100%	2,421,101	15

Tables 4 through 12 present the cost-effectiveness results at the program and measure category levels. 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 4: 2022 Benefit/Cost Ratios by Measure Category

Measure Category	PTRC	TRC	UCT	PCT	RIM
Appliances	0.87	0.79	0.70	2.93	0.43
Appliances (with NEIs)	1.55	1.47	0.70	4.48	0.43
Building Shell	0.36	0.33	1.05	0.50	0.60
Building Shell (with NEIs)	0.38	0.35	1.05	0.51	0.60
HVAC	0.58	0.53	0.79	1.19	0.47
HVAC (with NEIs)	0.72	0.67	0.79	1.40	0.47
Lighting	0.50	0.46	0.29	6.68	0.24



Lighting (with NEIs)	0.73	0.69	0.29	8.10	0.24
Water Heating	0.75	0.68	0.67	2.46	0.41
Water Heating (with NEIs)	0.77	0.70	0.67	2.50	0.41
Whole Home	1.35	1.23	1.46	2.24	0.71
Whole Home (with NEIs)	1.36	1.23	1.46	2.25	0.71
Total Program	0.58	0.53	0.77	1.21	0.47
Total Program (with NEIs)	0.72	0.67	0.77	1.42	0.47

Table 5: 2022 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	\$0.2095	\$5,292,387	\$3,090,726	-\$2,201,661	0.58
Total Resource Cost Test (TRC) No Adder	\$0.2095	\$5,292,387	\$2,809,751	-\$2,482,636	0.53
Utility Cost Test (UCT)	\$0.1437	\$3,629,851	\$2,809,751	-\$820,100	0.77
Participant Cost Test (PCT)		\$3,354,823	\$4,046,175	\$691,352	1.21
Rate Impact Test (RIM)		\$5,983,739	\$2,809,751	-\$3,173,988	0.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000914
Discounted Participant Payback (years)					9.94

Table 6: 2022 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	\$0.1290	\$17,364	\$15,121	-\$2,243	0.87
Total Resource Cost Test (TRC) No Adder	\$0.1290	\$17,364	\$13,747	-\$3,617	0.79
Utility Cost Test (UCT)	\$0.1450	\$19,522	\$13,747	-\$5,776	0.70
Participant Cost Test (PCT)		\$7,562	\$22,134	\$14,572	2.93
Rate Impact Test (RIM)		\$31,936	\$13,747	-\$18,190	0.43
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000008
Discounted Participant Payback (years)					2.98



Table 7: 2022 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	\$0.4541	\$163,488	\$59,414	-\$104,074	0.36
Total Resource Cost Test (TRC) No Adder	\$0.4541	\$163,488	\$54,013	-\$109,475	0.33
Utility Cost Test (UCT)	\$0.1428	\$51,423	\$54,013	\$2,590	1.05
Participant Cost Test (PCT)		\$144,561	\$71,746	-\$72,816	0.50
Rate Impact Test (RIM)		\$90,672	\$54,013	-\$36,659	0.60
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000014
Discounted Participant Payback (years)					87.38

Table 8: 2022 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	\$0.2081	\$4,917,661	\$2,869,018	-\$2,048,643	0.58
Total Resource Cost Test (TRC) No Adder	\$0.2081	\$4,917,661	\$2,608,198	-\$2,309,463	0.53
Utility Cost Test (UCT)	\$0.1402	\$3,312,476	\$2,608,198	-\$704,278	0.79
Participant Cost Test (PCT)		\$3,138,112	\$3,729,123	\$591,011	1.19
Rate Impact Test (RIM)		\$5,508,673	\$2,608,198	-\$2,900,474	0.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001308
Discounted Participant Payback (years)					10.47

Table 9: 2022 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	\$0.2449	\$101,953	\$51,101	-\$50,852	0.50
Total Resource Cost Test (TRC) No Adder	\$0.2449	\$101,953	\$46,455	-\$55,498	0.46
Utility Cost Test (UCT)	\$0.3861	\$160,709	\$46,455	-\$114,253	0.29
Participant Cost Test (PCT)		\$16,588	\$110,798	\$94,211	6.68
Rate Impact Test (RIM)		\$196,164	\$46,455	-\$149,708	0.24
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000106
Discounted Participant Payback (years)					0.60



Table 10: 2022 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	\$0.1404	\$47,004	\$35,346	-\$11,659	0.75
Total Resource Cost Test (TRC) No Adder	\$0.1404	\$47,004	\$32,133	-\$14,872	0.68
Utility Cost Test (UCT)	\$0.1430	\$47,855	\$32,133	-\$15,722	0.67
Participant Cost Test (PCT)		\$21,499	\$52,960	\$31,460	2.46
Rate Impact Test (RIM)		\$78,465	\$32,133	-\$46,332	0.41
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000020
Discounted Participant Payback (years)					5.21

Table 11: 2022 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	\$0.1184	\$44,916	\$60,726	\$15,810	1.35
Total Resource Cost Test (TRC) No Adder	\$0.1184	\$44,916	\$55,205	\$10,289	1.23
Utility Cost Test (UCT)	\$0.0998	\$37,866	\$55,205	\$17,339	1.46
Participant Cost Test (PCT)		\$26,500	\$59,413	\$32,913	2.24
Rate Impact Test (RIM)		\$77,830	\$55,205	-\$22,624	0.71
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000013
Discounted Participant Payback (years)					15.71

Table 12: 2022 Home Energy Savings Non-Energy Impacts by Measure Category

Measure	Annual Non-Energy Impacts	Quantity	Measure Life	Total Present Value NEIs
Appliances	\$1,243	68	13	\$11,707
Building Shell	\$183	95,653	45	\$2,700
HVAC	\$69,154	2,307	15	\$678,316
Lighting	\$5,375	49,708	5	\$23,632
Water Heating	\$79	25	13	\$707
Whole Home	\$18	7	35	\$248
Coupons	\$0	-	-	\$0
Total	\$76,052	\$147,768	15	\$717,308



Table 13: 2022 Home Energy Savings Program Cost-Effectiveness Results (Including NEIs)

Cost-Effectiveness Test	Levelized \$/kWh	Levelized \$/kW	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2095	\$1,249.67	\$5,292,387	\$3,808,034	\$1,484,353	0.72
Total Resource Cost Test (TRC) No Adder	\$0.2095	\$1,249.67	\$5,292,387	\$3,527,059	\$1,765,328	0.67
Utility Cost Test (UCT)	\$0.1437	\$857.10	\$3,629,851	\$2,809,751	-\$820,100	0.77
Participant Cost Test (PCT)			\$3,354,823	\$4,763,483	\$1,408,660	1.42
Rate Impact Test (RIM)			\$5,983,739	\$2,809,751	\$3,173,988	0.47
Lifecycle Revenue Impacts (\$/kWh)						\$0.0000914
Discounted Participant Payback (years)						9.94

Table 14: 2022 Home Energy Savings Appliances Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential_ERWH_7P)

Cost-Effectiveness Test	Levelized \$/kWh	Levelized \$/kW	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1290	\$769.17	\$17,364	\$26,828	\$9,464	1.55
Total Resource Cost Test (TRC) No Adder	\$0.1290	\$769.17	\$17,364	\$25,453	\$8,089	1.47
Utility Cost Test (UCT)	\$0.1450	\$864.77	\$19,522	\$13,747	-\$5,776	0.70
Participant Cost Test (PCT)			\$7,562	\$33,841	\$26,279	4.48
Rate Impact Test (RIM)			\$31,936	\$13,747	-\$18,190	0.43
Lifecycle Revenue Impacts (\$/kWh)						\$0.0000008
Discounted Participant Payback (years)						2.98

Table 15: 2022 Home Energy Savings Building Shell Cost-Effectiveness Results (Including NEIs) (Load Shape - WA_Single_Family_Heat_pump)

Cost-Effectiveness Test	Levelized \$/kWh	Levelized \$/kW	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.4541	\$2,708.54	\$163,488	\$62,114	-\$101,374	0.38
Total Resource Cost Test (TRC) No Adder	\$0.4541	\$2,708.54	\$163,488	\$56,712	-\$106,775	0.35
Utility Cost Test (UCT)	\$0.1428	\$851.94	\$51,423	\$54,013	\$2,590	1.05
Participant Cost Test (PCT)			\$144,561	\$74,445	-\$70,116	0.51
Rate Impact Test (RIM)			\$90,672	\$54,013	-\$36,659	0.60
Lifecycle Revenue Impacts (\$/kWh)						\$0.0000014



Discounted Participant
Payback (years)

87.38

Table 16: 2022 Home Energy Savings HVAC Cost-Effectiveness Results (Including NEIs) (Load Shape - WA_Single_Family_Heat_pump)

Cost-Effectiveness Test	Levelized \$/kWh	Levelized \$/kW	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2081	\$1,241.03	\$4,917,661	\$3,547,334	\$1,370,327	0.72
Total Resource Cost Test (TRC) No Adder	\$0.2081	\$1,241.03	\$4,917,661	\$3,286,514	\$1,631,147	0.67
Utility Cost Test (UCT)	\$0.1402	\$835.94	\$3,312,476	\$2,608,198	-\$704,278	0.79
Participant Cost Test (PCT)			\$3,138,112	\$4,407,440	\$1,269,327	1.40
Rate Impact Test (RIM)			\$5,508,673	\$2,608,198	\$2,900,474	0.47
Lifecycle Revenue Impacts (\$/kWh)						\$0.0001308
Discounted Participant Payback (years)						10.47

Table 17: 2022 Home Energy Savings Lighting Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential_LIGHTING_7P)

Cost-Effectiveness Test	Levelized \$/kWh	Levelized \$/kW	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2449	\$1,460.92	\$101,953	\$74,732	-\$27,221	0.73
Total Resource Cost Test (TRC) No Adder	\$0.2449	\$1,460.92	\$101,953	\$70,087	-\$31,866	0.69
Utility Cost Test (UCT)	\$0.3861	\$2,302.85	\$160,709	\$46,455	-\$114,253	0.29
Participant Cost Test (PCT)			\$16,588	\$134,430	\$117,842	8.10
Rate Impact Test (RIM)			\$196,164	\$46,455	-\$149,708	0.24
Lifecycle Revenue Impacts (\$/kWh)						\$0.0000106
Discounted Participant Payback (years)						0.60



Table 18: 2022 Home Energy Savings Water Heating Cost-Effectiveness Results (Including NEIs) (Load Shape - Residential_HPWH_7P)

Cost-Effectiveness Test	Levelized \$/kWh	Levelized \$/kW	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1404	\$837.68	\$47,004	\$36,052	-\$10,952	0.77
Total Resource Cost Test (TRC) No Adder	\$0.1404	\$837.68	\$47,004	\$32,839	-\$14,165	0.70
Utility Cost Test (UCT)	\$0.1430	\$852.84	\$47,855	\$32,133	-\$15,722	0.67
Participant Cost Test (PCT)			\$21,499	\$53,666	\$32,167	2.50
Rate Impact Test (RIM)			\$78,465	\$32,133	-\$46,332	0.41
Lifecycle Revenue Impacts (\$/kWh)						\$0.0000020
Discounted Participant Payback (years)						5.21

Table 19: 2022 Home Energy Savings Whole Home Cost-Effectiveness Results (Including NEIs) (Load Shape - WA_Single_Family_Heat_pump)

Cost-Effectiveness Test	Levelized \$/kWh	Levelized \$/kW	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1184	\$706.17	\$44,916	\$60,973	\$16,057	1.36
Total Resource Cost Test (TRC) No Adder	\$0.1184	\$706.17	\$44,916	\$55,453	\$10,536	1.23
Utility Cost Test (UCT)	\$0.0998	\$595.33	\$37,866	\$55,205	\$17,339	1.46
Participant Cost Test (PCT)			\$26,500	\$59,661	\$33,161	2.25
Rate Impact Test (RIM)			\$77,830	\$55,205	-\$22,624	0.71
Lifecycle Revenue Impacts (\$/kWh)						\$0.0000013
Discounted Participant Payback (years)						15.71



MEMORANDUM

To: Alesha Mander, PacifiCorp
From: Andrew Cottrell, Andy Hudson, Stephanie Chen, Elizabeth Applegate, AEG
Date: May 24, 2023
Re: PacifiCorp Washington Home Energy Reporting Program Cost-Effectiveness Results – PY2022

AEG estimated the cost-effectiveness of PacifiCorp’s overall energy efficiency portfolio in the state of Washington based on Program Year (PY) 2022 costs and savings estimates provided by PacifiCorp. This memo provides cost-effectiveness results for the Home Energy Reporting 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) cannot be calculated as there are no costs to the participant.

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

- Table 1: Cost-Effectiveness Analysis Inputs
- Table 2: Annual Program Level Costs, Nominal - PY2022
- Table 3: Annual Savings - PY2022
- Table 4: 2022 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:** 2021 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 Reporting program. All costs and impacts are presented at the program level. Tables 3 and 4 provide the annual savings and cost effectiveness for the program.



Table 1: Cost-Effectiveness Analysis Inputs

Parameter	Value
Discount Rate	6.88%
Residential Line Loss	7.68%
Residential Energy Rate (\$/kWh)	\$0.09
Inflation Rate ¹	2.16%
Measure Life	1
NTG	100%
Realization Rate	100%

Table 2: Annual Program Level Costs, Nominal - PY2022¹

Program Year	Program Delivery	Utility Admin	Engineering Costs	Program Development	Inspection Costs	Incentives	Total Utility Budget
2022	\$134,668	\$3,127	\$0	\$195	\$0	\$0	\$137,990
Total	\$134,668	\$3,127	\$0	\$195	\$0	\$0	\$137,990

Table 3: Annual Savings - PY2022

Program Year	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	NTG Ratio	Net kWh Savings at Site	Measure Life
2022	4,289,670	100%	4,289,670	100%	4,289,670	1
Total Program	4,289,670	100%	4,289,670	100%	4,289,670	1

Table 4: 2022 Home Energy Reports Cost-Effectiveness Results (Load Shape - WA_Single_Family_Heat_pump)

Cost-Effectiveness Test	Levelized \$/kWh	Levelized \$/kW	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0299	\$178.18	\$137,990	\$663,965	\$525,975	4.81
Total Resource Cost Test (TRC) No Adder	\$0.0299	\$178.18	\$137,990	\$603,604	\$465,615	4.37
Utility Cost Test (UCT)	\$0.0299	\$178.18	\$137,990	\$603,604	\$465,615	4.37
Participant Cost Test (PCT)			\$0	\$377,920	\$377,920	n/a
Rate Impact Test (RIM)			\$515,909	\$603,604	\$87,695	1.17
Lifecycle Revenue Impacts (\$/kWh)						\$0.0001238
Discounted Participant Payback (years)						0.00

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



MEMORANDUM

To: Alesha Mander, PacifiCorp
From: Andrew Cottrell, Andy Hudson, Stephanie Chen, Elizabeth Applegate, AEG
Date: May 24, 2023
Re: PacifiCorp Washington Low Income Weatherization Program Cost-Effectiveness Results – PY2022

AEG estimated the cost-effectiveness of PacifiCorp’s overall energy efficiency portfolio in the state of Washington based on Program Year (PY) 2022 costs and savings estimates provided by PacifiCorp. This memo provides cost-effectiveness results for the Low Income Weatherization program.

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

- Table 1: Cost-Effectiveness Analysis Inputs
- Table 2: Annual Program Level Costs, Nominal - PY2022
- Table 3: Annual Savings - PY2022
- Table 4: 2022 Low Income Weatherization Program Cost-Effectiveness Results
- Table 5: 2022 Low Income Weatherization Program Non-Energy Impacts
- Table 6: 2022 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:** 2021 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	Value
Discount Rate	6.88%
Residential Line Loss	7.68%
Residential Energy Rate (\$/kWh)	\$0.09
Inflation Rate	2.16%
Net-to-Gross	100%
Realization Rate	59%

Table 2: Annual Program Level Costs, Nominal - PY2022¹

Program Year	Program Delivery	Utility Admin	Engineering Costs	Program Development	Inspection Costs	Incentives	Total Utility Budget
2022	\$90,766	\$12,931	\$0	\$0	\$6,488	\$637,517	\$747,702
Total	\$90,766	\$12,931	\$0	\$0	\$6,488	\$637,517	\$747,702

Table 3: Annual Savings - PY2022

Program Year	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	NTG Ratio	Net kWh Savings at Site	Measure Life
2022	261,515	59%	154,294	100%	154,294	25
Total Program	261,515	59%	154,294	100%	154,294	25

Table 4 below presents the cost-effectiveness results at the program level. Tables 5 and 6 present the NEI impacts for the program and the cost-effectiveness results with NEIs at the program level.

Table 4: 2022 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	\$0.3521	\$747,702	\$314,360	-\$433,343	0.42
Total Resource Cost Test (TRC) No Adder	\$0.3521	\$747,702	\$285,781	-\$461,921	0.38
Utility Cost Test (UCT)	\$0.3521	\$747,702	\$304,492	-\$443,210	0.41
Participant Cost Test (PCT)		\$0	\$850,100	\$850,100	n/a
Rate Impact Test (RIM)		\$960,285	\$304,492	-\$655,792	0.32
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000172
Discounted Participant Payback (years)					0.00

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



Table 5: 2022 Low Income Weatherization Program Non-Energy Impacts

Non-Energy Impact	Program Impact	Perspective Adjusted
Home Repair Costs paid by Company	\$32,411	PTRC, TRC
Economic Benefit	\$304,781	PTRC, TRC
Arrearage	\$18,711	PTRC, TRC, UCT, RIM
Payment Assistance	\$64,522	PTRC, TRC
Total	\$420,425	N/A

Table 6: 2022 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	\$0.3521	\$747,702	\$734,785	-\$12,918	0.98
Total Resource Cost Test (TRC) No Adder	\$0.3521	\$747,702	\$706,207	-\$41,496	0.94
Utility Cost Test (UCT)	\$0.3521	\$747,702	304,492	-\$443,210	0.41
Participant Cost Test (PCT)		\$0	\$850,100	\$850,100	n/a
Rate Impact Test (RIM)		\$960,285	\$304,492	-\$655,792	0.32
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000172
Discounted Participant Payback (years)					0.00



MEMORANDUM

To: Alesha Mander, PacifiCorp
From: Andrew Cottrell, Andy Hudson, Stephanie Chen, Elizabeth Applegate, AEG
Date: May 30, 2023
Re: PacifiCorp Washington Wattsmart Business Program Cost-Effectiveness Results – PY2022

AEG estimated the cost-effectiveness of PacifiCorp’s overall energy efficiency portfolio in the state of Washington based on Program Year (PY) 2022 costs and savings¹ 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 - PY2022
- Table 3: Annual Savings - PY2022
- Table 4: 2022 Benefit/Cost Ratios by Measure Category
- Table 5: 2022 Wattsmart Business Program Cost-Effectiveness Results
- Table 6: 2022 Wattsmart Business Additional Measures Cost-Effectiveness Results (Load Shape - WA_Industrial_Machinery_General)
- Table 7: 2022 Wattsmart Business Compressed Air Cost-Effectiveness Results (Load Shape - WA_Industrial_Machinery_General)
- Table 8: 2022 Wattsmart Business Energy Management Cost-Effectiveness Results (Load Shape - WA_Miscellaneous_Mfg_General)
- Table 9: 2022 Wattsmart Business Food Service Equipment Cost-Effectiveness Results (Load Shape - WA_School_Cooking)
- Table 10: 2022 Wattsmart Business HVAC Cost-Effectiveness Results (Load Shape - WA_Large_Retail_Space_Cool)

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



- Table 11: 2022 Wattsmart Business Irrigation Cost-Effectiveness Results (Load Shape - WA_Irrigation_General)
- Table 12: 2022 Wattsmart Business Lighting Cost-Effectiveness Results (Load Shape - WA_Miscellaneous_Lighting)
- Table 13: 2022 Wattsmart Business Motors Cost-Effectiveness Results (Load Shape - WA_Industrial_Machinery_General)
- Table 14: 2022 Wattsmart Business Refrigeration Cost-Effectiveness Results (Load Shape - WA_Warehouse_Refrigeration)
- Table 15: 2022 Wattsmart Business Building Shell Cost-Effectiveness Results (Load Shape - WA_Industrial_Machinery_General)
- Table 16: 2022 Wattsmart Business Non-Energy Impacts by Measure Category
- Table 17: 2022 Wattsmart Business Program Cost-Effectiveness Results (Including NEIs)
- Table 18: 2022 Wattsmart Business Additional Measures (with NEIs) Cost-Effectiveness Results - PY2022
- Table 19: 2022 Wattsmart Business Compressed Air (with NEIs) Cost-Effectiveness Results - PY2022
- Table 20: 2022 Wattsmart Business Energy Management (with NEIs) Cost-Effectiveness Results - PY2022
- Table 21: 2022 Wattsmart Business HVAC (with NEIs) Cost-Effectiveness Results - PY2022
- Table 22: 2022 Wattsmart Business Irrigation (with NEIs) Cost-Effectiveness Results - PY2022
- Table 23: 2022 Wattsmart Business Lighting (with NEIs) Cost-Effectiveness Results - PY2022
- Table 24: 2022 Wattsmart Business Motors (with NEIs) Cost-Effectiveness Results - PY2022
- Table 25: 2022 Wattsmart Business Refrigeration (with NEIs) Cost-Effectiveness Results - PY2022

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:** 2021 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

Parameter	Value
Discount Rate	6.88%
Commercial Line Loss	7.60%
Industrial Line Loss	6.82%
Irrigation Line Loss	7.68%
Commercial Energy Rate (\$/kWh)	\$0.08
Industrial Energy Rate (\$/kWh)	\$0.07
Irrigation Energy Rate (\$/kWh)	\$0.07
Inflation Rate	2.16%

Table 2: Annual Program Level Costs, Nominal - PY2022²

Measure Category	Program Delivery	Utility Admin	Engineering Costs	Program Development	Incentives
Additional Measures	\$7,172	\$2,357	\$5,951	\$855	\$47,125
Compressed Air	\$51,101	\$12,077	\$23,598	\$3,390	\$130,517
Energy Management	\$158,863	\$70,595	\$128,329	\$18,436	\$106,794
Food Service Equipment	\$3,297	\$329	\$920	\$132	\$4,464
HVAC	\$27,516	\$8,017	\$14,422	\$2,072	\$80,197
Irrigation	\$104,694	\$8,555	\$16,470	\$2,366	\$116,046
Lighting	\$1,502,784	\$310,449	\$0	\$66,180	\$3,960,659
Motors	\$46,293	\$28,926	\$35,808	\$5,144	\$202,249
Refrigeration	\$316,640	\$41,031	\$114,344	\$16,427	\$633,738
Building Shell	\$504	\$50	\$141	\$20	\$1,380
Total:	\$2,218,863	\$482,387	\$339,982	\$115,022	\$5,283,169

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



Table 3: Annual Savings - PY2022

Measure Category	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	Net to Gross Ratio	Net kWh Savings at Site	Measure Life
Additional Measures	199,583	83%	164,856	100%	164,856	15
Compressed Air	791,351	99%	783,438	100%	783,438	14
Energy Management	4,303,543	100%	4,303,543	100%	4,303,543	3
Food Service Equipment	30,854	83%	25,485	100%	25,485	16
HVAC	483,636	88%	425,599	100%	425,599	16
Irrigation	552,321	100%	552,321	100%	552,321	9
Lighting	15,448,934	100%	15,448,934	100%	15,448,934	11
Motors	1,200,827	83%	991,883	100%	991,883	15
Refrigeration	3,834,555	100%	3,834,555	100%	3,834,555	13
Building Shell	4,715	83%	3,895	100%	3,895	15
Total:	26,850,318	99%	26,534,508	100%	26,534,508	11

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: 2022 Benefit/Cost Ratios by Measure Category

Measure Category	PTRC	TRC	UCT	PCT	RIM
Additional Measures	2.91	2.65	2.81	3.31	0.96
Compressed Air	3.21	2.92	3.85	3.54	1.06
Energy Management	3.31	3.01	3.08	9.65	0.98
Food Service Equipment	1.63	1.48	2.38	2.91	0.64
HVAC	2.52	2.29	4.45	2.51	1.04
Irrigation	1.68	1.53	2.31	1.80	1.00
Lighting	2.61	2.37	2.36	4.10	0.76
Motors	2.55	2.32	3.37	2.69	1.02
Refrigeration	3.03	2.76	3.73	3.92	0.93
Building Shell	0.72	0.65	2.74	0.62	1.00
Total Program	2.69	2.44	2.70	3.92	0.83
Total Program (with NEIs)	3.02	2.77	2.70	4.42	0.83



Table 5: 2022 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	\$0.0419	\$9,317,197	\$25,048,567	\$15,731,370	2.69
Total Resource Cost Test (TRC) No Adder	\$0.0419	\$9,317,197	\$22,771,425	\$13,454,228	2.44
Utility Cost Test (UCT)	\$0.0380	\$8,439,423	\$22,771,425	\$14,332,001	2.70
Participant Cost Test (PCT)		\$6,160,943	\$24,171,678	\$18,010,735	3.92
Rate Impact Test (RIM)		\$27,327,932	\$22,771,425	-\$4,556,507	0.83
Lifecycle Revenue Impacts (\$/kWh)					\$0.0006028
Discounted Participant Payback (years)					2.32

Table 6: 2022 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	\$0.0391	\$67,479	\$196,476	\$128,997	2.91
Total Resource Cost Test (TRC) No Adder	\$0.0391	\$67,479	\$178,615	\$111,135	2.65
Utility Cost Test (UCT)	\$0.0367	\$63,461	\$178,615	\$115,154	2.81
Participant Cost Test (PCT)		\$51,144	\$169,253	\$118,109	3.31
Rate Impact Test (RIM)		\$185,588	\$178,615	-\$6,974	0.96
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000044
Discounted Participant Payback (years)					4.42

Table 7: 2022 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	\$291,107	\$933,707	\$642,600	3.21
Total Resource Cost Test (TRC) No Adder	\$0.0355	\$291,107	\$848,824	\$557,717	2.92
Utility Cost Test (UCT)	\$0.0269	\$220,682	\$848,824	\$628,143	3.85
Participant Cost Test (PCT)		\$200,942	\$710,900	\$509,958	3.54
Rate Impact Test (RIM)		\$801,065	\$848,824	\$47,759	1.06
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000190
Discounted Participant Payback (years)					3.83



Table 8: 2022 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	\$0.0383	\$494,268	\$1,638,116	\$1,143,848	3.31
Total Resource Cost Test (TRC) No Adder	\$0.0383	\$494,268	\$1,489,196	\$994,928	3.01
Utility Cost Test (UCT)	\$0.0374	\$483,017	\$1,489,196	\$1,006,179	3.08
Participant Cost Test (PCT)		\$118,046	\$1,139,111	\$1,021,065	9.65
Rate Impact Test (RIM)		\$1,515,333	\$1,489,196	-\$26,137	0.98
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001287
Discounted Participant Payback (years)					0.23

Table 9: 2022 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	\$0.0532	\$14,742	\$23,959	\$9,217	1.63
Total Resource Cost Test (TRC) No Adder	\$0.0532	\$14,742	\$21,781	\$7,039	1.48
Utility Cost Test (UCT)	\$0.0330	\$9,142	\$21,781	\$12,639	2.38
Participant Cost Test (PCT)		\$10,064	\$29,280	\$19,217	2.91
Rate Impact Test (RIM)		\$33,958	\$21,781	-\$12,177	0.64
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000008
Discounted Participant Payback (years)					5.45

Table 10: 2022 Wattsmart Business HVAC Cost-Effectiveness Results (Load Shape - WA_Large_Retail_Space_Cool)

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0536	\$256,324	\$646,665	\$390,341	2.52
Total Resource Cost Test (TRC) No Adder	\$0.0536	\$256,324	\$587,878	\$331,553	2.29
Utility Cost Test (UCT)	\$0.0276	\$132,224	\$587,878	\$455,654	4.45
Participant Cost Test (PCT)		\$204,297	\$511,879	\$307,582	2.51
Rate Impact Test (RIM)		\$563,906	\$587,878	\$23,972	1.04
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000124
Discounted Participant Payback (years)					6.46



Table 11: 2022 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	\$0.0844	\$376,061	\$631,056	\$254,995	1.68
Total Resource Cost Test (TRC) No Adder	\$0.0844	\$376,061	\$573,687	\$197,626	1.53
Utility Cost Test (UCT)	\$0.0557	\$248,131	\$573,687	\$325,556	2.31
Participant Cost Test (PCT)		\$243,976	\$440,066	\$196,090	1.80
Rate Impact Test (RIM)		\$572,151	\$573,687	\$1,536	1.00
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000178
Discounted Participant Payback (years)					4.58

Table 12: 2022 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	\$0.0413	\$5,825,697	\$15,180,867	\$9,355,170	2.61
Total Resource Cost Test (TRC) No Adder	\$0.0413	\$5,825,697	\$13,800,788	\$7,975,091	2.37
Utility Cost Test (UCT)	\$0.0414	\$5,840,072	\$13,800,788	\$7,960,716	2.36
Participant Cost Test (PCT)		\$3,946,284	\$16,194,445	\$12,248,161	4.10
Rate Impact Test (RIM)		\$18,073,858	\$13,800,788	-\$4,273,070	0.76
Lifecycle Revenue Impacts (\$/kWh)					\$0.0004953
Discounted Participant Payback (years)					2.48

Table 13: 2022 Wattsmart Business Motors 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	\$0.0446	\$463,883	\$1,182,134	\$718,251	2.55
Total Resource Cost Test (TRC) No Adder	\$0.0446	\$463,883	\$1,074,667	\$610,784	2.32
Utility Cost Test (UCT)	\$0.0306	\$318,420	\$1,074,667	\$756,247	3.37
Participant Cost Test (PCT)		\$347,712	\$937,052	\$589,341	2.69
Rate Impact Test (RIM)		\$1,053,223	\$1,074,667	\$21,444	1.02
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000250
Discounted Participant Payback (years)					4.96



Table 14: 2022 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	\$0.0394	\$1,518,871	\$4,609,275	\$3,090,403	3.03
Total Resource Cost Test (TRC) No Adder	\$0.0394	\$1,518,871	\$4,190,250	\$2,671,378	2.76
Utility Cost Test (UCT)	\$0.0291	\$1,122,179	\$4,190,250	\$3,068,070	3.73
Participant Cost Test (PCT)		\$1,030,430	\$4,034,686	\$3,004,256	3.92
Rate Impact Test (RIM)		\$4,523,127	\$4,190,250	-\$332,878	0.93
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001121
Discounted Participant Payback (years)					3.09

Table 15: 2022 Wattsmart Business Building Shell 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	\$0.2148	\$8,765	\$6,313	-\$2,452	0.72
Total Resource Cost Test (TRC) No Adder	\$0.2148	\$8,765	\$5,739	-\$3,026	0.65
Utility Cost Test (UCT)	\$0.0513	\$2,095	\$5,739	\$3,644	2.74
Participant Cost Test (PCT)		\$8,050	\$5,007	-\$3,043	0.62
Rate Impact Test (RIM)		\$5,722	\$5,739	\$17	1.00
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000001
Discounted Participant Payback (years)					24.12

Table 16: 2022 Wattsmart Business Non-Energy Impacts by Measure Category

Measure	Annual Non-Energy Impacts	Quantity	Measure Life	Discount Rate	Total Present Value NEIs
Irrigation	\$458	3	15	6.88%	\$2,616,291
Total	\$458	3	15	6.88%	\$2,616,291



Table 17: 2022 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	\$0.0419	\$9,317,197	\$28,095,816	\$18,778,619	3.02
Total Resource Cost Test (TRC) No Adder	\$0.0419	\$9,317,197	\$25,818,674	\$16,501,477	2.77
Utility Cost Test (UCT)	\$0.0380	\$8,439,423	\$22,771,425	\$14,332,001	2.70
Participant Cost Test (PCT)		\$6,160,943	\$27,218,927	\$21,057,984	4.42
Rate Impact Test (RIM)		\$27,327,932	\$22,771,425	-\$4,556,507	0.83
Lifecycle Revenue Impacts (\$/kWh)					\$0.0006028
Discounted Participant Payback (years)					2.32

Table 18: 2022 Wattsmart Business Additional Measures (with NEIs) Cost-Effectiveness Results - PY2022

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.04	\$67,479	\$200,966	\$133,486	2.98
Total Resource Cost Test (TRC) No Adder	\$0.04	\$67,479	\$183,104	\$115,625	2.71
Utility Cost Test (UCT)	\$0.04	\$63,461	\$178,615	\$115,154	2.81
Participant Cost Test (PCT)		\$51,144	\$173,743	\$122,599	3.40
Rate Impact Test (RIM)		\$185,588	\$178,615	(\$6,974)	0.96
Lifecycle Revenue Impacts (\$/kWh)					\$0.000004
Discounted Participant Payback (years)					4.42

Table 19: 2022 Wattsmart Business Compressed Air (with NEIs) Cost-Effectiveness Results - PY2022

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.04	\$291,107	\$959,410	\$668,302	3.30
Total Resource Cost Test (TRC) No Adder	\$0.04	\$291,107	\$874,527	\$583,420	3.00
Utility Cost Test (UCT)	\$0.03	\$220,682	\$848,824	\$628,143	3.85
Participant Cost Test (PCT)		\$200,942	\$736,603	\$535,661	3.67
Rate Impact Test (RIM)		\$801,065	\$848,824	\$47,759	1.06
Lifecycle Revenue Impacts (\$/kWh)					\$0.000019
Discounted Participant Payback (years)					3.83



Table 20: 2022 Wattsmart Business Energy Management (with NEIs) Cost-Effectiveness Results - PY2022

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.04	\$494,268	\$2,030,475	\$1,536,207	4.11
Total Resource Cost Test (TRC) No Adder	\$0.04	\$494,268	\$1,881,556	\$1,387,288	3.81
Utility Cost Test (UCT)	\$0.04	\$483,017	\$1,489,196	\$1,006,179	3.08
Participant Cost Test (PCT)		\$118,046	\$1,531,470	\$1,413,424	12.97
Rate Impact Test (RIM)		\$1,515,333	\$1,489,196	(\$26,137)	0.98
Lifecycle Revenue Impacts (\$/kWh)					\$0.000129
Discounted Participant Payback (years)					0.23

Table 21: 2022 Wattsmart Business HVAC (with NEIs) Cost-Effectiveness Results - PY2022

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.05	\$256,324	\$648,131	\$391,806	2.53
Total Resource Cost Test (TRC) No Adder	\$0.05	\$256,324	\$589,343	\$333,019	2.30
Utility Cost Test (UCT)	\$0.03	\$132,224	\$587,878	\$455,654	4.45
Participant Cost Test (PCT)		\$204,297	\$513,344	\$309,047	2.51
Rate Impact Test (RIM)		\$563,906	\$587,878	\$23,972	1.04
Lifecycle Revenue Impacts (\$/kWh)					\$0.000012
Discounted Participant Payback (years)					6.46

Table 22: 2022 Wattsmart Business Irrigation (with NEIs) Cost-Effectiveness Results - PY2022

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.08	\$376,061	\$687,336	\$311,275	1.83
Total Resource Cost Test (TRC) No Adder	\$0.08	\$376,061	\$629,967	\$253,907	1.68
Utility Cost Test (UCT)	\$0.06	\$248,131	\$573,687	\$325,556	2.31
Participant Cost Test (PCT)		\$243,976	\$496,346	\$252,370	2.03
Rate Impact Test (RIM)		\$572,151	\$573,687	\$1,536	1.00
Lifecycle Revenue Impacts (\$/kWh)					\$0.000018
Discounted Participant Payback (years)					4.58



Table 23: 2022 Wattsmart Business Lighting (with NEIs) Cost-Effectiveness Results - PY2022

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.04	\$5,825,697	\$17,202,444	\$11,376,747	2.95
Total Resource Cost Test (TRC) No Adder	\$0.04	\$5,825,697	\$15,822,365	\$9,996,669	2.72
Utility Cost Test (UCT)	\$0.04	\$5,840,072	\$13,800,788	\$7,960,716	2.36
Participant Cost Test (PCT)		\$3,946,284	\$18,216,022	\$14,269,738	4.62
Rate Impact Test (RIM)		\$18,073,858	\$13,800,788	(\$4,273,070)	0.76
Lifecycle Revenue Impacts (\$/kWh)					\$0.000495
Discounted Participant Payback (years)					2.48

Table 24: 2022 Wattsmart Business Motors (with NEIs) Cost-Effectiveness Results - PY2022

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.04	\$463,883	\$1,296,550	\$832,667	2.79
Total Resource Cost Test (TRC) No Adder	\$0.04	\$463,883	\$1,189,083	\$725,201	2.56
Utility Cost Test (UCT)	\$0.03	\$318,420	\$1,074,667	\$756,247	3.37
Participant Cost Test (PCT)		\$347,712	\$1,051,469	\$703,757	3.02
Rate Impact Test (RIM)		\$1,053,223	\$1,074,667	\$21,444	1.02
Lifecycle Revenue Impacts (\$/kWh)					\$0.000025
Discounted Participant Payback (years)					4.96

Table 25: 2022 Wattsmart Business Refrigeration (with NEIs) Cost-Effectiveness Results - PY2022

Cost-Effectiveness Test	Levelized \$/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.04	\$1,518,871	\$5,040,232	\$3,521,361	3.32
Total Resource Cost Test (TRC) No Adder	\$0.04	\$1,518,871	\$4,621,207	\$3,102,336	3.04
Utility Cost Test (UCT)	\$0.03	\$1,122,179	\$4,190,250	\$3,068,070	3.73
Participant Cost Test (PCT)		\$1,030,430	\$4,465,644	\$3,435,214	4.33
Rate Impact Test (RIM)		\$4,523,127	\$4,190,250	(\$332,878)	0.93
Lifecycle Revenue Impacts (\$/kWh)					\$0.000112
Discounted Participant Payback (years)					3.09