Appendix 1
Cost Effectiveness

MEMORANDUM

To: Alesha Pino, PacifiCorp

From: Andy Hudson and Eli Morris, AEG

Date: April 23, 2021

Re: Washington Portfolio-Level Cost-Effectiveness Analysis – PY2020

AEG estimated the cost-effectiveness of PacifiCorp's overall energy efficiency portfolio[1] and individual programs in the state of Washington based on actual Program Year (PY) 2020 costs and savings provided by PacifiCorp. The portfolio passes the PacifiCorp Total Resource Cost (PTRC), Total Resource Cost (TRC), Utility Cost Test (UCT), and Participant Cost Test (PCT) tests.

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

- Table 1. Cost Effectiveness Analysis Inputs
- Table 2: Portfolio-Level Costs, Nominal - PY2020
- Table 3: NEEA Inputs - PY 2020
- Table 4: Benefit/Cost Ratios by Portfolio-Type
- Table 5: Total Cost Effectiveness Results - PY2020
- Table 6: Total Portfolio Cost-Effectiveness Results (Including NEEA) - PY2020
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- Table 8: Total Portfolio with NEIs Cost-Effectiveness Results (Including NEEA) - PY2020
- Table 9: Wattsmart Business Cost-Effectiveness Results - PY2020
- Table 10: Wattsmart Business Cost-Effectiveness Results (Including NEEA) - PY2020
- Table 11: Wattsmart Business with NEIs Cost-Effectiveness Results - PY2020
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- Table 13: Residential Sector Cost-Effectiveness Results - PY2020
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- Table 15: Residential Sector (Including NEIs) Cost-Effectiveness Results - PY2020
- Table 16: Residential Sector (Including NEEA and NEIs) Cost-Effectiveness Results - PY2020
- Table 17: Residential Non-Energy Impacts by Measure Category- PY2020
- Table 18: Wattsmart Business Non-Energy Impacts by Measure- PY2020

The following assumptions were utilized in the analysis:

[1] Low Income Weatherization is not included in the portfolio- or sector-level cost effectiveness analysis per WAC 480-109-100(10)(b).

- Avoided Costs: developed from a draft run of Portfolio "P-18 v06292019" in PacifiCorp's 2019 Integrated Resource Plan IRP),[2] 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: 2020 rates provided by PacifiCorp and escalated by inflation for future years.

The following tables summarize cost-effectiveness assumptions and results for the Washington portfolio and associated programs.

Table 1. Cost Effectiveness Analysis Inputs[3]

Parameter	Value
Discount Rate	6.92%
Residential Line Loss	7.68%
Commercial Line Loss	7.60%
Industrial Line Loss	6.82%
Irrigation Line Loss	7.68%
Residential Energy Rate ($/kWh)	$0.0828
Commercial Energy Rate ($/kWh)	$0.0809
Industrial Energy Rate ($/kWh)	$0.0666
Irrigation Energy Rate ($/kWh)	$0.0890
Inflation Rate	2.28%

Table 2: Portfolio-Level Costs, Nominal - PY2020[4]

Category	PY2020
Process & Impact Evaluation	$351,377
Class 2 Potential Study	$107,628
Portfolio Evaluation	$3,376
Portfolio DSM Central	$39,977
NEEA End Use Load Research	$31,057
Outreach and Communication	$249,711
Total	**$783,125**

[2] Proxy decrement study aligned with P-18 proxy portfolio.

[3] Future rates determined using a 2.28% annual escalator.

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

Table 3: NEEA Inputs - PY 2020

Sector	Savings at Meter (kWh)	Expenses ($)
Residential	$2,504,196	$450,652
Commercial	$2,963,222	$533,258
Industrial	$101,806	$18,321
Total	**$5,569,225**	**$1,002,231**

Table 4: Benefit/Cost Ratios by Portfolio-Type

Program	PTRC	TRC	UCT	PCT	RIM
Total Portfolio	2.22	2.02	2.66	4.05	0.76
Total Portfolio with NEEA	2.64	2.40	3.09	4.88	0.81
Total Portfolio with NEIs	2.24	2.04	2.66	4.10	0.76
Total Portfolio with NEEA and NEIs	2.66	2.42	3.09	4.93	0.81
Wattsmart Business	2.87	2.61	3.83	4.35	0.83
Wattsmart Business with NEEA	3.13	2.85	4.07	4.83	0.86
Wattsmart Business with NEIs	2.87	2.61	3.83	4.36	0.83
Wattsmart Business with NEEA and NEIs	3.14	2.85	4.07	4.84	0.86
Residential	1.05	0.95	1.06	2.89	0.52
Residential with NEEA	1.99	1.81	1.99	5.04	0.71
Residential with NEIs	1.14	1.05	1.06	3.11	0.52
Residential with NEEA and NEIs	2.08	1.89	1.99	5.26	0.71

Table 5: Total Cost Effectiveness Results - PY2020[5]

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0444	$12,527,395	$27,770,815	$15,243,420	2.22
Total Resource Cost Test (TRC) No Adder	$0.0444	$12,527,395	$25,246,196	$12,718,800	2.02
Utility Cost Test (UCT)	$0.0337	$9,491,073	$25,246,196	$15,755,123	2.66
Participant Cost Test (PCT)		$6,834,842	$27,670,242	$20,835,400	4.05
Rate Impact Test (RIM)		$33,362,796	$25,246,196	($8,116,600)	0.76
Lifecycle Revenue Impacts ($/kWh)					$0.0005948

[5] All cost-effectiveness analysis outputs are in 2020 dollars.

Table 6: Total Portfolio Cost-Effectiveness Results (Including NEEA) - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0392	$13,529,626	$35,703,768	$22,174,142	2.64
Total Resource Cost Test (TRC) No Adder	$0.0392	$13,529,626	$32,457,971	$18,928,345	2.40
Utility Cost Test (UCT)	$0.0304	$10,493,303	$32,457,971	$21,964,668	3.09
Participant Cost Test (PCT)		$6,834,842	$33,333,223	$26,498,381	4.88
Rate Impact Test (RIM)		$40,028,007	$32,457,971	($7,570,036)	0.81
Lifecycle Revenue Impacts ($/kWh)					$0.0007136

Table 7: Total Portfolio with NEIs Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0444	$12,527,395	$28,100,369	$15,572,973	2.24
Total Resource Cost Test (TRC) No Adder	$0.0444	$12,527,395	$25,575,749	$13,048,354	2.04
Utility Cost Test (UCT)	$0.0337	$9,491,073	$25,246,196	$15,755,123	2.66
Participant Cost Test (PCT)		$6,834,842	$27,999,795	$21,164,954	4.10
Rate Impact Test (RIM)		$33,362,796	$25,246,196	($8,116,600)	0.76
Lifecycle Revenue Impacts ($/kWh)					$0.0005948

Table 8: Total Portfolio with NEIs Cost-Effectiveness Results (Including NEEA) - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0392	$13,529,626	$36,033,321	$22,503,695	2.66
Total Resource Cost Test (TRC) No Adder	$0.0392	$13,529,626	$32,787,524	$19,257,898	2.42
Utility Cost Test (UCT)	$0.0304	$10,493,303	$32,457,971	$21,964,668	3.09
Participant Cost Test (PCT)		$6,834,842	$33,662,776	$26,827,935	4.93
Rate Impact Test (RIM)		$40,028,007	$32,457,971	($7,570,036)	0.81
Lifecycle Revenue Impacts ($/kWh)					$0.0007136

Table 9: Wattsmart Business Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0344	$8,478,247	$24,347,419	$15,869,171	2.87
Total Resource Cost Test (TRC) No Adder	$0.0344	$8,478,247	$22,134,017	$13,655,770	2.61
Utility Cost Test (UCT)	$0.0234	$5,776,230	$22,134,017	$16,357,787	3.83
Participant Cost Test (PCT)		$5,416,168	$23,576,322	$18,160,154	4.35
Rate Impact Test (RIM)		$26,638,401	$22,134,017	($4,504,384)	0.83
Lifecycle Revenue Impacts ($/kWh)					$0.0006462

Table 10: Wattsmart Business Cost-Effectiveness Results (Including NEEA) - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0326	$9,029,826	$28,305,281	$19,275,455	3.13
Total Resource Cost Test (TRC) No Adder	$0.0326	$9,029,826	$25,732,073	$16,702,248	2.85
Utility Cost Test (UCT)	$0.0228	$6,327,809	$25,732,073	$19,404,265	4.07
Participant Cost Test (PCT)		$5,416,168	$26,183,522	$20,767,354	4.83
Rate Impact Test (RIM)		$29,797,179	$25,732,073	($4,065,106)	0.86
Lifecycle Revenue Impacts ($/kWh)					$0.0008904

Table 11: Wattsmart Business with NEIs Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0344	$8,478,247	$24,362,111	$15,883,864	2.87
Total Resource Cost Test (TRC) No Adder	$0.0344	$8,478,247	$22,148,709	$13,670,462	2.61
Utility Cost Test (UCT)	$0.0234	$5,776,230	$22,134,017	$16,357,787	3.83
Participant Cost Test (PCT)		$5,416,168	$23,591,014	$18,174,846	4.36
Rate Impact Test (RIM)		$26,638,401	$22,134,017	($4,504,384)	0.83
Lifecycle Revenue Impacts ($/kWh)					$0.0006462

Table 12: Wattsmart Business Cost-Effectiveness Results (Including NEEA and NEIs) - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0326	$9,029,826	$28,319,973	$19,290,147	3.14
Total Resource Cost Test (TRC) No Adder	$0.0326	$9,029,826	$25,746,766	$16,716,940	2.85
Utility Cost Test (UCT)	$0.0228	$6,327,809	$25,732,073	$19,404,265	4.07
Participant Cost Test (PCT)		$5,416,168	$26,198,214	$20,782,046	4.84
Rate Impact Test (RIM)		$29,797,179	$25,732,073	($4,065,106)	0.86
Lifecycle Revenue Impacts ($/kWh)					$0.0008904

Table 13: Residential Sector Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0923	$3,266,023	$3,423,397	$157,374	1.05
Total Resource Cost Test (TRC) No Adder	$0.0923	$3,266,023	$3,112,179	($153,844)	0.95
Utility Cost Test (UCT)	$0.0828	$2,931,717	$3,112,179	$180,462	1.06
Participant Cost Test (PCT)		$1,418,674	$4,093,920	$2,675,247	2.89
Rate Impact Test (RIM)		$5,941,269	$3,112,179	($2,829,091)	0.52
Lifecycle Revenue Impacts ($/kWh)					$0.0001059

Table 14: Residential Sector (Including NEEA) Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0546	$3,716,675	$7,398,487	$3,681,813	1.99
Total Resource Cost Test (TRC) No Adder	$0.0546	$3,716,675	$6,725,897	$3,009,223	1.81
Utility Cost Test (UCT)	$0.0497	$3,382,369	$6,725,897	$3,343,529	1.99
Participant Cost Test (PCT)		$1,418,674	$7,149,701	$5,731,028	5.04
Rate Impact Test (RIM)		$9,447,702	$6,725,897	($2,721,805)	0.71
Lifecycle Revenue Impacts ($/kWh)					$0.0004166

Table 15: Residential Sector (Including NEIs) Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0923	$3,266,023	$3,738,258	$472,235	1.14
Total Resource Cost Test (TRC) No Adder	$0.0923	$3,266,023	$3,427,040	$161,017	1.05
Utility Cost Test (UCT)	$0.0828	$2,931,717	$3,112,179	$180,462	1.06
Participant Cost Test (PCT)		$1,418,674	$4,408,781	$2,990,108	3.11
Rate Impact Test (RIM)		$5,941,269	$3,112,179	($2,829,091)	0.52
Lifecycle Revenue Impacts ($/kWh)					$0.0002620

Table 16: Residential Sector (Including NEEA and NEIs) Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0546	$3,716,675	$7,713,348	$3,996,674	2.08
Total Resource Cost Test (TRC) No Adder	$0.0546	$3,716,675	$7,040,758	$3,324,084	1.89
Utility Cost Test (UCT)	$0.0497	$3,382,369	$6,725,897	$3,343,529	1.99
Participant Cost Test (PCT)		$1,418,674	$7,464,562	$6,045,889	5.26
Rate Impact Test (RIM)		$9,447,702	$6,725,897	($2,721,805)	0.71
Lifecycle Revenue Impacts ($/kWh)					$0.0002991

The following tables summarize the non-energy impacts for the Residential Home Energy Savings Program and the Wattsmart Business program that were included in the tables above.

Table 17: Residential Non-Energy Impacts by Measure Category- PY2020

Measure	Annual Non-Energy Impacts	Quantity	Measure Life	Total Present Value NEIs
Appliances	$0	106	14	$0
Building Shell	$1,157	132,722	45	$17,001
Energy Kits	$4,404	5,795	8	$28,206
HVAC	$12,721	765	15	$124,510
Lighting	$50,624	155,002	2	$142,255
Water Heating	$0	13	13	$0
Whole Home	$208	24	34	$2,888
Total	$69,115	294,427	10	$314,861

Table 18: Wattsmart Business Non-Energy Impacts by Measure- PY2020

Measure	Annual Non-Energy Impacts	Quantity	Measure Life	Total Present Value NEIs
Irrigation	$1,547	1,495	12	$13,192
Lighting	$164	40,211	10	$1,321
Appliances	$19	1	14	$179
Total	$1,730	41,707	12	$14,692

MEMORANDUM

To: Alesha Pino, PacifiCorp

From: Andy Hudson and Eli Morris, AEG

Date: April 23, 2021

Re: Washington Home Energy Savings Program Cost-Effectiveness Analysis – PY2020

AEG estimated the cost-effectiveness of PacifiCorp's Home Energy Savings Program in the state of Washington based on actual Program Year (PY) 2020 costs and savings provided by PacifiCorp. This memo provides cost-effectiveness results at the program and measure category levels. 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: Home Energy Savings Annual Program Costs, Nominal - PY2020
- Table 3: Home Energy Savings in kWh by Measure Category - PY2020 (Source: PacifiCorp)
- Table 4: Benefit/Cost Ratios by Measure Category - PY2020
- Table 5: Home Energy Savings Program Cost-Effectiveness Results - PY2020
- Table 6: Appliances Cost-Effectiveness Results - PY2020 (Load Shape - Residential_ERWH_7P)
- Table 7: Building Shell Cost-Effectiveness Results - PY2020 (Load Shape - WA_Single_Family_Heat_pump)
- Table 8: Home Energy Kit Cost-Effectiveness Results - PY2020 (Load Shape - Residential_ERWH_7P)
- Table 9: HVAC Cost-Effectiveness Results - PY2020 (Load Shape - WA_Single_Family_Heat_pump)
- Table 10: Lighting Cost-Effectiveness Results - PY2020 (Load Shape - Residential_LIGHTING_7P)
- Table 11: Water Heating Cost-Effectiveness Results - PY2020 (Load Shape - Residential_HPWH_7P)
- Table 12: Whole Home Cost-Effectiveness Results - PY2020 (Load Shape - WA_Single_Family_Heat_pump)
- Table 13: Home Energy Savings Non-Energy Impacts by Measure Category- PY2020
- Table 14: Home Energy Savings Program with NEIs Cost-Effectiveness Results - PY2020
- Table 15: Appliances with NEIs Cost-Effectiveness Results - PY2020 (Load Shape - Residential_ERWH_7P)
- Table 16: Building Shell with NEIs Cost-Effectiveness Results - PY2020 (Load Shape Single_Family_Heat_pump)
- Table 17: Home Energy Kit with NEIs Cost-Effectiveness Results - PY2020 (Load Shape - Residential_ERWH_7P)
- Table 18: HVAC with NEIs Cost-Effectiveness Results - PY2020 (Load Shape - WA_Single_Family_Heat_pump)

- Table 19: Lighting with NEIs Cost-Effectiveness Results - PY2020 (Load Shape - Residential_LIGHTING_7P)
- Table 20: Water Heating with NEIs Cost-Effectiveness Results - PY2020 (Load Shape - Residential_HPWH_7P)
- Table 21: Whole Home with NEIs Cost-Effectiveness Results - PY2020 (Load Shape - Single_Family_Heat_pump)

The following assumptions were utilized in the analysis:

- Avoided Costs: developed from a draft run of Portfolio "P-18 v06292019" in PacifiCorp's 2019 Integrated Resource Plan IRP),[1] converted into annual values using load shapes from the same IRP.
- Modeling Inputs: measure savings, costs, non-energy impacts (NEIs), measure lives, incentive levels, and program delivery 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: 2020 rates provided by PacifiCorp and escalated by inflation for future years.

The following tables summarize cost-effectiveness assumptions and results for the Washington Home Energy Savings Program.

Table 1: Cost Effectiveness Analysis Inputs[2]

Parameter	Value
Discount Rate	6.92%
Residential Line Loss	7.68%
Residential Energy Rate ($/kWh)	$0.0828
Inflation Rate	2.28%

Table 2: Home Energy Savings Annual Program Costs, Nominal - PY2020[3]

Measure Category	Program Delivery	Utility Admin	Engineering Costs	Program Development	Inspection Costs	Incentives	Total Utility Budget	Gross Customer Costs
Appliances	$8,362	$271	$0	$65	$0	$9,744	$18,442	$6,305
Building Shell	$25,541	$826	$0	$200	$0	$34,200	$60,768	$98,539
Energy Kits	$168,945	$7,111	$0	$1,721	$0	$38,366	$216,142	$0
HVAC	$1,208,190	$30,021	$0	$7,268	$0	$745,951	$1,991,430	$950,156
Lighting	$52,479	$26,958	$0	$6,526	$0	$194,531	$280,495	$326,709
Water Heating	$7,716	$250	$0	$60	$0	$6,300	$14,326	$4,271
Whole Home	$34,441	$1,114	$0	$270	$0	$55,275	$91,100	$32,692
Total Program	**$1,505,676**	**$66,550**	**$0**	**$16,111**	**$0**	**$1,084,368**	**$2,672,704**	**$1,418,674**

[1] Proxy decrement study aligned with P-18 proxy portfolio.

[2] Future rates determined using a 2.28% annual escalator.

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

Table 3: Home Energy Savings in kWh by Measure Category - PY2020 (Source: PacifiCorp)

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	19,188	100%	19,188	100%	19,188	14
Building Shell	58,607	100%	58,607	100%	58,607	45
Energy Kits	504,352	100%	504,352	100%	504,352	8
HVAC	2,129,376	80%	1,703,501	100%	1,703,501	15
Lighting	1,912,119	71%	1,357,605	100%	1,357,605	2
Water Heating	17,706	100%	17,706	100%	17,706	13
Whole Home	79,029	100%	79,029	100%	79,029	34
Total Program	**4,720,378**	**79%**	**3,739,988**	**100%**	**3,739,988**	**10**

Table 4: Benefit/Cost Ratios by Measure Category - PY2020

Measure Category	PTRC	TRC	UCT	PCT	RIM
Appliances	1.34	1.22	0.99	4.23	0.52
Appliances (with NEIs)	1.34	1.22	0.99	4.23	0.52
Building Shell	0.99	0.90	1.86	1.33	0.72
Building Shell (with NEIs)	1.13	1.04	1.86	1.50	0.72
Energy Kits	1.78	1.62	1.33	0.00	0.57
Energy Kits (with NEIs)	1.94	1.78	1.33	0.00	0.57
HVAC	0.89	0.81	0.89	2.45	0.50
HVAC (with NEIs)	0.95	0.87	0.89	2.58	0.50
Lighting	0.79	0.72	1.06	1.58	0.49
Lighting (with NEIs)	1.14	1.06	1.06	2.02	0.49
Water Heating	1.36	1.24	1.06	4.94	0.52
Water Heating (with NEIs)	1.36	1.24	1.06	4.94	0.52
Whole Home	2.25	2.04	1.54	5.28	0.67
Whole Home (with NEIs)	2.29	2.09	1.54	5.37	0.67
Total Program	**0.97**	**0.88**	**0.99**	**2.48**	**0.52**
Total Program (with NEIs)	**1.07**	**0.98**	**0.99**	**2.70**	**0.52**

Table 5: Home Energy Savings Program Without NEIs Cost-Effectiveness Results - PY2020[4]

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1074	$3,007,010	$2,911,637	($95,372)	0.97
Total Resource Cost Test (TRC) No Adder	$0.1074	$3,007,010	$2,646,943	($360,067)	0.88
Utility Cost Test (UCT)	$0.0954	$2,672,704	$2,646,943	($25,761)	0.99
Participant Cost Test (PCT)		$1,418,674	$3,520,049	$2,101,375	2.48
Rate Impact Test (RIM)		$5,108,385	$2,646,943	($2,461,442)	0.52
Lifecycle Revenue Impacts ($/kWh)					$0.0000911

Table 6 through *Table 12* summarize cost-effectiveness results without non-energy impacts (NEIs) for each measure category.

Table 6: Appliances Cost-Effectiveness Results - PY2020 (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	$0.0773	$15,003	$20,106	$5,103	1.34
Total Resource Cost Test (TRC) No Adder	$0.0773	$15,003	$18,279	$3,275	1.22
Utility Cost Test (UCT)	$0.0950	$18,442	$18,279	($164)	0.99
Participant Cost Test (PCT)		$6,305	$26,682	$20,377	4.23
Rate Impact Test (RIM)		$35,380	$18,279	($17,102)	0.52
Lifecycle Revenue Impacts ($/kWh)					$0.0000010

[4] All cost-effectiveness analysis outputs are in 2020 dollars.

Table 7: Building Shell Cost-Effectiveness Results - PY2020 (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	$0.1350	$125,107	$124,340	($767)	0.99
Total Resource Cost Test (TRC) No Adder	$0.1350	$125,107	$113,036	($12,071)	0.90
Utility Cost Test (UCT)	$0.0656	$60,768	$113,036	$52,268	1.86
Participant Cost Test (PCT)		$98,539	$130,835	$32,295	1.33
Rate Impact Test (RIM)		$157,403	$113,036	($44,367)	0.72
Lifecycle Revenue Impacts ($/kWh)					$0.0000028

Table 8: Home Energy Kit Cost-Effectiveness Results - PY2020 (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	$0.0511	$177,777	$317,253	$139,477	1.78
Total Resource Cost Test (TRC) No Adder	$0.0511	$177,777	$288,412	$110,635	1.62
Utility Cost Test (UCT)	$0.0621	$216,142	$288,412	$72,270	1.33
Participant Cost Test (PCT)		$0	$325,878	$325,878	n/a
Rate Impact Test (RIM)		$503,655	$288,412	($215,243)	0.57
Lifecycle Revenue Impacts ($/kWh)					$0.0000200

Table 9: HVAC Cost-Effectiveness Results - PY2020 (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	$0.1223	$2,195,635	$1,952,407	($243,229)	0.89
Total Resource Cost Test (TRC) No Adder	$0.1223	$2,195,635	$1,774,915	($420,720)	0.81
Utility Cost Test (UCT)	$0.1109	$1,991,430	$1,774,915	($216,515)	0.89
Participant Cost Test (PCT)		$950,156	$2,325,510	$1,375,353	2.45
Rate Impact Test (RIM)		$3,570,989	$1,774,915	($1,796,074)	0.50
Lifecycle Revenue Impacts ($/kWh)					$0.0000929

Table 10: Lighting Cost-Effectiveness Results - PY2020 (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	$0.1005	$412,672	$326,755	($85,917)	0.79
Total Resource Cost Test (TRC) No Adder	$0.1005	$412,672	$297,050	($115,622)	0.72
Utility Cost Test (UCT)	$0.0683	$280,495	$297,050	$16,555	1.06
Participant Cost Test (PCT)		$326,709	$517,337	$190,628	1.58
Rate Impact Test (RIM)		$603,301	$297,050	($306,251)	0.49
Lifecycle Revenue Impacts ($/kWh)					$0.0000546

Table 11: Water Heating Cost-Effectiveness Results - PY2020 (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	$0.0719	$12,298	$16,783	$4,486	1.36
Total Resource Cost Test (TRC) No Adder	$0.0719	$12,298	$15,258	$2,960	1.24
Utility Cost Test (UCT)	$0.0837	$14,326	$15,258	$931	1.06
Participant Cost Test (PCT)		$4,271	$21,106	$16,835	4.94
Rate Impact Test (RIM)		$29,133	$15,258	($13,875)	0.52
Lifecycle Revenue Impacts ($/kWh)					$0.0000008

Table 12: Whole Home Cost-Effectiveness Results - PY2020 (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	$0.0581	$68,518	$153,993	$85,476	2.25
Total Resource Cost Test (TRC) No Adder	$0.0581	$68,518	$139,994	$71,476	2.04
Utility Cost Test (UCT)	$0.0772	$91,100	$139,994	$48,894	1.54
Participant Cost Test (PCT)		$32,692	$172,699	$140,007	5.28
Rate Impact Test (RIM)		$208,525	$139,994	($68,531)	0.67
Lifecycle Revenue Impacts ($/kWh)					$0.0000038

The Appliances, Building Shell, Energy Kits, HVAC, Lighting, and Whole Home measure categories also provide quantifiable non-energy impacts (NEIs). Table 13 summarizes the NEIs included in these categories, while Table 14 through Table 21 detail the cost-effectiveness results of the measure categories after adding in the NEIs.

Table 13: Home Energy Savings Non-Energy Impacts by Measure Category- PY2020

Measure	Annual Non-Energy Impacts	Quantity	Measure Life	Total Present Value NEIs
Appliances	$2,488	106	14	$23,376
Building Shell	$1,883	132,722	45	$27,755
Energy Kits	$58,069	5,795	9	$405,897
HVAC	$15,031	765	15	$152,630
Lighting	$80,654	155,002	4	$354,340
Water Heating	$0	13	13	$0
Whole Home	$382	24	31	$5,211
Total	**$158,508**	**294,427**	**132**	**$969,208**

Table 14: Home Energy Savings Program with NEIs Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1074	$3,007,010	$3,226,498	$219,489	1.07
Total Resource Cost Test (TRC) No Adder	$0.1074	$3,007,010	$2,961,804	($45,206)	0.98
Utility Cost Test (UCT)	$0.0954	$2,672,704	$2,646,943	($25,761)	0.99
Participant Cost Test (PCT)		$1,418,674	$3,834,910	$2,416,236	2.70
Rate Impact Test (RIM)		$5,108,385	$2,646,943	($2,461,442)	0.52
Lifecycle Revenue Impacts ($/kWh)					$0.0000911

Table 15: Appliances with NEIs Cost-Effectiveness Results - PY2020 (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	$0.0773	$15,003	$20,106	$5,103	1.34
Total Resource Cost Test (TRC) No Adder	$0.0773	$15,003	$18,279	$3,275	1.22
Utility Cost Test (UCT)	$0.0950	$18,442	$18,279	($164)	0.99
Participant Cost Test (PCT)		$6,305	$26,682	$20,377	4.23
Rate Impact Test (RIM)		$35,380	$18,279	($17,102)	0.52
Lifecycle Revenue Impacts ($/kWh)					$0.0000010

Table 16: Building Shell with NEIs Cost-Effectiveness Results - PY2020 (Load Shape - 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	$0.1350	$125,107	$141,341	$16,234	1.13
Total Resource Cost Test (TRC) No Adder	$0.1350	$125,107	$130,037	$4,930	1.04
Utility Cost Test (UCT)	$0.0656	$60,768	$113,036	$52,268	1.86
Participant Cost Test (PCT)		$98,539	$147,836	$49,297	1.50
Rate Impact Test (RIM)		$157,403	$113,036	($44,367)	0.72
Lifecycle Revenue Impacts ($/kWh)					$0.0000028

Table 17: Home Energy Kit with NEIs Cost-Effectiveness Results - PY2020 (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	$0.0511	$177,777	$345,459	$167,683	1.94
Total Resource Cost Test (TRC) No Adder	$0.0511	$177,777	$316,618	$138,842	1.78
Utility Cost Test (UCT)	$0.0621	$216,142	$288,412	$72,270	1.33
Participant Cost Test (PCT)		$0	$354,084	$354,084	n/a
Rate Impact Test (RIM)		$503,655	$288,412	($215,243)	0.57
Lifecycle Revenue Impacts ($/kWh)					$0.0000200

Table 18: HVAC with NEIs Cost-Effectiveness Results - PY2020 (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	$0.1223	$2,195,635	$2,076,916	($118,719)	0.95
Total Resource Cost Test (TRC) No Adder	$0.1223	$2,195,635	$1,899,425	($296,210)	0.87
Utility Cost Test (UCT)	$0.1109	$1,991,430	$1,774,915	($216,515)	0.89
Participant Cost Test (PCT)		$950,156	$2,450,020	$1,499,863	2.58
Rate Impact Test (RIM)		$3,570,989	$1,774,915	($1,796,074)	0.50
Lifecycle Revenue Impacts ($/kWh)					$0.0000929

Table 19: Lighting with NEIs Cost-Effectiveness Results - PY2020 (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	$0.1005	$412,672	$469,010	$56,338	1.14
Total Resource Cost Test (TRC) No Adder	$0.1005	$412,672	$439,305	$26,633	1.06
Utility Cost Test (UCT)	$0.0683	$280,495	$297,050	$16,555	1.06
Participant Cost Test (PCT)		$326,709	$659,593	$332,883	2.02
Rate Impact Test (RIM)		$603,301	$297,050	($306,251)	0.49
Lifecycle Revenue Impacts ($/kWh)					$0.0000546

Table 20: Water Heating with NEIs Cost-Effectiveness Results - PY2020 (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	$0.0719	$12,298	$16,783	$4,486	1.36
Total Resource Cost Test (TRC) No Adder	$0.0719	$12,298	$15,258	$2,960	1.24
Utility Cost Test (UCT)	$0.0837	$14,326	$15,258	$931	1.06
Participant Cost Test (PCT)		$4,271	$21,106	$16,835	4.94
Rate Impact Test (RIM)		$29,133	$15,258	($13,875)	0.52
Lifecycle Revenue Impacts ($/kWh)					$0.0000008

Table 21: Whole Home with NEIs Cost-Effectiveness Results - PY2020 (Load Shape - 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	$0.0581	$68,518	$156,882	$88,364	2.29
Total Resource Cost Test (TRC) No Adder	$0.0581	$68,518	$142,882	$74,365	2.09
Utility Cost Test (UCT)	$0.0772	$91,100	$139,994	$48,894	1.54
Participant Cost Test (PCT)		$32,692	$175,588	$142,896	5.37
Rate Impact Test (RIM)		$208,525	$139,994	($68,531)	0.67
Lifecycle Revenue Impacts ($/kWh)					$0.0000038

MEMORANDUM

To: Alesha Pino, PacifiCorp

From: Andy Hudson and Eli Morris, AEG

Date: April 23, 2021

Re: Washington Home Energy Reports Program Cost-Effectiveness Analysis – PY2020

AEG estimated the cost-effectiveness of PacifiCorp's Home Energy Reports Program in the state of Washington based on actual Program Year (PY) 2020 costs and savings provided by PacifiCorp. This memo provides cost-effectiveness results at the program level. The program passes the PacifiCorp Total Resource Cost (PTRC), Total Resource Cost (TRC), Utility Cost Test (UCT), and Participant Cost Test (PCT) cost-effectiveness tests[1].

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

- Table 1: Cost Effectiveness Analysis Inputs
- Table 2: Annual Program Costs, Nominal - PY2020
- Table 3: Annual Savings - PY2020
- Table 4: Home Energy Reports Cost-Effectiveness Results - PY2020 (Load Shape - Single_Family_Heat_pump)

The following assumptions were utilized in the analysis:

- Avoided Costs: developed from a draft run of Portfolio "P-18 v06292019" in PacifiCorp's 2019 Integrated Resource Plan IRP),[2] converted into annual values using load shapes from the same IRP.
- Modeling Inputs: measure savings, costs, non-energy impacts (NEIs), measure lives, incentive levels, and program delivery 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: 2020 rates provided by PacifiCorp and escalated by inflation for future years.

The following tables summarize cost-effectiveness assumptions and results for the Washington Home Energy Savings Program.

[1] The PCT benefit cost ratio (BCR) is technically zero since there are only benefits and no customer costs when reported at this level.

[2] Proxy decrement study aligned with P-18 proxy portfolio.

Table 1: Cost Effectiveness Analysis Inputs[3]

Parameter	Value
Discount Rate	6.92%
Residential Line Loss	7.68%
Residential Energy Rate ($/kWh)	$0.0828
Inflation Rate	2.28%
Measure Life	2

Table 2: Annual Program Costs, Nominal - PY2020[4]

Program Year	Program Delivery	Utility Admin	Engineering Costs	Program Development	Inspection Costs	Incentives	Total Utility Budget
2020	$228,113	$29,777	$0	$1,122	$0	$0	$259,013
Total Program	**$228,113**	**$29,777**	**$0**	**$1,122**	**$0**	**$0**	**$259,013**

Table 3: Annual Savings - PY2020

Program Year	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	Net to Gross Ratio	Net kWh Savings at Site	Measure Life
2020	3,542,270	100%	3,542,270	100%	3,542,270	2
Total Program	**3,542,270**	**100%**	**3,542,270**	**100%**	**3,542,270**	**2**

Table 4: Home Energy Reports Cost-Effectiveness Results - PY2020 (Load Shape - Single_Family_Heat_pump)[5]

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0351	$259,013	$511,759	$252,746	1.98
Total Resource Cost Test (TRC) No Adder	$0.0351	$259,013	$465,236	$206,223	1.80
Utility Cost Test (UCT)	$0.0351	$259,013	$465,236	$206,223	1.80
Participant Cost Test (PCT)		$0	$573,872	$573,872	n/a
Rate Impact Test (RIM)		$832,885	$465,236	($367,649)	0.56
Lifecycle Revenue Impacts ($/kWh)					$0.0001093

[3] Future rates determined using a 2.28% annual escalator.

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

[5] All cost-effectiveness analysis outputs are in 2020 dollars.

MEMORANDUM

To: Alesha Pino, PacifiCorp

From: Andy Hudson and Eli Morris, AEG

Date: April 23, 2021

Re: Washington Low Income Weatherization Program Cost-Effectiveness Analysis – PY2020

AEG estimated the cost-effectiveness of PacifiCorp's Low Income Weatherization Program in the state of Washington based on actual Program Year (PY) 2020 costs and savings provided by PacifiCorp. This memo provides cost-effectiveness results at the program level. 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 Costs, Nominal - PY2020
- Table 3: Annual Savings - PY2020
- Table 4: Low Income Weatherization Program Cost-Effectiveness Results - PY2020 (Load Shape - Single_Family_Heat_pump)
- Table 5: Low Income Weatherization Non Energy Impacts - PY2020
- Table 6: Low Income Weatherization Program with NEIs Cost-Effectiveness Results - PY2020

The following assumptions were utilized in the analysis:

- Avoided Costs: developed from a draft run of Portfolio "P-18 v06292019" in PacifiCorp's 2019 Integrated Resource Plan IRP),[1] converted into annual values using load shapes from the same IRP.
- Modeling Inputs: measure savings, costs, non-energy impacts (NEIs), measure lives, incentive levels, and program delivery 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: 2020 rates provided by PacifiCorp and escalated by inflation for future years.

The following tables summarize cost-effectiveness assumptions and results for the Washington Home Energy Savings Program.

[1] Proxy decrement study aligned with P-18 proxy portfolio.

Table 1: Cost Effectiveness Analysis Inputs[2]

Parameter	Value
Discount Rate	6.92%
Residential Line Loss	7.68%
Residential Energy Rate ($/kWh)	$0.0828
Inflation Rate	2.28%

Table 2: Annual Program Costs, Nominal - PY2020[3]

Program Year	Program Delivery	Utility Admin	Engineering Costs	Program Development	Inspection Costs	Incentives	Total Utility Budget
2020	$41,677	$9,449	$0	$0	$155	$295,907	$347,189
Total Program	**$41,677**	**$9,449**	**$0**	**$0**	**$155**	**$295,907**	**$347,189**

Table 3: Annual Savings - PY2020

Program Year	Gross kWh Savings at Site	Realization Rate	Adjusted Gross kWh Savings at Site	Net to Gross Ratio	Net kWh Savings at Site	Measure Life
2020	69,527	59%	41,021	100%	41,021	25
Total Program	**$69,527**	**59%**	**$41,021**	**100%**	**$41,021**	**25**

Table 4: Low Income Weatherization Program Cost-Effectiveness Results - PY2020 (Load Shape - Single_Family_Heat_pump)[4]

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.6263	$347,189	$68,678	($278,511)	0.20
Total Resource Cost Test (TRC) No Adder	$0.6263	$347,189	$62,434	($284,754)	0.18
Utility Cost Test (UCT)	$0.6263	$347,189	$62,902	($284,287)	0.18
Participant Cost Test (PCT)		$0	$348,359	$348,359	n/a
Rate Impact Test (RIM)		$399,640	$62,902	($336,738)	0.16
Lifecycle Revenue Impacts ($/kWh)					$0.0000081

The Low Income Weatherization Program also provides quantifiable non-energy impacts (NEIs). Table 5 summarizes the NEIs included in these categories, while Table 6 details the cost-effectiveness results of the Low Income Weatherization program after adding in the NEIs.

[2] Future rates determined using a 2.28% annual escalator.

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

[4] All cost-effectiveness analysis outputs are in 2020 dollars.

Table 5: Low Income Weatherization Non Energy Impacts - PY2020

Program Year	Program Impact	Perspective Adjusted
Home Repair Costs paid by Company	$18,057	PTRC, TRC
Economic Benefit	$91,434	PTRC, TRC
Arrearage	$468	PTRC, TRC, UCT, RIM
Payment Assistance	$1,613	PTRC, TRC
Total:	**$111,572**	**N/A**

Table 6: Low Income Weatherization Program with NEIs Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.6263	$347,189	$180,250	($166,939)	0.52
Total Resource Cost Test (TRC) No Adder	$0.6263	$347,189	$174,006	($173,182)	0.50
Utility Cost Test (UCT)	$0.6263	$347,189	62,902	($284,287)	0.18
Participant Cost Test (PCT)		$0	$348,359	$348,359	n/a
Rate Impact Test (RIM)		$399,640	$62,902	($336,738)	0.16
Lifecycle Revenue Impacts ($/kWh)					$0.0000081

MEMORANDUM

To: Alesha Pino, PacifiCorp

From: Andy Hudson and Eli Morris, AEG

Date: April 23, 2021

Re: Washington Wattsmart Business Program Cost-Effectiveness Analysis – PY2020

AEG estimated the cost-effectiveness of PacifiCorp's Wattsmart Business Program in the state of Washington based on actual Program Year (PY) 2020 costs and savings provided by PacifiCorp. The Program passes the PacifiCorp Total Resource Cost (PTRC), Total Resource Cost (TRC), Utility Cost Test (UCT), and Participant Cost Test (PCT tests.

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

- *Table 1. Cost Effectiveness Analysis Inputs*
- *Table 2: Annual Program Costs, Nominal - PY2020*
- Table 3: Annual Savings - PY2020Table 3: Annual Savings - PY2020
- Table 4: Benefit/Cost Ratios by Measure Category - PY2020
- Table 5: Wattsmart Business Program Cost-Effectiveness Results - PY2020
- Table 6: Wattsmart Business Additional Measures Cost-Effectiveness Results - PY2020 (Load Shape - WA_Miscellaneous_Mfg_General)
- Table 7: Wattsmart Business Building Shell Cost-Effectiveness Results - PY2020 (Load Shape - WA_Large_Office_Space_Cool)
- Table 8: Wattsmart Business Compressed Air Cost-Effectiveness Results - PY2020 (Load Shape - WA_Industrial_Machinery_General)
- Table 9: Wattsmart Business Energy Management Cost-Effectiveness Results - PY2020 (Load Shape - WA_Miscellaneous_Mfg_General)
- Table 10: Wattsmart Business Food Service Equipment Cost-Effectiveness Results - PY2020 (Load Shape - WA_School_Cooking)
- Table 11: Wattsmart Business HVAC Cost-Effectiveness Results - PY2020 (Load Shape - WA_Large_Retail_Space_Cool)
- Table 12: Wattsmart Business Irrigation Cost-Effectiveness Results - PY2020 (Load Shape - WA_Irrigation_General)
- Table 13: Wattsmart Business Lighting Cost-Effectiveness Results - PY2020 (Load Shape - WA_Miscellaneous_Lighting)
- Table 14: Wattsmart Business Motors Cost-Effectiveness Results - PY2020 (Load Shape - WA_Industrial_Machinery_General)

- Table 15: Wattsmart Business Refrigeration Cost-Effectiveness Results - PY2020 (Load Shape - WA_Warehouse_Refrigeration)
- Table 16: Wattsmart Business Non-Energy Impacts by Measure- PY2020
- Table 17: Wattsmart Business Program (with NEIs) Cost-Effectiveness Results - PY2020
- Table 18: Wattsmart Business Irrigation (with NEIs) Cost-Effectiveness Results - PY2020
- Table 19: Wattsmart Business Lighting (with NEIs) Cost-Effectiveness Results - PY2020

The following assumptions were utilized in the analysis:

- Avoided Costs: developed from a draft run of Portfolio "P-18 v06292019" in PacifiCorp's 2019 Integrated Resource Plan IRP),[1] converted into annual values using load shapes from the same IRP.
- Modeling Inputs: measure savings, costs, non-energy impacts (NEIs), measure lives, incentive levels, and program delivery 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: 2020 rates provided by PacifiCorp and escalated by inflation for future years.

The following tables summarize cost-effectiveness assumptions and results for the Washington Wattsmart Business Program.

Table 1. Cost Effectiveness Analysis Inputs[2]

Parameter	Value
Discount Rate	6.92%
Commercial Line Loss	7.60%
Industrial Line Loss	6.82%
Irrigation Line Loss	7.68%
Commercial Energy Rate ($/kWh)	$0.0809
Industrial Energy Rate ($/kWh)	$0.0666
Irrigation Energy Rate ($/kWh)	$0.0890
Inflation Rate	2.28%

[1] Proxy decrement study aligned with P-18 proxy portfolio.

[2] Future rates determined using a 2.28% annual escalator.

Table 2: Annual Program Costs, Nominal - PY2020[3]

Measure Category	Program Delivery	Utility Admin	Engineering Costs	Program Development	Inspection Costs	Incentives	Total Utility Budget	Gross Customer Costs
Additional Measures	$11,484	$3,486	$1,935	$1,374	$0	$38,630	$56,909	$79,567
Building Shell	$2,666	$215	$120	$115	$0	$8,311	$11,428	$25,778
Compressed Air	$280,963	$53,895	$29,761	$13,189	$0	$205,583	$583,392	$482,362
Energy Management	$149,157	$38,374	$21,305	$15,685	$0	$58,246	$282,766	$74,773
Food Service Equipment	$6,653	$502	$280	$281	$0	$2,400	$10,115	$4,295
HVAC	$57,525	$9,370	$5,221	$4,891	$0	$141,705	$218,713	$305,998
Irrigation	$134,340	$12,436	$1,767	$5,154	$0	$138,204	$291,902	$321,028
Lighting	$1,410,754	$164,385	$89,283	$70,885	$0	$1,333,501	$3,068,808	$2,674,464
Motors	$6,196	$5,092	$2,815	$1,430	$0	$43,948	$59,481	$124,065
Refrigeration	$263,161	$92,663	$51,515	$41,732	$0	$743,572	$1,192,643	$1,323,608
Total:	**$2,322,899**	**$380,418**	**$204,003**	**$154,737**	**$0**	**$2,714,101**	**$5,776,157**	**$5,415,938**

Table 3: Annual Savings - PY2020

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	257,533	94%	242,081	100%	242,081	15
Building Shell	20,111	94%	18,904	100%	18,904	17
Compressed Air	2,865,749	96%	2,751,119	100%	2,751,119	15
Energy Management	2,912,284	100%	2,912,284	100%	2,912,284	3
Food Service Equipment	48,529	94%	45,617	100%	45,617	12
HVAC	858,145	100%	856,740	100%	856,740	14
Irrigation	1,109,721	100%	1,109,721	100%	1,109,721	12
Lighting	12,915,186	90%	11,623,667	100%	11,623,667	10
Motors	296,265	94%	278,489	100%	278,489	15
Refrigeration	7,566,625	100%	7,566,625	100%	7,566,625	15
Total:	**28,850,148**	**95%**	**27,405,248**	**100%**	**27,405,248**	12

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

Table 4: Benefit/Cost Ratios by Measure Category - PY2020

Measure Category	PTRC	TRC	UCT	PCT	RIM
Additional Measures	2.64	2.40	4.13	3.24	0.85
Building Shell	0.99	0.90	2.27	1.05	0.86
Compressed Air	3.41	3.10	4.56	5.59	0.87
Energy Management	2.10	1.91	2.02	9.83	0.60
Food Service Equipment	2.78	2.53	3.00	8.73	0.67
HVAC	3.11	2.82	4.95	3.00	1.09
Irrigation	2.32	2.11	3.43	3.09	0.87
Lighting	2.10	1.91	2.74	3.63	0.74
Motors	2.12	1.93	4.53	2.39	0.86
Refrigeration	4.86	4.42	6.57	5.98	0.94
Total Program	**2.87**	**2.61**	**3.83**	**4.35**	**0.83**
Total Program (with NEIs)	**2.87**	**2.61**	**3.83**	**4.36**	**0.83**

Table 5: Wattsmart Business Program Cost-Effectiveness Results - PY2020[4]

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0344	$8,478,247	$24,347,419	$15,869,171	2.87
Total Resource Cost Test (TRC) No Adder	$0.0344	$8,478,247	$22,134,017	$13,655,770	2.61
Utility Cost Test (UCT)	$0.0234	$5,776,230	$22,134,017	$16,357,787	3.83
Participant Cost Test (PCT)		$5,416,168	$23,576,322	$18,160,154	4.35
Rate Impact Test (RIM)		$26,638,401	$22,134,017	($4,504,384)	0.83
Lifecycle Revenue Impacts ($/kWh)					$0.0006462

Table 6 through Table 15 summarize cost-effectiveness results for each of the measure categories.

[4] All cost-effectiveness analysis outputs are in 2020 dollars.

Table 6: Wattsmart Business Additional Measures Cost-Effectiveness Results - PY2020 (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	$0.0384	$97,846	$258,575	$160,729	2.64
Total Resource Cost Test (TRC) No Adder	$0.0384	$97,846	$235,068	$137,222	2.40
Utility Cost Test (UCT)	$0.0223	$56,909	$235,068	$178,159	4.13
Participant Cost Test (PCT)		$79,567	$257,947	$178,380	3.24
Rate Impact Test (RIM)		$276,226	$235,068	($41,158)	0.85
Lifecycle Revenue Impacts ($/kWh)					$0.0000072

Table 7: Wattsmart Business Building Shell Cost-Effectiveness Results - PY2020 (Load Shape - WA_Large_Office_Space_Cool)

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1353	$28,895	$28,552	($343)	0.99
Total Resource Cost Test (TRC) No Adder	$0.1353	$28,895	$25,957	($2,938)	0.90
Utility Cost Test (UCT)	$0.0535	$11,428	$25,957	$14,529	2.27
Participant Cost Test (PCT)		$25,778	$26,976	$1,198	1.05
Rate Impact Test (RIM)		$30,093	$25,957	($4,136)	0.86
Lifecycle Revenue Impacts ($/kWh)					$0.0000007

Table 8: Wattsmart Business Compressed Air Cost-Effectiveness Results - PY2020 (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	$0.0297	$860,170	$2,929,139	$2,068,969	3.41
Total Resource Cost Test (TRC) No Adder	$0.0297	$860,170	$2,662,854	$1,802,684	3.10
Utility Cost Test (UCT)	$0.0201	$583,392	$2,662,854	$2,079,462	4.56
Participant Cost Test (PCT)		$482,362	$2,698,002	$2,215,640	5.59
Rate Impact Test (RIM)		$3,075,810	$2,662,854	($412,956)	0.87
Lifecycle Revenue Impacts ($/kWh)					$0.0000801

Table 9: Wattsmart Business Energy Management Cost-Effectiveness Results - PY2020 (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	$0.0340	$299,294	$628,920	$329,626	2.10
Total Resource Cost Test (TRC) No Adder	$0.0340	$299,294	$571,745	$272,451	1.91
Utility Cost Test (UCT)	$0.0321	$282,766	$571,745	$288,979	2.02
Participant Cost Test (PCT)		$74,773	$734,827	$660,054	9.83
Rate Impact Test (RIM)		$959,348	$571,745	($387,603)	0.60
Lifecycle Revenue Impacts ($/kWh)					$0.0000868

Table 10: Wattsmart Business Food Service Equipment Cost-Effectiveness Results - PY2020 (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	$0.0287	$12,010	$33,364	$21,354	2.78
Total Resource Cost Test (TRC) No Adder	$0.0287	$12,010	$30,331	$18,321	2.53
Utility Cost Test (UCT)	$0.0242	$10,115	$30,331	$20,216	3.00
Participant Cost Test (PCT)		$4,295	$37,505	$33,209	8.73
Rate Impact Test (RIM)		$45,220	$30,331	($14,889)	0.67
Lifecycle Revenue Impacts ($/kWh)					$0.0000014

Table 11: Wattsmart Business HVAC Cost-Effectiveness Results - PY2020 (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	$0.0424	$383,006	$1,190,094	$807,088	3.11
Total Resource Cost Test (TRC) No Adder	$0.0424	$383,006	$1,081,903	$698,897	2.82
Utility Cost Test (UCT)	$0.0242	$218,713	$1,081,903	$863,190	4.95
Participant Cost Test (PCT)		$305,998	$917,882	$611,884	3.00
Rate Impact Test (RIM)		$994,890	$1,081,903	$87,014	1.09
Lifecycle Revenue Impacts ($/kWh)					$0.0000259

Table 12: Wattsmart Business Irrigation Cost-Effectiveness Results - PY2020
(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	$0.0466	$474,726	$1,102,136	$627,410	2.32
Total Resource Cost Test (TRC) No Adder	$0.0466	$474,726	$1,001,942	$527,216	2.11
Utility Cost Test (UCT)	$0.0287	$291,902	$1,001,942	$710,040	3.43
Participant Cost Test (PCT)		$321,028	$992,188	$671,161	3.09
Rate Impact Test (RIM)		$1,145,886	$1,001,942	($143,945)	0.87
Lifecycle Revenue Impacts ($/kWh)					$0.0000342

Table 13: Wattsmart Business Lighting Cost-Effectiveness Results - PY2020
(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	$0.0438	$4,409,771	$9,263,083	$4,853,312	2.10
Total Resource Cost Test (TRC) No Adder	$0.0438	$4,409,771	$8,420,985	$4,011,214	1.91
Utility Cost Test (UCT)	$0.0305	$3,068,808	$8,420,985	$5,352,177	2.74
Participant Cost Test (PCT)		$2,674,464	$9,701,258	$7,026,794	3.63
Rate Impact Test (RIM)		$11,436,565	$8,420,985	($3,015,580)	0.74
Lifecycle Revenue Impacts ($/kWh)					$0.0003621

Table 14: Wattsmart Business Motors Cost-Effectiveness Results - PY2020
(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	$0.0476	$139,598	$296,510	$156,912	2.12
Total Resource Cost Test (TRC) No Adder	$0.0476	$139,598	$269,554	$129,957	1.93
Utility Cost Test (UCT)	$0.0203	$59,481	$269,554	$210,073	4.53
Participant Cost Test (PCT)		$124,065	$296,250	$172,185	2.39
Rate Impact Test (RIM)		$311,782	$269,554	($42,228)	0.86
Lifecycle Revenue Impacts ($/kWh)					$0.0000081

Table 15: Wattsmart Business Refrigeration Cost-Effectiveness Results - PY2020 (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	$0.0214	$1,772,679	$8,616,911	$6,844,233	4.86
Total Resource Cost Test (TRC) No Adder	$0.0214	$1,772,679	$7,833,556	$6,060,877	4.42
Utility Cost Test (UCT)	$0.0144	$1,192,643	$7,833,556	$6,640,913	6.57
Participant Cost Test (PCT)		$1,323,608	$7,913,322	$6,589,714	5.98
Rate Impact Test (RIM)		$8,362,392	$7,833,556	($528,837)	0.94
Lifecycle Revenue Impacts ($/kWh)					$0.0002097

The Irrigation and Lighting measure categories also provide quantifiable non-energy impacts (NEIs). Table 16 summarizes the NEIs included in these categories, while Table 17 through Table 19 detail the cost-effectiveness results of the Wattsmart Business Program and the Irrigation and Lighting categories after adding in the NEIs.

Table 16: Wattsmart Business Non-Energy Impacts by Measure- PY2020

Measure	Annual Non-Energy Impacts	Quantity	Measure Life	Discount Rate	Total Present Value NEIs
Irrigation	$1,547	1,495	12	6.92%	$13,192
Lighting	$164	40,211	10	6.92%	$1,321
Total	**$1,711**	**41,706**	**12**	**6.92%**	**$14,513**

Table 17: Wattsmart Business Program (with NEIs) Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0344	$8,478,247	$24,362,111	$15,883,864	2.87
Total Resource Cost Test (TRC) No Adder	$0.0344	$8,478,247	$22,148,709	$13,670,462	2.61
Utility Cost Test (UCT)	$0.0234	$5,776,230	$22,134,017	$16,357,787	3.83
Participant Cost Test (PCT)		$5,416,168	$23,591,014	$18,174,846	4.36
Rate Impact Test (RIM)		$26,638,401	$22,134,017	($4,504,384)	0.83
Lifecycle Revenue Impacts ($/kWh)					$0.0006462

Table 18: Wattsmart Business Irrigation (with NEIs) Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0466	$474,726	$1,115,328	$640,602	2.35
Total Resource Cost Test (TRC) No Adder	$0.0466	$474,726	$1,015,134	$540,408	2.14
Utility Cost Test (UCT)	$0.0287	$291,902	$1,001,942	$710,040	3.43
Participant Cost Test (PCT)		$321,028	$1,005,380	$684,353	3.13
Rate Impact Test (RIM)		$1,145,886	$1,001,942	($143,945)	0.87
Lifecycle Revenue Impacts ($/kWh)					$0.0000342

Table 19: Wattsmart Business Lighting (with NEIs) Cost-Effectiveness Results - PY2020

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0438	$4,409,771	$9,264,405	$4,854,634	2.10
Total Resource Cost Test (TRC) No Adder	$0.0438	$4,409,771	$8,422,306	$4,012,535	1.91
Utility Cost Test (UCT)	$0.0305	$3,068,808	$8,420,985	$5,352,177	2.74
Participant Cost Test (PCT)		$2,674,464	$9,702,579	$7,028,115	3.63
Rate Impact Test (RIM)		$11,436,565	$8,420,985	($3,015,580)	0.74
Lifecycle Revenue Impacts ($/kWh)					$0.0003621

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Appendix 2
Washington Measure Installation Verifications

Washington Measure Installation Verifications

Home Energy Savings (effective 10/1/2020)

Site or virtual inspections by Program Administrator staff for the following retrofit and/or new homes measures. Inspections are performed on >=5 percent of single family homes, >=5 percent of manufactured homes, 100 percent of multifamily projects (retrofit and new) , and 20 percent of new homes projects. Single family homes inspection rates will be applied to the total aggregate of downstream mechanical and weatherization measures.

- Central air conditioning Duct sealing
- Duct sealing and insulation
- Heat pump
- Heat pump water heaters
- Insulation
- Windows

No site or virtual inspections are conducted for the following measures. However, all post-purchase incented measures undergo a quality assurance review prior to the issuance of the customer/dealer incentive and recording of savings (e.g. proof of purchase receipt review) and eligible equipment review. Additionally, customer account and customer address are checked to ensure the program administrator does not double pay for the same measure or double count measure savings.

- Central air conditioners
- Clothes washers
- Evaporative cooler
- Hybrid/heat pump clothes dryers
- Line voltage thermostats
- New manufactured homes
- Smart thermostats

No site or virtual inspections are conducted for the following measures, which are delivered via an upstream, manufacturer buy-down model. Promotion agreement contracts are signed with manufacturers and retailers to set incentive levels, final product prices, and limits to the total number of units that can be purchased per customer. Program Administrator verifies measures for product eligibility and correct pricing. Pricing is also verified by Program Administrator field visits to retail locations.

- LED bulbs
- Light fixtures (upstream)

Customer eligibility for wattsmart Starter Kits is verified using the customer's account number and last name and cross-verifying with the current PacifiCorp customer database.

Low Income Weatherization

All projects

- All measures are qualified through US Department of Energy approved audit tool or priority list.
- 100 percent inspection by agency inspector of all homes treated, reconciling work completed and quality (corrective action includes measure verification) prior to invoicing Company.
- State inspector follows with random inspections.

The Company hires independent inspector to inspect between 5-10 percent of homes treated (post treatment and payment).

Wattsmart Business (effective 10/1/2020)

Lighting projects
Inspection requirements vary depending on the amount of the incentive and the type of project.

- Incentive above high threshold
    - Retrofits - 100 percent pre- and post-installation site or virtual inspections of all projects with incentives over a specified dollar amount. Project cost documentation reviewed for all projects.
    - New construction - 100 percent post-installation site or virtual inspections of all projects with incentives over a specified dollar amount.
- Incentive between low and high thresholds
    - Retrofits - 100 percent pre-installation site or virtual inspections of all projects with incentives between the low and high threshold amounts. Note inspections may be waived on a case by case basis for projects completed by Premium Vendors and below a threshold that is between the low and high threshold. A percent of post-installation site or virtual inspections by program administrator of projects with incentives between the low and high threshold amounts. Project cost documentation reviewed for all projects. For lighting controls only retrofit projects, 100 percent post-installation site or virtual inspections.
    - New construction – 100 percent post-installation site or virtual inspections of projects with incentives between the low and high threshold amounts.
- Incentive below low threshold
    - A percent of post-installation site or virtual inspections by program administrator of projects with incentives under a specified dollar amount.

Lighting – small business
On-site or virtual post-incentive inspections will be performed by third party program administrator on a minimum of x percent of approved projects for each approved Small Business Vendor based on project count per calendar year. On-site, virtual, or phone surveys will be conducted with participating customers to ensure documentation accuracy, installation and product quality, and customer satisfaction.

Lighting – midmarket/instant incentives

Third party program administrator will conduct regular spot checks on a sampling of approved projects after incentive processing. Inspections will include phone, virtual, and on-site inspections.

- All projects with customer incentives over $y will receive an on-site or virtual inspection.
- A minimum of x percent sampling of all remaining projects will be selected for phone inspections. An additional x percent sampling will be selected for on-site or virtual inspections.

For typical upgrades, small business, and instant incentive offers, required inspections are performed by the program administrator.

Non-lighting projects (typical upgrades/listed measures where savings is deemed)

- 100 percent of applications with an incentive that exceeds a specified dollar amount will be inspected (via site or virtual inspection) (typically by program administrator).
- A minimum of a specified percent of remaining non-lighting applications will be inspected, either in person or via telephone interview, (typically by program administrator).

Non-lighting projects (typical upgrades/listed measures where savings is determined using a simplified analysis tool)

- 100 percent of applications with project savings that exceeds a specified threshold will be inspected (via site or virtual inspection) (typically by program administrator).
- A minimum of a specified percent of remaining non-lighting applications will be inspected, either in person or via telephone interview, (typically by program administrator).

Custom projects

- 100 percent pre/post-installation inspections, invoice reconciled to inspection results. On-site or virtual pre/post inspections are required for projects with savings over a specified threshold. For projects with savings below the threshold, inspection information may be collected by phone or email.
- No pre-inspection for new construction.
- Inspections are conducted by the program administrator.

All Programs

As part of the third-party program evaluations (two-year cycle) process, the Company has implemented semi-annual customer surveys to collect evaluation-relevant data more frequently to help compensate for customer difficulty remembering details about past projects and other detractors such as customers moving and data not be readily available at evaluation time). This will serve as a further check verifying customer participation and measures installed.

Additional record reviews and site inspections (including metering/data logging) is conducted as part of the process and impact evaluations, a final verification of measure installations.

The company also hires a third party to provide a summary report that will be submitted as an appendix to PacifiCorp's Biennial Conservation Report (BCR), which will be filed by June 1 of even numbered years. This review is not meant to duplicate already-completed impact evaluations of the individual energy efficiency programs, but rather to assess field verification practices and tracking, and the reporting processes helping validate the accuracy of the savings being reported. It also provides an

assessment of PacifiCorp's evaluation, measurement, and verification (EM&V) procedures and third-party evaluation methodologies, and whether they meet reasonable industry best practice standards.

This review relies on multiple approaches. The review team examines selected overarching documents, databases, and calculations underpinning the PacifiCorp biennial portfolio claims. In addition, the review team is selecting random samples of project-level documentation for each program, and subjecting these samples to careful scrutiny and analysis, including field verification. Examining the portfolio claims at both summary and detail levels helps identify problems and potential improvements that can strengthen PacifiCorp's future claims.

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Appendix 3
Home Energy Savings Retailers

Contents

Participating Upstream/Midstream Lighting Retailers and Redemptions

The Company worked with 45 lighting retailers in 2020 to promote efficient lighting. Table 1 lists the retailer and the type of redemption(s) provided.

Table 1[1]
Participating Upstream/Midstream Lighting Retailers and Redemptions

Retailer	City	State	LEDs	Fixtures
Ace Hardware - Stein's #7047	Yakima	WA	✓	✓
Ace Hardware #15365	Kennewick	WA	✓	
Ace Hardware #14426	Naches	WA	✓	
Ace Hardware Hometown #11909	Yakima	WA	✓	
Ace Hardware Roy's #10640	Yakima	WA	✓	
Batteries Plus #250	Kennewick	WA	✓	
Batteries Plus #654	Yakima	WA	✓	✓
Batteries Plus #967	Walla Walla	WA	✓	
Best Buy #831	Yakima	WA	✓	
Best Buy #590	Kennewick	WA	✓	
Bi-Mart #619	Walla Walla	WA	✓	✓
Bi-Mart #636	Sunnyside	WA	✓	
Costco #486	Kennewick	WA	✓	✓
Costco #1013	Union Gap	WA	✓	✓
Dollar Tree #2387	Yakima	WA	✓	
Dollar Tree #2691	Walla Walla	WA	✓	
Dollar Tree #2696	Kennewick	WA	✓	
Dollar Tree #5342	Yakima	WA	✓	
Dollar Tree #5863	Walla Walla	WA	✓	
Dollar Tree #3450	Kennewick	WA	✓	
Dollar Tree #4295	Yakima	WA	✓	
Fred Meyer #163	Kennewick	WA	✓	
Fred Meyer #486	Yakima	WA	✓	✓
Goodwill	Kennewick	WA	✓	✓
Goodwill	Selah	WA	✓	✓
Goodwill	Walla Walla	WA	✓	✓
Goodwill	Yakima	WA	✓	✓

[1] To be considered as a participating retailer for discounted lighting products, the retailer's sales coming from Pacific Power customers must be a significant majority of their total sales.

Retailer	City	State	LEDs	Fixtures
Grocery Outlet	Kennewick	WA	✓	
Habitat For Humanity (Yakima, 1st St)	Yakima	WA	✓	✓
Habitat For Humanity (Yakima, Mead Ave)	Yakima	WA	✓	✓
Home Depot #4727	Yakima	WA	✓	✓
Home Depot #4735	College Place	WA	✓	✓
Home Depot #4739	Kennewick	WA	✓	✓
Hometown Ace Hardware #11909	Yakima	WA	✓	✓
Lowe's #249	Kennewick	WA	✓	
Lowe's #3240	Yakima	WA	✓	✓
Target #760	Yakima	WA	✓	
Target #830	Kennewick	WA	✓	
True Value (Helms)	Selah	WA	✓	
True Value Hardware – Country Farm and Garden	Yakima	WA	✓	
True Value Hardware #5353	Selah	WA	✓	
Wal-Mart - Supercenter #2101	Kennewick	WA	✓	
Wal-Mart - Supercenter #5078	Yakima	WA	✓	✓
Wal-Mart #2269	Yakima	WA	✓	✓

Downstream Retailers

Eighteen **participating** retailers provided redemptions for downstream clothes washers, evaporative coolers, self-installed heat pump water heaters, attic insulation, floor insulation, wall insulation, smart thermostats, and windows.

Table 2
Downstream Retailers

Participating Retailer (Retailers who are not actively enrolled in the program)	City	State	Clothes Washer	Evaporative Cooler - Tier 2	Heat Pump Water Heater, Self-installed	Insulation-Attic	Insulation-Floor	Insulation- Wall	Smart Thermostat	Windows
Bemis Home Appliance & Tv Ctr	Yakima	WA	✓							
Best Buy #831	Yakima	WA	✓						✓	
Costco #1013	Union Gap	WA							✓	
Elgin's Appliance Center	Milton-Freewater	WA	✓							
Ferguson Enterprises	Walla Walla	WA	✓							
Ferguson Enterprises	Yakima	WA	✓							
Fred Meyer #486	Yakima	WA							✓	
Home Depot #4727	Yakima	WA	✓	✓	✓	✓	✓	✓	✓	
Home Depot #4735	College Place	WA	✓		✓	✓			✓	✓
Lowe's #3240	Yakima	WA	✓		✓	✓			✓	
Lowe's of Pasco	Pasco	WA	✓						✓	
Sears #2029	Union Gap	WA	✓							
Sears #6914	Walla Walla	WA	✓							
Target #760	Yakima	WA							✓	
Wal-Mart #2241	Sunnyside	WA							✓	
Wal-Mart #2269	Yakima	WA							✓	
Wal-Mart #5078	Yakima	WA							✓	

Nine **non-participating** retailers provided redemptions for downstream clothes washers, heat pump water heaters, and smart thermostats. Some retailers are located outside Pacific Power's service territory. However, the customer resides with the service territory.

Table 3
Non-Participating Retailers

Redemptions from Non-Participating Retailer's (Retailer may not be located in the service territory)	City	State	Clothes Washer	Heat Pump Dryer	Heat Pump Water Heater, Self-installed	Smart Thermostat
AJ Madison Inc	Walla Walla	WA			✓	
Amazon.com	Seattle	WA				✓
BestBuy.com	N/A					✓
Costco.com	N/A		✓		✓	
HomeDepot.com	N/A			✓		
Home Depot - Longview	Longview	WA		✓		
Keller Supply Co	Union Gap	WA				
Sears	Sunnyside	WA	✓			
SearsOutlet.com	N/A			✓		

The Company worked with 29 HVAC trade allies. Some trade allies are located outside Pacific Power's service territory. However, the customer resides with the service territory.

Table 4
HVAC Trade Ally

Trade Ally (Trade ally may be located outside of the territory)	City	State	Central Air Conditioner Equipment	Duct Sealing	Duct Sealing and Duct Insulation	Electric System to Heat Pump Conversion	Heat Pump to Heat Pump Upgrade	Heat Pump - PTCS Commissioning, Controls, and	Heat Pump, Ductless
Absolute Comfort Technology, LLC	Yakima	WA	✓			✓	✓	✓	✓
AccuTemp Heating and Air Conditioning	Yakima	WA				✓			
American Air Heating and Conditioning	Walla Walla	WA				✓	✓		✓
Aztec Heating & Air	Grandview	WA				✓			✓
Blaze to Blizzard Heating & Cooling	Walla Walla	WA							✓
Bob Rhodes Heating & Air Conditioning	Kennewick	WA				✓			
Brian Dow Heat & Air LLC	Cowiche	WA							✓
Campbell & Company	Pasco	WA	✓	✓		✓	✓	✓	✓
Chapman Heating & Air Conditioning Inc	Dayton	WA							✓
CK Home Comfort Systems	Grandview	WA				✓	✓		✓
College Place Heating & Air Conditioning	College Place	WA	✓			✓	✓	✓	✓
Comfort Pro's Heating & Air Conditioning	Yakima	WA	✓			✓	✓		✓
Dave's Heating and Cooling	Yakima	WA				✓			
Dayco Inc	Kennewick	WA				✓			
Farwest Climate Control	Yakima	WA				✓	✓		✓
Four Seasons HVAC	Yakima	WA				✓			✓
Mike's Mechanical	Lewiston	ID							✓
Mill Creek Mechanical	Walla Walla	WA							✓
Miller & Team Heating & AC	Zillah	WA				✓			✓
Platte Heating & AC	Yakima	WA							✓
ThermAll Heating & Cooling Inc	Yakima	WA		✓		✓	✓	✓	✓
TNG Heating & Refrigeration	Zillah	WA							✓
Total Quality Air	Pasco	WA	✓			✓	✓		✓
Total Comfort Solutions, LLC	Walla Walla	WA	✓			✓	✓		✓
Vance Heating and AC	Yakima	WA	✓			✓	✓	✓	✓
Young's Heating & Cooling, LLC	Walla Walla	WA				✓			✓

Table 5
Manufactured Homes Trade Ally

Trade Ally Name (Trade ally may be located outside of the territory)	City	State	Manufactured Homes Duct Sealing	Energy Star/Eco-Rated Manufactured Homes
Clayton Homes	Union Gap	WA	✓	
Gillespie Homes	Kennewick	WA		✓
Lakeshore Homes Sales LLC	Yakima	WA		✓
Sunrise Home Center, Inc.	Clarkston	WA		✓
Valley Quality Homes	Yakima	WA		✓

Plumbing Trade Ally

Table 6 lists 3 plumbing trade allies the Company worked with to promote efficient plumbing technologies.

Table 6
Plumbing Trade Ally

Trade Ally Name (Trade ally may be located outside of the territory)	City	State	Heat Pump Water Heaters
Dave's Heating and AC	Yakima	WA	✓
Rainwater	Grandview	WA	✓

Shephard Plumbing	Yakima	WA	✓

Weatherization Trade Ally

Table 7 lists 9 weatherization trade allies the Company worked with.

Table 7
Weatherization Trade Ally

Trade Ally Name (Trade ally may be located outside of the territory)	City	State	Insulation-Attic	Insulation-Floor	Insulation-Wall	Windows
A+ Quality Insulation	Pasco	WA	✓	✓		
Central Valley Glass	Yakima	WA				✓
Don Jordan Energy Systems	Yakima	WA	✓	✓		
Insul Homes	Yakima	WA	✓	✓		
Intermountain West Insulation	Kennewick	WA	✓	✓	✓	
McKinney Glass Inc.	Yakima	WA				✓
RJ Weatherization & Insulation	Yakima	WA	✓	✓		
Smith Insulation	Walla Walla	WA	✓	✓	✓	
ThermALL Heating & Cooling	Yakima	WA	✓			

Table 8
Applications by Customer City and Measure Category

Customer City	% of All Applications
BUENA	0.11%
BURBANK	0.90%
COLLEGE PLACE	4.49%
COWICHE	0.29%
DAYTON	1.36%
GRANDVIEW	3.62%
GRANGER	0.95%
HARRAH	0.48%
MABTON	0.33%
MOXEE	1.77%

Customer City	% of All Applications
NACHES	1.35%
OUTLOOK	0.51%
PARKER	0.06%
POMEROY	0.37%
PRESCOTT	0.19%
PROSSER	0.20%
SELAH	9.67%
SUNNYSIDE	4.07%
TIETON	0.62%
TOPPENISH	1.47%
TOUCHET	0.67%
UNION GAP	1.77%
WAITSBURG	1.13%
WALLA WALLA	23.3%
WALLULA	0.03%
WAPATO	1.43%
YAKIMA	36.22%
ZILLAH	2.02%

Appendix 4

*watt*smart Business Vendor Network

Search Criteria

Sector Business

HVAC - unitary
Lighting
Building envelope
Controls - Lighting
Motors and VFDs
Appliances
Food service
Compressed air
Irrigation

Specialties Farm and dairy
Other Specialty
HVAC - evaporative
Office equipment
Lighting instant incentives
Small business lighting
Controls - HVAC
Controls - Advanced Rooftop Unit
Controls

The following is a list of contractors, distributors, manufacturers and other vendors participating in Pacific Power's Wattsmart® Vendor Network displayed in random order (unless sorted by the user) based on the search criteria selected. This listing is provided solely as a convenience to our customers. Pacific Power does not warrant or guarantee the work performed by these participating vendors. You are solely responsible for any contract with a participating vendor and the performance of any vendor you have chosen.

Name and Address	Website	Contact	Specialties	Business Type	Language Spoken	Projects Completed
MH Electric Inc. *PREMIUM VENDOR* P.O. Box 11224 Yakima, WA 98909		Walt Wenda ww@mhelectricinc.com 509-452-6039	Controls - Lighting Farm and dairy Lighting Motors and VFDs Small business lighting	Contractor Design-Build Firm Consultant Electrician	Spanish English	22

M. Campbell & Company 2828 W Irving St Pasco, WA 99301	http://www.callcampbell.com	Becky Tenny beckyt@callcampbell.com 509-545-9848	HVAC - evaporative HVAC - unitary	Contractor	English	
Columbia Electric Supply 1913 Washington Street Pasco, WA 99301	https://ces-pasco.com	Teri Bostock tbostock@ces-pasco.com 509-547-9733	Controls - Lighting Lighting Motors and VFDs	Distribution / Wholesaler	English	1
College Place Heating & Air Conditioning 970 NE Rose College Place, WA 99324	https://www.cpheat.com/	Dan Peterson sales@cpheat.com 509-525-8073	Controls - HVAC	Contractor Electrician	English	
BITS LIMITED 700 N. Valley St, Suite B-41123 Anaheim,, CA 92801	http://www.bitsltd.net	Scott Markshausen kurt.markshausen@bitsltd.net 831-419-1627	Lighting Office equipment Other Specialty	Distribution / Wholesaler Manufacturing	English	
Stoneway Electric Supply - Yakima 23 N. 3rd Ave Yakima, WA 98902	http://www.stoneway.com/	Tyler Hicks tyler.hicks@stoneway.com 509-469-6154	Controls - Lighting Lighting Lighting instant incentives Motors and VFDs	Distribution / Wholesaler	English	1
All-Phase Electric, Inc. 2500 S 12th Ave Union Gap, WA 98903	http://allphaseelectric.org	Andrew Lea andrew@allphaseelectric.org 509-454-5093	Lighting Motors and VFDs	Contractor	English	1
TJ's Refrigeration, Heating & Air 329 S 6th St Sunnyside, WA 98944	http://tjsrefrigerationheatingandair.com	Joe Tovar tjsref@hotmail.com 509-839-8840	Appliances Building envelope Controls - Lighting Food service HVAC - evaporative HVAC - unitary Motors and VFDs	Contractor	English	
Apollo Mechanical Contractors 1201 W Columbia Drive Kennewick, WA 99336	http://www.apollomech.com/	Gene Batey gbatey@apollosm.com	Appliances Building envelope Controls - Lighting Food service HVAC - evaporative HVAC - unitary Irrigation Motors and VFDs Office equipment	Contractor Design-Build Firm Distribution / Wholesaler Manufacturing Engineering Services	English	
Total Energy Management 2521 Stevens Drive Richland, WA 99354	http://teminc.com/	Aaron DeWitt adewitt@teminc.com 509-946-4500	Controls - HVAC HVAC - evaporative HVAC - unitary Motors and VFDs	Contractor Design-Build Firm Electrician	English	

KIE Supply 113 E Columbia Dr Kennewick, WA 99336	https://www.kiesupply.com	Leigh Kluthe leigh@kiesupply.com 509-582-5156	Controls - Lighting Lighting	Distribution / Wholesaler	English	2
American Wholesale Lighting 1725 Rutan Dr Livermore, CA 94551	https://www.awlighting.com	Rianto Lie rlie@awlighting.com 510-252-1088	Lighting	Contractor Distribution / Wholesaler Manufacturing Retailer Electrician	Spanish Chinese English	
Columbia Electric Supply 3211 Allen Rd Sunnyside, WA 98944	http://www.ces-sunnyside.com	Tye Kaple tkaple@ces-sunnyside.com 509-837-6033	Controls - Lighting Lighting Motors and VFDs	Distribution / Wholesaler	English	2
Batteries Plus Bulbs - Kennewick 321 N Columbia Center Blvd. Kennewick, WA 99336	https://www.batteriesplus.com/	Kristie Midili mgr250@batteriesplus.net 509-783-3400	Lighting Lighting instant incentives	Distribution / Wholesaler	English	
North Coast Electric - Yakima 215 N 3rd Ave Building A Yakima, WA 98902 Yakima, WA 98902	http://www.northcoastelectric.com	Jay Claussner jclaussn@nclec.com 630-639-3084	Controls - Lighting Lighting Lighting instant incentives	Distribution / Wholesaler	English	1
Knobel's 801 Tennant ln Yakima, WA 98901		Steve Soderstrom knobelselectric@msn.com 509-452-9157	Controls - Lighting Lighting Motors and VFDs Small business lighting	Contractor	English	1
Conserve Energy 1045 Andover Park East #200 Tukwila, WA 98188	https://www.ezmetro.com	Mark Hansen mark.hansen@ezmetro.com 206-409-4869	Controls - HVAC Controls - Lighting Lighting Motors and VFDs Small business lighting	Contractor	English	4
Leidos Engineering, LLC. 301 Plainfield Rd. Suite 310 Syracuse, NY 13212	https://energy.leidos.com/	Christopher Piechuta amplify@leidos.com 855-926-7543	Appliances Compressed air Controls - Lighting Food service HVAC - evaporative HVAC - unitary Lighting Motors and VFDs Office equipment Other Specialty	Engineering Services	English	1
CED - Richland 1920 Fowler St Richland, WA 99352		Dan Derosio dan@cedyakima.com 509-737-8282	Lighting instant incentives	Distribution / Wholesaler	English	

Stusser Yakima 116 N. 2nd Ave. Yakima, WA 98902	https://www.www.com	Steve DiBenedetto steved@stusseryakima.com 509-453-0378	Lighting Lighting instant incentives Motors and VFDs	Distribution / Wholesaler	English	1
North Coast Electric - Pasco 1928 W. A St Pasco, WA 99301	http://www.NorthCoastElectric.com	Zack Boucher zboucher@ncelec.com 206-442-9846	Building envelope Controls - Lighting Lighting Lighting instant incentives Motors and VFDs Other Specialty	Distribution / Wholesaler	English	1
Platt Electric - Walla Walla 415 west main Walla Walla, WA 99362	https://www.platt.com	Robert Kinion robert.kinion@platt.com 509-522-0611	Lighting Lighting instant incentives	Distribution / Wholesaler	English	3
Renewal by Andersen 7433 5th Ave S Renewal by Andersen Seattle, WA 98108	https://RenewMyWindows.com	Steve Daylong steve.daylong@rbawa.com 206-777-0141	Building envelope	Contractor	English	
CED - Yakima 131 S 1st Ave YAKIMA, WA 98903		Dan Derosier dan@cedyakima.com 509-248-0872	Lighting Lighting instant incentives	Distribution / Wholesaler	English	2
McKinney Glass Inc. 2220 Goodman Road. Union Gap, WA 98903	http://mckinneyglass.com	Mike McKinney mgmckinney@yvn.com 509-248-2770	Building envelope	Contractor Dealer	English	
Walla Walla Electric 1225 W. Poplar Walla Walla, WA 99362	http://www.wwelectric.com	Spike Teal spike@wwelectric.com 509-525-8672	Controls - Lighting Lighting Motors and VFDs Small business lighting	Contractor Electrician	English	3
ENERGY MANAGEMENT COLLABORATIVE 2890 Vicksburg Lane N PLYMOUTH, MN 55447	http://www.emcllc.com	NICK OLSEN nolsen@emcllc.com 952-542-7967	Controls - Lighting Lighting	Contractor	English	1
ecomodus, LLC 5110 Tieton Drive Yakima, WA 98908		Dan Richards ecomodus@msn.com 509-307-4363	Lighting	Other	English	7
Stoneway Electric Supply 44 s Palouse St. Walla Walla, WA 99362	http://www.stoneway.com	Robin Saxby robin.saxby@stoneway.com 509-522-1550	Lighting Lighting instant incentives	Distribution / Wholesaler	English	2

Stoneway 630 Railroad St. Richland, WA 99352	https://www.stoneway.com	Joel Garcia jgarcia@stoneway.com 509-943-4664	Lighting Lighting instant incentives	Distribution / Wholesaler	English	
Core Northwest LLC 1413 River Road Yakima, WA 98902	http://www.corenorthwest.com	Rod Cassel rod@corenorthwest.com 509-248-2673	Controls - Lighting Irrigation Lighting Motors and VFDs	Contractor	English	3
Tom S Construction 4907 Ahtanum Rd Yakima, WA 98903		Tom Stoothoff tastoothoff@hotmail.com 509-307-1954	Building envelope	Contractor	English	
Schneider Electric, Inc. 20830 N Tatum Boulevard, Suite 330 Phoenix, AZ 85050	https://www.schneider-electric.com/ess	Jeanette Strickstein jeanette.strickstein@se.com 480-346-5829	Appliances Building envelope Controls - HVAC Controls - Lighting Farm and dairy Food service HVAC - evaporative HVAC - unitary Lighting Motors and VFDs Office equipment Other Specialty	Consultant Other	English	
Young's Heating & Cooling LLC 878 Wallula Ave Walla Walla, WA 99362	https://youngsheating.com	Susan Fouste mail@youngsheating.com 509-525-4328	Controls - HVAC HVAC - evaporative HVAC - unitary Motors and VFDs	Contractor	English	1
Batteries Plus Bulbs - Yakima 1731 South 1st Street Yakima, WA 98901	https://www.batteriesplus.com	Jessie Hottell mgr654@batteiresplus.net 509-571-1322	Lighting Lighting instant incentives	Distribution / Wholesaler	English	
Batteries Plus Bulbs - Walla Walla 632 S 9th Ave Walla Walla, WA 99362	https://www.batteriesplus.com/	Michelle Russell mrussell@batteriesplus.net 509-924-6645	Lighting Lighting instant incentives	Distribution / Wholesaler	English	
Yakima Air Compressor 2535 S. 12th Ave Yakima, WA 98903	http://www.wedonthaveone.com	Evan Bohannon yakimaair@outlook.com 509-453-5059	Compressed air Motors and VFDs	Distribution / Wholesaler	English	
Blaze 2 Blizzard LLC 502 COUNTY RD.448 WALLA WALLA WALLA WALLA, WA 99362	https://www.blaze2blizzard.com	ANATOLIY SEMENKO INFO@BLAZE2BLIZZARD.COM 509-200-6723	Controls - HVAC HVAC - evaporative HVAC - unitary	Contractor	Spanish English	
			Controls - Lighting			

509 Electric 3402 W Washington Ave Suite 101 Yakima, WA 98903	https://509electric.com	Nick Nalley nick@509electric.com 509-571-1082	Irrigation Lighting Lighting instant incentives Motors and VFDs Small business lighting	Contractor Electrician	English	
Columbia Electric Supply - Walla Walla 932 N 13TH AVE Walla Walla, WA 99362	http://www.ced-columbia.com/	Daron Waldon dwalden@ces-ww.com 509-522-1419	Lighting Motors and VFDs	Distribution / Wholesaler	English	3
Platt Electric Supply - Yakima 16 S. 1st Avenue Yakima, WA 98902	http://www.platt.com	Jeremy Sandino jlsandino@platt.com 509-452-6444	Controls - HVAC Controls - Lighting Lighting Lighting instant incentives Motors and VFDs Other Specialty	Distribution / Wholesaler	English	25
Lumenal Lighting LLC 21706 66th Ave W Mountlake Terrace, WA 98043	https://www.Lumenal.com	Shane Petitt spetitt@lumenal.com 425-737-1444	Controls - Lighting Lighting	Contractor Electrician	English	2
BidEnergy Inc. 1628 JFK Blvd, Ste 2100 Philadelphia, PA 19103	http://bidenergy.com	Timothy Mayo tim.mayo@bidenergy.com 215-732-4480	Appliances Building envelope Controls - Lighting Food service HVAC - evaporative HVAC - unitary Lighting Motors and VFDs Office equipment	Other	English	1
Transformative Wave 1012 Central Ave S Kent, WA 98032	http://transformativewave.com/	Joe Schmutzler joe.s@twavetech.com 253-867-2333	Controls - Advanced Rooftop Unit Controls Controls - HVAC HVAC - unitary Motors and VFDs	Distribution / Wholesaler	English	
ICE AND FIRE MECHANICAL INC. 210 AMERICAN FRUIT RD. YAKIMA, WA 98903	https://iceandfiremechanical.com/contact/	Kennedee Lecuyer iceandfiremech@msn.com 509-966-8731	Controls - Advanced Rooftop Unit Controls Controls - HVAC HVAC - evaporative HVAC - unitary	Contractor	English	
Platt Electric - Grandview 100 Stover Loop Rd. Grandview, WA 98930	https://www.platt.com/	Rolando Solis rolly.solis@platt.com 509-882-1616	Lighting Lighting instant incentives	Distribution / Wholesaler	English	

Appendix 5
Comminications

Energy Efficiency Communications 2020

Creative *(click on the hyperlinks below to see the creative)*

TV

- Washington Good :30 – English
- Washington Good :30 – Spanish
- Washington efficiency "Apple King"

Radio

- Washington Better :60 – English
- Washington Better :60 – Spanish
- Incentives for Lighting and lighting controls for businesses
- Washington efficiency "Apple King"
- Washington efficiency "Canoe Ridge Vineyard"

Print

- Washington spring/winter – "Good"
- Spanish spring/winter "Bueno"
- Irrigation – color
- Ad to thank business customers and vendors for being Wattsmart last year
- LED Lighting and Controls for business b/w
- Washington efficiency "Canoe Ridge Vineyard"
- Washington efficiency "Apple King"
- Washington efficiency "Wray's"

Digital Ads

- Being Wattsmart is "good"
- Being Wattsmart "helps"
- Being Wattsmart is "better"
- Being Wattsmart is "good"
- Being Wattsmart "helps"
- Being Wattsmart is "better"

- Being Wattsmart is "good" winter animated
- Being Wattsmart is "good" summer animated
- Wray's Marketfresh
- Canoe Ridge Vineyard
- Apple King
- Apple King tall

Social

- Winter Wattsmart tips 68 degrees Facebook ads – English
- Cooling – thermostat

- Thermostat offer
- Washington savings – family
- Washington savings
- Canoe Ridge Vineyard
- Apple King

Newsletters:

- February Connect newsletter
- May Connect newsletter
- July Connect newsletter
- October Connect newsletter

Onserts:

- Wattsmart Auto Pay onsert

Direct mail:

- Mailing to irrigation customers encouraging application for incentives:
  - Letter – March
  - Application – March
  - Pivot flyer – March
  - Letter – October
  - Application – October
  - Energy Savings Flyer – October

Emails:

- Wattsmart Starter Kit email
- Wattsmart Starter Kit email (2)
- Wattsmart Starter Kit email (2) – Spanish
- Wattsmart Starter Kit email (3)
- Smart Thermostat email
- Energy Assessment email
- Irrigation Incentives email

Collateral:

- Wattsmart Business – incentive brochure
- Wattsmart Business – Energy Management brochure
- Wattsmart Business – Energy Project Manager co-funding handout
- Wattsmart Business – light midstream brochure
- Wattsmart Business – overview handout
- Wattsmart Business – Small Business flyer
- Wattsmart Business – wastewater handout

2020

NEF

Be Wattsmart, Begin at home

WASHINGTON

Program Report

Prepared for:

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Rocky Mountain Power

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Prepared by:

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Program Director

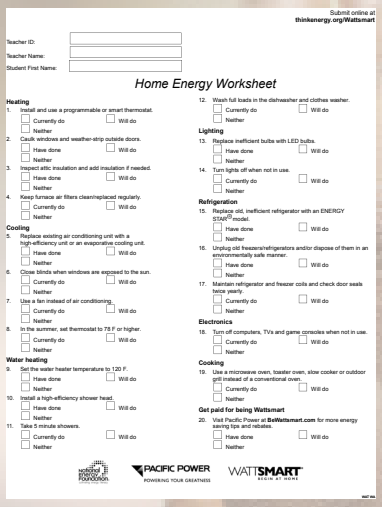
National Energy Foundation

4516 South 700 East, Suite 100

Salt Lake City, UT 84107

March 2, 2021

Savings



Submit online at
thinkenergy.org/Wattsmart

Teacher ID:

Teacher Name:

Student First Name:

Home Energy Worksheet

Heating

1. Install and use a programmable or smart thermostat.
   ☐ Currently do ☐ Will do ☐ Neither
2. Caulk windows and weather-strip outside doors.
   ☐ Have done ☐ Will do ☐ Neither
3. Inspect attic insulation and add insulation if needed.
   ☐ Have done ☐ Will do ☐ Neither
4. Keep furnace air filters clean/replaced regularly.
   ☐ Currently do ☐ Will do ☐ Neither

Cooling

5. Replace existing air conditioning unit with a high-efficiency unit or an evaporative cooling unit.
   ☐ Have done ☐ Will do ☐ Neither
6. Close blinds when windows are exposed to the sun.
   ☐ Currently do ☐ Will do ☐ Neither
7. Use a fan instead of air conditioning.
   ☐ Currently do ☐ Will do ☐ Neither
8. In the summer, set thermostat to 78 F or higher.
   ☐ Currently do ☐ Will do ☐ Neither

Water heating

9. Set the water heater temperature to 120 F.
   ☐ Have done ☐ Will do ☐ Neither
10. Install a high-efficiency shower head.
    ☐ Have done ☐ Will do ☐ Neither
11. Take 5 minute showers.
    ☐ Currently do ☐ Will do ☐ Neither
12. Wash full loads in the dishwasher and clothes washer.
    ☐ Currently do ☐ Will do ☐ Neither

Lighting

13. Replace inefficient bulbs with LED bulbs.
    ☐ Have done ☐ Will do ☐ Neither
14. Turn lights off when not in use.
    ☐ Currently do ☐ Will do ☐ Neither

Refrigeration

15. Replace old, inefficient refrigerator with an ENERGY STAR® model.
    ☐ Have done ☐ Will do ☐ Neither
16. Unplug old freezers/refrigerators and/or dispose of them in an environmentally safe manner.
    ☐ Have done ☐ Will do ☐ Neither
17. Maintain refrigerator and freezer coils and check door seals twice yearly.
    ☐ Currently do ☐ Will do ☐ Neither

Electronics

18. Turn off computers, TVs and game consoles when not in use.
    ☐ Currently do ☐ Will do ☐ Neither

Cooking

19. Use a microwave oven, toaster oven, slow cooker or outdoor grill instead of a conventional oven.
    ☐ Currently do ☐ Will do ☐ Neither

Get paid for being Wattsmart

20. Visit Pacific Power at **BeWattsmart.com** for more energy saving tips and rebates.
    ☐ Have done ☐ Will do ☐ Neither

NATIONAL ENERGY FOUNDATION · PACIFIC POWER POWERING YOUR GREATNESS · WATTSMART BEGIN AT HOME

Home Energy Worksheets

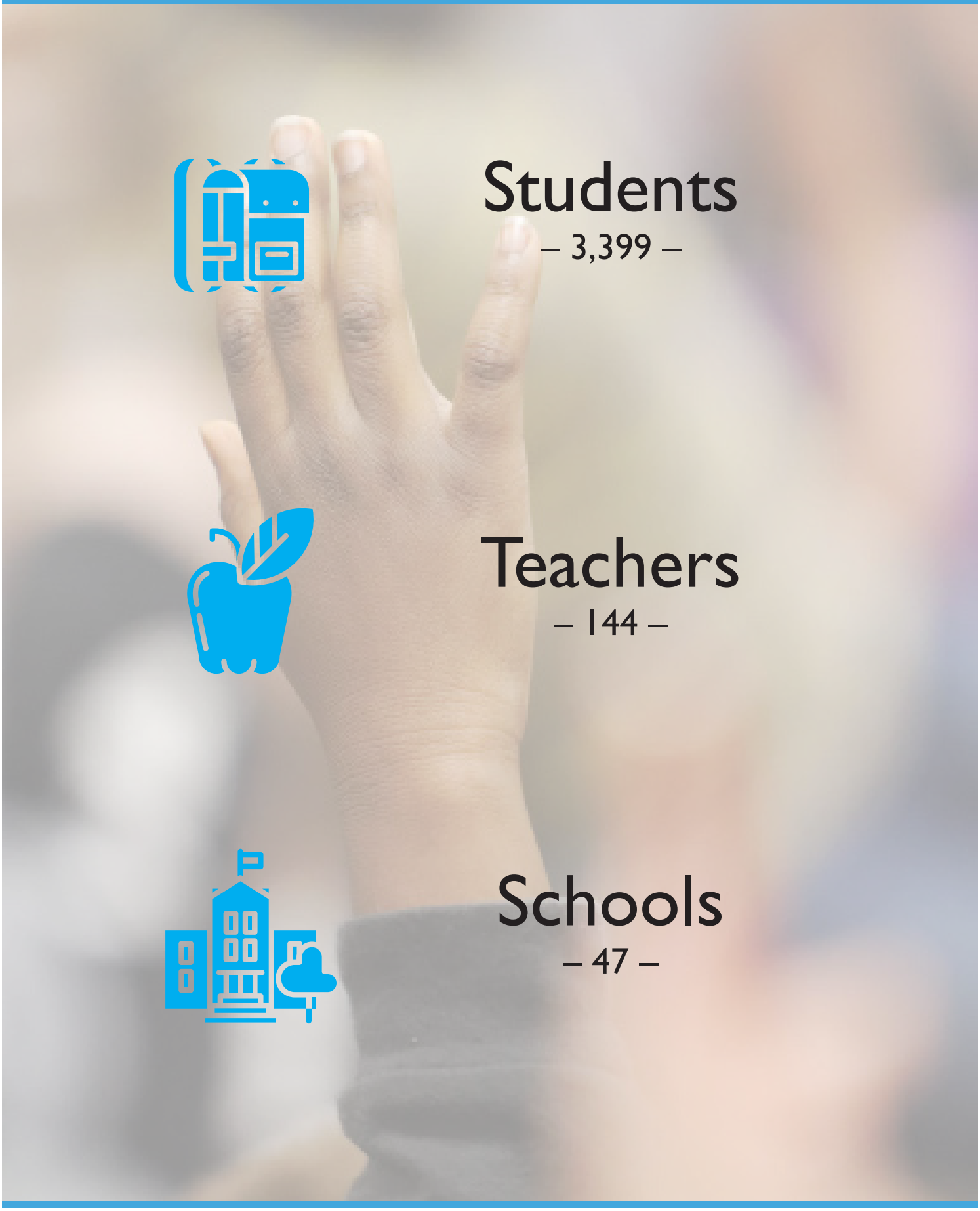
– Returned: 656 –

– 20% –

Teacher Packets

– Returned: 45 –

Participants



Students
– 3,399 –

Teachers
– 144 –

Schools
– 47 –

Table of Contents

Program Overview

Program Description

Be Wattsmart, Begin at home, an energy efficiency education program, is a collaborative partnership between Pacific Power and the National Energy Foundation (NEF). This unique and interactive program teaches the importance of energy and natural resources and their impact on the environment. The objective is to expand and promote energy awareness through a school-based education program which encourages Washington students and teachers to change behaviors which will impact the energy consumption in their homes and community. Teachers are also provided teaching materials to support further classroom instruction on this valuable message.

Program Administration

Be Wattsmart, Begin at home is administered by NEF, is a 501(c)(3) non-profit organization (established in 1976) dedicated to the development, dissemination and implementation of supplementary educational materials, programs and services relating primarily to energy, energy safety, the environment and natural resources. Our mission remains constant, to cultivate and promote an energy literate society. NEF is pleased to report on activities of the Be Wattsmart, Begin at home energy efficiency education program conducted during the 2020 - 2021 school year.

Anne Lowe, Vice President – Operations, oversees program organization. Gary Swan, Vice President – Development, oversees contract accounting. Patti Clark, Program Director, is responsible for overseeing and implementing the scope of work and Megan Hirschi was responsible for scheduling the program. Due to the COVID-19 pandemic, we were unable to present to students and teachers in person. Instead, a team of trained and seasoned energy educators brought the program virtually to classrooms and students learning from home via a Loom presentation. Teachers were able to access a link to the presentation through a website dedicated to the Be Wattsmart, Begin at home program from October 1 through December 1, 2020.

Building Collaborations

The Washington State Office of Education's Core Curriculum for fourth grade correlates well to the content of Be Wattsmart, Begin at home program. Teachers appreciated the collaborative efforts to align program components to their learning standards. Curriculum correlations were provided to teacher participants in the *Teacher Guide* delivered to each teacher prior to the presentation date.

Yakima and Walla Walla Districts were contacted to clarify policy that mini-grant checks must be made payable to the school and not to individual teachers. Although teachers would prefer the grant money be made payable directly to them, it was determined that Washington State requires all incoming dollars to be deposited through the schools.

Program Implementation

During the month of August 2020 an invitation to register for the fall 2020 program was sent via email to all schools that had participated in the 2019 program. In September, a program coordinator made phone calls and emails to all unregistered schools. Teacher questions were addressed and highlights of the program content with an emphasis on how teachers could implement the program without in person presenters were reviewed. Teachers were also provided a short five minute "Tips and Tricks" video to help them see the ease of conducting the program this fall.

Program Registration

Registration for the program was online at bewattsmart.com/begin. Registered schools were checked against the qualified school list before email and phone communications were made to enroll teachers and to verify their student numbers.

After registration was qualified, a series of email communications with teachers, were sent automatically by the program registration website. The website calculated *Home Energy Worksheet* returns as well as earned mini-grant levels and communicated this information to the participating teachers. Later communications were customized through programming to be sent only to teachers needing a reminder to return their program documents.

Be Wattsmart, Begin at home Presentation

Be Wattsmart, Begin at home presentations were designed as a keynote and filmed as a Loom with two of NEF's accomplished energy educators delivering the presentation. Using this delivery method allowed students to see a real face in the corner of the presentation which added personality and brought the content to life. The presentation focused on important concepts, such as natural resources, electrical generation, the energy mix used by Pacific Power to generate electricity and tips for energy efficiency in the home. NEF believes that having presenters inside the classroom is our most effective way of teaching students. However, given the unusual circumstances of the pandemic, this virtual delivery was an effective way of delivering important science information to students.

NEF energy educators demonstrated the making a human electrical circuit, during which they taught key core curriculum concepts such as insulators and conductors of electricity and electrical generation. All students reviewed material with an "Energy Lingo" activity at designated points throughout the presentation. To help students remember energy efficiency tips, participants viewed "Caitlynn Power" energy efficiency video vignettes produced by PacifiCorp. The videos are always well received by both teachers and students. At the end of each short video, students learned a rhyme about Caitlyn's wise energy choices to help them remember the efficiency concept.

The last portion of the presentation communicated the importance of the program take-home pieces. These documents enabled households to participate in energy education along with students.

Program Materials

A *Parent Letter* was provided to explain the importance of Be Wattsmart, Begin at home. In addition, students were given a *Student Guide* and *Home Energy Worksheet* to share with their families. Students who returned their worksheet or completed a worksheet online, received an LED nightlight featuring the Pacific Power logo as a reward.

Educators were also given helpful energy educational materials. Each teacher participant was provided a custom Be Wattsmart, Begin at home folder. The folder contained a custom *Teacher Guide* with additional information and activities to supplement and continue energy education in the classroom. Also, in the folder were two NEF instructional posters, *Energy Efficiency* and *Renewable Energy Sources*.

A program *Implementation Steps Flier* assisted teachers in carrying out the program for students learning both at school and online. It also gave simple steps for successfully returning *Home Energy Worksheets* and the sponsor *Thanks a "Watt" Card* in the postage paid envelope. A *Rewarding Results Flier* gave information concerning the mini-grant teacher participants would receive for returning their student surveys. Educators received a $50 mini-grant check (made out to the school) for a 50% return of their student surveys by the deadline.

Program Accomplishments – Fall 2020

- 3,399 students and families reached
- 144 Washington teachers reached
- 45 Washington teachers returned packets
- 20% student *Home Energy Worksheet* surveys return
- $50 checks delivered to 35 Washington teachers

Program Improvements - Fall 2020

- Updated all program materials
- New Loom delivery method for virtual presentations
- Created "Tips & Tricks" video for teachers to view implementation steps
- Added online *Home Energy Worksheet* option with teacher ID locator to website
- Updated the program website for teachers and students thinkenergy.org/wattsmart/

Program Attachments – Fall 2020

- Fall 2020 Participating Schools
- Program Promotions
- Program Documents
    - Keynote Presentation
    - *Teacher Implementation Steps Flier*
    - *Rewarding Results Flier*
    - *Student Guide*
    - *Teacher Guide*
    - Lingo Card
    - *Parent Letter*
- *Home Energy Worksheet*
- *Home Energy Worksheet* Summary – Pacific Power
- Wise Energy Behaviors in Pacific Power Washington Homes
- Sampling of Thanks a "Watt" Cards

Attachments

Fall 2020 Participating Schools

Participating Schools	Address	City	State	Zip
Adams Elementary - Wapato	1309 S. Camas Avenue	Wapato	WA	98951
Adams Elementary - Yakima	723 S. 8th St.	Yakima	WA	98901
Ahtanum Valley Elementary	3006 S Wiley Rd	Yakima	WA	98903
Apple Valley Elementary School	9206 Zier Road	Yakima	WA	98908
Art-Fox Elementary	805 Washington	Mabton	WA	98935
Arthur H. Smith Elementary	205 Fir Street	Grandview	WA	98930
Barge Lincoln Elementary	219 E. I Street	Yakima	WA	98901
Chief Kamiakin	1700 E. Lincoln Ave.	Sunnyside	WA	98944
Christ the Teacher	5508 W. Chestnut Ave.	Yakima	WA	98908
Cottonwood Elementary	1041 S 96th Ave	Yakima	WA	98908
Davis Elementary	31 SE Ash St	College Place	WA	99324
Dayton Elementary	302 E Park Street	Dayton	WA	99328
Discovery Lab School	812 S 18th Ave	Yakima	WA	98902
Dixie Elementary	10520 US-12	Dixie	WA	99329
East Valley Elementary	1951 Beaudry Rd.	Yakima	WA	98901
Edison Elementary School	1315 E. Alder	Walla Walla	WA	99362
Garfield Elementary - Yakima	612 N. 6th Ave	Yakima	WA	98902
Gilbert Elementary	4400 Douglas Drive	Yakima	WA	98908
Green Park Elementary	1105 E Isaacs Ave	Walla Walla	WA	99362
Harriet Thompson Elementary	1105 2nd Street	Grandview	WA	98930
Hoover Elementary	400 West Viola Avenue	Yakima	WA	98902
Lincoln Elementary	309 N Alder Street	Toppenish	WA	98948
Martin Luther King	2000 S. 18th Street	Union Gap	WA	98903
McClure Elementary - Grandview	811 West 2nd St.	Grandview	WA	98930
McClure Elementary - Yakima	1222 S 22nd Ave	Yakima	WA	98902
McKinley Elementary	621 S. 13th Ave	Yakima	WA	98902
Montessori School of Yakima	511 N 44th Avenue	Yakima	WA	98908
Naches Valley Elementary	151 Bonlow Drive	Naches	WA	98937
Nob Hill Elementary	801 S. 34th Ave.	Yakima	WA	98903
Outlook Elementary	3800 Van Belle Rd	Outlook	WA	98938
Prospect Point	55 Reser Road	Walla Walla	WA	99362
Ridgeview Elementary	609 W. Washington Ave	Yakima	WA	98903
Riverside Christian School	721 Keys Road	Yakima	WA	98901
Robertson Elementary	2807 West Lincoln	Yakima	WA	98902
Roosevelt Elementary - Yakima	120 N. 16th Avenue	Yakima	WA	98902
Roosevelt Elementary - Granger	405 Bailey Ave	Granger	WA	98932
Saint Joseph School	202 N Fourth Street	Yakima	WA	98901
Satus Elementary	910 S. Camas Ave	Wapato	WA	98951
Selah Intermediate School	1401 W Fremont Ave	Selah	WA	98942
Sharpstein Elementary	410 S. Howard St.	Walla Walla	WA	99362
Terrace Heights Elementary	101 N. 41st Street	Yakima	WA	98901
Union Gap School	3201 SO 4th Street	Union Gap	WA	98903
Valley View	515 Zillah Ave	Toppenish	WA	98948
Waitsburg Elementary	184 Academy St	Waitsburg	WA	99361
Whitney Elementary	4411 W. Nob Hill Blvd.	Yakima	WA	98908
Wide Hollow Elementary	1000 S. 72nd Ave	Yakima	WA	98908
Zillah Intermediate	303 2nd Ave.	Zillah	WA	98953

Program Promotions

You have the *power* to be Wattsmart®

Enroll your fourth-grade science students in our free, engaging energy education program.

BE WATTSMART, BEGIN AT HOME

National Energy Foundation
cultivating energy literacy

PACIFIC POWER
POWERING YOUR GREATNESS

WATTSMART®
BEGIN AT HOME

The Wattsmart, Begin at home program reinforces electricity learning standards in an engaging and interactive assembly. Participating teachers receive free energy education posters, activities and student materials as well as the chance to receive a mini-grant of up to $50, depending on participation.

Presentations begin in fall 2020. Reserve your classroom's spot today at **BeWattsmart.com/begin**.

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Program Documents

Keynote Presentation

WATTSMART®

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POWERING YOUR GREATNESS

What is
ENERGY?

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ENERGY is the ability to do **WORK**.

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Potential Energy

Kinetic Energy

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Natural Resources

A natural resource is anything we use that comes from the earth or the sun.

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Renewable Resources




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Nonrenewable Resources




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POWERING YOUR GREATNESS

It's time to play Lingo!

natural gas

The blue flame of n_ _ _ _ _ _ _ is a nonrenewable resource.

natural resource

Anything we use that comes from the earth or the s_ _ _ _ _ _ _ n_ _ _ _ _ _ r_ _ _ _ _ _ _.

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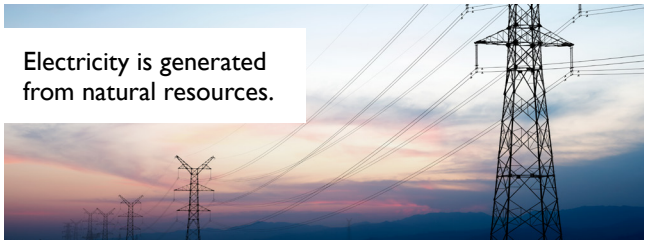
Electricity

Electricity is generated from natural resources.



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Pacific Power

Electric generation by energy source

Coal 56%

Renewables 19%

Natural gas 15%

Other sources 10%

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How many people does it take to turn on a light bulb?

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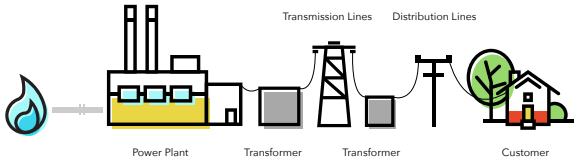
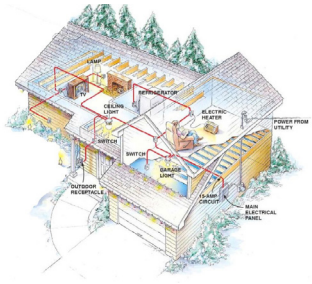
Electric Generation



POWERING YOUR GREATNESS

Transforming Energy with Circuits

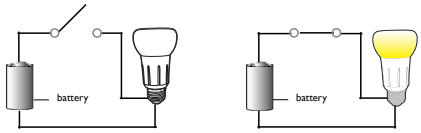


POWERING YOUR GREATNESS

Let's make a circuit.

What things do we need to make an electrical circuit?

energy source | **conductor** | **load**



Open circuit:
No electricity can flow

Closed circuit:
Electricity can flow

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Transforming Energy

Conductors
allow electricity to flow through them.

Insulators
resist the flow of electricity.

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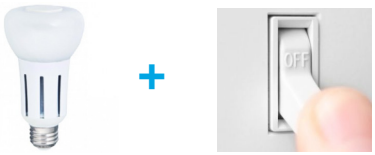
Energy Efficiency

Using less energy to accomplish the same amount of work.



Technology + Behaviors

POWERING YOUR GREATNESS

It's time to play Lingo!

Energy efficiency

E_ _ _ _ _
e_ _ _ _ _ _ _ _ _ _ is
to do the same amount
of work.

Renewable

R_ _ _ _ _ _ _ _ _ _
naturally replaced.

Nonrenewable

N_ _ _ _ _ _ _ _ _ _ _ _
or not at all.

Oil

urce used to produce
e. O_ _

Caitlynn Power

Caitlynn Power

Home Efficiencies

What can you do to be Wattsmart?

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Be the Energy Expert in your home.

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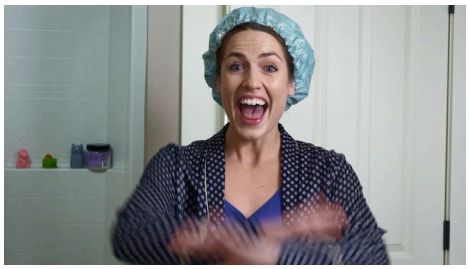

Caitlynn Power

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Water Efficiencies

What can you do to be Wattsmart?

- Take shorter showers.
- Turn off the **water** when brushing teeth.
- Make sure your dishwasher or clothes washer has a **full load** before you push start.
- Install an energy-efficient shower head.

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What else can you do to be Wattsmart?

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POWERING YOUR GREATNESS

It's time to play Lingo!

LED

A light that can last 25 [illegible] longer than an incandescent. L _ _

Phantom Load

Electricity consumed by an electronic device [illegible] is turned off but in standby mode. P_ _ _ _ _ _ L_ _ _

full load

Make sure you have a f_ _ _ load before starting your dishwasher.

water

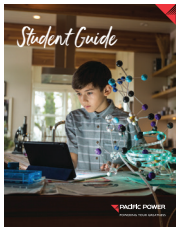
[illegible] when brushing your teeth.

What have we done today?

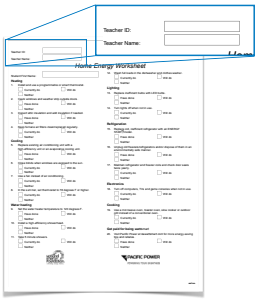
- **Learned** why energy is important.
- Discussed energy and where it comes from.

Engage in energy efficiency

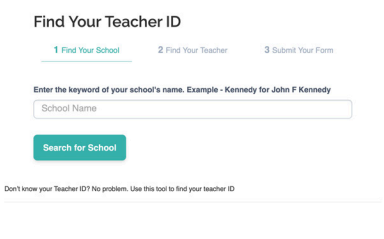
1. Review your **Be Wattsmart, Begin at home** booklet with your family.

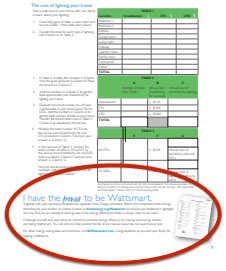


2. Complete the *Home Energy Worksheet.*



Online Worksheet
*ThinkEnergy.org/**Wattsmart/***





3. Receive your very own Pacific Power LED nightlight.

YOU have the *power to* be Wattsmart!

Implementation Steps

1 Verify you have received:

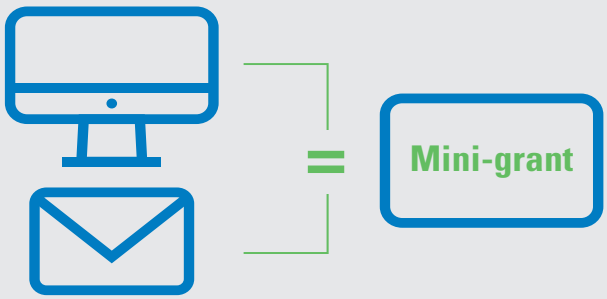
- *Teacher Materials Folder*
- Your **Be Wattsmart, Begin at home** *Teacher Guide*
- *Home Energy Worksheets* for you and your students
- **Be Wattsmart, Begin at home** student booklets
- Set of *Parent Letters*
- Wattsmart nightlights (student incentive for completing the *Home Energy Worksheet*)

2 After the presentation, distribute to each student a:

- **Be Wattsmart, Begin at home** student booklet
- *Home Energy Worksheet*
- *Parent Letter*

3 Final steps:

- Reward students with a Wattsmart nightlight when they complete their worksheet on paper or online at **thinkenergy.org/Wattsmart**.
- Have each student sign the *Thank You Card* to Pacific Power.
- *Home Energy Worksheets* submitted online can be verified through the teacher portal (nef1.org/programs/teacher-lookup) with your Teacher ID.
- Mail any completed paper *Home Energy Worksheets* and the *Thank You Card* in the self-addressed postage paid envelope (found in your materials folder) by December 6, 2020.



WATTSMART® BEGIN AT HOME

National Energy Foundation® cultivating energy literacy

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WA

Implementation Options 2020

Pacific Power and the National Energy Foundation (NEF) prefer to present the Be Wattsmart, Begin at Home program in your school with our energy educators. However, to be profusely cautious this fall, we have prepared online delivery options that can be done in your classroom or with students at home.

1 If students are in school –

a) At your convenience, show students the prerecorded interactive presentation from the website **thinkenergy.org/Wattsmart**. The password is BeWattsmart and the presentation is approximately 40 minutes.

b) Use the online chat option following your presentation if students have questions (the link is found on the same website).

c) After the presentation, distribute a student booklet, *Home Energy Worksheet* and *Parent Letter* to each student to take home.

d) To ensure you get credit toward the mini-grant, have students write your teacher ID on the top of their *Home Energy Worksheet* before it goes home.

e) Have students complete the worksheets either online at **thinkenergy.org/Wattsmart** or return papers to you.

f) Students can also use our online lookup tool on the website to find your ID.

g) Reward your students with a nightlight when they return their worksheet or complete it online.

h) Return any papers in the postage paid envelope from your folder along with the signed *Thank You Card.*

2 If students are learning from home or a school closure is likely –

a) Send home a student booklet, *Home Energy Worksheet, Parent Letter* and a nightlight with each student.

b) Have students watch the prerecorded interactive presentation from the website **thinkenergy.org/Wattsmart**. The password is BeWattsmart.

c) Provide your students with your teacher ID or they can use our online lookup tool to find it on the same website.

d) Have students complete the worksheets online at **thinkenergy.org/Wattsmart**.

e) To ensure you qualify for the mini-grant, you can track your students' worksheets by going to **nef1.org/programs/teacher-lookup**.

WATTSMART® BEGIN AT HOME

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Attention Teachers
Return your student *Home Energy Worksheets* and receive a **$25 – $50** mini-grant for classroom use, depending upon participation. Students may submit worksheets online or return the completed survey to you. See the *Implementation Steps* for additional *Home Energy Worksheet* online information.
80% or greater return of registered students' *Home Energy Worksheets* = $50
50 – 79% return of registered students' *Home Energy Worksheets* = $25
Postmark due date:
December 6, 2020
Offer open only to teachers participating in Be Wattsmart, Begin at home. Certain restrictions may apply. Good while grant funding is in place. *Home Energy Worksheets* must be completed for eligibility. For more information, contact Megan Hirschi at megan@nef1.org.
NEF
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POWERING YOUR GREATNESS
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Dear Parents,

The **Be Wattsmart, Begin at home** program assists teachers and students to learn about energy, discuss important energy topics and engage in energy efficiency actions now. Your child has participated in a presentation addressing natural resources, energy basics and energy efficiency. Your participation in this program will help you be Wattsmart, enhance energy efficiency in your home and help save money on your utility bills. Here are three simple ways that you can help:

- Review this **Be Wattsmart, Begin at home** booklet with your child.
- Assist your child with completing the activities on Page 7.
- Have your child complete the ***Home Energy Worksheet*** online at **thinkenergy.org/Wattsmart** or return it to your child's teacher.

Thank you for being Wattsmart and for your participation!

What's inside?

This booklet is divided into three sections that will give you the power to:

1. Learn about sources of energy, how they get to your home and why they are important in your life.
2. Discuss Wattsmart energy efficiency tips that will help you use energy wisely and save money.
3. Engage in energy efficiency by determining how energy can be saved in your home through a simple audit activity and the *Home Energy Worksheet*.

About Pacific Power

Pacific Power is committed to the delivery of reliable electric service that's safe, low-cost and increasingly from clean, renewable resources. Serving more than 700,000 customers in Washington, Oregon and California, the company is one of the lowest cost energy producers in the nation. Pacific Power is moving toward a sustainable energy future that includes increased use of solar, wind and other renewable resources; and provides customers with more choices to meet their energy needs.

About the National Energy Foundation

The National Energy Foundation (NEF) is a 501 (c)(3) nonprofit organization, founded in 1976. It is dedicated to increasing energy literacy through the development, distribution and implementation of educational programs and materials. These resources relate primarily to energy, natural resources, energy efficiency, energy safety and the environment. Concepts are taught through science, math, art, technology and writing. NEF recognizes the importance of educating individuals about energy so they can make informed decisions about energy issues and use.

I have the *power* to be Wattsmart.

- Being Wattsmart is all about taking steps to save energy – which in turn can help you save money.
- You have the power to become more energy efficient. Pacific Power can help with Wattsmart programs and incentives for homes and businesses. Saving energy also saves money and is good for the environment.

I have the power to *learn.*

The importance of energy:

Energy is the ability to do work or produce change. Virtually everything we do or use at work and home uses energy.

- Heating and cooling systems
- Computers
- Electronic equipment such as gaming and entertainment systems and TVs
- Charging electronic tablets, music players and cell phones
- Appliances
- Lights
- Food storage and preparation
- Security systems

Where does energy come from?

Our energy comes from natural resources. There are two general categories of natural resources – nonrenewable and renewable. A nonrenewable resource is not capable of being renewed, replaced or takes a very long time to replace. A renewable resource is capable of being renewed or replaced.

Primary natural resources are used to convert energy into electricity. They can be either nonrenewable or renewable.

Nonrenewable examples are:

Coal is the most abundant nonrenewable energy source in the world. The U.S. has more coal reserves than any other country in the world, but the reserves are shrinking.

Oil can be both refined and unrefined. Refined oil is transformed into petroleum products and unrefined oil remains as crude oil.

Natural Gas is usually captured alongside oil deposits and is a major source for electrical generation.

Uranium is the fuel most widely used by nuclear plants. Nuclear energy is the energy inside the nucleus (core) of the atom of uranium.

Renewable examples are:

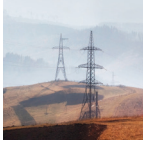
Solar is energy from the sun.

Wind is energy from the wind captured by a group of wind turbines (generators).

Geothermal is energy derived from the heat of the earth.

Hydropower is energy from water that generates electricity.

Secondary energy resources are created by using nonrenewable and renewable resources of energy.



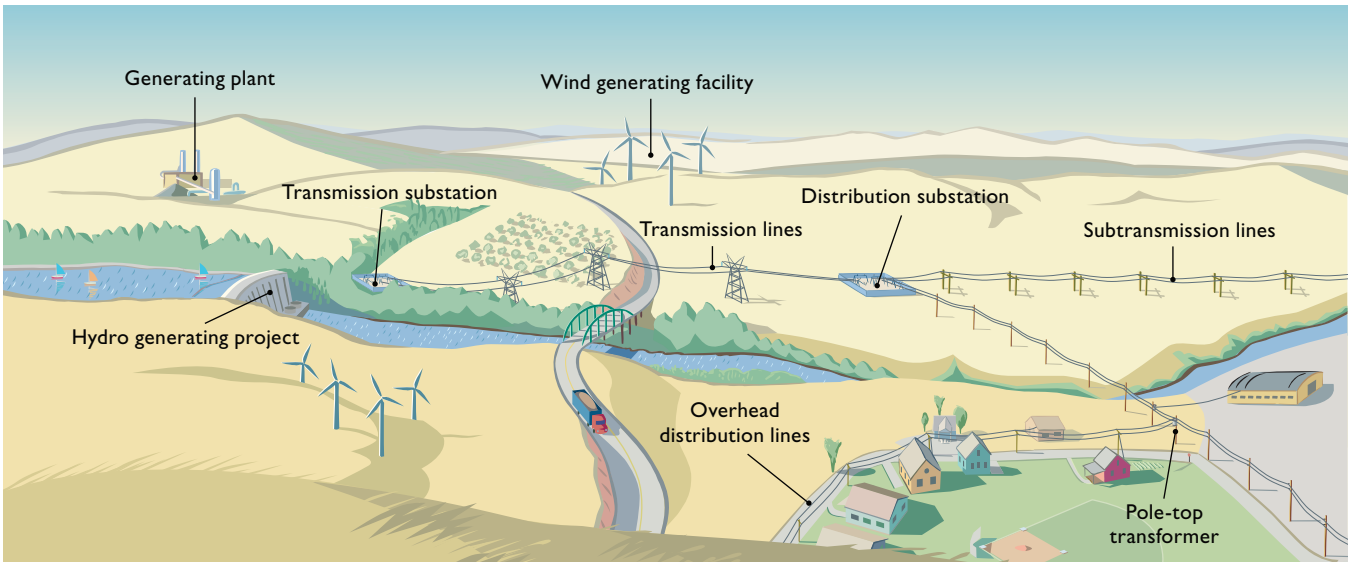
Electricity is the most abundant **secondary energy resource** used. It is the flow of electrical power or charge. It occurs in nature as lightning and static electricity. A generator uses energy resources to create mechanical energy that is then converted into electrical energy.

Energy efficiency

Energy efficiency is using less energy to accomplish the same amount of work – we call it being Wattsmart. There are many technologies we can use today that decrease the amount of energy needed to do work. Good examples are ENERGY STAR® products and LED lighting.

You can save even more money if you start thinking about using energy wisely. Try turning off the lights when you leave the room, take shorter showers or turn off your electronics when you are not using them.

Using electricity



For more than 100 years, electricity has made our homes more comfortable and industries more productive. Today electricity is powering a world of electronics.

How is electricity generated? It begins with a fuel that heats water and turns it to steam. The steam drives the turbine that turns the generator motor to produce electricity.

How is electricity transmitted? Once the electricity is produced, the current flows from the generator to the power plant transformer where the voltage is increased to boost the flow of the electric current through the transmission lines. The transmission lines transport the electricity to Pacific Power's substations where the voltage is decreased. Power lines then carry the electricity from the substations to be used in our homes and businesses.

ELECTRICAL GENERATION		
Energy Source	Pacific Power (2019 Basic Fuel Mix)*	United States (U.S. EPA, 2019 data)
Natural Gas	15.44%	35.1%
Coal	56.39%	27.5%
Nuclear	0.00%	19.4%
Petroleum	0.00%	.6%
Other/misc.	9.75%	.5%
Renewables (total)	18.42%	16.9%
Hydropower	5.15%	6.9%
Wind	8.80%	6.5%
Biomass	0.34%	1.6%
Solar	3.79%	1.5%
Geothermal	0.34%	0.4%

**This information is based on Federal Energy Regulatory Commission Form 1 data. The Pacific Power "basic fuel mix" is based on energy production and not resource capability, capacity or delivered energy. All or some of the renewable energy attributes associated with wind, solar, biomass, geothermal and qualifying hydro facilities in Pacific Power's basic fuel mix may be: (a) used in future years to comply with renewable portfolio standards or other regulatory requirements, (b) sold to third parties in the form of renewable energy credits and/or other environmental commodities or (c) excluded from energy purchased. Pacific Power's basic fuel mix includes owned resources and purchases from third parties.*

I have the power to *discuss* energy use to help save money.

Saving energy happens in two ways. First, you can use less energy through wise behaviors that conserve energy. Second, you can install energy-efficient products, appliances and devices that use less energy to accomplish the same task. Let's talk about the following areas of your home that have the largest potential to save energy.

Home heating and cooling

- Install a programmable thermostat or smart thermostat. Set your thermostat to 78°F or higher in the summer and 68°F or lower in the winter.
- Make sure your house is properly insulated. If you have less than 6 inches of insulation in your attic, you would benefit from adding more.
- You can save 10% or more on your energy bill by reducing the air leaks in your home with caulking and weather stripping.

- To help your furnace run more efficiently and cost-effectively, keep your air filters clean.
- For windows with direct sunlight, close your blinds in the summer to keep the heat out. Open them on winter days to let the warmth in.
- Small room fans are an energy-efficient alternative to air conditioning.
- For information about energy-saving programs and cash incentives, visit **Wattsmart.com**.

Water and water heating

- Check your faucets for leaks that can cost you hundreds of dollars each year.
- Install a water-efficient shower head and save as much as $50 in utility bills and more than 2,300 gallons of water per year.
- Set the water heater at 120°F.
- Install faucet aerators to decrease water use.

Lighting

- Let the sun shine in. Use daylight and turn off lights.

- Replace your incandescent bulbs with LEDs (light-emitting diodes) and save $5 to $8 per year per bulb. These bulbs use up to 80% less energy than incandescent bulbs and last much longer.
- Use lighting controls such as motion detectors and timers.
- Turn off lights when you leave the room.
- Always use the lowest wattage bulb that still gives you the light you need.
- Keep your light bulbs clean. It increases the amount of light from the bulb and reduces the need to turn on more lights.

Electronics

- Turn off your computer and game consoles when not in use.
- Home electronics are made to turn on and off many times. Always turn them off to save energy.
- Electronics with the ENERGY STAR® label use as much as 50% less energy while providing the same performance.
- Beware of phantom loads which continue to draw electricity when they are plugged in but not in use. Examples are telephone chargers, electronic games and television sets.
- Use advanced power strips for household electronics. One button will turn off multiple appliances, which conserves electricity.

Refrigerators and freezers

- When looking to replace your old refrigerator, do so with an ENERGY STAR® model, which requires approximately 40% less energy than conventional models and provides energy savings without sacrificing the features you want.
- Clean door gaskets with warm water or a detergent that leaves no residue.

Dishwashers

- Only run dishwashers when full and use the "air-dry" or "no heat dry" settings.
- ENERGY STAR® dishwashers use less energy than the federal minimum standard for energy consumption.
- Try running your dishwasher before 3 p.m. or after 8 p.m. to avoid peak demand.

Laundry

- Buy a moisture sensitive dryer that automatically shuts off when clothes are dry.
- Use a drying rack whenever possible.
- To avoid peak demand, wash and dry clothing before 3 p.m. or after 8 p.m. when possible.

Cooking

- Use a microwave oven, toaster oven or slow cooker instead of a conventional oven.
- Use the right-sized pan for the stove top element.
- Cover pans with lids to keep heat from escaping.

Reduce

- Use less.
- Purchase products with little packaging.

Reuse

- Use something again.
- Reuse a box or a grocery bag.

Recycle

- Make something into another new item.
- Participate in the recycling programs in your community.

I have the power to *engage* in energy efficiency.

Parents, be Wattsmart and watch the energy savings add up.

An individual with a combined electric and heating fuel bill of $2,500 per year could save 20% or $42/month by using these and other energy efficiency tips. That is like getting a pay raise without having to work harder or longer.

The cost of lighting your home

Take a walk around your home with your family to learn about your lighting.

1. Count the types of bulbs in each room and record in Table 1; then total each column.
2. Transfer the total for each type of lighting into Column A on Table 2.

TABLE 1

Location	Incandescent	CFL	LED
Bedroom 1			
Bedroom 2			
Kitchen			
Dining room			
Living room			
Hallway			
Laundry room			
Family room			
Front porch			
Other			
TOTAL			

3. In Table 2, multiply the numbers in Column A by the given amounts in Column B. Place the answers in Column C.
4. Add the numbers in Column C to get the total approximate cost of electricity for lighting your home.
5. Discover how much money you will save if all the bulbs in your home were CFLs or LEDs. Add the numbers in Column A to get the total number of bulbs in your home. Transfer the total to both rows in Table 3, Column E as indicated by the arrows.
6. Multiply the total number of CFLs by the annual cost of electricity for one CFL provided in Column F and put your answer in Column G.
7. In the last row of Table 3, multiply the total number of LEDs in Column E by the annual cost of electricity for one LED bulb provided in Column F and put your answer in Column G.

   How do the amounts in Column G compare with your current total cost for lighting in Column C above?

TABLE 2

	A Number of bulbs from Table 1	B Annual cost of electricity for one bulb	C Annual cost of electricity for lighting
Incandescent		× $5.16	
CFL		× $1.08	
LED		× $0.60	
TOTAL			

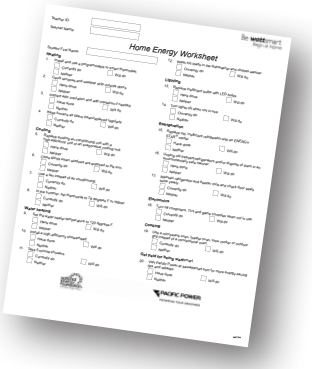
TABLE 3

	E	F	G
All CFLs		× $1.08	Annual cost of electricity with only CFLs
All LEDs		× $0.60	Annual cost of electricity with only LEDs

Cost figures are for an individual bulb (60 Watt incandescent), the lumens equivalent CFL (13 Watts) and LED (7.5 Watts) each used for 2 hours each day for 30 days. EEI Typical Bills and Rates Report, Winter 2019 (12 months ending 2018).

I have the *power* to be Wattsmart.

Together with your parent(s), complete the separate *Home Energy Worksheet*. Return the completed *Home Energy Worksheet* to your teacher or submit it online at **thinkenergy.org/Wattsmart** to receive your Wattsmart nightlight. You may find you are already practicing ways to be energy efficient but there is always room to do more.



Challenge yourself and your family to commit to practice energy efficiency by making wise energy choices and being Wattsmart. You will not only help extend the life of our natural resources, but save money, too!

For other energy saving ideas and incentives, visit **BeWattsmart.com**. Congratulations to you and your family for making a difference.

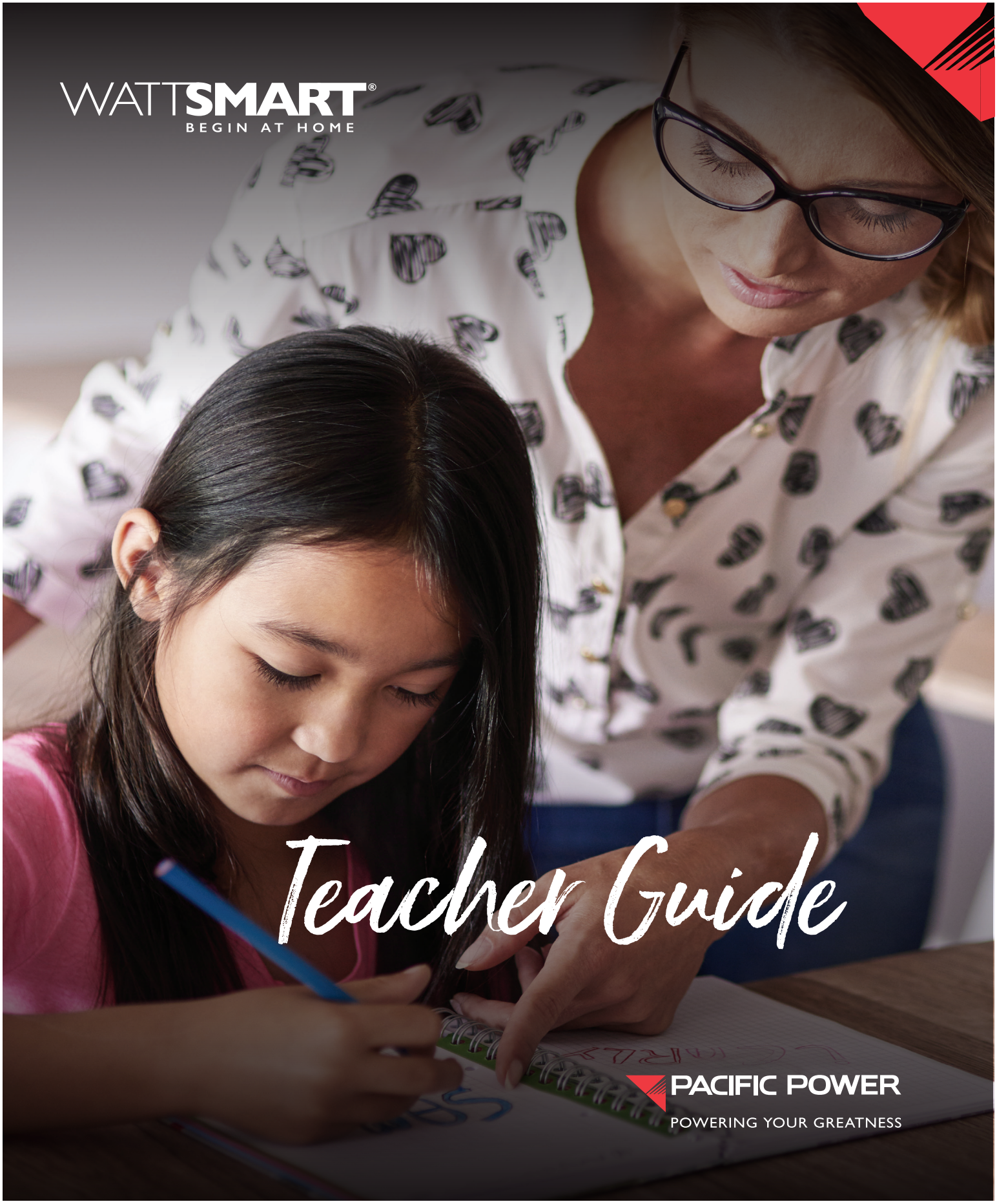
7

WATTSMART®

BEGIN AT HOME

National Energy Foundation®
cultivating energy literacy

PACIFIC POWER
POWERING YOUR GREATNESS



Welcome to Be Wattsmart, Begin at home

This program teaches the importance of energy and assists students and their families in saving energy in their homes. For teachers, Be Wattsmart, Begin at home reinforces important electrical concepts from your curriculum.

This *Teacher Guide* was designed to supplement program instruction. A variety of tools have been provided to allow you to format Be Wattsmart, Begin at home to meet your instructional needs. These tools include:

- General guidelines and activity suggestions
- Classroom activities to further the impact of lessons
- Additional fun and interesting activities for students
- Activities containing STEM-correlated curriculum for your classroom

About Pacific Power

Pacific Power is committed to the delivery of reliable electric service that's safe, low-cost and increasingly from clean, renewable resources. Serving more than 700,000 customers in Washington, Oregon and California, the company is one of the lowest cost energy producers in the nation.

About the National Energy Foundation

The National Energy Foundation (NEF) is a 501 (c)(3) nonprofit organization, founded in 1976. It is dedicated to increasing energy literacy through the development, distribution and implementation of educational programs and materials. These resources relate primarily to energy, natural resources, energy efficiency, energy safety and the environment. Concepts are taught through science, math, art, technology and writing. NEF recognizes the importance of educating individuals about energy so they can make informed decisions about energy issues and use.

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WATTSMART BEGIN AT HOME

STEM Connections

Activity	Science				Technology				Engineering					Math			
	Science as Inquiry	Energy Sources, Forms and Transformations	Science and Technology	Personal and Social Perspectives	Productivity Tools	Communication Tools	Research Tools	Problem-solving and Decision-making Tools	Historical Perspective	Design and Modeling	Invention and Innovation	Test Design and Troubleshooting	Use and Maintain	Numbers and Operations	Measurement	Data Analysis and Probability	Connection to the Real World
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Activity: Pass the Sack

Objective
Students will demonstrate the difference between renewable and nonrenewable resources and the need for conservation of resources.

Curriculum Focus
Science
Social Studies

Materials
- Two different kinds of candy or other objects students find desirable
- Sack to hold candy, such as a gallon size plastic bag

Key Vocabulary
Nonrenewable resource
Renewable resource

Next Generation Science Correlations
4-ETS1 – 2
4-ESS3 – 1-2
4-ESS3.A
5-ETS1 – 2
5-ETS1 – 1
5-ESS3 – 1
MS-ESS3 – 4
MS-ESS3.A

Introduction

Statistical research confirms world consumption of natural resources is increasing every year. Continued population growth ensures that demand for renewable and nonrenewable energy resources necessary to maintain our way of life will continue to increase. This creates problems for future availability of nonrenewable resources. Nonrenewable resources are just that, resources that cannot be renewed. For example, a resource used at our present rate might last about 100 years. Factor in population growth and increasing reliance on technology, and that resource may last only 79 years.

In this activity, two different types of candy (or other objects students would like) will represent resources. One type of candy will represent renewable resources and the other will represent nonrenewable resources.

Procedure

1. Before class, count out enough candy so there is one piece per student (some of each type of candy – less of one so it will run out faster). Put it in the sack or bag. Save the remaining candy. If you have a very polite class, count enough candy for half of the class. **You want the contents to run out before everyone gets candy!**
2. Tell students you will be demonstrating how resources get used over time by playing "Pass the Sack." Show students the sack and explain that when they get the sack, they should take some energy and pass the sack to the person next to them.
3. Before passing the sack to the first student, review renewable and nonrenewable resources. Have students give examples of each as you hand the sack to a student.
4. While this discussion is taking place, allow students to pass around the bag of candy without any rules about how many pieces students may take. Occasionally, add four or five pieces of **one** type of candy you are using, this will be your renewable resource. The sack will be empty before it reaches all the students.
5. Ask students who did not get any candy how they might obtain energy from other students. What if each student represented a country? How do countries obtain resources, trade, barter (trade for goods), buy (trade for currency), invade and take or go to war? What effect did the availability of candy have on relationships between students? What effect might the availability of natural resources have on the relationship among nations, provinces, states, people, standards of living and quality of life?

6. Explain how our resources are like the candy. Which type was the nonrenewable? How could you tell? (No more was added to the bag once it was being passed around.) Which type was renewable? How could you tell? (It was added periodically to renew it.)

7. Point out that resources have limits just like the candy. Emphasize that many resources, such as fossil fuels, are nonrenewable and are being consumed faster than they are being replaced by nature. Discuss the fact that it would be more difficult for students to eat the candy if they had to search the room to find it instead of just taking it from the sack. Energy companies must seek resource deposits and obtain rights to drill or mine for them; they do not just magically appear.

8. Point out that renewable resources can also have limitations. They may not generate electricity as reliably as nonrenewable sources and the amount of energy produced may vary with weather and location.

9. Plan how to pass out the remaining candy.

Discussion

- Should rules be established to determine how the candy is distributed?
- Do oil, coal and natural gas companies have rules/regulations that must be followed to find resources?
- Should there be rules and regulations on how much oil, coal and natural gas people use?
- How do the class' social decisions influence the availability of candy?

To Know and Do More

Go to **eia.gov/kids** to access games, tips and facts for kids to learn about renewable energy and energy efficiency.

Discuss whether or not it is possible to run out of a renewable resource. Wood and fresh water are examples of renewable resources that can be used faster than nature can replace them.

Activity: The Search for Energy

Objective

Students will learn the difference between renewable and nonrenewable resources.

Curriculum Focus

Math
Science
Social Studies

Materials

- 1/2 bag popcorn or other small item to represent solar energy
- Small pieces of ripped paper to represent approximate U.S. nonrenewable energy reserves
  - 164 black - coal
  - 22 red - uranium
  - 8 green - natural gas
  - 2 blue - oil
- Large sheet or tarp to place paper and popcorn on for easy clean up (optional)
- Copies of "Data Table and Graph"

Key Vocabulary

Nonrenewable resources
Renewable resources

Next Generation Science Correlations

4-ESS3-1
4-ESS3.A
5-ESS3 - 1
MS-PS1 - 2
MS-LS2 - 1
MS-ESS3.A

Introduction

Fossil fuels are extremely useful energy sources. Our society has adopted them because they can be readily available and economical. In the early part of the 20th century, a fledgling solar industry took root but was ultimately displaced by less expensive energy sources such as fossil fuels. Today some fossil fuels are harder to find and increasingly more costly. The sun, on the other hand, is just as plentiful as it was 100 years ago. It is a renewable resource that could become our most widely used source of energy.

The following activity is a simulation game in which students learn the difference between renewable and nonrenewable resources. The game reflects society's use and exhaustion of nonrenewable fuels and the eventual transition to renewable technologies.

Procedure

1. Divide the class into five equal groups. Each group will be a company going after a particular resource (coal, uranium, natural gas, oil or the sun). The paper and popcorn represent reserves of the various energy resources. Pass out copies of the student sheet "Data Table and Graph" to each group or have students create their own data tables on paper.
2. Have students gather in a large circle. Scatter the papers plus a handful of "solar" popcorn so they are well spread out in the center of the circle. You can do this on a sheet for easier clean up. Explain that this exercise demonstrates how the availability of resources changes over time. You may want to designate certain places as protected areas, where the resources are off limits to protect the environment.

3. Tell students you will do several trials and look to see how the types of resources that are available change after each trial. Tell each group that they will have 30 seconds to pick up as many papers or popcorn as they can of their assigned type. Start timing.

   After 30 seconds have the groups stop and count the items they have gathered. Have each group announce their results to the class and record every count in their data table. If some groups have collected all of their available resource, point out that the resource is now depleted and they are unemployed.

4. Scatter another handful of "solar energy," helping students realize that since the sun is a renewable resource, there is the same amount of it each time you look, whereas the nonrenewable fuels are being depleted. Repeat the search period so students can get more papers or popcorn.

5. Stop after 30 seconds and have the group count and record the papers and popcorn collected again. Note that there are fewer nonrenewable fuels found in the second round. Students have to look harder to find what is left. The solar count is slowly catching up with the nonrenewable fuels. Repeat with additional trials as needed.

6. Have groups create a bar chart or, for more advanced students, a multiline graph of the number of papers and popcorn collected each trial.

Discussion

- Why does the solar line differ from the others? Why does it go up rather than down?
- How do improvements in technology affect the extraction of resources from the earth?
- How do improvements in technology affect our usage of renewable resources?
- In the real world, can we extract ALL of a resource? Why do some deposits go unused?

To Know and Do More

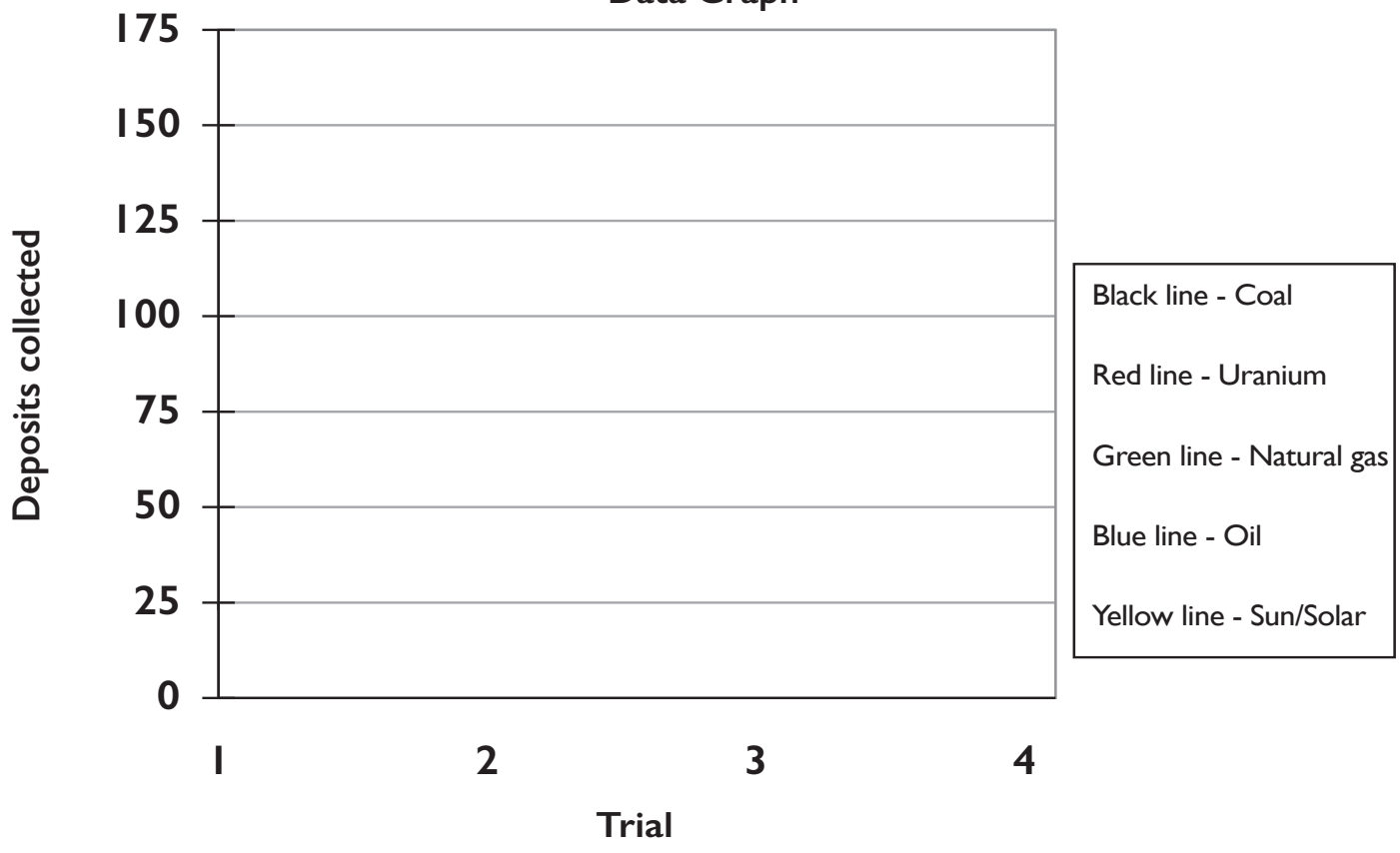
Add wind and water to the activity. Lead a discussion to be sure the students understand why you continued adding more sun, wind and/or water after each trial, but did not add more of the other papers. As a class, come up with a general outline of how to more effectively manage the resources that are available to us.

Student Sheet: Data Table and Graph

Data Table

Search Period	Coal (Black)	Uranium (Red)	Natural Gas (Green)	Oil (Blue)	Sun/Solar (Popcorn)
1					
2					
3					
4					
Totals					

Data Graph



WATTSMART BEGIN AT HOME

Activity: A Bright Idea!

Objective
Students will study an example of potential energy converted to energy in the forms of heat and light.

Curriculum Focus
Science

Materials
- Several general purpose C dry cell batteries
- A string of holiday lights, cut apart and stripped at the ends or small bulbs and sockets with wires
- Battery operated toy and batteries
- Small flashlight bulbs and sockets
- Copies of "A Bright Idea!"

Key Vocabulary
chemical energy, circuit, closed circuit, current, electrode, electrolyte, kinetic energy, open circuit, parallel circuit, potential energy, radiant energy, series circuit, thermal energy, transformation, voltage

Next Generation Science Correlations
4-ETS1 – 1-2
4-PS3 – 2-4
4-ESS3 – 1
5-PS1.B
5-ESS3 – 1
5-ESS3.C
MS-PS3 – 3
MS-PS3.B
MS-LS2 – 1
MS-ESS3.A

Introduction

Alessandro Volta, an Italian physicist, made the first battery in 1799. Volta placed two different metal electrodes in an electrolyte solution (a chemical mixture which will conduct an electrical current). The chemical reaction caused an electromotive force. A common misconception is that batteries store electrical energy. This is not really true; batteries convert chemical energy to electrical energy. They store chemical energy that can be released during a chemical reaction. By using metals or carbons that have different chemical properties and an acid or base that will allow the movement of electrical charges, an electric current can be produced.

Procedure

1. Demonstrate a battery operated toy with and without the battery. Explain that energy is the ability to do work or cause change, such as moving the toy or powering a light bulb.
2. Discuss:
   - How do we know the energy from the battery is working?
   - What kind of energy is the toy giving off? (possible answers include kinetic energy, mechanical, light, sound and heat)
   - The battery converts chemicals (chemical energy) to electricity (electrical energy) and the toy converts electricity to many possible forms of energy, including mechanical energy, heat (thermal energy), light and sound.
3. Have students use the materials provided to experiment with simple circuits by following the guided inquiry activity on the student sheet. As the students do the activity, have them note the light and heat energy given off.
4. Give students examples of types of potential and kinetic energy.

   Kinetic energy – a person riding a bike, a fire in a woodburning stove, a person running

   Potential energy – a lump of coal, a sandwich, a rock at the top of a hill

Discussion

Write the word choices on the board. Read the statements to the students and have them fill in the blanks using the words.

1. A battery converts chemical energy into _____ energy.
2. Electricity is a form of _____ energy.
3. The light bulb converts electrical energy into _____ and _____ energy.
4. A battery contains _____ energy.

Word choices:

potential electrical heat kinetic light

Answers:

1. electrical 2. kinetic 3. light, heat 4. potential

To Know and Do More

Ask students if they believe batteries are important to our way of life today. Have students make a list of all the items they used yesterday that contained a battery. Their list might include:

Wristwatch	Tablet
Automobile	Video game controller
Cell phone	TV remote control

To continue this, have students add to the list all of the items they can think of that use batteries. Are your students surprised at how many items today depend on batteries to operate and how many battery operated items they depend on daily?

Career Awareness Activity

Search the internet for a company that produces batteries. Discover the various job opportunities and careers within that company. Your list might include: scientists, chemists, research analysts, accountants, purchasing agents and administrative assistants.

WATTSMART BEGIN AT HOME

Student Sheet: A Bright Idea!

Alessandro Volta, an Italian physicist, made the first battery in 1799. Volta put sheets of two different types of metal in a jar of water with a chemical that could carry electricity (an electrolyte). The chemical reaction between the electrolyte and the metal plates caused electrons to move when the plates were connected with a wire. The flow of electrons moving in a wire is called an electric current, or electricity.

Using one battery and one light, make the bulb light up. Congratulations, you have made an electrical circuit!

1. What did you have to do to get the light to come on and complete the circuit? How was it touching the battery?

2. What do you have to do to make the light bulb turn off and then back on?

3. What do you think the electrical terms "open circuit" and "closed circuit" mean?

4. How do you think a light switch works?

5. What type and form of energy is in the battery?

6. The battery's energy was transformed into what other forms of energy?

Using one battery, try to light up two lights.

1. Sketch how the wires are connected to the battery when you light two lights.

2. Are the lights the same brightness as when you lit only one or are they dimmer?

3. A series circuit has only one path that electrons can follow as they are pushed from one side of the battery to the other. A parallel circuit has more than one path and the electrons can go more than one way to get from one end of the battery to the other. Which type of circuit did you make and draw?

4. Experiment with multiple batteries connected together, placing the positive end of one battery touching the negative end of another battery. What effect does the number of batteries have on the brightness of the bulbs?

5. If you leave the battery connected to a bulb long enough, you will feel the wire and the ends of the battery getting warm. What do you think is causing this?

6. Can that heat be useful? Can it be dangerous? Give an example to prove your point.

7. Wash your hands when you are finished.

WATTSMART BEGIN AT HOME

Activity: The Art of Circuits

Objective

Students will learn about conservation of energy and energy transfer by experimenting with electrical circuits.

Curriculum Focus

Science
Social Studies
Language Arts
Art

Materials

- Playdough® or homemade salt dough
- 9V batteries
- 9V battery clips with red and black cables
- 2V LED miniature light bulbs
- Insulating material - cardboard, packaging plastic or dough made from sugar, not salt (optional)

Key Vocabulary

Energy transfer
Electric current
LED (light-emitting diode)
Electric circuit
Insulator
Conductor

Next Generation Science Correlations

4-PS3 - 2
4-PS3 - 4
4-PS3.A-B, D
4-ETS1 - 1
4-ETS1.A
5-ETS1 - 1
5-ETS1.A
MS-PS3 - 3
MS-PS3.A-B
MS-ETS1 - 1
MS-ETS1.A

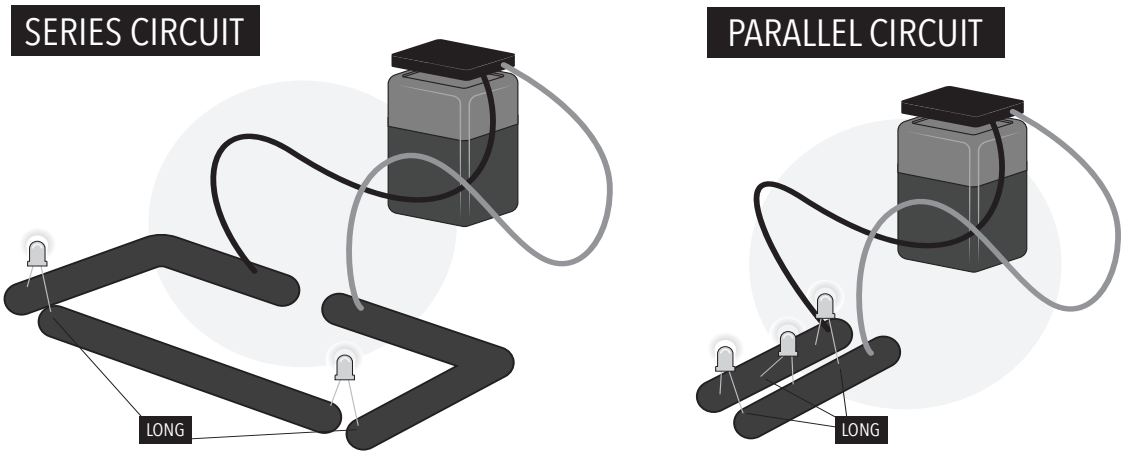
Introduction

Materials that allow a flow of electric current to pass through them more easily are called conductors. Aluminum, silver, copper and water are examples. Insulators block the flow of electricity. Nonmetallic materials, such as rubber, plastic, wood, cloth and dry air are insulators. An electrical circuit is a path of conductors through which electric current flows. Energy can be transferred from place to place by electric current.

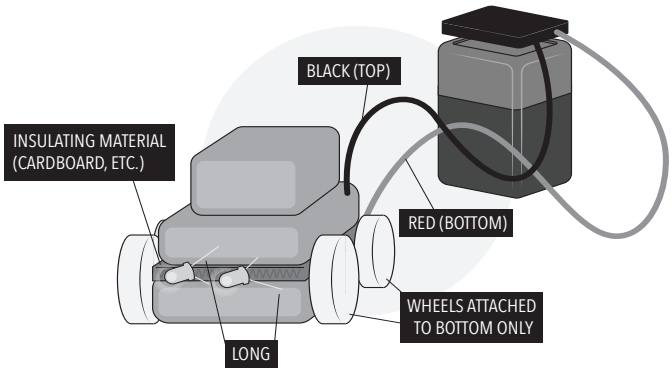
In this activity, students will use salt dough, which is a conductor, to design circuits which will transfer electrical energy. If they are successful, the electricity will be transformed to light and heat energy in a miniature LED bulb.

Procedure

1. Introduce students to their materials:
   a. Attach the battery to a battery clip with red and black cables. The red lead is the positive terminal and the black lead is the negative terminal.
   b. Examine the LED bulb. Two wires (or legs) extend from the bulb. The longer wire is the positive side of the LED and the short wire is the negative side. The LED should only be connected to dough, never directly to the battery terminals, which will cause the bulb to burn out.
2. Tell students that electricity can only go through the circuits they will create in one way. The positive terminal of the battery (red lead on battery clip) must be nearest a positive (long) leg of the LED. A battery pushes electricity around the circuit through the positive leg and out the negative (short) leg, then repeating through the next positive leg (if there is more than one LED in the circuit).
3. Explain that electricity will take the path of least resistance. It is easier for electricity to travel through the dough than through the LED, so if two pieces of dough are touching, the LED will not light.
4. Challenge students to design a simple circuit like the ones on the next page.



If time allows, have students create a circuit work of art like the one below. Since the conductive dough cannot touch, use insulating material between layers.

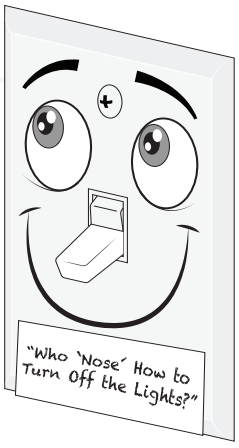


Discussion

- How does your dough circuit light the LED compared to the circuits at your home?
- In a series circuit with multiple LEDs, what happens to the brightness of the LEDs that are further from the battery? Why?

To Know and Do More

When a light switch is off, the electrical pathway to a bulb is not complete and electricity cannot flow to light that bulb. When you flip the switch on, you close the circuit and the light turns on. If light is not needed, it is important not to waste the natural resources used to generate the electrical power that is being transformed to light. Have students create characters without noses to put over light switches at school or home. The art should help remind them to turn lights off!



WATTSMART BEGIN AT HOME

Activity: Shine a Light on History

Objective

Students will gather details and make inferences from text to explain historical events related to electricity. They will use their knowledge to write information text to support an opinion.

Curriculum Focus

Language Arts
Social Studies
Science

Materials per student group

- Copies of "Edison v. Holonyak"

Key Vocabulary

LED (light-emitting diode)
Incandescent bulb
Filament
Electric meter
Inference
Persuasive
Lumen
Watt

Next Generation Science Correlations

4-PS3 - 2
4-PS3.A-B
MS-PS3 - 3

Introduction

Thomas Edison and Nick Holonyak are two famous lighting inventors. They both made major contributions that changed the way people lived. Thomas Edison patented the incandescent bulb in the late 1870s. Since that time, people have enjoyed the convenience of using electricity for light. Nick Holonyak created the first practical, visible spectrum LED which revamped lighting as we know it.

In this activity, students will study the contributions of these two inventors. They will gather details to form an opinion about which man was more influential in history.

Procedure

1. Pass out copies of "Edison v. Holonyak" and have students read about each. If time allows, they can use the internet, or other sources, to find additional information.
2. Have students fill out the research cards for each inventor. Using that information, they should decide which inventor was more influential in history and write a persuasive paragraph, with details from their research to support their opinion.
3. Challenge students to practice reciting their paragraph and then present it to another student(s) in an attempt to change a differing opinion.

Discussion

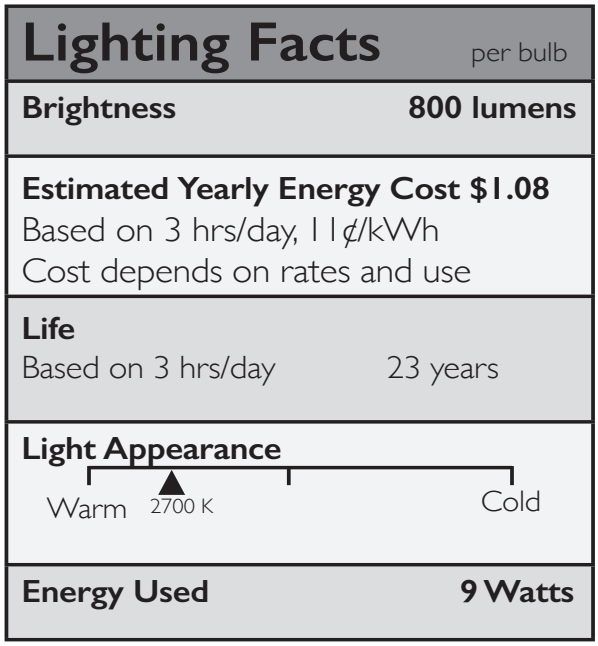
- What kinds of light bulbs are used in your home? How do they affect the way you live and work?
- What do you think the next great electrical invention will be?
- Thomas Edison said, "Genius is one percent inspiration and ninety-nine percent perspiration." What did he mean? How does his quote apply to you?

To Know and Do More

A light bulb package has a lighting facts label that contains different numbers.

- The light output in lumens.
- The power used by the bulbs, measured in Watts. The higher the wattage, the more energy the bulb uses.
- A measure of how warm or cool the light from that bulbs looks, measured in Kelvin (K). Low numbers are warmer light hues (orange or yellow). High numbers are cooler hues (blue or green).

When buying new bulbs, we should shop by lumens, not wattage. We save energy by finding bulbs with the lumens we need, then choosing the lowest wattage possible for that number of lumens.



WATTSMART BEGIN AT HOME

Activity: Layered Lunch

Objective

Students will understand that natural gas deposits are trapped and held by certain types of geologic formations.

Curriculum Focus

Science
Art

Materials

- Slices of bread
- Almond butter or other thick spread (e.g. cream cheese)
- Honey
- Plastic wrap or wax paper
- Plastic knife

Key Vocabulary

Permeable
Impermeable
Source rock

Next Generation Science Correlations

4-ETS1 - 1
4-ETS1.A
5-ETS1 - 1
5-ETS1.A
MS-LS4 - 1
MS-LS4.A
MS-ESS1 - 4
MS-ESS1.C
MS-ETS1 - 4
MS-ETS1.B

Introduction

How do we find natural gas? Try this activity to get an idea of the type of rock formations and characteristics geologists look for when locating natural gas deposits.

As natural gas molecules form, they migrate from shale "source rock" into more porous areas such as sandstone. Porous or permeable layers are much like a sponge with little pockets throughout the rock. The natural gas continues to move to either the earth's surface (where it escapes into the atmosphere) or it is trapped when nonporous or impermeable rock layers block its path.

Procedure

Using bread, almond butter and honey, create some edible models of rock layers. (In place of almond butter you could use peanut butter, nutella or even thick frosting depending on allergies within the classroom.)

1. Spread thick layers of almond butter then honey on a slice of bread. Top it with another slice of bread.
2. Make a second sandwich just like the first, or gently cut the sandwich in half.
3. Now put one sandwich (or one half) with the almond butter layer above the honey and the other sandwich (or other half) with the honey on top of the almond butter.
4. Next spread a thick layer of only honey on a slice of bread, adding another slice on top.
5. Cover your sandwiches with wax paper or plastic wrap and gently press down on them for about three seconds, representing millions of years of pressure.
6. Cut the sandwiches in half and observe what has happened.

Discussion

1. What do you think the honey represents?

2. Which layer do you think represents porous rock?

3. Which layer is the nonporous rock?

4. Did the honey seep into both slices of bread? Why or why not?

5. What do you predict would happen with a sandwich made with only almond butter?

6. How might the ingredients you used affect your results?

7. Draw the layers of your sandwich and use colored pencils or crayons to distinguish the different layers and write labels for each layer that includes: impermeable, permeable, natural gas, nonporous rock and porous rock.

Answers

The honey represented natural gas or a fossil fuel. The bread was the porous rock where the honey or natural gas gets into the little pockets or air spaces. Almond butter acted like a nonporous rock layer blocking the honey from seeping into the slice of bread above the almond butter. The results may be different depending on your ingredients: denser bread – less seepage, creamier almond butter may be less impermeable or thicker honey may not fill the little pockets as easily.

To Know and Do More

Assign students to further investigate how natural gas is trapped in rock formations. Have them draw pictures of a formation and the trapping of oil and natural gas in the earth.

Visit a natural history museum and look for prehistoric life forms and rock formations.

WATTSMART BEGIN AT HOME

Activity: How Do You Rate?

Objective
Students will conduct a home survey to determine how they can use energy more efficiently by changing their habits and improving conditions and thereby improve the environment in which they live.

Curriculum Focus
Language Arts
Science
Social Studies

Materials
- Copies of "How Do You Rate?"

Key Vocabulary
Conservation
Efficiency
Environment
Natural resources
Quality of life

Next Generation Science Correlations
4-ESS3 – 1
5-ESS3 – 1
5-ESS3.C
MS-LS2 – 1
MS-ESS3 – 3
MS-ESS3.A

Introduction

We use natural resources every day. Sometimes we use them just as they come from earth or the atmosphere. At other times we alter their makeup to fit our needs. For instance, we use the sun just as it is to dry clothes, but we use photovoltaic cells to capture the sun's energy and convert it to electricity, a secondary energy source. We use coal just as it comes to us from the earth to make electricity, or we use coal to provide coke for steel manufacturing. Many natural resources we use every day are nonrenewable, once we use them they are gone; others are renewable, they can be replaced through natural and/or human processes.

It is responsible to use all resources efficiently and wisely. When we do, we reduce energy use, save money and preserve the environment. Making wise decisions today will have a positive impact on our future.

Imagine the difference we could make if we all used energy more efficiently. We would conserve natural resources for the future and enjoy better air quality and a better life. Each one of us can truly make a difference. All it takes is knowledge and action.

Procedure

Using energy efficiently and conserving our natural resources are responsible and easy actions that students can take today to show they respect the environment and have a desire to protect and preserve it.

1. Pass out "How Do You Rate?" Discuss the actions that may apply to the school (e.g., windows and doors have weather stripping; drapes or blinds are open on cold, sunny days and closed on hot days; thermostats are adjusted at night; lawns are only watered early or late in the day). As you discuss each action, write a T for true or F for false on the board to see how the school rates. What can the students do to improve energy use at school?
2. Decide on several actions the students can take at school to help save energy and protect the environment. One action might be to use both sides of their paper and then recycle. If a room is empty during lunch or at other times, they can be sure lights are turned off and computers are on sleep mode.
3. Have the students take the survey home and complete it with their parent's or guardian's help. Explain to students that it is important to record their true energy use and not mark what they think they should be doing.
4. How did the students' homes rate? Discuss the results of the home survey. Help students to become enthusiastic about conserving natural resources and using energy more efficiently.

5. Prepare a graph to show the results of the energy efficiency survey. Which efficiency tips are already practiced by most students? Which were least used? Graph the number of students marking true for each item.
6. Find the mean, median, mode and range of the data on the home survey.

Discussion

Discuss the benefits of energy conservation. How will our energy use impact our future? Compare the benefits and possible inconveniences and their correlation to our quality of life.

To Know and Do More

Why do you think people do not practice all of the energy efficiency tips on the survey? Are there false assumptions that affect people's behavior? (Believing that turning things on and off uses more energy than leaving them on, for example.)

Discuss how people in other geographic areas and cultures would rate. Does everyone have a car, dishwasher or an air conditioner?

Career Awareness Activity

Have the students think of some careers that could have a big impact on your community's energy usage. Some areas to consider: teachers — impact energy usage through education and by example; utility workers — through education and incentives; government regulators — through restrictions and rewards, such as financial benefits or tax breaks.

WATTSMART BEGIN AT HOME

Student Sheet: How Do You Rate?

How energy efficient is the building you live in? Together with your parents or guardians, answer the following questions to rate your home or apartment.

Circle T if the statement is true, F if the statement is false or NA if the statement does not apply to your living situation.

Heating and Cooling

Windows and doors have good weather-stripping.	T F NA	Ducts are insulated in unheated/uncooled areas.	T F NA
Window coverings are open on cold, sunny days and closed on hot days.	T F NA	Garage is insulated.	T F NA
Window coverings are closed at night when heat is on.	T F NA	Air filters on furnace and air conditioner are cleaned and changed regularly.	T F NA
Thermostat is set at 68 F (20 C) or lower in winter.	T F NA	Thermostat is adjusted at night.	T F NA
Air conditioning is set at 78 F (26 C) or higher in summer.	T F NA	Fireplace damper is closed when fireplace is not in use.	T F NA

Water

A pitcher of water is kept in the refrigerator for drinking.	T F NA	Hot water heater is set at 120 F (49 C). • If someone in your household has a compromised immune system, consult your physician.	T F NA
Faucets and toilets do not leak.	T F NA	Hot water pipes from water heater are insulated.	T F NA
Showers and faucets are fitted with energy-efficient shower heads and aerators.	T F NA	If located in an unheated area, hot water heater is wrapped in an insulation blanket.	T F NA
Showers last no longer than 5 minutes.	T F NA	Broom, not hose, is used to clean driveways and sidewalks.	T F NA
Toilets are low flow, or tanks use water displacement devices.	T F NA	Faucet is shut off while brushing teeth and shaving.	T F NA

Appliances

Dishwasher is usually run with a full load.	T F NA	Clothes dryer is usually run with a full load.	T F NA
Automatic air-dry is used with the dishwasher.	T F NA	Clothes are often hung up to dry.	T F NA
Washing machine is usually run with a full load.	T F NA	Refrigerator is set no lower than 37 F (3 C).	T F NA
Cold water is used in washing machine most of the time and is always used for rinses.	T F NA	Lids are usually put on pots when boiling water.	T F NA
		Oven is preheated for only 10 minutes (if at all).	T F NA

Lighting

Lights are turned off when not in use.	T F NA	Light bulbs are kept dusted and clean.	T F NA
LED bulbs are used in at least one room.	T F NA	Sunlight is used whenever possible.	T F NA
Security and decorative lighting is powered by solar energy.	T F NA		

Trash

Glass, cans and newspapers are recycled.	T F NA	Overpackaged products are usually avoided.	T F NA
Plastic is separated and recycled.	T F NA	Reusable bags are used for groceries, or bags are recycled.	T F NA
Old clothes are often given to charities, secondhand clothing stores, etc.	T F NA	Rechargeable batteries are used when possible.	T F NA
Food scraps and organic waste are composted.	T F NA	Food is often bought in bulk.	T F NA
		Products made of recycled materials are favored.	T F NA

Transportation

Car is properly tuned and tires properly inflated.	T F NA	Public transportation is used when possible.	T F NA
Family drivers obey speed limit on the highway.	T F NA	Family members often walk or ride a bike for short trips.	T F NA
Family drives an electric vehicle.	T F NA	Kids and parents carpool when possible.	T F NA

Yard and Workshop

Lawns are watered early or late in the day.	T F NA	Cutting edges on tools are kept sharp.	T F NA
Grass is mowed to a height of 2 to 3 inches (5 to 8 cm).	T F NA	Electrical tools are maintained and gas equipment is kept tuned and serviced.	T F NA
Hand tools, like pruners and clippers (rather than power tools) are used whenever possible.	T F NA		

Score 1 point for True, 0 points for False and 0 points for Not Applicable (NA).

Total Points: _____

Discuss the results of this survey with your family.
What can you and your family do to raise your score?

WATTSMART BEGIN AT HOME

Activity: Energy in Math

Objective
Students will interpret and evaluate numerical expressions as they solve word problems.

Materials
- Student Worksheet
- Individual White Boards (optional)

Key Vocabulary
Watt

Common Core Correlations
Numbers and Operations

Data Analysis and Probability

Connection to the Real World

Measurement

Introduction:

In this activity, students will complete the problem set found on the bottom of Page 22 within an allotted time (10 minutes). Students will solve the mathematical problems making connections to real world situations.

Procedure:

1. Instruct students on the importance of learning to solve real world problems using their math skills. You may want to review some steps to solving word problems before beginning the first problem. The following questions might be useful to review:
   - Can you draw something to help you?
   - What can you draw?
   - What conclusions can you make from your drawing?
2. Pass out the worksheet.
3. Model the problem.

   Have a pair of students work at the board while the others work independently or in pairs at their seats.

   As students work, circulate. Reiterate the questions above. After several minutes, have the demonstrating students receive and respond to feedback and questions from their peers if necessary.
4. Calculate to solve and write a statement.

   Give everyone two minutes to finish work on that question, sharing their work and thinking with a peer. All should write their equations and statements of the answer.
5. Assess the solution for reasonableness.

   Give students one to two minutes to assess and explain the reasonableness of their solution.

Discussion/Debrief

The student debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the problem set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed. Then guide students in a conversation to debrief the Problem Set and process the lesson.

Any combination of the questions below may be used to lead the discussion.

- What did you notice about this word problem?
- What is different in the problem?
- What are we trying to find out?
- How can we represent this part of the story? (draw, write a number, use manipulatives)
- What would help us organize our thinking and our work? (answers may vary: draw it out, act it out, write an equation, etc.)
- What strategies can we use to solve this problem?

To Know and Do More

Have your students turn in their worksheet showing their work to solve each problem. This will help you to assess your students' understanding of the math concepts presented in the lesson.

1. Jessie saved more energy than Michael. Michael saved more energy than Maggie. Maggie saved less energy than Jessie. Karen saved more energy than Jessie. List the kids' names in order of how much energy they saved, least to most:
   - Jessie, Karen, Maggie, Michael
   - Maggie, Michael, Jessie, Karen
   - Michael, Jessie, Maggie, Karen
   - Maggie, Karen, Michael, Jessie
2. The Maher family used 57,000 gallons of water a year, costing them $525 to heat it. Estimate how much money they would save in a year if they cut their hot water use by 30,820 gallons.
   - $100
   - $240
   - $284
   - $525
3. If each person in a house uses a 60 Watt bulb in their own bedroom 4 hours a day, and there are three people living there, how many Watts will be used a day to light the bedrooms?
   - 20 Watts
   - 240 Watts
   - 650 Watts
   - 720 Watts
4. For every 10 degrees the water heater setting is turned down, you can save 6% of the energy used. If Charles turns his water heater down by 15 degrees, about what percent savings in energy will he save?
   - 6%
   - 9%
   - 12%
   - 15%

Answers: 1. Maggie, Michael, Jessie, Karen; 2. $284; 3. 720 Watts; 4. 9%

WATTSMART BEGIN AT HOME

Activity: Be Wattsmart, Begin at home Poster

Objective
Students will make their own energy-efficient choices that can be practiced at home to help future societies.

The students will also learn how they can be part of the solution to save energy and natural resources.

Materials
- House poster found on the following page
- Colored markers or pens

Key Vocabulary
Carbon footprint
Recycle
Energy efficient

Common Core Correlations
Energy Sources, Forms and Transformation

Personal and Social Perspectives

Research Tools

Problem-solving and Decision-making Tools

Connection to the Real World

Introduction:

This is a fun project for students to create after they have studied energy, energy efficiency and renewable and nonrenewable resources. Using the poster given, students will add or color the items listed below to create a house that is eco-friendly and energy efficient. You can help your students answer questions about what types of energy they can use and how it will work in the house to create efficiency and save energy.

Procedure:

1. Add or color the items listed below. You may want to do different items each day as you cover different topics: electricity, natural gas, water, etc.
    - Add a bicycle.
    - Add recycling bins in the garage.
    - Add trees to shade the house.
    - Add a ceiling or floor fan to the home for cooling.
    - Put a blue star (for ENERGY STAR® products) on the refrigerator, television and furnace.
    - Color the energy-efficient shower head, red.
    - Color all items that use electricity, yellow.
    - Color the thermostat, brown.
    - Color the furnace filter that is being changed, orange.
    - Draw a purple water drop next to all items in the house that use water.

To Know and Do More

- Have your students write a brief description of the things their family has done to improve energy efficiency at home. Have your students add any items that will encourage their families to be energy efficient in the future.
- Choose a natural resource used for energy and create a Venn diagram comparing the positive and negative effects of the use of this resource on the physical environment.

Lingo Card

L	I	N	G	O
Water Heater	Natural Gas	Natural Resource	Incandescent	Reduce
Reuse	Phantom Load	Oil	Coal	ENERGY STAR®
Renewable	Energy	Be ***watt***smart Begin at home	Turn It Off!	Uranium
Energy Efficiency	LED	Recycle	68 Degrees	Embodied Energy
Cooking	78 Degrees	Solar	Programmable or Smart Thermostat	Electricity

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L	I	N	G	O
Reuse	Natural Gas	Phantom Load	LED	78 Degrees
Cooking	Electricity	Renewable	Recycle	68 Degrees
Natural Resource	Water Heater	Be ***watt***smart Begin at home	ENERGY STAR®	Nonrenewable
Embodied Energy	Coal	Energy Efficiency	Heating	Incandescent
Programmable or Smart Thermostat	Reduce	Oil	Solar	Uranium

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L	I	N	G	O
Coal	Natural Gas	Solar	Turn It Off!	Renewable
Water Heater	Nonrenewable	Phantom Load	Electricity	Reuse
Energy	Oil	Be ***watt***smart Begin at home	68 Degrees	Cooking
Programmable or Smart Thermostat	Incandescent	Recycle	Uranium	Natural Resource
Reduce	78 Degrees	Embodied Energy	LED	Energy Efficiency

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L	I	N	G	O
Natural Resource	Water Heater	Natural Gas	Programmable or Smart Thermostat	78 Degrees
Turn It Off!	Reduce	Oil	Embodied Energy	Cooking
Phantom Load	ENERGY STAR®	Be ***watt***smart Begin at home	Uranium	Recycle
Energy	LED	68 Degrees	Energy Efficiency	Heating
Electricity	Renewable	Incandescent	Reuse	Solar

http://print-bingo.com

Dear Parents,

Today your child participated in the **Be Wattsmart, Begin at home** program sponsored by Pacific Power. In this engaging presentation, your child learned key science curriculum concepts as well as important ways to be more efficient with energy use at home.

As part of the **Be Wattsmart, Begin at home** program, your child received a:

- **Be Wattsmart, Begin at home** booklet
- *Home Energy Worksheet*

Please take a moment to read through this informative booklet with your child. Then, fill out the *Home Energy Worksheet* in one of two ways:

- Visit **thinkenergy.org/Wattsmart** and fill out an online worksheet. You will need to enter the teacher ID found on the paper worksheet. If you do not have the teacher ID, you can find it by searching for your teacher's name on the website.

  or

- Fill out the paper worksheet and return it to your child's teacher. To thank you, Pacific Power will provide your child with a Wattsmart nightlight.

We appreciate your efforts to reinforce important **Be Wattsmart, Begin at home** energy knowledge and efficiency actions in your home!

WATTSMART® BEGIN AT HOME

National Energy Foundation® cultivating energy literacy

PACIFIC POWER POWERING YOUR GREATNESS

WA

Estimados padres,

Su hijo ha participado en el programa **Ser Wattsmart, Empieza en casa**, patrocinado por Pacific Power. En esta presentación atractiva, su hijo aprendió conceptos claves de su plan de estudios de ciencias, así como formas importantes para ser más eficiente con el uso de energía en el hogar.

Como parte del programa de **Ser Wattsmart, Empieza en casa**, su hijo recibirá:

- El folleto de **Ser Wattsmart, Empieza en casa**
- *Verificación de Energía Doméstica*

Tome un momento para leer el folleto informativo con su hijo. Luego, complete la *Verificación de Energía Doméstica* de una de estas maneras:

- Visite **thinkenergy.org/Wattsmart** para rellenar el formulario en línea. Necesitará entrar el número de identificación de su profesor que se encuentra en el formulario de papel. Si no tiene el numero de identificación del maestro, se puede encontrarlo buscando el nombre de su maestro en el sitio web.

  o

- Rellenar el formulario y devolverlo al profesor de su hijo. Para agradecerle, Pacific Power le proporcionará a su hijo una luz de noche.

Apreciamos sus esfuerzos para reforzar la importancia del **Ser Wattsmart, Empieza en casa** de la energía y los acciónes eficientes en el hogar.

WATTSMART® BEGIN AT HOME

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WA

Submit online at
thinkenergy.org/Wattsmart

Teacher ID: _____

Teacher Name: _____

Student First Name: _____

Home Energy Worksheet

Heating

1. Install and use a programmable or smart thermostat.
   ☐ Currently do ☐ Will do ☐ Neither
2. Caulk windows and weather-strip outside doors.
   ☐ Have done ☐ Will do ☐ Neither
3. Inspect attic insulation and add insulation if needed.
   ☐ Have done ☐ Will do ☐ Neither
4. Keep furnace air filters clean/replaced regularly.
   ☐ Currently do ☐ Will do ☐ Neither

Cooling

5. Replace existing air conditioning unit with a high-efficiency unit or an evaporative cooling unit.
   ☐ Have done ☐ Will do ☐ Neither
6. Close blinds when windows are exposed to the sun.
   ☐ Currently do ☐ Will do ☐ Neither
7. Use a fan instead of air conditioning.
   ☐ Currently do ☐ Will do ☐ Neither
8. In the summer, set thermostat to 78 F or higher.
   ☐ Currently do ☐ Will do ☐ Neither

Water heating

9. Set the water heater temperature to 120 F.
   ☐ Have done ☐ Will do ☐ Neither
10. Install a high-efficiency shower head.
    ☐ Have done ☐ Will do ☐ Neither
11. Take 5 minute showers.
    ☐ Currently do ☐ Will do ☐ Neither
12. Wash full loads in the dishwasher and clothes washer.
    ☐ Currently do ☐ Will do ☐ Neither

Lighting

13. Replace inefficient bulbs with LED bulbs.
    ☐ Have done ☐ Will do ☐ Neither
14. Turn lights off when not in use.
    ☐ Currently do ☐ Will do ☐ Neither

Refrigeration

15. Replace old, inefficient refrigerator with an ENERGY STAR® model.
    ☐ Have done ☐ Will do ☐ Neither
16. Unplug old freezers/refrigerators and/or dispose of them in an environmentally safe manner.
    ☐ Have done ☐ Will do ☐ Neither
17. Maintain refrigerator and freezer coils and check door seals twice yearly.
    ☐ Currently do ☐ Will do ☐ Neither

Electronics

18. Turn off computers, TVs and game consoles when not in use.
    ☐ Currently do ☐ Will do ☐ Neither

Cooking

19. Use a microwave oven, toaster oven, slow cooker or outdoor grill instead of a conventional oven.
    ☐ Currently do ☐ Will do ☐ Neither

Get paid for being Wattsmart

20. Visit Pacific Power at **BeWattsmart.com** for more energy saving tips and rebates.
    ☐ Have done ☐ Will do ☐ Neither

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BEGIN AT HOME

WAT WA

Enviar en línea a
thinkenergy.org/Wattsmart

Identificación del profesor(a): _____

Nombre del profesor(a): _____

Primer nombre del estudiante: _____

Verificación de Energía Doméstica

Calefacción

1. Instalar y usar un termostato programable o termostato inteligente.
   ☐ Lo hago ☐ Lo haré ☐ Ninguno
2. Calafatear ventanas e instalar burletes en el exterior de las puertas.
   ☐ Lo he hecho ☐ Lo haré ☐ Ninguno
3. Inspeccionar el aislamiento del ático y agregar aislamiento si es necesario.
   ☐ Lo he hecho ☐ Lo haré ☐ Ninguno
4. Mantener limpios y reemplezar regularmente los filtros de aire de la caleffacción.
   ☐ Lo hago ☐ Lo haré ☐ Ninguno

Enfriamiento

5. Reemplazar la unidad de aire acondicionado existente por una unidad de alta eficiencia o un enfriador evaporativo.
   ☐ Lo he hecho ☐ Lo haré ☐ Ninguno
6. Cerrar las persianas cuando las ventanas estén expuestas al sol.
   ☐ Lo hago ☐ Lo haré ☐ Ninguno
7. Usar un ventilador en lugar del aire acondicionado.
   ☐ Lo hago ☐ Lo haré ☐ Ninguno
8. En el verano, ajustar el termostato a 78 F o más.
   ☐ Lo hago ☐ Lo haré ☐ Ninguno

Calentadores de agua

9. Programar el calentador de agua a 120 F.
   ☐ Lo he hecho ☐ Lo haré ☐ Ninguno
10. Instalar un cabezal de ducha de alta eficiencia.
    ☐ Lo he hecho ☐ Lo haré ☐ Ninguno
11. Tomar duchas de 5 minutos.
    ☐ Lo hago ☐ Lo haré ☐ Ninguno
12. Lavar cargas llenas en los lavaplatos y las lavadoras de ropa.
    ☐ Lo hago ☐ Lo haré ☐ Ninguno

Iluminación

13. Reemplazar los focos ineficientes con focos LED.
    ☐ Lo he hecho ☐ Lo haré ☐ Ninguno
14. Apagar las luces cuando no estén en uso.
    ☐ Lo hago ☐ Lo haré ☐ Ninguno

Refrigerador

15. Reemplazar el refrigerador viejo e ineficiente con un modelo de ENERGY STAR®.
    ☐ Lo he hecho ☐ Lo haré ☐ Ninguno
16. Desenchufar refrigeradores/congeladores viejos y/o desecharlos de una manera ambientalmente segura.
    ☐ Lo he hecho ☐ Lo haré ☐ Ninguno
17. Mantener las bobinas del refrigerador y del congelador e inspeccionar el sello de las puertas dos veces al año.
    ☐ Lo hago ☐ Lo haré ☐ Ninguno

Electrónicos

18. Apagar computadoras, televisores y consolas de juegos cuando no estén en uso.
    ☐ Lo hago ☐ Lo haré ☐ Ninguno

Cocinar

19. Usar un horno microonda, un horno tostador, una olla de cocción lenta o una parrilla de aire libre en lugar del horno convencional.
    ☐ Lo hago ☐ Lo haré ☐ Ninguno

Reciba paga siendo Wattsmart

20. Visite Pacific Power en **BeWattsmart.com** para obtener más consejos y rebajas de ahorro de energía.
    ☐ Lo he hecho ☐ Lo haré ☐ Ninguno

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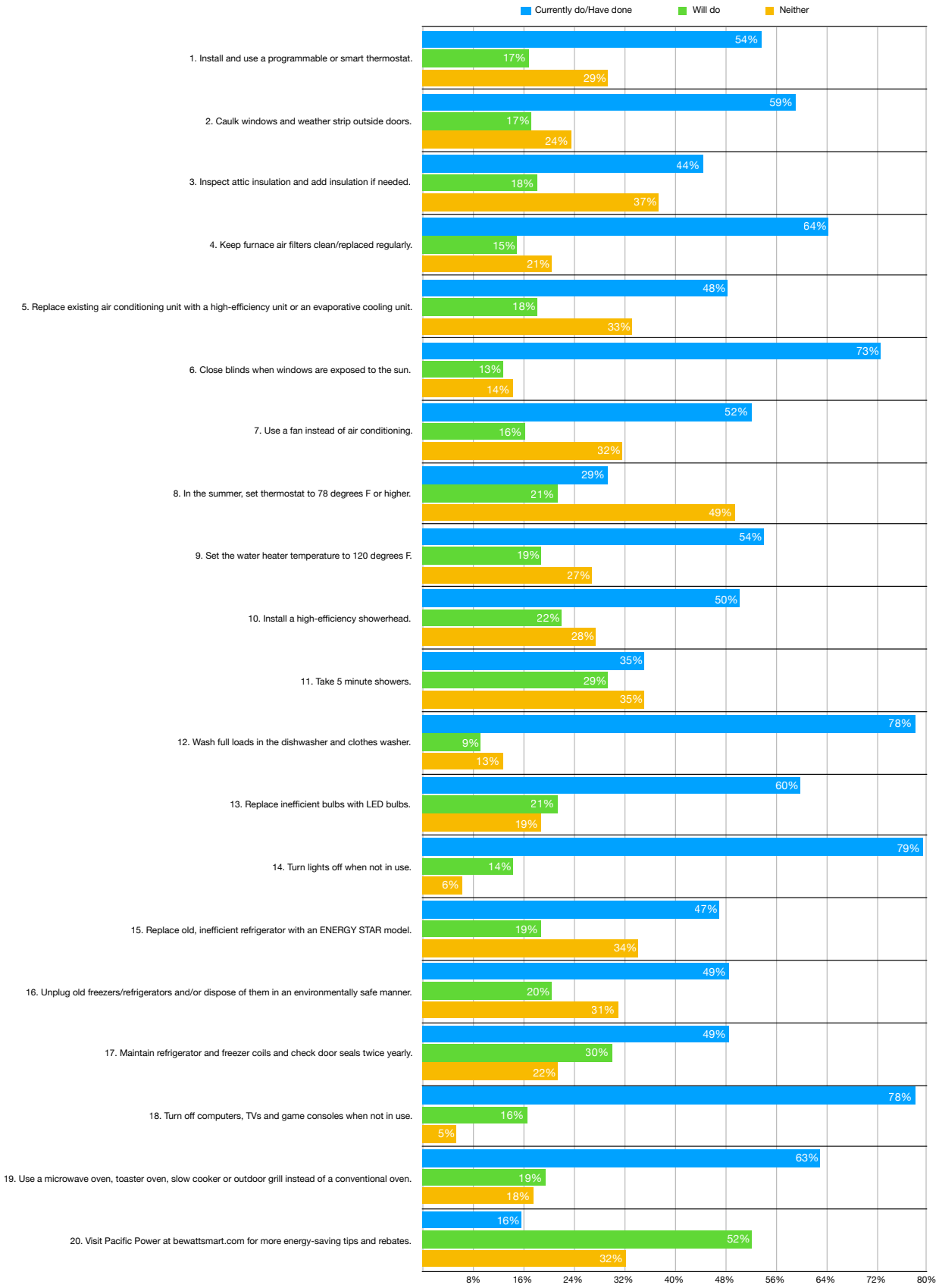
EMPIEZA EN CASA

WAT WA

Home Energy Worksheet Summary – Pacific Power

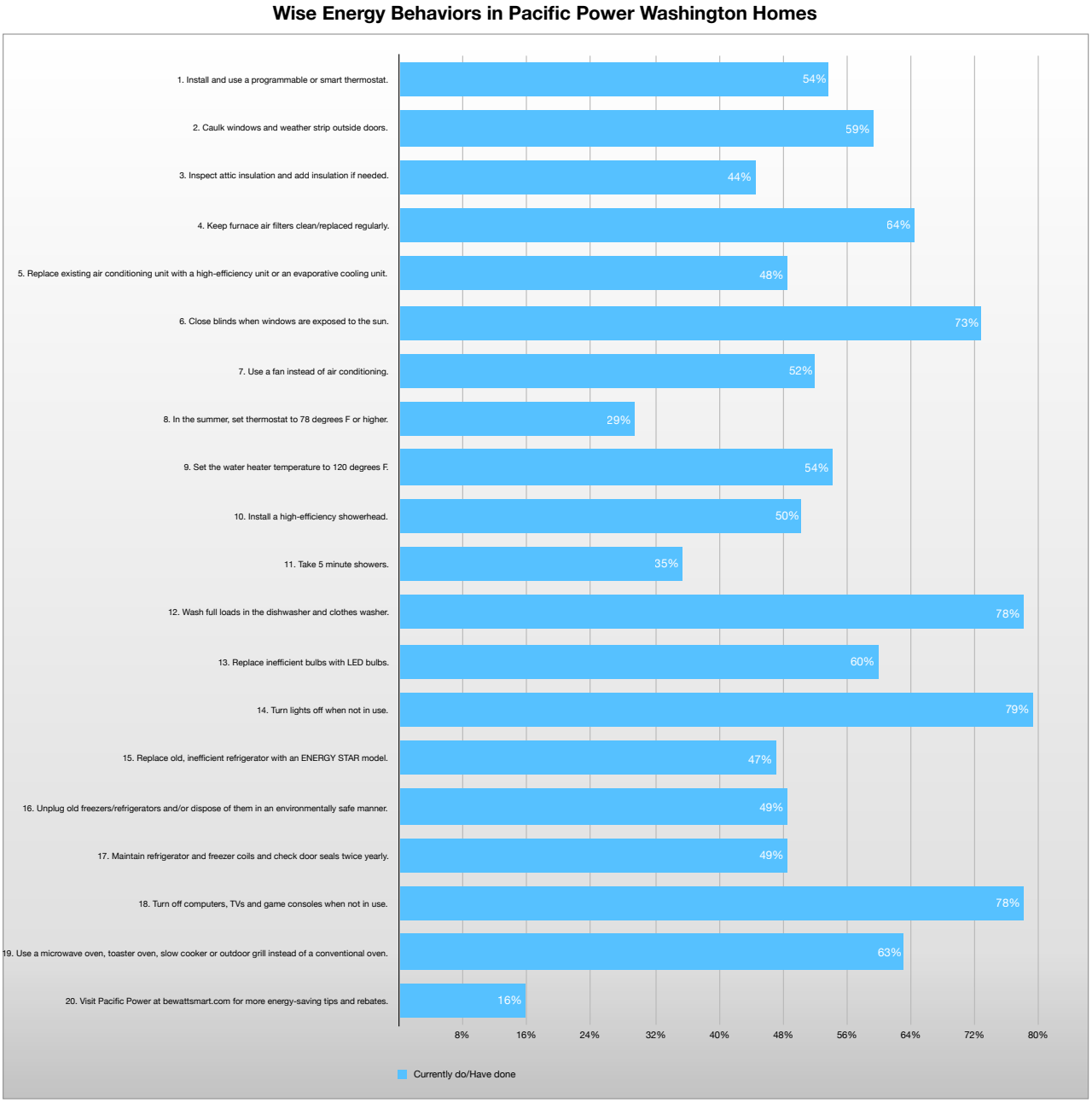
Energy Efficient Activity	Currently do/Have done	Will do	Neither
1. Install and use a programmable or smart thermostat.	54%	17%	29%
2. Caulk windows and weather strip outside doors.	59%	17%	24%
3. Inspect attic insulation and add insulation if needed.	44%	18%	37%
4. Keep furnace air filters clean/replaced regularly.	64%	15%	21%
5. Replace existing air conditioning unit with a high-efficiency unit or an evaporative cooling unit.	48%	18%	33%
6. Close blinds when windows are exposed to the sun.	73%	13%	14%
7. Use a fan instead of air conditioning.	52%	16%	32%
8. In the summer, set thermostat to 78 degrees F or higher.	29%	21%	49%
9. Set the water heater temperature to 120 degrees F.	54%	19%	27%
10. Install a high-efficiency showerhead.	50%	22%	28%
11. Take 5 minute showers.	35%	29%	35%
12. Wash full loads in the dishwasher and clothes washer.	78%	9%	13%
13. Replace inefficient bulbs with LED bulbs.	60%	21%	19%
14. Turn lights off when not in use.	79%	14%	6%
15. Replace old, inefficient refrigerator with an ENERGY STAR model.	47%	19%	34%
16. Unplug old freezers/refrigerators and/or dispose of them in an environmentally safe manner.	49%	20%	31%
17. Maintain refrigerator and freezer coils and check door seals twice yearly.	49%	30%	22%
18. Turn off computers, TVs and game consoles when not in use.	78%	16%	5%
19. Use a microwave oven, toaster oven, slow cooker or outdoor grill instead of a conventional oven.	63%	19%	18%
20. Visit Pacific Power at bewattsmart.com for more energy-saving tips and rebates.	16%	52%	32%



Data Numbers

Energy Efficient Activity	Currently do/Have done	Will do	Neither	Total Responses
1. Install and use a programmable or smart thermostat.	334	105	183	622
2. Caulk windows and weather strip outside doors.	367	107	146	620
3. Inspect attic insulation and add insulation if needed.	275	112	232	619
4. Keep furnace air filters clean/replaced regularly.	402	94	128	624
5. Replace existing air conditioning unit with a high-efficiency unit or an evaporative cooling unit.	300	113	207	620
6. Close blinds when windows are exposed to the sun.	452	80	89	621
7. Use a fan instead of air conditioning.	321	100	196	617
8. In the summer, set thermostat to 78 degrees F or higher.	181	131	305	617
9. Set the water heater temperature to 120 degrees F.	337	118	167	622
10. Install a high-efficiency showerhead.	312	137	171	620
11. Take 5 minute showers.	217	181	217	615
12. Wash full loads in the dishwasher and clothes washer.	483	58	78	619
13. Replace inefficient bulbs with LED bulbs.	374	133	117	624
14. Turn lights off when not in use.	488	89	39	616
15. Replace old, inefficient refrigerator with an ENERGY STAR model.	294	117	214	625
16. Unplug old freezers/refrigerators and/or dispose of them in an environmentally safe manner.	301	127	192	620
17. Maintain refrigerator and freezer coils and check door seals twice yearly.	300	185	133	618
18. Turn off computers, TVs and game consoles when not in use.	488	103	34	625
19. Use a microwave oven, toaster oven, slow cooker or outdoor grill instead of a conventional oven.	392	120	109	621
20. Visit Pacific Power at bewattsmart.com for more energy-saving tips and rebates.	98	326	201	625

Wise Energy Behaviors in Pacific Power Washington Homes



Thanks a "Watt!"

Thank you for providing the **Be Wattsmart, Begin at home** program to our school. We learned how to make a difference and use energy wisely and had fun doing it.

WATTSMART® BEGIN AT HOME

National Energy Foundation® cultivating energy literacy

PACIFIC POWER POWERING YOUR GREATNESS

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Appendix 6
Washington Program Evaluations

Washington 2020 Evaluations

Program Evaluation Recommendations and Company Responses

Evaluation reports provide detailed information on the process and impact evaluations performed on each program, summarizing the methodology used to calculate the evaluated savings as well as providing recommendations for the Company to consider for improving the process or impact of the program, as well as customer satisfaction.

Outlined below is a list of the programs, the years that were evaluated during 2020 and the third-party evaluator who completed the evaluation. Program evaluations are available for review at https://www.pacificorp.com/environment/demand-side-management.html

Program	Years Evaluated	Evaluator
Low Income Weatherization	2016-2017	ADM
Home Energy Reports	2018-2019	Cadmus

Company responses to the program recommendations contained in the evaluations are provided below.

Table 1
Low Income Weatherization Evaluation Recommendations 2017-2018

Evaluation Recommendations	Pacific Power Response
Discussions with stakeholders on the application of contractor/agency payments for the TRC test. Currently the program costs include both material and labor costs. Pacific Power could consider applying only the material cost as the program cost.	Pacific Power plans to have discussion with stakeholders regarding applying only the material cost as the program cost.
Pacific Power could consider sharing program objectives to clearly determine the success of the program.	Implementation agencies bear the responsibility and drives the process for weatherization services and submit bills to company for reimbursement of the cost of installed eligible measures and administration services per tariff.
Pacific Power could consider detailed tracking data from implementers to increase the accuracy and granularity of measures' energy saving data.	Program Manager requested detailed tracking data from implementers for bulbs and refrigerators per recommendation.
Pacific Power could consider reducing the interval between program implementation and evaluation to facilitate more accurate and timely energy savings estimates,	Rocky Mountain Power conducts evaluation biennially and there is no change to frequency at this time.
Pacific Power could consider implementing a process for collecting weatherization program customers email addresses to increase accurate and comprehensive program evaluations.	Program Manager will work with both EICAP and SEICAA to determine funding need and rebalance funding allocation accordingly. In the past, Company has allowed transfer of money from SEICAA to EICAP with approval by company and both agencies and continue to allow this practice.
Pacific Power could consider using a blended ex-ante value from prior program year's analysis, rather than updating annually to the most recent evaluation findings.	Pacific Power began its review per recommendation, however, due to staff turn-over, review has been delayed.

Table 2
Home Energy Reports 2018-2019

Evaluation Recommendations	Pacific Power Response
Consider developing strategies to modify the control group to better align with the treatment group on an annual or monthly basis.	Recommendation implemented in 2020. Because the program experienced a longer-than-expected transition period to a new implementation contractor and needed a quick path to relaunch, PacifiCorp and Bidgely decided to maintain the same RCT design and waves for the 2018-2019 program. Bidgely refreshed

Evaluation Recommendations	Pacific Power Response
	the program population in 2020 by re-randomizing the customers into treatment and control group.
Where possible, tailor program recommendations to demographics	Recommendation not implemented. Bidgely's algorithm for generating factors is the customer's energy consumption data, their heating/cooling type, and the appliances used
Consider cross-referencing treatment customers with known low-income screening tools to spur outreach for Pacific Power low-income programs	Recommendation not implemented. The 2018-2019 HERs did not include a module to promote other energy efficiency programs from Pacific Power. Low-income customer segmentation was not used in anyway with the HERs.