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Appendix 1
Cost Effectiveness

NAVIGANT

Memorandum

To: PacifiCorp

From: David Basak, Navigant

Date: April 25, 2019

Re: Cost-Effectiveness for the Portfolio and Sector Level - Washington

Navigant estimated the cost-effectiveness for the overall energy efficiency portfolio and component sectors, based on 2018 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall energy efficiency portfolio and the two sector components.

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

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Table 1 - Utility Inputs

Parameter	Value
Discount Rate	6.57%
Residential Line Loss	9.67%
Commercial Line Loss	9.53%
Industrial Line Loss	8.16%
Irrigation Line Loss	9.67%
Residential Energy Rate ($/kWh)[1]	$0.0872
Commercial Energy Rate ($/kWh)[1]	$0.0857
Industrial Energy Rate ($/kWh)[1]	$0.0698
Irrigation Energy Rate ($/kWh)[1]	$0.0920
Inflation Rate	2.20%

[1] Future rates determined using a 2.20% annual escalator.

Table 2 – Portfolio Level Costs 2018

Expense	Cost
School Energy Education	$63,679
Outreach and Communication	$224,854
Portfolio Evaluation	$318,975
Portfolio Potential Study	$102,029
Portfolio System Support	$26,943
End Use Load Research	$35,082
Total Costs	**$771,563**

Table 3 – NEEA Inputs 2018

Sector	Savings at Meter (kWh)	NEEA Expenses ($)
Residential	1,664,400	$487,379
Industrial	1,226,400	$359,121
Commercial	44,349	$12,986
Total	**2,935,149**	**$859,487**

Table 4 - Benefit/Cost Ratios by Portfolio Type

Measure Group	PTRC	TRC	UCT	RIM	PCT
Total Portfolio	1.15	1.04	1.66	0.37	3.70
Total Portfolio (Including NEEA)	1.19	1.08	1.67	0.37	4.00
Total Portfolio (Including NEBs)	1.30	1.19	1.66	0.37	3.92
Total Portfolio (Including NEEA & NEBs)	1.33	1.22	1.67	0.37	4.22
C&I Programs	1.36	1.24	2.07	0.40	3.92
C&I Programs (Including NEEA)	1.39	1.26	2.06	0.40	4.11
Residential Programs	0.80	0.73	1.16	0.31	3.06
Residential Programs (Including NEEA)	0.91	0.83	1.23	0.32	3.69
Residential Programs (Including NEBs)	1.39	1.31	1.16	0.31	3.93
Residential Programs (Including NEEA & NEBs)	1.43	1.34	1.23	0.32	4.55

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

Table 5 – 2018 Total Portfolio Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0409	$14,743,234	$16,894,015	$2,150,780	1.15
Total Resource Cost Test (TRC) No Adder	$0.0409	$14,743,234	$15,358,195	$614,961	1.04
Utility Cost Test (UCT)	$0.0256	$9,243,361	$15,358,195	$6,114,834	1.66
Rate Impact Test (RIM)		$41,402,967	$15,358,195	-$26,044,772	0.37
Participant Cost Test (PCT)		$9,879,682	$36,539,415	$26,659,733	3.70
Lifecycle Revenue Impacts ($/kWh)					$0.0000228886
Discounted Participant Payback (years)					1.41

Table 6 – 2018 Total Portfolio Cost-Effectiveness Results (Including NEEA)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0397	$15,602,721	$18,519,673	$2,916,952	1.19
Total Resource Cost Test (TRC) No Adder	$0.0397	$15,602,721	$16,836,066	$1,233,345	1.08
Utility Cost Test (UCT)	$0.0257	$10,102,848	$16,836,066	$6,733,218	1.67
Rate Impact Test (RIM)		$45,245,606	$16,836,066	-$28,409,540	0.37
Participant Cost Test (PCT)		$9,879,682	$39,522,567	$29,642,885	4.00
Lifecycle Revenue Impacts ($/kWh)					$0.0000220638
Discounted Participant Payback (years)					1.32

Table 7 – 2018 Total Portfolio Cost-Effectiveness Results (Including NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0409	$14,743,234	$19,110,706	$4,367,472	1.30
Total Resource Cost Test (TRC) No Adder	$0.0409	$14,743,234	$17,574,886	$2,831,652	1.19
Utility Cost Test (UCT)	$0.0256	$9,243,361	$15,358,195	$6,114,834	1.66
Rate Impact Test (RIM)		$41,402,967	$15,358,195	-$26,044,772	0.37
Participant Cost Test (PCT)		$9,879,682	$38,756,106	$28,876,424	3.92
Lifecycle Revenue Impacts ($/kWh)					$0.0000228886
Discounted Participant Payback (years)					1.41

Table 8 – 2018 Total Portfolio Cost-Effectiveness Results (Including NEEA and NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0397	$15,602,721	$20,736,364	$5,133,643	1.33
Total Resource Cost Test (TRC) No Adder	$0.0397	$15,602,721	$19,052,757	$3,450,036	1.22
Utility Cost Test (UCT)	$0.0257	$10,102,848	$16,836,066	$6,733,218	1.67
Rate Impact Test (RIM)		$45,245,606	$16,836,066	-$28,409,540	0.37
Participant Cost Test (PCT)		$9,879,682	$41,739,258	$31,859,576	4.22
Lifecycle Revenue Impacts ($/kWh)					$0.0000220638
Discounted Participant Payback (years)					1.32

Table 9 – 2018 C&I Energy Efficiency Portfolio Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0352	$10,167,384	$13,835,031	$3,667,647	1.36
Total Resource Cost Test (TRC) No Adder	$0.0352	$10,167,384	$12,577,301	$2,409,917	1.24
Utility Cost Test (UCT)	$0.0211	$6,082,393	$12,577,301	$6,494,908	2.07
Rate Impact Test (RIM)		$31,536,043	$12,577,301	-$18,958,742	0.40
Participant Cost Test (PCT)		$7,313,091	$28,681,750	$21,368,659	3.92
Lifecycle Revenue Impacts ($/kWh)					$0.0000366109
Discounted Participant Payback (years)					1.68

Table 10 – 2018 C&I Energy Efficiency Portfolio Cost-Effectiveness Results (Including NEEA)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0347	$10,539,492	$14,617,274	$4,077,782	1.39
Total Resource Cost Test (TRC) No Adder	$0.0347	$10,539,492	$13,288,431	$2,748,939	1.26
Utility Cost Test (UCT)	$0.0213	$6,454,501	$13,288,431	$6,833,931	2.06
Rate Impact Test (RIM)		$33,286,856	$13,288,431	-$19,998,425	0.40
Participant Cost Test (PCT)		$7,313,091	$30,060,456	$22,747,364	4.11
Lifecycle Revenue Impacts ($/kWh)					$0.0000327345
Discounted Participant Payback (years)					1.60

Table 11 – 2018 Residential Energy Efficiency Portfolio Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0530	$3,804,287	$3,058,984	-$745,304	0.80
Total Resource Cost Test (TRC) No Adder	$0.0530	$3,804,287	$2,780,894	-$1,023,393	0.73
Utility Cost Test (UCT)	$0.0333	$2,389,406	$2,780,894	$391,489	1.16
Rate Impact Test (RIM)		$9,095,362	$2,780,894	-$6,314,467	0.31
Participant Cost Test (PCT)		$2,566,591	$7,857,665	$5,291,075	3.06
Lifecycle Revenue Impacts ($/kWh)					$0.0000101838
Discounted Participant Payback (years)					0.96

Table 12 – 2018 Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEEA)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0482	$4,291,666	$3,902,399	-$389,268	0.91
Total Resource Cost Test (TRC) No Adder	$0.0482	$4,291,666	$3,547,635	-$744,031	0.83
Utility Cost Test (UCT)	$0.0323	$2,876,785	$3,547,635	$670,850	1.23
Rate Impact Test (RIM)		$11,187,187	$3,547,635	-$7,639,552	0.32
Participant Cost Test (PCT)		$2,566,591	$9,462,111	$6,895,521	3.69
Lifecycle Revenue Impacts ($/kWh)					$0.0000112898
Discounted Participant Payback (years)					0.87

Table 13 – 2018 Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0530	$3,804,287	$5,275,675	$1,471,388	1.39
Total Resource Cost Test (TRC) No Adder	$0.0530	$3,804,287	$4,997,586	$1,193,298	1.31
Utility Cost Test (UCT)	$0.0333	$2,389,406	$2,780,894	$391,489	1.16
Rate Impact Test (RIM)		$9,095,362	$2,780,894	-$6,314,467	0.31
Participant Cost Test (PCT)		$2,566,591	$10,074,356	$7,507,766	3.93
Lifecycle Revenue Impacts ($/kWh)					$0.0000101838
Discounted Participant Payback (years)					0.96

Table 14 – 2018 Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEEA and NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0482	$4,291,666	$6,119,090	$1,827,423	1.43
Total Resource Cost Test (TRC) No Adder	$0.0482	$4,291,666	$5,764,326	$1,472,660	1.34
Utility Cost Test (UCT)	$0.0323	$2,876,785	$3,547,635	$670,850	1.23
Rate Impact Test (RIM)		$11,187,187	$3,547,635	-$7,639,552	0.32
Participant Cost Test (PCT)		$2,566,591	$11,678,802	$9,112,212	4.55
Lifecycle Revenue Impacts ($/kWh)					$0.0000112898
Discounted Participant Payback (years)					0.87

The table below summarizes the non-energy benefits for the Home Energy Savings program that were included in the results above.

Table 15 – Home Energy Savings Non-Energy Benefits (2018)

Non-Energy Benefits	Non-Energy Benefits Water ($/yr)	Non-Energy Benefits Other ($/yr)	Measure Life	Quantity	Total Present Value Benefits
Appliances	$2,805	$0	14	108	$26,834
Building Envelope	$0	$16,950	44	147,551	$258,680
Electronics	$0	$0	5	3	$0
Energy Kits - DHW	$127,150	$5,392	10	2,442	$981,526
Energy Kits - Lighting	$0	$993	10	463	$7,693
HVAC	$0	$10,123	16	1,037	$103,838
Lighting	$0	$149,633	7	242,401	$834,694
Water Heating	$0	$0	13	33	$0
Whole Home	$0	$242	32	33	$3,427
Total NEBs	**$129,956**	**$183,332**	**11**	**394,071**	**$2,216,691**

NAVIGANT

Memorandum

To: PacifiCorp

From: David Basak, Navigant

Date: April 25, 2019

Re: Cost-Effectiveness Results for the Home Energy Savings Program - Washington

Navigant estimated the cost-effectiveness results for the Washington Home Energy Savings Program, based on 2018 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program and for the 8 measure categories.

Cost-effectiveness was tested using the 2017 IRP decrement for all measure categories. The program passes the cost-effectiveness for the UCT and PCT tests. The memo consists of the following tables.

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Table 1 - Home Energy Savings Inputs

Parameter	Value
Discount Rate	6.57%
Residential Line Loss	9.67%
Residential Energy Rate ($/kWh)[1]	$0.0872
Inflation Rate	2.20%

[1] Future rates determined using a 2.20% annual escalator.

Table 2 – Home Energy Savings Annual Program Costs

Measure Category	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Incentives	Total Utility Costs	Gross Customer Costs
Appliances	$0	$94	$4,321	$214	$5,400	$10,029	$15,607
Building Shell	$0	$325	$14,919	$738	$38,135	$54,116	$163,733
Electronics	$0	$4	$179	$9	$130	$321	$101
Energy Kits - DHW	$0	$6,558	$55,025	$14,893	$30,884	$107,360	$30,884
Energy Kits - Lighting	$0	$146	$1,225	$331	$2,685	$4,387	$2,685
HVAC	$0	$12,031	$552,493	$27,323	$716,104	$1,307,952	$1,697,029
Lighting	$0	$19,883	$94,359	$47,959	$280,299	$442,500	$506,615
Water Heating	$0	$336	$15,409	$762	$20,400	$36,907	$29,674
Whole Home	$0	$683	$31,350	$1,550	$57,672	$91,255	$120,261
Total	**$0**	**$40,060**	**$769,280**	**$93,779**	**$1,151,709**	**$2,054,828**	**$2,566,591**

Table 3 – Home Energy Savings – Savings by Measure Category

Measure Category	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
Appliances	15,244	100%	15,244	100%	15,244	14
Building Shell	52,629	100%	52,629	100%	52,629	44
Electronics	630	100%	630	100%	630	5
Energy Kits - DHW	1,062,308	100%	1,062,308	100%	1,062,308	10
Energy Kits - Lighting	23,641	100%	23,641	100%	23,641	10
HVAC	1,949,011	100%	1,949,011	100%	1,949,011	16
Lighting	3,220,974	100%	3,220,974	100%	3,220,974	7
Water Heating	54,358	100%	54,358	100%	54,358	13
Whole Home	110,592	100%	110,592	100%	110,592	32
Total	**6,489,387**	**100%**	**6,489,387**	**100%**	**6,489,387**	**11**

Table 4 - Benefit/Cost Ratios by Measure Category

Measure Group	PTRC	TRC	UCT	RIM	PCT
Appliances	0.37	0.34	0.68	0.28	1.29
Appliances with NEBs	1.70	1.66	0.68	0.28	3.01
Building Shell	0.36	0.33	1.10	0.40	0.82
Building Shell with NEBs	1.80	1.77	1.10	0.40	2.40
Electronics	0.33	0.30	0.28	0.15	3.85
Energy Kits - DHW	3.16	2.88	2.88	0.34	26.57
Energy Kits - DHW with NEBs	12.31	12.02	2.88	0.34	58.35
Energy Kits - Lighting	1.71	1.56	1.56	0.31	7.55
Energy Kits - Lighting with NEBs	3.47	3.31	1.56	0.31	10.41
HVAC	0.50	0.46	0.80	0.31	1.64
HVAC with NEBs	0.55	0.50	0.80	0.31	1.70
Lighting	1.06	0.97	1.46	0.29	4.06
Lighting with NEBs	2.31	2.21	1.46	0.29	5.71
Water Heating	0.53	0.48	0.60	0.26	2.36
Whole Home	0.76	0.69	1.16	0.39	1.95
Whole Home with NEBs	0.78	0.71	1.16	0.39	1.98
Total with NEBs	**1.34**	**1.27**	**1.07**	**0.31**	**3.26**
Total	**0.70**	**0.63**	**1.07**	**0.31**	**2.39**

Table 5 – Home Energy Savings Program Level (without NEBs) Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0650	$3,469,709	$2,422,965	-$1,046,744	0.70
Total Resource Cost Test (TRC) No Adder	$0.0650	$3,469,709	$2,202,695	-$1,267,014	0.63
Utility Cost Test (UCT)	$0.0385	$2,054,828	$2,202,695	$147,868	1.07
Rate Impact Test (RIM)		$7,046,936	$2,202,695	-$4,844,241	0.31
Participant Cost Test (PCT)		$2,566,591	$6,143,817	$3,577,227	2.39
Lifecycle Revenue Impacts ($/kWh)					$0.0000079159
Discounted Participant Payback (years)					2.53

Table 6 through Table 14 provides cost-effectiveness results without NEBs for all 9 measures.

Table 6 - Home Energy Savings Appliances Cost-Effectiveness Results (Load Shape – Residential_ERWH_7P)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1288	$20,236	$7,543	-$12,692	0.37
Total Resource Cost Test (TRC) No Adder	$0.1288	$20,236	$6,858	-$13,378	0.34
Utility Cost Test (UCT)	$0.0638	$10,029	$6,858	-$3,171	0.68
Rate Impact Test (RIM)		$24,724	$6,858	-$17,866	0.28
Participant Cost Test (PCT)		$15,607	$20,095	$4,488	1.29
Lifecycle Revenue Impacts ($/kWh)					$0.0000003155
Discounted Participant Payback (years)					8.81

Table 7 - Home Energy Savings Building Shell Cost-Effectiveness Results (Load Shape – WA_Single_Family_Heat_pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1760	$179,715	$65,412	-$114,302	0.36
Total Resource Cost Test (TRC) No Adder	$0.1760	$179,715	$59,466	-$120,249	0.33
Utility Cost Test (UCT)	$0.0530	$54,116	$59,466	$5,350	1.10
Rate Impact Test (RIM)		$150,371	$59,466	-$90,905	0.40
Participant Cost Test (PCT)		$163,733	$134,389	-$29,344	0.82
Lifecycle Revenue Impacts ($/kWh)					$0.0000005085
Discounted Participant Payback (years)					n/a

Table 8 - Home Energy Savings Electronics Cost-Effectiveness Results (Load Shape – WA_Single_Family_Plug)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1053	$292	$97	-$195	0.33
Total Resource Cost Test (TRC) No Adder	$0.1053	$292	$89	-$204	0.30
Utility Cost Test (UCT)	$0.1158	$321	$89	-$233	0.28
Rate Impact Test (RIM)		$580	$89	-$491	0.15
Participant Cost Test (PCT)		$101	$389	$288	3.85
Lifecycle Revenue Impacts ($/kWh)					$0.0000000243
Discounted Participant Payback (years)					n/a

Table 9 - Home Energy Savings Energy Kits – DHW Cost-Effectiveness Results (Load Shape – Residential_ERWH_7P)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0127	$107,360	$339,600	$232,240	3.16
Total Resource Cost Test (TRC) No Adder	$0.0127	$107,360	$308,727	$201,367	2.88
Utility Cost Test (UCT)	$0.0127	$107,360	$308,727	$201,367	2.88
Rate Impact Test (RIM)		$897,175	$308,727	-$588,448	0.34
Participant Cost Test (PCT)		$30,884	$820,700	$789,815	26.57
Lifecycle Revenue Impacts ($/kWh)					$0.0000145626
Discounted Participant Payback (years)					n/a

Table 10 - Home Energy Savings Energy Kits – Lighting Cost-Effectiveness Results (Load Shape – Residential_Lighting_7P)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0233	$4,387	$7,519	$3,131	1.71
Total Resource Cost Test (TRC) No Adder	$0.0233	$4,387	$6,835	$2,448	1.56
Utility Cost Test (UCT)	$0.0233	$4,387	$6,835	$2,448	1.56
Rate Impact Test (RIM)		$21,964	$6,835	-$15,129	0.31
Participant Cost Test (PCT)		$2,685	$20,262	$17,577	7.55
Lifecycle Revenue Impacts ($/kWh)					$0.0000003744
Discounted Participant Payback (years)					n/a

Table 11 - Home Energy Savings HVAC Cost-Effectiveness Results (Load Shape – WA_Single_Family_Heat_Pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1036	$2,288,877	$1,151,737	-$1,137,140	0.50
Total Resource Cost Test (TRC) No Adder	$0.1036	$2,288,877	$1,047,034	-$1,241,844	0.46
Utility Cost Test (UCT)	$0.0592	$1,307,952	$1,047,034	-$260,919	0.80
Rate Impact Test (RIM)		$3,376,095	$1,047,034	-$2,329,061	0.31
Participant Cost Test (PCT)		$1,697,029	$2,784,246	$1,087,217	1.64
Lifecycle Revenue Impacts ($/kWh)					$0.0000359561
Discounted Participant Payback (years)					6.30

Table 12 - Home Energy Savings Lighting Cost-Effectiveness Results (Load Shape – Residential_Lighting_7P)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0351	$668,817	$710,241	$41,424	1.06
Total Resource Cost Test (TRC) No Adder	$0.0351	$668,817	$645,673	-$23,144	0.97
Utility Cost Test (UCT)	$0.0232	$442,500	$645,673	$203,173	1.46
Rate Impact Test (RIM)		$2,220,870	$645,673	-$1,575,197	0.29
Participant Cost Test (PCT)		$506,615	$2,058,669	$1,552,053	4.06
Lifecycle Revenue Impacts ($/kWh)					$0.0000556895
Discounted Participant Payback (years)					0.79

Table 13 - Home Energy Savings Water Heating Cost-Effectiveness Results (Load Shape – Residential_HPWH_7P)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0870	$46,181	$24,424	-$21,756	0.53
Total Resource Cost Test (TRC) No Adder	$0.0870	$46,181	$22,204	-$23,977	0.48
Utility Cost Test (UCT)	$0.0696	$36,907	$22,204	-$14,703	0.60
Rate Impact Test (RIM)		$86,496	$22,204	-$64,292	0.26
Participant Cost Test (PCT)		$29,674	$69,989	$40,315	2.36
Lifecycle Revenue Impacts ($/kWh)					$0.0000012229
Discounted Participant Payback (years)					1.95

Table 14 - Home Energy Savings Whole Home Cost-Effectiveness Results (Load Shape – WA_Single_Family_Heat_pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0815	$153,844	$116,391	-$37,453	0.76
Total Resource Cost Test (TRC) No Adder	$0.0815	$153,844	$105,810	-$48,034	0.69
Utility Cost Test (UCT)	$0.0484	$91,255	$105,810	$14,555	1.16
Rate Impact Test (RIM)		$268,662	$105,810	-$162,851	0.39
Participant Cost Test (PCT)		$120,261	$235,079	$114,817	1.95
Lifecycle Revenue Impacts ($/kWh)					$0.0000012535
Discounted Participant Payback (years)					n/a

In addition to the energy benefits reported above, appliances, building envelope, energy savings kits, HVAC, lighting, and whole home in the Home Energy Savings program offer significant non-energy benefits (NEBs). Table 15 through Table 23 detail the non-energy benefits and cost-effectiveness results.

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

Measure Category	Non-Energy Benefits Water ($/yr)	Non-Energy Benefits Other ($/yr)	Quantity	Measure Life	Total NEBs ($/yr)	Discount Rate	Total Net Present Value Benefits
Appliances	$2,805	$0	108	14	$2,805	6.57%	$26,834
Building Envelope	$0	$16,950	147,551	44	$16,950	6.57%	$258,680
Electronics	$0	$0	3	5	$0	6.57%	$0
Energy Kits - DHW	$127,150	$5,392	2,442	10	$132,542	6.57%	$981,526
Energy Kits - Lighting	$0	$993	463	10	$993	6.57%	$7,693
HVAC	$0	$10,123	1,037	16	$10,123	6.57%	$103,838
Lighting	$0	$149,633	242,401	7	$149,633	6.57%	$834,694
Water Heating	$0	$0	33	13	$0	6.57%	$0
Whole Home	$0	$242	33	32	$242	6.57%	$3,427
Total NEBs	**$129,956**	**$183,332**	**394,071**	**11**	**$313,288**	**6.57%**	**$2,216,691**

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

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

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0650	$3,469,709	$4,639,656	$1,169,947	1.34
Total Resource Cost Test (TRC) No Adder	$0.0650	$3,469,709	$4,419,387	$949,677	1.27
Utility Cost Test (UCT)	$0.0385	$2,054,828	$2,202,695	$147,868	1.07
Rate Impact Test (RIM)		$7,046,936	$2,202,695	-$4,844,241	0.31
Participant Cost Test (PCT)		$2,566,591	$8,360,509	$5,793,918	3.26
Lifecycle Revenue Impacts ($/kWh)					$0.0000079159
Discounted Participant Payback (years)					2.53

The following tables provide the cost-effectiveness results after adding in the non-energy benefits for the measure categories receiving NEBs.

Table 17 - Home Energy Savings Appliances (with NEBs) Cost-Effectiveness Results (Load Shape – Residential_ERWH_7P)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1288	$20,236	$34,378	$14,142	1.70
Total Resource Cost Test (TRC) No Adder	$0.1288	$20,236	$33,692	$13,456	1.66
Utility Cost Test (UCT)	$0.0638	$10,029	$6,858	-$3,171	0.68
Rate Impact Test (RIM)		$24,724	$6,858	-$17,866	0.28
Participant Cost Test (PCT)		$15,607	$46,929	$31,323	3.01
Lifecycle Revenue Impacts ($/kWh)					$0.0000003155
Discounted Participant Payback (years)					8.81

Table 18 - Home Energy Savings Building Shell (with NEBs) Cost-Effectiveness Results (Load Shape – WA_Single_Family_Heat_pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1760	$179,715	$324,092	$144,378	1.80
Total Resource Cost Test (TRC) No Adder	$0.1760	$179,715	$318,146	$138,431	1.77
Utility Cost Test (UCT)	$0.0530	$54,116	$59,466	$5,350	1.10
Rate Impact Test (RIM)		$150,371	$59,466	-$90,905	0.40
Participant Cost Test (PCT)		$163,733	$393,069	$229,336	2.40
Lifecycle Revenue Impacts ($/kWh)					$0.0000005085
Discounted Participant Payback (years)					n/a

Table 19 - Home Energy Savings Energy Kit – DHW (with NEBs) Cost-Effectiveness Results (Load Shape – Residential_ERWH_7P)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0127	$107,360	$1,321,126	$1,213,766	12.31
Total Resource Cost Test (TRC) No Adder	$0.0127	$107,360	$1,290,253	$1,182,893	12.02
Utility Cost Test (UCT)	$0.0127	$107,360	$308,727	$201,367	2.88
Rate Impact Test (RIM)		$897,175	$308,727	-$588,448	0.34
Participant Cost Test (PCT)		$30,884	$1,802,226	$1,771,341	58.35
Lifecycle Revenue Impacts ($/kWh)					$0.0000145626
Discounted Participant Payback (years)					n/a

Table 20 - Home Energy Savings Energy Kit – Lighting (with NEBs) Cost-Effectiveness Results (Load Shape – Residential_Lighting_7P)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0233	$4,387	$15,211	$10,824	3.47
Total Resource Cost Test (TRC) No Adder	$0.0233	$4,387	$14,528	$10,140	3.31
Utility Cost Test (UCT)	$0.0233	$4,387	$6,835	$2,448	1.56
Rate Impact Test (RIM)		$21,964	$6,835	-$15,129	0.31
Participant Cost Test (PCT)		$2,685	$27,955	$25,270	10.41
Lifecycle Revenue Impacts ($/kWh)					$0.0000003744
Discounted Participant Payback (years)					n/a

Table 21 - Home Energy Savings HVAC (with NEBs) Cost-Effectiveness Results (Load Shape – WA_Single_Family_Heat_Pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1036	$2,288,877	$1,255,575	-$1,033,303	0.55
Total Resource Cost Test (TRC) No Adder	$0.1036	$2,288,877	$1,150,871	-$1,138,006	0.50
Utility Cost Test (UCT)	$0.0592	$1,307,952	$1,047,034	-$260,919	0.80
Rate Impact Test (RIM)		$3,376,095	$1,047,034	-$2,329,061	0.31
Participant Cost Test (PCT)		$1,697,029	$2,888,084	$1,191,055	1.70
Lifecycle Revenue Impacts ($/kWh)					$0.0000359561
Discounted Participant Payback (years)					6.30

Table 22 - Home Energy Savings Lighting (with NEBs) Cost-Effectiveness Results (Load Shape – Residential_Lighting_7P)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0351	$668,817	$1,544,934	$876,117	2.31
Total Resource Cost Test (TRC) No Adder	$0.0351	$668,817	$1,480,367	$811,550	2.21
Utility Cost Test (UCT)	$0.0232	$442,500	$645,673	$203,173	1.46
Rate Impact Test (RIM)		$2,220,870	$645,673	-$1,575,197	0.29
Participant Cost Test (PCT)		$506,615	$2,893,362	$2,386,747	5.71
Lifecycle Revenue Impacts ($/kWh)					$0.0000556895
Discounted Participant Payback (years)					0.79

Table 23 - Home Energy Savings Whole Home (with NEBs) Cost-Effectiveness Results (Load Shape – WA_Single_Family_Heat_pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0815	$153,844	$119,818	-$34,026	0.78
Total Resource Cost Test (TRC) No Adder	$0.0815	$153,844	$109,237	-$44,607	0.71
Utility Cost Test (UCT)	$0.0484	$91,255	$105,810	$14,555	1.16
Rate Impact Test (RIM)		$268,662	$105,810	-$162,851	0.39
Participant Cost Test (PCT)		$120,261	$238,505	$118,244	1.98
Lifecycle Revenue Impacts ($/kWh)					$0.0000012535
Discounted Participant Payback (years)					n/a

NAVIGANT

Memorandum

To: PacifiCorp

From: David Basak, Navigant

Date: April 25, 2019

Re: Cost-Effectiveness Results for the Home Energy Reporting Program - Washington

Navigant estimated the cost-effectiveness results for the Washington Home Energy Reporting Program, based on 2018 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program.

Cost-effectiveness was tested using the 2017 IRP decrement. The program passes the cost-effectiveness for all the tests except the RIM and PCT tests.

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Table 1 - Home Energy Reporting Inputs

Parameter	Value
Discount Rate	6.57%
Residential Line Loss	9.67%
Residential Energy Rate ($/kWh)[1]	$0.0872
Inflation Rate	2.20%

[1] Future rates determined using a 2.20% annual escalator.

Table 2 – Home Energy Reporting Annual Program Costs

Measure Category	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Incentives	Total Utility Costs	Gross Customer Costs
HER Program	$0	$11,106	$279,922	$43,550	$0	$334,578	$0

Table 3 – Home Energy Reporting Savings

Measure Category	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
HER Program	9,816,840	100%	9,816,840	100%	9,816,840	2

Table 4 - HER Program Level Cost-Effectiveness Results
(Load Shape – WA_Single_Family_Heat_Pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0182	$334,578	$636,019	$301,441	1.90
Total Resource Cost Test (TRC) No Adder	$0.0182	$334,578	$578,199	$243,621	1.73
Utility Cost Test (UCT)	$0.0182	$334,578	$578,199	$243,621	1.73
Rate Impact Test (RIM)		$2,048,426	$578,199	-$1,470,227	0.28
Participant Cost Test (PCT)		$0	$1,713,848	$1,713,848	n/a
Lifecycle Revenue Impacts ($/kWh)					$0.0001819427
Discounted Participant Payback (years)					n/a

NAVIGANT

Memorandum

To: PacifiCorp

From: David Basak, Navigant

Date: April 25, 2019

Re: Cost-Effectiveness Results for the Home Energy Reporting Program - Washington

Navigant estimated the cost-effectiveness results for the Washington Home Energy Reporting Program, based on 2018 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program.

Cost-effectiveness was tested using the 2017 IRP decrement. The program passes the cost-effectiveness for all the tests except the RIM and PCT tests.

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Table 1 - Home Energy Reporting Inputs

Parameter	Value
Discount Rate	6.57%
Residential Line Loss	9.67%
Residential Energy Rate ($/kWh)[1]	$0.0872
Inflation Rate	2.20%

[1] Future rates determined using a 2.20% annual escalator.

Table 2 – Home Energy Reporting Annual Program Costs

Measure Category	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Incentives	Total Utility Costs	Gross Customer Costs
Total	$0	$11,106	$279,922	$43,550	$0	$334,578	$0
Total w/o startup fees	$0	$11,106	$129,922	$43,550	$0	$184,578	$0

Table 3 – Home Energy Reporting Savings by Measure Category

Measure Category	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
Total	9,816,840	100%	9,816,840	100%	9,816,840	2
Total w/o startup fees	9,816,840	100%	9,816,840	100%	9,816,840	2

Table 4 - Benefit/Cost Ratios by Measure Category

Measure Category	PTRC	TRC	UCT	RIM	PCT
Total	1.90	1.73	1.73	0.28	n/a
Total w/o startup fees	3.45	3.13	3.13	0.30	n/a

Table 5 - HER Program Level Cost-Effectiveness Results
(Load Shape – WA_Single_Family_Heat_Pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0182	$334,578	$636,019	$301,441	1.90
Total Resource Cost Test (TRC) No Adder	$0.0182	$334,578	$578,199	$243,621	1.73
Utility Cost Test (UCT)	$0.0182	$334,578	$578,199	$243,621	1.73
Rate Impact Test (RIM)		$2,048,426	$578,199	-$1,470,227	0.28
Participant Cost Test (PCT)		$0	$1,713,848	$1,713,848	n/a
Lifecycle Revenue Impacts ($/kWh)					$0.0001819427
Discounted Participant Payback (years)					n/a

Table 6 provides the cost-effectiveness results for the Home Energy Reporting program with startup fees removed.

Table 6 – HER Program Level Cost-Effectiveness Results – Without Startup Fees (Load Shape – WA_Single_Family_Heat_Pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0100	$184,578	$636,019	$451,441	3.45
Total Resource Cost Test (TRC) No Adder	$0.0100	$184,578	$578,199	$393,621	3.13
Utility Cost Test (UCT)	$0.0100	$184,578	$578,199	$393,621	3.13
Rate Impact Test (RIM)		$1,898,426	$578,199	-$1,320,227	0.30
Participant Cost Test (PCT)		$0	$1,713,848	$1,713,848	n/a
Lifecycle Revenue Impacts ($/kWh)					$0.0001633800
Discounted Participant Payback (years)					n/a

NAVIGANT

Memorandum

To: Esther Giezendanner and Brian Ludwig, PacifiCorp

From: David Basak, Navigant

Date: April 29, 2019

Re: Cost-Effectiveness Results for the Low Income Weatherization Program - Washington

Navigant estimated the cost-effectiveness results for the Washington Low Income Weatherization Program, based on 2018 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program.

Cost-effectiveness was tested using the 2017 IRP decrement. The program does not pass any of the cost-effectiveness tests.

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Table 1 - Low Income Weatherization Inputs

Parameter	Value
Discount Rate	6.57%
Residential Line Loss	9.67%
Residential Energy Rate ($/kWh)[1]	$0.0872
Inflation Rate	2.20%

[1] Future rates determined using a 2.20% annual escalator.

Table 2 - Low Income Weatherization Annual Program Costs

Measure Category	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Inspection Costs	Incentives	Total Utility Costs	Gross Customer Costs
Low Income Weatherization	$0	$19,902	$113,152	$3,212	$3,843	$789,214	$929,323	$0
Total	**$0**	**$19,902**	**$113,152**	**$3,212**	**$3,843**	**$789,214**	**$929,323**	**$0**

Table 3 - Low Income Weatherization Savings by Measure Category

Measure Category	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
Low Income Weatherization	182,237	100%	182,237	100%	182,237	30
Total	**182,237**	**100%**	**182,237**	**100%**	**182,237**	**30**

Table 4 - Low Income Weatherization Program Level Cost-Effectiveness Results (Load Shape – WA_Single_Family_Heat_Pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.3083	$929,323	$184,126	-$745,197	0.20
Total Resource Cost Test (TRC) No Adder	$0.3083	$929,323	$167,387	-$761,935	0.18
Utility Cost Test (UCT)	$0.3083	$929,323	$167,387	-$761,935	0.18
Rate Impact Test (RIM)		$1,212,599	$167,387	-$1,045,211	0.14
Participant Cost Test (PCT)		$0	$1,072,490	$1,072,490	n/a
Lifecycle Revenue Impacts ($/kWh)					$0.0000085834
Discounted Participant Payback (years)					n/a

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

Table 5 - Low Income Weatherization Non-Energy Benefits

Non-Energy Benefit	Program Impact	Perspective Adjusted
Home Repair Costs pd by Company	$34,868.61	PTRC, TRC
Economic Benefit	$706,285.27	PTRC, TRC
Arrearage	-$36,288.00	PTRC, TRC, UCT, RIM
Payment Assistance	$25,056.00	PTRC, TRC
Total	**$729,921.88**	-

Table 6 - Low Income Weatherization Program (with NEBs) Level Cost-Effectiveness Results (Load Shape – WA_Single_Family_Heat_Pump)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.3083	$929,323	$914,048	-$15,275	0.98
Total Resource Cost Test (TRC) No Adder	$0.3083	$929,323	$897,309	-$32,013	0.97
Utility Cost Test (UCT)	$0.3083	$929,323	$131,099	-$798,223	0.14
Rate Impact Test (RIM)		$1,212,599	$131,099	-$1,081,499	0.11
Participant Cost Test (PCT)		$0	$1,072,490	$1,072,490	n/a
Lifecycle Revenue Impacts ($/kWh)					$0.0000088814
Discounted Participant Payback (years)					n/a

NAVIGANT

Memorandum

To: Esther Giezendanner and Brian Ludwig, PacifiCorp

From: David Basak, Navigant

Date: April 25, 2019

Re: Cost-Effectiveness Results for the Wattsmart Business Program - Washington

Navigant estimated the cost-effectiveness results for the Washington Wattsmart Business Program, based on 2018 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program and for the 10 measure categories.

Cost-effectiveness was tested using the 2017 IRP decrement for all measure categories. The program passes PTRC, TRC, UCT and PCT cost-effectiveness tests. The memo consists of the following tables.

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Table 1 - Utility Inputs

Parameter	Value
Discount Rate	6.57%
Commercial Line Loss	9.53%
Industrial Line Loss	8.16%
Irrigation Line Loss	9.67%
Commercial Energy Rate ($/kWh)[1]	$0.0857
Industrial Energy Rate ($/kWh)[1]	$0.0698
Irrigation Energy Rate ($/kWh)[1]	$0.0920
Inflation Rate	2.20%

[1] Future rates determined using a 2.20% annual escalator.

Table 2 – Annual Wattsmart Business Program Costs by Measure Category

Measure Category	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Incentives	Inspection Cost	Total Utility Costs	Gross Customer Costs
Additional Measures	$30,583	$14,887	$862	$2,990	$53,271	$0	$102,593	$109,512
Building Shell	$0	$383	$3,444	$226	$21,525	$0	$25,578	$75,743
Compressed Air	$80,939	$38,172	$3,631	$7,531	$168,519	$0	$298,791	$339,268
Energy Mgmt.	$106,284	$32,345	$11,966	$14,131	$50,784	$0	$215,511	$60,240
Farm & Dairy	$0	$2,202	$26,564	$1,148	$20,765	$0	$50,678	$38,875
HVAC	$8,714	$5,959	$17,048	$1,910	$33,301	$0	$66,932	$92,479
Irrigation	$2,486	$6,869	$42,226	$2,322	$52,295	$0	$106,198	$121,489
Lighting	$0	$197,581	$1,349,407	$91,939	$1,629,515	$89,720	$3,358,161	$4,212,223
Motors	$3,385	$6,960	$15,502	$1,949	$42,279	$0	$70,076	$111,432
Refrigeration	$233,018	$94,608	$254,772	$49,630	$1,155,847	$0	$1,787,875	$2,151,831
Total	**$465,409**	**$399,966**	**$1,725,422**	**$173,776**	**$3,228,100**	**$89,720**	**$6,082,393**	**$7,313,091**

Table 3 – Annual Wattsmart Business Program Savings by Measure Category

Measure Category	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
Additional Measures	537,363	94%	505,121	100%	505,121	15
Building Shell	40,611	94%	38,174	100%	38,174	16
Compressed Air	1,353,235	96%	1,299,106	100%	1,299,106	14
Energy Management	2,539,217	100%	2,539,217	100%	2,539,217	3
Farm & Dairy	206,242	100%	206,242	100%	206,242	13
HVAC	343,286	100%	343,286	100%	343,286	15
Irrigation	417,195	100%	417,195	100%	417,195	12
Lighting	16,520,907	90%	14,868,817	100%	14,868,817	14
Motors	350,297	94%	329,279	100%	329,279	11
Refrigeration	8,918,159	100%	8,918,159	100%	8,918,159	15
Total	**31,226,512**	**94%**	**29,464,596**	**100%**	**29,464,596**	**13**

Table 4 - Benefit/Cost Ratios by Measure Category

Measure Category	PTRC	TRC	UCT	RIM	PCT
Additional Measures	1.70	1.55	2.40	0.47	4.32
Building Shell	0.30	0.27	0.84	0.33	0.80
Compressed Air	1.38	1.25	1.97	0.44	3.53
Energy Management	1.05	0.96	1.00	0.26	11.00
Farm & Dairy	1.39	1.26	1.71	0.37	5.28
HVAC	1.57	1.43	2.70	0.46	3.88
Irrigation	1.01	0.92	1.52	0.34	3.45
Lighting	1.22	1.11	1.97	0.39	3.61
Motors	0.95	0.86	1.71	0.38	2.59
Refrigeration	1.72	1.56	2.43	0.42	4.55
Total	**1.36**	**1.24**	**2.07**	**0.40**	**3.92**

Table 5 – Wattsmart Business Program Level Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0352	$10,167,384	$13,835,031	$3,667,647	1.36
Total Resource Cost Test (TRC) No Adder	$0.0352	$10,167,384	$12,577,301	$2,409,917	1.24
Utility Cost Test (UCT)	$0.0211	$6,082,393	$12,577,301	$6,494,908	2.07
Rate Impact Test (RIM)		$31,536,043	$12,577,301	-$18,958,742	0.40
Participant Cost Test (PCT)		$7,313,091	$28,681,750	$21,368,659	3.92
Lifecycle Revenue Impacts ($/kWh)					$0.0000366109
Discounted Participant Payback (years)					1.68

Table 6 through Table 15 provide cost-effectiveness results for all 10 measures.

Table 6 - Wattsmart Business Additional Measures Cost-Effectiveness Results (Load Shape – WA_Miscellaneous_Mfg_General)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0290	$158,834	$270,672	$111,838	1.70
Total Resource Cost Test (TRC) No Adder	$0.0290	$158,834	$246,066	$87,232	1.55
Utility Cost Test (UCT)	$0.0187	$102,593	$246,066	$143,472	2.40
Rate Impact Test (RIM)		$522,541	$246,066	-$276,475	0.47
Participant Cost Test (PCT)		$109,512	$473,219	$363,707	4.32
Lifecycle Revenue Impacts ($/kWh)					$0.0000045545
Discounted Participant Payback (years)					1.55

Table 7 - Wattsmart Business Building Shell Cost-Effectiveness Results (Load Shape – WA_School_Space_Cool)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1836	$79,796	$23,614	-$56,182	0.30
Total Resource Cost Test (TRC) No Adder	$0.1836	$79,796	$21,467	-$58,329	0.27
Utility Cost Test (UCT)	$0.0588	$25,578	$21,467	-$4,111	0.84
Rate Impact Test (RIM)		$64,811	$21,467	-$43,344	0.33
Participant Cost Test (PCT)		$75,743	$60,758	-$14,985	0.80
Lifecycle Revenue Impacts ($/kWh)					$0.0000006691
Discounted Participant Payback (years)					25.79

Table 8 - Wattsmart Business Compressed Air Cost-Effectiveness Results (Load Shape – WA_Miscellaneous_Mfg_General)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0349	$469,540	$646,774	$177,234	1.38
Total Resource Cost Test (TRC) No Adder	$0.0349	$469,540	$587,976	$118,437	1.25
Utility Cost Test (UCT)	$0.0222	$298,791	$587,976	$289,185	1.97
Rate Impact Test (RIM)		$1,326,466	$587,976	-$738,490	0.44
Participant Cost Test (PCT)		$339,268	$1,196,194	$856,926	3.53
Lifecycle Revenue Impacts ($/kWh)					$0.0000130399
Discounted Participant Payback (years)					1.84

Table 9 - Wattsmart Business Energy Management Cost-Effectiveness Results (Load Shape – WA_Miscellaneous_Mfg_General)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0322	$224,966	$236,383	$11,417	1.05
Total Resource Cost Test (TRC) No Adder	$0.0322	$224,966	$214,894	-$10,072	0.96
Utility Cost Test (UCT)	$0.0308	$215,511	$214,894	-$617	1.00
Rate Impact Test (RIM)		$827,209	$214,894	-$612,315	0.26
Participant Cost Test (PCT)		$60,240	$662,482	$602,243	11.00
Lifecycle Revenue Impacts ($/kWh)					$0.0000504774
Discounted Participant Payback (years)					0.04

Table 10 - Wattsmart Business Farm & Dairy Cost-Effectiveness Results (Load Shape – WA_Irrigation_General)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0350	$68,788	$95,403	$26,615	1.39
Total Resource Cost Test (TRC) No Adder	$0.0350	$68,788	$86,730	$17,942	1.26
Utility Cost Test (UCT)	$0.0258	$50,678	$86,730	$36,052	1.71
Rate Impact Test (RIM)		$235,159	$86,730	-$148,429	0.37
Participant Cost Test (PCT)		$38,875	$205,246	$166,371	5.28
Lifecycle Revenue Impacts ($/kWh)					$0.0000028232
Discounted Participant Payback (years)					0.98

Table 11 - Wattsmart Business HVAC Cost-Effectiveness Results
(Load Shape – WA_School_HVAC_Aux)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0326	$126,109	$198,458	$72,348	1.57
Total Resource Cost Test (TRC) No Adder	$0.0326	$126,109	$180,416	$54,307	1.43
Utility Cost Test (UCT)	$0.0173	$66,932	$180,416	$113,485	2.70
Rate Impact Test (RIM)		$392,196	$180,416	-$211,780	0.46
Participant Cost Test (PCT)		$92,479	$358,565	$266,086	3.88
Lifecycle Revenue Impacts ($/kWh)					$0.0000034887
Discounted Participant Payback (years)					2.20

Table 12 - Wattsmart Business Irrigation Cost-Effectiveness Results
(Load Shape – WA_Irrigation_General)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0464	$175,392	$177,475	$2,083	1.01
Total Resource Cost Test (TRC) No Adder	$0.0464	$175,392	$161,341	-$14,051	0.92
Utility Cost Test (UCT)	$0.0281	$106,198	$161,341	$55,143	1.52
Rate Impact Test (RIM)		$472,649	$161,341	-$311,308	0.34
Participant Cost Test (PCT)		$121,489	$418,746	$297,257	3.45
Lifecycle Revenue Impacts ($/kWh)					$0.0000064162
Discounted Participant Payback (years)					1.82

Table 13 - Wattsmart Business Lighting Cost-Effectiveness Results
(Load Shape – WA_Miscellaneous_Lighting)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0388	$5,940,870	$7,268,431	$1,327,562	1.22
Total Resource Cost Test (TRC) No Adder	$0.0388	$5,940,870	$6,607,665	$666,795	1.11
Utility Cost Test (UCT)	$0.0219	$3,358,161	$6,607,665	$3,249,503	1.97
Rate Impact Test (RIM)		$16,949,774	$6,607,665	-$10,342,110	0.39
Participant Cost Test (PCT)		$4,212,223	$15,221,127	$11,008,905	3.61
Lifecycle Revenue Impacts ($/kWh)					$0.0001826165
Discounted Participant Payback (years)					2.11

Table 14 - Wattsmart Business Motors Cost-Effectiveness Results
(Load Shape – WA_Miscellaneous_Mfg_General)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0475	$139,229	$131,819	-$7,411	0.95
Total Resource Cost Test (TRC) No Adder	$0.0475	$139,229	$119,835	-$19,394	0.86
Utility Cost Test (UCT)	$0.0239	$70,076	$119,835	$49,760	1.71
Rate Impact Test (RIM)		$316,528	$119,835	-$196,693	0.38
Participant Cost Test (PCT)		$111,432	$288,731	$177,299	2.59
Lifecycle Revenue Impacts ($/kWh)					$0.0000044233
Discounted Participant Payback (years)					2.78

Table 15 - Wattsmart Business Refrigeration Cost-Effectiveness Results
(Load Shape – WA_Grocery_Refrigeration)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0288	$2,783,859	$4,786,001	$2,002,142	1.72
Total Resource Cost Test (TRC) No Adder	$0.0288	$2,783,859	$4,350,910	$1,567,051	1.56
Utility Cost Test (UCT)	$0.0185	$1,787,875	$4,350,910	$2,563,035	2.43
Rate Impact Test (RIM)		$10,428,710	$4,350,910	-$6,077,800	0.42
Participant Cost Test (PCT)		$2,151,831	$9,796,682	$7,644,851	4.55
Lifecycle Revenue Impacts ($/kWh)					$0.0001001218
Discounted Participant Payback (years)					1.32

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Appendix 2
Washington Measure Installation Verifications

Washington Measure Installation Verifications

Home Energy Savings

Site 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, and 20 percent of new homes projects.

- Air sealing
- Central air conditioning best practices installation and sizing
- Duct sealing
- Duct sealing and insulation
- Ductless heat pumps
- Heat pump conversion
- Heat pump upgrade
- Heat pump performance tested comfort systems, commissioning, controls, and sizing
- Heat pump water heaters
- Insulation (attic, floor, wall)
- Whole Homes Performance Path

No site 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 Company does not double pay for the same measure or double count measure savings.

- Central air conditioners
- Clothes washers
- Electric water heaters
- Evaporative coolers
- Freezers
- Light fixtures (post-purchase)
- Refrigerators
- Smart thermostats
- Windows

No site 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.

- CFL bulbs
- LED bulbs
- Light fixtures (upstream)
- Room air conditioners

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

Lighting projects (typical upgrades, small business and midmarket/instant incentive offer)

- Retrofits - 100 percent pre- and post-installation site 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 inspections of all projects with incentives over a specified dollar amount.
- A percent of post-installation site inspections by program administrator of projects with incentives under a specified dollar amount. For the midmarket/instant incentive offer, these inspections are done by phone.

For typical upgrades, required inspections are performed by a third party consultant. For the 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 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 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 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 third party energy engineering firms for the in-house project manager/consultant delivery channel.
- Inspections are conducted by outsourced delivery team for projects delivered by third party outsourced program delivery teams.

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 cure for memory loss 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.

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Appendix 3
Home Energy Savings Retailers

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

The Company worked with 30 lighting retailers in 2018 to promote efficient lighting. Table 1 lists the retailer and the type of redemption(s) provided.

Retailer	City	State	LEDs	Fixtures
Ace Hardware - Stein's #7047	Yakima	WA	x	x
Ace Hardware #15365	Kennewick	WA	x	
Ace Hardware #14426	Naches	WA	x	
Batteries Plus 250	Kennewick	WA	x	
Best Buy #831	Yakima	WA	x	
Best Buy 590	Kennewick	WA	x	
Bi-Mart #619	Walla Walla	WA	x	x
Costco 486	Kennewick	WA	x	x
Costco #1013	Union Gap	WA	x	x
Dollar Tree #2387	Yakima	WA	x	
Dollar Tree #2696	Kennewick	WA	x	
Dollar Tree #5342	Yakima	WA	x	
Dollar Tree #5863	Walla Walla	WA	x	
Dollar Tree #3450	Kennewick	WA	x	
Dollar Tree #4295	Yakima	WA	x	
Fred Meyer #163	Kennewick	WA	x	
Home Depot #4727	Yakima	WA	x	x
Home Depot #4735	College Place	WA	x	x
Home Depot #4739	Kennewick	WA	x	x
Hometown Ace Hardware #11909	Yakima	WA	x	x
Lowe's #249	Kennewick	WA	x	
Lowe's #3240	Yakima	WA	x	x
Roy's Ace Hardware #10640	Yakima	WA	x	
Target 830	Kennewick	WA	x	
True Value (Helms)	Selah	WA	x	
True Value Hardware – Country Farm and Garden	Yakima	WA	x	
True Value Hardware #5353	Selah	WA	x	
Wal-Mart - Supercenter #2101	Kennewick	WA	x	
Wal-Mart - Supercenter #5078	Yakima	WA	x	x
Wal-Mart #2269	Yakima	WA	x	x

[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.

Table 2
Participating Upstream/Midstream Retailers and Redemptions

Table 2 provides the list of 2018 participating Upstream/Midstream retailer and the product types that were redeemed at each location.

Retailer	City	State	Room Air Conditioners
There was no Room Air Conditioner participation in 2018.			

Table 3
Downstream Retailers

Eleven **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 window.

Participating Retailer (Retailers who are 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	x							
Best Buy #831	Yakima	WA	x						x	
Costco #1013	Union Gap	WA							x	
Elgin's Appliance Center	Milton-Freewater	WA	x							
Home Depot #4727	Yakima	WA	x	x	x	x	x	x	x	
Home Depot #4735	College Place	WA	x		x	x			x	x
Home Depot #4739	Kennewick	WA		x						
Lowe's #3240	Yakima	WA	x		x	x			x	
Lowe's of Pasco	Pasco	WA	x							
Sears #2029	Union Gap	WA	x							
Sears #6914	Walla Walla	WA	x							

Twenty-six **non-participating** retailers provided redemptions for downstream clothes washers, evaporative coolers, heat pump water heaters, attic insulation, floor insulation, wall insulation, smart thermostats, and windows. Some retailers are located outside Pacific Power's service territory. However, the customer resides with the service territory.

Redemptions from Non-Participating Retailer's (*Retailer may not be located in the service territory)	City	State	Clothes Washer	Evaporative Cooler - Tier 2	Heat Pump Water Heater, Self-installed	Insulation-Attic	Insulation-Floor	Insulation-Wall	Smart Thermostat	Windows
APEX Plumbing	Yakima	WA			x					
Ace Hardware Corporation	Oak Brook	IL			x					
Amazon.com	Seattle	WA							x	
Bed Bath & Beyond #1332	Union Gap	WA							x	
BestBuy.com	N/A		x						x	
Bi-Rite Lumber Co of Washington	Sunnyside	WA						x		
Costco.com	N/A		x						x	
Costco #486	Kennewick	WA							x	
Ecobee.com	Toronto	ON							x	
Google, Inc.	Mountain View	CA							x	
Home Depot	Baton Rouge	LA		x						
Home Depot #1808	Lewiston	ID	x							
Home Depot #4746	Richland	WA	x							
HomeDepot.com	N/A		x						x	
The Home Depot Inc.	Atlanta	GA			x					
Keller Supply Company #11	Union Gap	WA			x					
Kohls.com	Middletown	OH							x	
Lowe's Home Centers Inc.	Spokane Valley	WA			x					
Lowes.com	N/A		x						x	x
Nest.com	Palo Alto	CA							x	
Prudential Builders Center	Spokane	WA	x							
Sears	Ann Arbor	MI	x							
Sears #5578	Logan	UT	x							
Sears.com	N/A		x							
Target.com	Minneapolis	MN							x	
Whirlpool.com	N/A		x							

Table 4
HVAC Trade Ally

The Company worked with 30 HVAC trade allies. Some trade allies are located outside Pacific Power's service territory. However, the customer resides with the service territory.

Trade Ally (Trade ally may be located outside of the territory)	City	State	Central Air Conditioner	Duct Sealing	Duct Sealing and Duct Insulation	Electric System to Heat Pump	Heat Pump to Heat Pump Upgrade	Heat Pump - PTCS Commissioning, Controls, and Sizing	Heat Pump, Ductless
Absolute Comfort Technology, LLC	Yakima	WA				x	x		x
AccuTemp Heating and Air Conditioning	Yakima	WA				x			
All Seasons Heating & Air Conditioning	Yakima	WA	x			x	x		x
Allard Enterprises	Yakima	WA					x		
American Air Heating and Conditioning	Walla Walla	WA				x	x		x
A-One Refrigeration & Heating	Kennewick	WA					x		
Blaze to Blizzard Heating & Cooling	Walla Walla	WA							x
Campbell & Company	Pasco	WA		x		x	x	x	x
Chapman Heating & Air Conditioning Inc	Dayton	WA							x
Chinook Heating & Air Inc	Kennewick	WA					x		
CK Home Comfort Systems	Grandview	WA				x	x		
College Place Heating & Air Conditioning	College Place	WA	x	x		x	x		x
Comfort Pro's Heating & Air Conditioning	Yakima	WA			x				
Dayco Inc	Kennewick	WA				x	x	x	
Farwest Climate Control	Yakima	WA	x			x	x		x
Four Seasons HVAC	Yakima	WA				x	x		x
Grassi Refrigeration	Walla Walla	WA							x
Jacobs & Rhodes, Inc.	Kennewick	WA				x			
Miller & Team Heating & AC	Zillah	WA							x
Panchos Heating & Cooling LLC	Kennewick	WA				x	x		
Paul's Air F/X	Yakima	WA							x
Polar Heating & Air Conditioning	Selah	WA					x		
Quality Comfort	Yakima	WA							x
Smith Insulation	Walla Walla	WA		x	x				
ThermAll Heating & Cooling Inc	Yakima	WA			x	x	x		x
Thermex Valley Heating and AC	Yakima	WA							x
TNG Heating & Refrigeration	Zillah	WA				x			
Total Comfort Solutions, LLC	Walla Walla	WA	x			x	x	x	x
Vance Heating and AC	Yakima	WA	x			x	x	x	x
Young's Heating & Cooling, LLC	Walla Walla	WA				x	x		x

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		x
Columbia Homes	Union Gap	WA		x
Gillespie Homes	Kennewick	WA		x
Home Energy Experts	Clearfield	UT	x	
Smith Insulation	Walla Walla	WA	x	
Stout Homes Inc	Lewiston	ID		x
Sunrise Home Center, Inc.	Clarkston	WA		x
Valley Quality Homes	Yakima	WA		x

Table 6
Plumbing Trade Ally

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

Trade Ally Name (Trade ally may be located outside of the territory)	City	State	Heat Pump Water Heaters
AccuTemp Heating and Air Conditioning	Yakima	WA	x
Bulz-I Plumbing Inc.	Walla Walla	WA	x
Burke's Plumbing	Selah	WA	x
Ray's Plumbing, Inc.	Yakima	WA	x
RossCo Plumbing	Yakima	WA	x
Shephard Plumbing, LLC	Yakima	WA	x

Table 7
Weatherization Trade Ally

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

Trade Ally Name (Trade ally may be located outside of the territory)	City	State	Air Sealing	Insulation-Attic	Insulation-Floor	Insulation-Wall	Windows
Chon Insulation and Drywall	Walla Walla	WA		x			
Don Jordan Energy Systems	Yakima	WA		x	x		
Insul Homes	Yakima	WA		x			
Intermountain West Insulation	Kennewick	WA		x	x	x	
K-5 Contracting, Inc.	Yakima	WA		x			
McKinney Glass Inc.	Yakima	WA					x
Smith Insulation	Walla Walla	WA	x	x	x	x	

Table 8
Applications by Customer City and Measure Category

Customer City	% of All Applications	% of Appliance Applications	% of HVAC Applications	% of Manufactured Homes Applications	% of Kits Applications
BROWNSTOWN	0.02%	0.00%	0.10%	0.00%	0.00%
BUENA	0.16%	0.00%	0.00%	0.00%	0.24%
BURBANK	0.78%	0.00%	0.86%	2.63%	0.79%
COLLEGE PLACE	3.50%	5.45%	2.88%	10.53%	3.41%
COWICHE	0.31%	0.00%	0.00%	0.00%	0.41%
DAYTON	1.83%	2.73%	2.02%	5.26%	1.58%
DIXIE	0.16%	0.00%	0.19%	0.00%	0.17%
GRANDVIEW	2.70%	0.91%	0.96%	0.00%	3.51%
GRANGER	0.99%	0.00%	0.38%	0.00%	1.31%
HARRAH	0.07%	0.00%	0.10%	0.00%	0.07%
MABTON	0.89%	0.00%	0.00%	2.63%	1.27%
MOXEE	2.35%	3.64%	4.32%	5.26%	1.65%
NACHES	1.55%	0.00%	0.58%	0.00%	2.07%
OUTLOOK	0.26%	0.91%	0.29%	0.00%	0.24%
PARKER	0.02%	0.00%	0.00%	0.00%	0.03%
POMEROY	0.85%	0.91%	0.00%	2.63%	1.17%
PRESCOTT	0.33%	0.00%	0.29%	0.00%	0.31%
PROSSER	0.05%	0.00%	0.00%	0.00%	0.07%
SELAH	6.53%	7.27%	6.05%	13.16%	6.57%
SUNNYSIDE	3.97%	3.64%	0.86%	0.00%	4.99%
TIETON	1.03%	0.91%	0.48%	0.00%	1.24%
TOPPENISH	1.48%	0.00%	0.48%	0.00%	2.00%
Toppenish Ave	0.02%	0.00%	0.00%	2.63%	0.00%
TOUCHET	0.35%	0.91%	0.67%	2.63%	0.21%
UNION GAP	2.33%	0.91%	3.84%	0.00%	1.96%
WAITSBURG	1.08%	2.73%	0.48%	0.00%	1.14%
WALLA WALLA	15.37%	23.64%	13.45%	10.53%	14.56%
WAPATO	2.44%	1.82%	0.58%	7.89%	3.20%
WHITE SWAN	0.09%	0.00%	0.00%	0.00%	0.14%
YAKIMA	46.39%	42.73%	58.79%	31.58%	43.30%
ZILLAH	2.07%	0.91%	1.34%	2.63%	2.38%

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Appendix 4

*watt*smart Business Vendor Network

wattsmart® Business Vendor Network

The following is a list of contractors, distributors, manufacturers and other vendors participating in Pacific Power's wattsmart® Business 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.

Search Criteria:

State(s)	[Washington]
Program(s)	[Commercial]
Specialties	[Appliances, Building envelope, Compressed air, Controls – HVAC, Controls – Lighting, Farm and dairy, Food service, HVAC - evaporative, HVAC - unitary, Irrigation, Lighting, Lighting instant incentives, Motors and VFDs, Office equipment, Other Specialty, Small business lighting]
Service Address	
Business Name	

Search Results: 30 record(s) found

About Us	Service Areas	Company Name	Contact Information	Specialty	Business Type	Projects Completed	Distance (miles)
Premium Vendor Learn More: https://wattsmartbusiness.com/premiumvendors/ces-sunnyside/	Washington	**Columbia Electric Supply** Address: 3211 Allen Rd Sunnyside, WA 98944 Website: https://www.ced-columbia.com	Phone: Name: Tye Kaple Email: tkaple@ces-sunnyside.com	Controls – Lighting, Lighting, Motors and VFDs	Distributor	6	
Premium Vendor	Washington	**Stusser Yakima** Address: 116 N. 2nd Ave. Yakima, WA 98902 Website: https://www.www.com	Phone: 509-453-0378 Name: Steve DiBenedetto Email: steved@stusseryakima.com	Lighting, Lighting instant incentives	Distributor	6	

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	Washington	**Platt Electric Supply - Yakima** Address: 16 S. 1st Avenue Yakima, WA 98902 Website: http://www.platt.com	Phone: 509-452-6444 Name: Jeremy Sandino Email: jlsandino@platt.com	Lighting, Lighting instant incentives	Distributor	42
	Washington	**MH Electric Inc.** Address: P.O. Box 11224 Yakima, WA 98909 Website:	Phone: 509-452-6039 Name: Walt Wenda Email: ww@mhelectricinc.com	Lighting, Motors and VFDs, Small business lighting	Contractor	24
	Washington	**ecomodus, LLC** Address: 5110 Tieton Drive Yakima, WA 98908 Website:	Phone: 509-307-4363 Name: Dan Richards Email: ecomodus@msn.com	Lighting	Other	20
	Washington	**Core Northwest LLC** Address: 1413 River Road Yakima, WA 98902 Website: http://www.corenorthwest.com	Phone: 509-248-2673 Name: Rod Cassel Email: rod@corenorthwest.com	Controls – Lighting, Irrigation, Lighting, Motors and VFDs	Contractor	18
	Washington	**Walla Walla Electric*** Address: 1225 W. Poplar Walla Walla, WA 99362 Website: http://www.wwelectric.com	Phone: 509-525-8672 Name: Spike Teal Email: spike@wwelectric.com	Lighting, Small business lighting	Contractor	11
	Washington	**Lumenal Lighting LLC** Address: 21706 66th Ave W Mountlake Terrace, WA 98043 Website: https://www.Lumenal.com	Phone: Name: Don Nielsen Email: service@lumenal.com	Controls – Lighting, Lighting	Contractor	6
	Washington	**Knobel's** Address: 801 Tennant ln Yakima, WA 98901 Website:	Phone: 509-452-9157 Name: Steve Soderstrom Email: knobelselectric@msn.com	Lighting, Motors and VFDs, Small business lighting	Contractor	5

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	Washington	**All-Phase Electric, Inc.** Address: 2500 S 12th Ave Union Gap, WA 98903 Website: http://allphaseelectric.org	Phone: 509-454-5093 Name: Andrew Lea Email: andrew@allphaseelectric.org	Lighting, Motors and VFDs	Contractor	4
	Washington	**CED - Yakima** Address: 131 S 1st Ave YAKIMA, WA 98903 Website:	Phone: 509-248-0872 Name: Dan Derosier Email: DAN@CEDYAKIMA.COM	Lighting, Lighting instant incentives	Distributor	4
	California, Washington	**Leidos Engineering, LLC.** Address: 301 Plainfield Rd. Suite 310 Syracuse, NY 13212 Website: https://energy.leidos.com/	Phone: 855-926-7543 Name: Christopher Piechuta Email: AMPLIFY@Leidos.com	Appliances, Compressed air, Controls – Lighting, Food service, HVAC - evaporative, HVAC - unitary, Lighting, Motors and VFDs, Office equipment, Other Specialty	Engineering Firm	4
	Washington	**Columbia Electric Supply - Walla Walla** Address: 932 N 13TH AVE Walla Walla, WA 99362 Website: http://www.ced-columbia.com/	Phone: 509-522-1419 Name: Daron Waldon Email: dwalden@ces-ww.com	Lighting, Motors and VFDs	Distributor	3
	Washington	**KIE Supply** Address: 113 E Columbia Dr Kennewick, WA 99336 Website: https://www.kiesupply.com	Phone: 509-582-5156 Name: Leigh Kluthe Email: leigh@kiesupply.com	Controls – Lighting, Lighting	Distributor	3
	Washington	**Platt Electric - Walla Walla** Address: 415 west main Walla Walla, WA 99362 Website: https://www.platt.com	Phone: 509-522-0611 Name: Robert Kinion Email: robert.kinion@platt.com	Lighting, Lighting instant incentives	Distributor	3

wattsmart® Business Vendor Network

	Washington	**Stoneway Electric Supply - Yakima** Address: 23 N. 3rd Ave Yakima, WA 98902 Website: http://www.stoneway.com/	Phone: 509-469-6154 Name: Tyler Hicks Email: tyler.hicks@stoneway.com	Controls – Lighting, Lighting, Lighting instant incentives, Motors and VFDs	Distributor	2
	Washington	**Columbia Electric Supply** Address: 1913 Washington Street Pasco, WA 99301 Website: http://www.columbiaelectricsupplypasco.com	Phone: 509-547-9733 Name: Teri Bostock Email: twade@ces-pasco.com	Controls – Lighting, Lighting, Motors and VFDs	Distributor	2
	California, Washington	**BidEnergy Inc.** Address: 1628 JFK Blvd, Ste 2100 Philadelphia, PA 19103 Website: http://bidenergy.com	Phone: 215-732-4480 Name: Timothy Mayo Email: tim.mayo@bidenergy.com	Appliances, Building envelope, Controls – Lighting, Food service, HVAC - evaporative, HVAC - unitary, Lighting, Motors and VFDs, Office equipment	Other	1
	Washington	**Young's Heating and Cooling LLC** Address: 878 Wallula Ave Walla Walla, WA 99362 Website: www.youngsheating.com	Phone: 509-525-4328 Name: Erik Young Email: mail@youngsheating.com	Controls – HVAC, HVAC - evaporative, HVAC - unitary, Motors and VFDs	Contractor	1
	Washington	**Lake Shore Electric, Inc.** Address: 9702 Tieton Drive Yakima, WA 98908 Website: http://www.lakeshoreelectric.com	Phone: 509-965-4281 Name: Bill Ross Email: billjr@lakeshoreelectric.com	Lighting, Motors and VFDs	Contractor	1
	Washington	**North Coast Electric - Yakima** Address: 215 N 3rd Ave Building A Yakima, WA 98902 Yakima, WA 98902 Website: http://www.northcoastelectric.com	Phone: 630-639-3084 Name: Jay Claussner Email: JClaussn@nclec.com	Controls – Lighting, Lighting, Lighting instant incentives	Distributor	1

wattsmart® Business Vendor Network

	Washington	**Batteries Plus Bulbs - Walla Walla** Address: 632 S 9th Ave Walla Walla, WA 99362 Website: https://www.batteriesplus.com/	Phone: 509-924-6645 Name: Michelle Russell Email: mrussell@batteriesplus.net	Lighting, Lighting instant incentives	Distributor
	Washington	**LED SUPPLY CO** Address: 12340 W Cedar Dr Lakewood, CO 80228 Website: https://www.ledsupplyco.com/	Phone: Name: Ian Skolnick Email: orders@ledsupplyco.com	Lighting instant incentives	Other
	Washington	**Batteries Plus Bulbs - Kennewick** Address: 321 N Columbia Center Blvd. Kennewick, WA 99336 Website: https://www.batteriesplus.com/	Phone: 509-783-3400 Name: Kristie Midili Email: mgr250@batteriesplus.net	Lighting, Lighting instant incentives	Distributor
	Washington	**Bulbs** Address: 243 Stafford St Worcester, MA 01603 Website: https://www.bulbs.com/contactus.aspx	Phone: Name: Bulbs Bulbs Email: customerservice@bulbs.com	Lighting instant incentives	Other
	Washington	**Batteries Plus Bulbs - Yakima** Address: 1731 South 1st Street Yakima, WA 98901 Website: https://www.batteriesplus.com	Phone: 509-571-1322 Name: Jessie Hottell Email: mgr654@batteiresplus.net	Lighting, Lighting instant incentives	Distributor
	California, Washington	**Transformative Wave** Address: 1012 Central Ave S Kent, WA 98032 Website: http://transformativewave.com/	Phone: 253-867-2333 Name: Joe Schmutzler Email: joe.s@twavetech.com	Controls – HVAC, HVAC - unitary, Motors and VFDs	Distributor

wattsmart® Business Vendor Network

	California, Washington	**Forever Green Indoors** Address: 1314 S Grand Blvd, Ste 2, #127 Spokane, WA 99202 Website: http://www.forevergreenindoors.com	Phone: 800-630-7345 Name: Kathleen Sullivan Email: ksullivan@forevergreenindoors.com	Lighting	Distributor, Manufacturer - Rep
	Washington	**eledlights** Address: 7835 Wilkerson Court San Diego, CA 92111 Website: https://www.eledlights.com/	Phone: 215-607-6830 Name: Landon Landon Email: lights@eledlights.com	Lighting instant incentives	Other
	Washington	**ShineRetrofits** Address: 1550 Larimer St Denver, CO 80202 Website: https://www.shineretrofits.com/	Phone: 877-643-4534 Name: Shine Retrofits Email: sales@shineretrofits.com	Lighting instant incentives	Other

*watt*smart® Business - Washington

LED Instant Incentives - Approved Distributors

wattsmart Business LED Instant Incentives

LED instant incentives make the investment in this technology easy, and we're covering up to 70 percent of the cost to purchase qualifying LED lamps. Instant incentives are available for select, easy-to-install LEDs that fit in many existing light fixtures. Speak to your lighting distributor about the right kind of lamps for your fixtures.

Below is a list of approved lighting distributors that can assist you through the LED selection, incentive and purchase process. Please visit bewattsmart.com for more information.

Distributor Name	Branch Address	Phone Number	Website
Batteries Plus Bulbs	321 N. Columbia Center Blvd. Kennewick, WA 99336	509-783-3400	www.batteriesplus.com
	1731 South 1st Street Yakima, WA 98901	509-571-1322	
	632 S 9th Ave Walla Walla, WA 99362	509-529-7001	
CED	1920 Fowler St Richland, WA 99352	509-737-8282	www.cednw.com
	131 S First Ave Yakima, WA 98902	509-248-0872	
North Coast Electric	215 N. 3rd Ave, Bldg A Yakima, WA 98902	509-452-2221	www.northcoastelectric.com
	1928 W. A St Pasco, WA 99301	509-547-9514	
Platt Electric	16 S. 1st Ave Yakima, WA 98902	509-452-6444	www.platt.com
	100 Stover Loop Rd, Ste A Grandview, WA 98930	509-882-1616	
	415 W. Main St Walla Walla, WA 99362	509-522-0611	
Stoneway	44 S Palouse Street Walla Walla, WA 99362	509-522-1550	www.stoneway.com
	23 N 3rd Ave Yakima, WA 98902	509-469-6154	
	630 Railroad Street Richland, WA 99352	509-943-4664	
Stusser	116 N 2nd Ave Yakima, WA 98902	509-453-0378	N/A

*The Approved Distributor list is subject to change. If you have questions about the LED Instant Incentive or require assistance finding an Approved Distributor in your area please contact 1-800-222-4335.
**Pacific Power does not warrant the performance of qualifying purchased equipment or the quality of the product sold by the Approved Distributor.

PACIFIC POWER

Premium *watt*smart® Business Lighting Vendors Washington

Winter 2018

PACIFIC POWER

POWERING YOUR GREATNESS

The wattsmart Business Vendor Network is a resource for Pacific Power customers to find qualified and knowledgeable vendors to help with their energy efficiency projects. Vendors on our list meet Network requirements such as holding appropriate licenses and insurance, having knowledge of lighting technology and the wattsmart Business program and having good business references.

Continued on the other side

PACIFIC POWER
POWERING YOUR GREATNESS

The following Vendors earned Premium Vendor status based on their top performance in the Network:

Columbia Electric Supply, Sunnyside
Sunnyside, WA
Lighting Distributor
Phone: 509-837-6033
Email: **tkaple@ces-sunnyside.com**
Online: **www.ced-columbia.com**

Stusser Electric, Yakima
Yakima, WA
Lighting Distributor
Phone: 509-453-0378
Email: **steved@stusseryakima.com**

We update the list of Premium Vendors quarterly based on the previous 12 months of wattsmart Business participation. Top performing Vendors are selected based on:

- Program participation
- Project quality
- Application submission quality
- Industry training (e.g. achieving NXT Level 1 designation)
- Customer and program feedback

To find a complete searchable list of wattsmart Business Vendors, visit **bewattsmart.com**. We do not guarantee the work performed by these participating vendors. You are responsible for any contract or the performance of any vendor you have chosen.

Continued on the other side

PACIFIC POWER
A DIVISION OF PACIFICORP

Appendix 5
Communications

Energy Efficiency Communications 2018

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

TV

- Washington winter 68-degree :30 – English
- Washington winter 68-degree :15 – English
- Washington winter 68-degree :30 – Spanish
- Washington winter 68-degree :15 – Spanish

- Washington summer 78-degree – English
- Washington summer 78-degree :15 – English
- Washington summer 78-degree :30 – Spanish

- Washington efficiency for business customers" Baker"
- Washington hidden savings for business customers "Vet"

Radio

- Washington Better :60 – English
- Washington Better :60 – Spanish
- Incentives for Lighting and lighting controls for businesses

Print

- Yakima summer – "Good"
- Yakima summer– "Helps
- Yakima summer 78-degrees – "Better"
- Walla Walla summer – "Good"
- Walla Walla summer– "Helps"
- Walla Walla summer 78-degrees – "Better"
- Spanish winter "Bueno"
- Spanish summer "Bueno"
- Spanish summer "Ayuda"
- Spanish summer "Meyor"
- Farm Bureau ad – color
- Irrigation – color
- Ad to thank business customers and vendors for being wattsmart last year

- LED Lighting and Controls for business b/w
- LED Lighting and Controls for business color

Digital Ads

- Pandora residential– "Helps" winter screen ad | Pandora recorded ad
- Pandora business – "Good" for your bottom line screen ad | Pandora recorded ad
- Cooling – ceiling fan
- Cooling – 78-degree thermostat
- Being wattsmart is "good"
- Being wattsmart "helps"
- Being wattsmart is "better"
- Energy efficiency is GOOD for your bottom line and Washington - business

Social

- Facebook and YouTube video thumbnail - winter
- Winter wattsmart tips 68 degrees Facebook ads – English - February
- Winter wattsmart tips 68 degrees Facebook ads – Spanish - February
- Facebook and YouTube video thumbnail - summer
- Cooling – ceiling fan
- Cooling – thermostat

Press releases:

- Winter Energy Bill Savings – December 12, 2018
- Pexco Aerospace wattsmart Business Partner of the Year – November 2018
- Headed Out of Town This Weekend? Save Energy by Putting Your Home in Summer Vacation-mode – August 31, 2018
- Heat Wave: Tips from Pacific Power to Be Safe, Stay Cool and Use Less Energy – July 13, 2018
- Pacific Power gives Customers the Power to Save - June 25, 2018

Newsletters:

- February Voices newsletter
- July Connect newsletter
- October Connect newsletter

Direct mail:

- Home Energy Report postcard
- Mailing to irrigation customers encouraging application for incentives:
  - Letter – April
  - Application – April
  - LESA flyer – April
  - Letter – October
  - Application – October
  - VFD Flyer – October
- Small business outreach postcard – December 2018

Emails:

- Smart thermostat September email – version 1
- Smart thermostat September email – version 2
- Black Friday smart thermostat email
- Thank you for being wattsmart last year - January
- wattsmart Business lighting 2/28/18

Collateral:

- wattsmart Business - overview
- wattsmart Business – overview (Spanish)
- wattsmart Business - brochure
- wattsmart Business – instant incentives for lighting
- wattsmart Business – HBC Finance Overview
- wattsmart Small Business lighting incentives
- wattsmaert Small Business lighting incentives (Spanish)
- wattsmart Business – Energy Project Manager Co-funding
- wattsmart Business – Energy Management
- wattsmart Business – Advanced Rooftop Controls
- wattsmart Business wastewater incentives

2018

NEF

BE *WATT*SMART, BEGIN AT HOME

WASHINGTON

Program Report

Prepared for:

Barbara Modey, Customer and Community Communications

Michael S. Snow, Manager, Regulatory Projects

PacifiCorp

825 NE Multnomah, Suite 800

Portland, OR 97232

Prepared by:

Patti Clark

Program Director

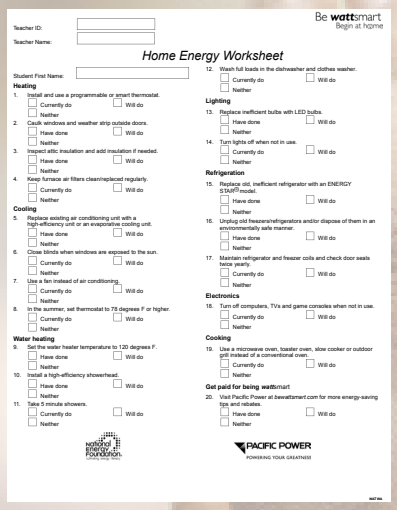
National Energy Foundation

4516 South 700 East, Suite 100

Salt Lake City, UT 84107

February 25, 2019

Savings



Be wattsmart
Begin at home

Teacher ID:

Teacher Name:

Home Energy Worksheet

Student First Name:

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 degrees F or higher.
   ☐ Currently do ☐ Will do ☐ Neither

Water heating

9. Set the water heater temperature to 120 degrees F.
   ☐ Have done ☐ Will do ☐ Neither
10. Install a high-efficiency showerhead.
    ☐ 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 Environmental Education Foundation

PACIFIC POWER
POWERING YOUR GREATNESS

Home Energy Worksheets

– Returned: 2,179 –

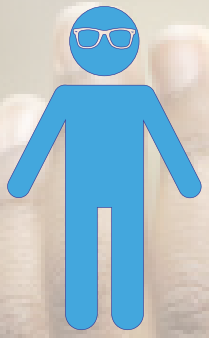
– 60% –

Teacher Packets

– Returned: 106 –

– 71% –

Participants

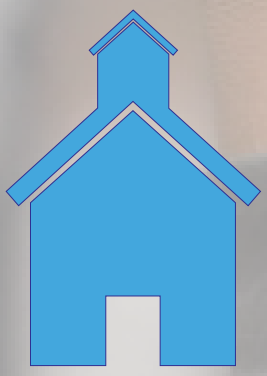


Students

– 3,647 –

Teachers

– 150 –



Schools

– 47 –

Table of Contents

Program Overview

Program Description

Be *watt*smart, 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. A total of 47 schools participate in the program.

Program Administration

Be *watt*smart, Begin at home is administered by NEF, a 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 *watt*smart, Begin at home energy efficiency education program conducted during the 2018 – 2019 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 is responsible for scheduling the presentations. A team of trained and seasoned presenters brought the interactive, hands-on program to Washington schools during October and November of 2018.

Building Collaborations

The Washington Office of Superintendent of Public Instruction Learning Standards correlate well to the content of Be wattsmart, Begin at home program and appropriately with the 4th grade standards. Teachers appreciate the collaborative efforts to align program components to their core curriculum. Curriculum correlations were provided to teacher participants in the *Teacher Guide* delivered to each teacher prior to the presentation date.

Program Implementation

During the month of May 2018 an invitation to register for the fall 2018 program was sent via email to all teachers that had participated in the 2017 program. In August and September, Megan Hirschi made phone calls to all unregistered schools. Teacher questions were addressed and highlights of the program content with an emphasis on how the program aligns with Washington content standards were reviewed.

Program Registration

Registration for the program was online at bewattsmart.com/begin. Each registered school was checked against the qualified school list before email and phone communications were made with teachers to determine optimum presentation dates and student numbers.

After registration was qualified, a series of email communications with teachers, was 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 *watt*smart, Begin at home Presentation

Be *watt*smart, Begin at home presentations were given during the month of October through the first week of November 2018. The presentation featured a custom Keynote slideshow that brought energy concepts to the

forefront of Washington education. 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.

The presentation provided interactive activities that involved and engaged the audience. Students participated in making a human electrical circuit, during which they learned key core curriculum concepts such as insulators and conductors of electricity and electrical generation. Student volunteers used props to demonstrate the process of electrical generation for their classmates. All students reviewed material learned with an "Energy Lingo" review 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. These videos were new to the program this year and were 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 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 the students.

Program Materials

A *Parent Letter* was provided to explain the importance of Be *watt*smart, Begin at home. In addition, students took home a *Student Guide* and *Home Energy Worksheet* to share with their families. Students who returned their worksheet 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 *watt*smart, 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 *Electricity Serves Our Community.*

A program *Implementation Steps Flier* assisted teachers in carrying out the program. It also gave simple steps for successfully returning *Home Energy Worksheets* and the sponsor *Thanks a "Watt" Card* in the postage paid envelope provided in the *Teacher Materials Folder*. A *Rewarding Results Flier* gave information concerning the mini-grant teacher participants would receive for returning their student surveys. Educators received a $50 gift card for an 80% return, or a $25 gift card for a 50 – 79% return by the December 5, 2018 deadline.

Program Accomplishments – Fall 2018

- 47 Be *watt*smart, Begin at home presentations
- 3,647 students and families reached
- 150 Washington teachers reached
- 60% student *Home Energy Worksheet* surveys return
- $50 mini-grant checks delivered to 83 Washington teachers
- $25 mini-grant checks delivered to 18 Washington teachers

Program Improvements - Fall 2018

- Updated all program materials with new Pacific Power style guide and look
- New video vignettes entitled "Caitlin Power" produced by sponsor for presentation
- Updated the *Energy Efficiency* instructional poster
- New LED nightlight incentive with Pacific Power logo
- Added online *Home Energy Worksheet* option to program
- *Program Evaluation* completed online by teachers

Program Attachments – Fall 2018

- Fall 2018 Participating Schools
- Program Promotions
- Program Documents
    - Keynote Presentation
    - *Teacher Implementation Steps Flier*
    - *Rewarding Results Flier*
    - *Student Guide*
    - *Teacher Guide*
    - Lingo Card
    - *Parent Letter*
- *Teacher Evaluation* Compilation
- *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 2018 Participating Schools

School Name	School 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 Elem School	3006 S. Wiley Rd	Yakima	WA	98903
Arthur H. Smith Elementary	205 Fir Avenue	Grandview	WA	98930
Artz-Fox Elementary	805 Washington	Mabton	WA	98935
Barge Lincoln	219 East I Street	Yakima	WA	98901
Blue Ridge Elementary	1150 W. Chestnut	Walla Walla	WA	99362
Chief Kamiakin Elementary	1700 E. Lincoln Ave	Sunnyside	WA	98944
Christ the Teacher Catholic School	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 St.	Dayton	WA	99328
Discovery Lab School	2810 Castlevale	Yakima	WA	98902
East Valley Elementary	1951 Beaudry Rd.	Yakima	WA	98901
Edison Elementary	1315 E. Alder	Walla Walla	WA	99362
Garfield Elementary - Toppenish	505 Madison Ave	Toppenish	WA	98948
Gilbert Elementary	4400 Douglas Drive	Yakima	WA	98908
Green Park Elementary	1105 E. Isaacs Street	Walla Walla	WA	99362
Harriet Thompson Elementary	1105 W. 2nd St.	Grandview	WA	98930
Hoover Elementary	400 West Viola Avenue	Yakima	WA	98902
Martin Luther King Jr.	2000 S 18th Street	Union Gap	WA	98903
McClure Elementary - Grandview	811 W. 2nd	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 Ave	Yakima	WA	98902
Naches Valley Elementary	151 Bonlow Drive	Naches	WA	98937
Nob Hill Elementary	801 South 34th Avenue	Yakima	WA	98902
Oakridge Montessori School	6403 Summitview Ave	Yakima	WA	98902
Outlook Elementary	3800 Van Belle Rd	Outlook	WA	98938
Prospect Point Elementary	55 Reser Road	Walla Walla	WA	99362
Ridgeview Elementary	609 West Washington Ave	Yakima	WA	98903
Riverside Christian School	721 Keys Road	Yakima	WA	98901
Robertson Elementary	2707 West Lincoln	Yakima	WA	98902
Rogers Adventist School	200 SW Academy Way	College Place	WA	99324
Roosevelt Elementary – Granger	701 E. Avenue	Granger	WA	98932
Roosevelt Elementary - Yakima	120 N. 16th Avenue	Yakima	WA	98902
Satus Elementary	910 S. Camas Ave	Wapato	WA	98951
Sharpstein Elementary	410 S. Howard St.	Walla Walla	WA	99362
St Joseph-Marquette School	202 N. 4th St	Yakima	WA	98901
Terrace Heights Elementary	101 N. 41st Street	Yakima	WA	98901
Tieton Intermediate School	711 Franklin Road	Tieton	WA	98947
Union Gap	3201 South 4th Street	Union Gap	WA	98903
Valley View Elementary	515 Zillah Ave	Toppenish	WA	98948
Waitsburg Elementary	184 Academy	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

Be ***watt***smart
Begin at home

Be *watt*smart, Begin at home 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 will be held from October 1 to November 2, 2018. Sign up today at be*watt*smart.com/begin.

National Energy Foundation

PACIFIC POWER

Program Documents

Keynote Presentation

Be **watt**smart
Begin at home

PACIFIC POWER
POWERING YOUR GREATNESS

We have the power to learn.

Learn about natural resources.

Learn how we make and use energy.

Learn how to use energy wisely by being **watt**smart.

Play energy LINGO.

POWERING YOUR GREATNESS

What is **ENERGY**?

POWERING YOUR GREATNESS

ENERGY is the ability to do WORK.

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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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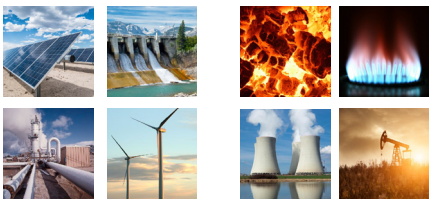
Renewable and nonrenewable resources



POWERING YOUR GREATNESS

Renewable resources




POWERING YOUR GREATNESS

Nonrenewable resources

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Let's LINGO

Find the words on your LINGO board that match these definitions:

- The ability to do work. **Energy**
- A resource often found with oil. **Natural gas**
- Something useful from the earth or the sun. **Natural resource**

POWERING YOUR GREATNESS

Electricity

- The electricity we use is not a natural resource.
- It is made from natural resources.
- Since electricity is made from natural resources, it is called a secondary energy source.
- Power lines carry the electricity from where it is generated to where it is used.

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Pacific Power

Electric generation by energy source

Coal 58.89% 

Renewables 19.95%    

Natural gas 10.57% 

Other sources 10.59%

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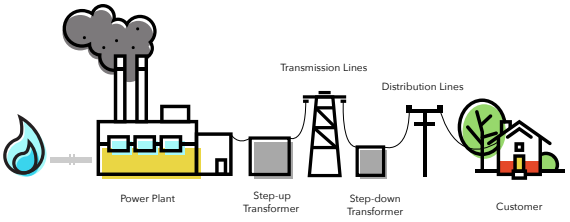
Electric generation



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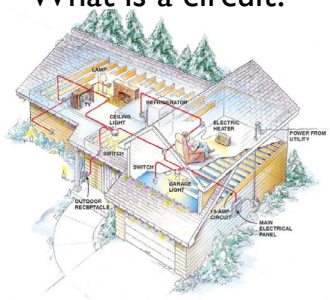
What is a circuit?



Let's make a circuit.

What things do we need to make an electrical circuit?

- An **energy source**, such as a battery.
- A **conductor** to carry electrical energy, such as wire.
- A **load** to use the energy, such as a light bulb.

Open circuit:
No electricity can flow

Closed circuit:
Electricity can flow

Energy efficiency

Energy efficiency

- Using less energy to accomplish the same amount of work.

Technology

- Install energy-efficient products, appliances and devices.

Behavior

- Use less energy through wise behaviors that conserve energy.

Let's LINGO

Find the words on your LINGO board that match these definitions:

- Using less energy to accomplish the same amount of work. **Energy efficiency**
- An energy resource that is capable of being renewed or is replaceable. **Renewable**
- Fossil fuels – such as coal, natural gas and oil – are considered **Nonrenewable** resources.
- A resource used to produce gasoline. **Oil**

Caitlynn Power

Caitlynn Power

Caitlynn Power

POWERING YOUR GREATNESS

Home heating and cooling

What can you do to be ***watt***smart?

- Use a fan instead of an air conditioner.

Remind your parents to:

- Install a smart or programmable thermostat.
- Change furnace filters.
- Insulate your home and seal air leaks.

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Caitlynn Power

POWERING YOUR GREATNESS

Caitlynn Power

POWERING YOUR GREATNESS

Water heating

What can you do to be ***watt***smart?

- Take shorter showers.
- Turn off the water when brushing teeth.
- Set your **water heater** to 120°F.
- Install an energy-efficient showerhead.

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What else can you do to be ***watt***smart?

- Use advanced power strips to reduce **phantom** loads.
- Use a microwave oven when possible.
- Use lids to shorten **cooking** time.

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The 3 Rs

What can you do to be ***watt***smart?

- **Reduce**
  – use less of something.
- **Reuse**
  – use something again.
- **Recycle**
  – make something into another new thing.

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Let's LINGO

Find the words on your LINGO board that match these definitions:

- A light that can last 25 times longer than an incandescent. **LED**
- Electricity consumed by an electronic device while it is turned off or in standby mode. **Phantom load**
- Using a toaster oven or microwave for **Cooking** is more energy-efficient than using the oven.
- Set this to 120°F for a comfortable shower. **Water heater**
- To use less of something. **Reduce**

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What have we done today?

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

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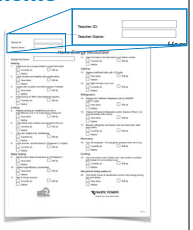
Engage in energy efficiency

Review your **Be *watt***smart**, Begin at home** booklet with your parent(s).

Complete the *Home Energy Worksheet* either online or return it to your teacher to receive an energy-efficient nightlight.

Sign the *Thanks A "Watt" Card* and your teacher will mail it along with your worksheet.



POWERING YOUR GREATNESS

YOU *have the* ***power*** *to be* ***watt***smart**!**

Visit **bewattsmart.com**
for more energy-saving ideas.

POWERING YOUR GREATNESS



Implementation Steps

1. Verify that you have received each of the following:
   - *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*
   - *watt*smart nightlights (student incentive for completing the *Home Energy Worksheet*)
2. Distribute to each student a:
   - **Be wattsmart, Begin at home** student booklet
   - *Home Energy Worksheet*
   - *Parent Letter*
3. Reward each student who completes a *Home Energy Worksheet,* either online or paper, with a *watt*smart nightlight.
4. Have each student sign the *Thank You Card* to Pacific Power.
5. Mail in the self-addressed postage-paid envelope:
   - any completed *Home Energy Worksheets*
   - the *Thank You Card*

To thank you for postmarking your envelope by December 5, 2018, you will receive a mini-grant for classroom use.
80 percent or greater return of registered students' *Home Energy Worksheets* **= $50**
50 – 79 percent return of registered students' *Home Energy Worksheets* **= $25**

For questions, or additional information, please email Megan Hirschi at **megan@nef1.org**.

National Energy Foundation®
cultivating energy literacy

PACIFIC POWER
POWERING YOUR GREATNESS


Attention Teachers
Help us out by mailing your student *Home Energy Worksheets* and receive a **$25 – $50** mini-grant for classroom use, depending upon participation.
80 percent or greater return of registered students' *Home Energy Worksheets* = $50
50 – 79 percent return of registered students' *Home Energy Worksheets* = $25
Postmark due date:
December 5, 2018
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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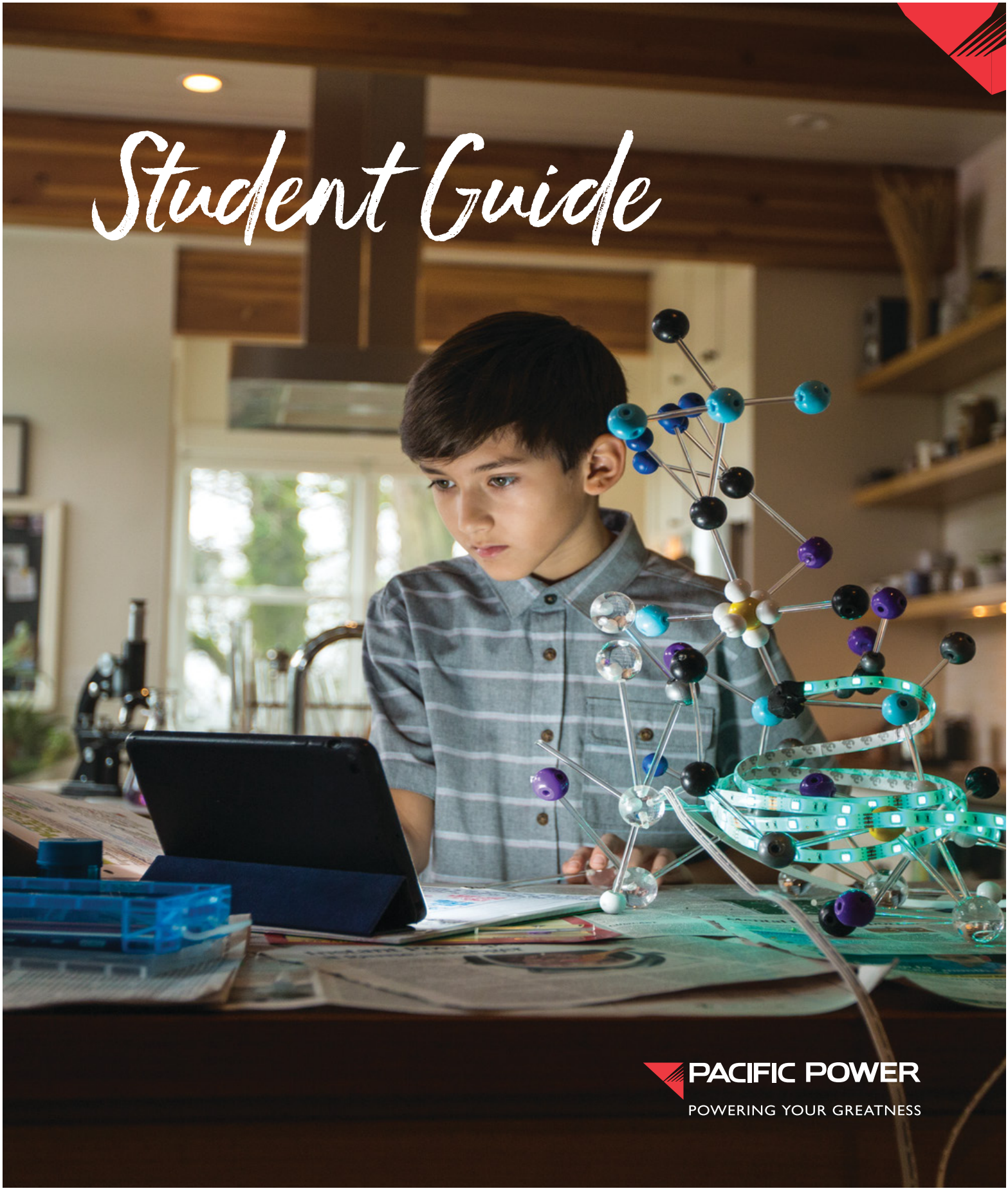


Dear Parents,

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 or return it to his or her teacher.

Thank you for being *watt*smart 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 ***watt***smart.

- 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. There is an estimated 129 year supply remaining.

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.

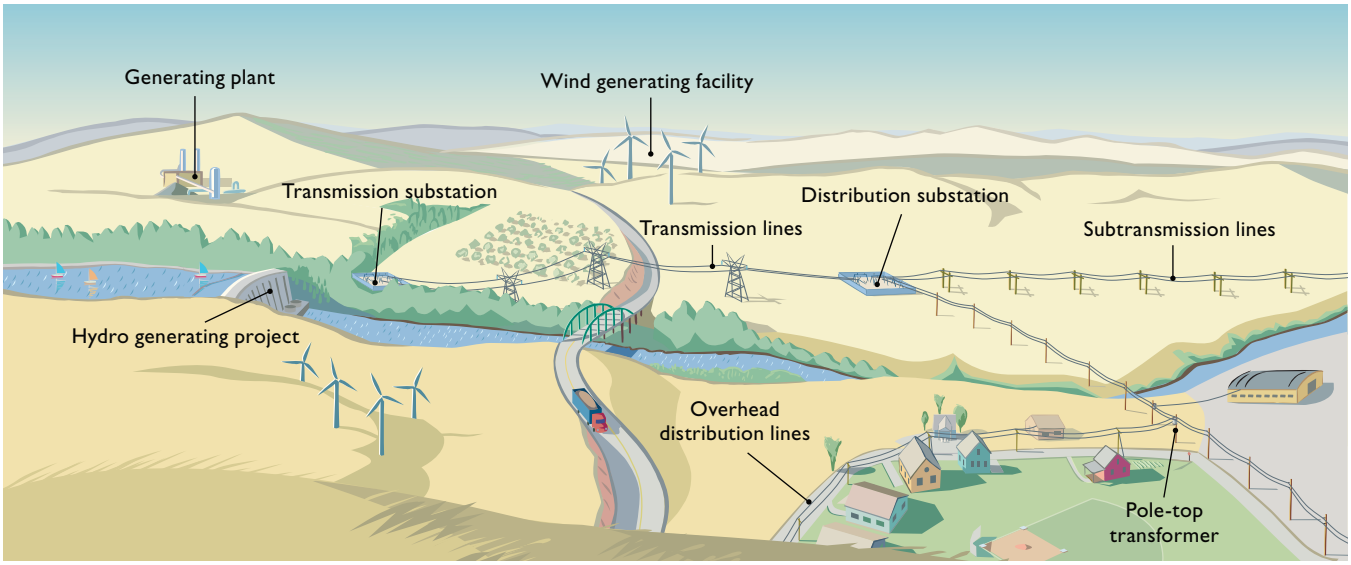
Electricity is the most abundant secondary energy resource used. It is the flow of electrical power or charge. It occurs in nature as lightning and static electricity. A generator uses energy resources to create mechanical energy that is then converted into electrical energy.

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 (2017 Basic Fuel Mix)*	United States (U.S. EPA, data)
Natural Gas	10.57%	32%
Coal	58.89%	30%
Nuclear	0.00%	20%
Petroleum	0.00%	1%
Other/misc.	10.59%	0%
Renewables (total)	19.95%	17%
Hydropower	7.09%	7.5%
Wind	8.56%	6.3%
Biomass	0.37%	1.6%
Solar	3.54%	1.3%
Geothermal	0.39%	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 percent 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 **bewattsmart.com**.

Water and water heating

- Check your faucets for leaks that can cost you hundreds of dollars each year.
- Install a water-efficient showerhead and save as much as $145 a 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 percent 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 60 percent 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 percent 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 at least 41 percent less energy than the federal minimum standard for energy consumption.

Laundry

- Buy a moisture-sensitive dryer that automatically shuts off when clothes are dry.
- Use a drying rack whenever 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 *watt*smart 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 percent 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	B	C
	Number of bulbs from Table 1	Annual cost of electricity for one bulb	Annual cost of electricity for lighting
Incandescent		× $3.96	
CFL		× $0.84	
LED		× $0.48	
TOTAL			

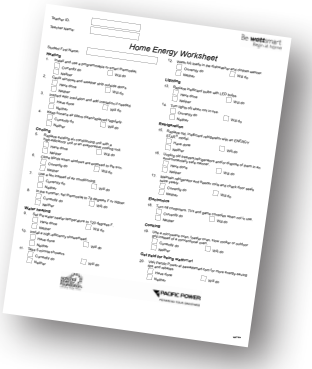
TABLE 3

	E	F	G
All CFLs		× $0.84	Annual cost of electricity with only CFLs
All LEDs		× $0.48	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 Watts) each used for 2 hours each day for 30 days. EEI Typical Bills and Rates Report, Winter 2018 (12 months ending 2017).

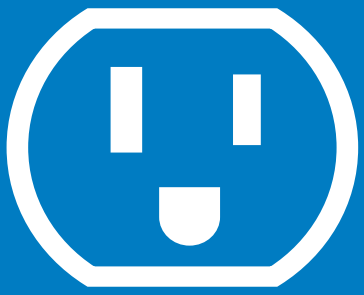
I have the *power* to be **watt**smart.

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 hews@nef1.org 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.



Be *watt*smart

Begin at home

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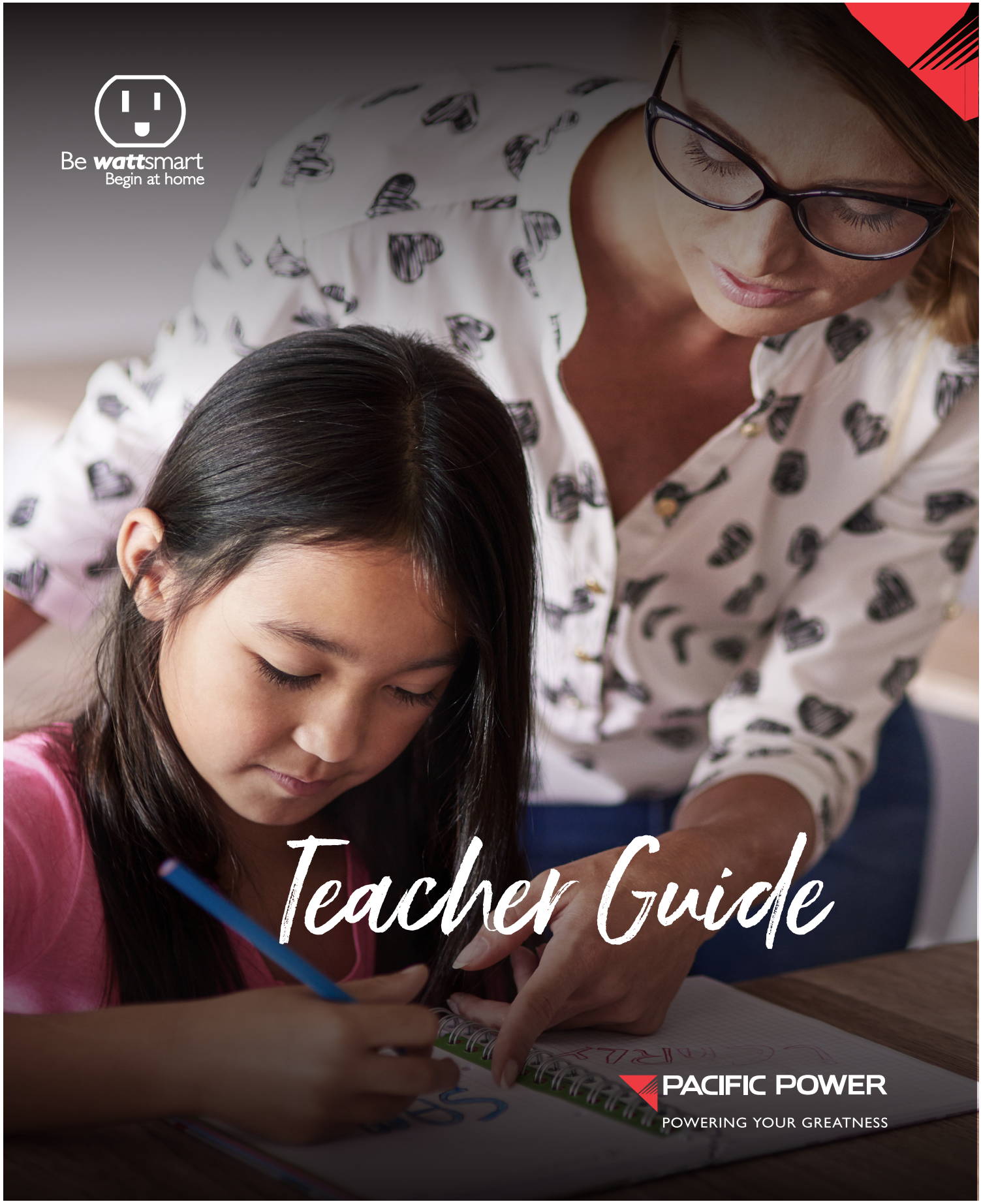
*watt*smart is registered in U.S. Patent and Trademark Office.



Welcome to Be ***watts***mart, 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 ***watts***mart, 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 ***watts***mart, 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 unique 501(c)(3) nonprofit educational organization dedicated to the development, dissemination and implementation of supplementary educational materials and programs. These resources for education relate primarily to energy, water, natural resources, science, math, technology, conservation, energy efficiency and the environment. NEF recognizes the importance and contribution of natural resources to our economy, to our national security, the environment and our quality of life.

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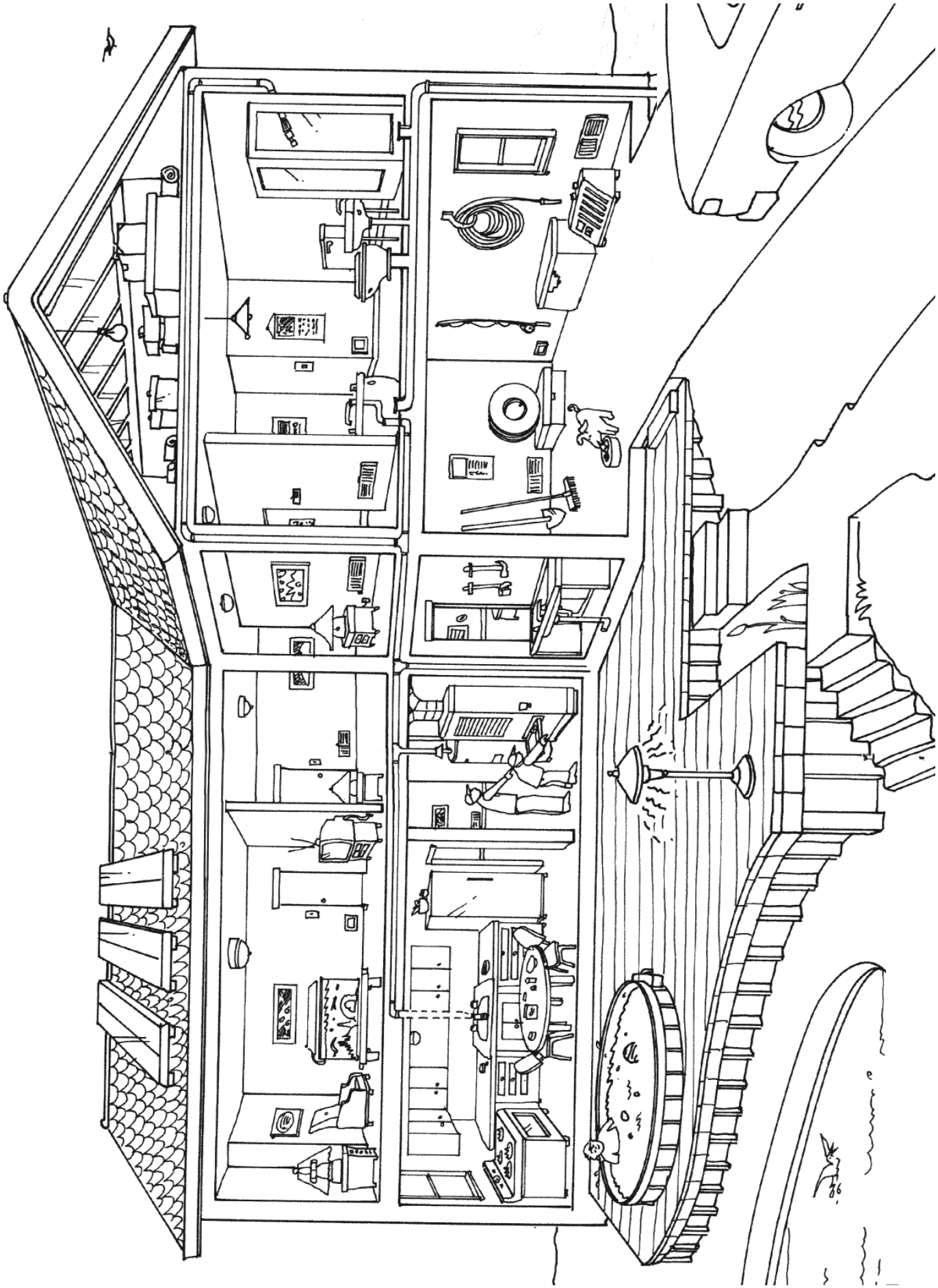


Table of Contents

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
Pass the Sack		•		•													
The Search for Energy	•	•	•	•										•		•	•
A Bright Idea!	•	•	•	•	•	•	•	•	•	•	•	•	•				
The Art of Circuits	•	•	•					•		•	•	•					•
Shine a Light on History		•	•	•		•	•	•	•		•						
Layered Lunch	•		•							•							
How Do You Rate?	•	•		•		•	•					•	•		•		•
Energy in Math														•	•	•	•
Be wattsmart, Begin at home Poster		•		•			•	•									•

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

The student 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 multi-line 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

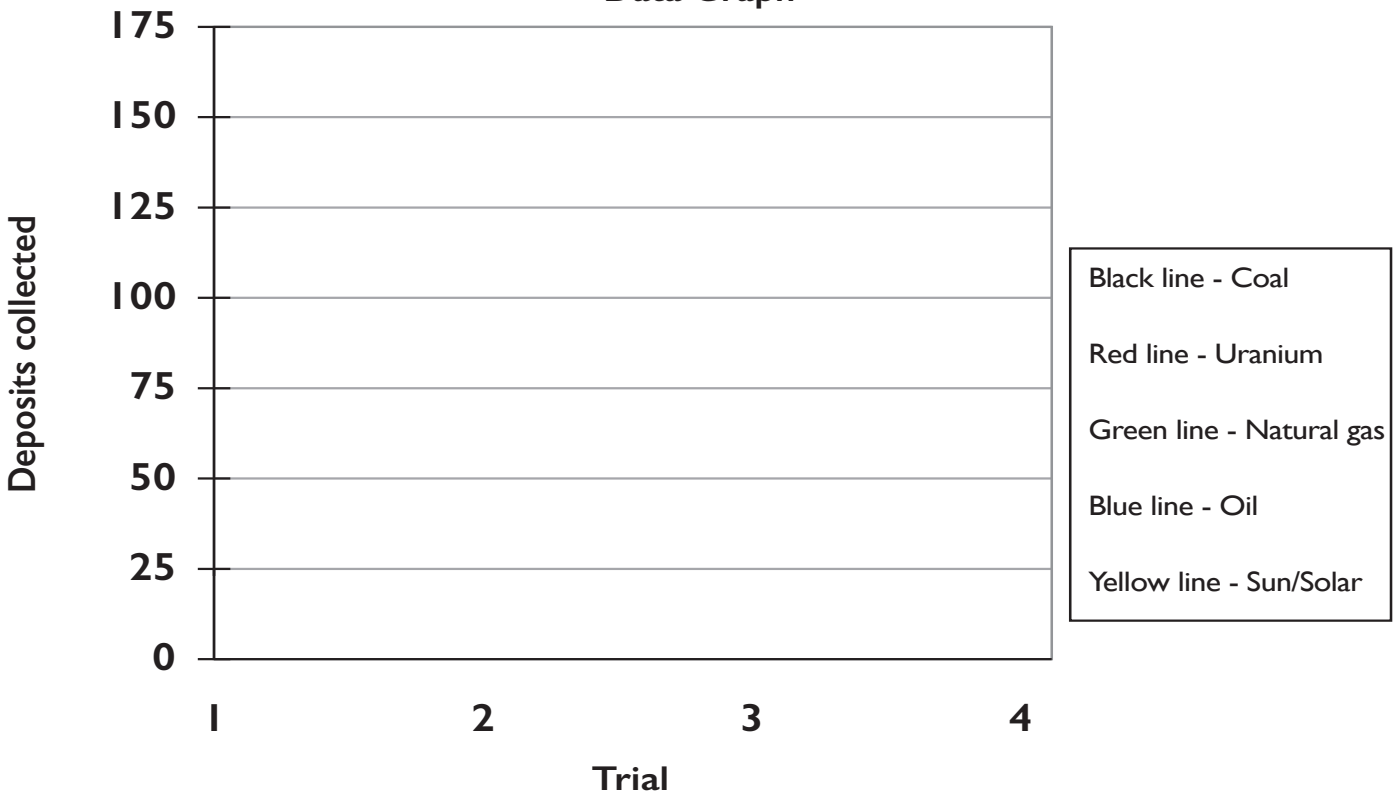
Add wind and water to the activity. Lead a discussion to be sure the students understand why you continued adding more sun, wind and/or water after each trial, but did not add more of the other papers. As a class, come up with a general outline of how to more effectively manage the resources that are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



Be *watt*smart
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 1795. 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 wood-burning 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.

Student Sheet: A Bright Idea!

Alessandro Volta, an Italian physicist, made the first battery in 1795. 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.

Activity: The Art of Circuits

Objective

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

Curriculum Connection

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

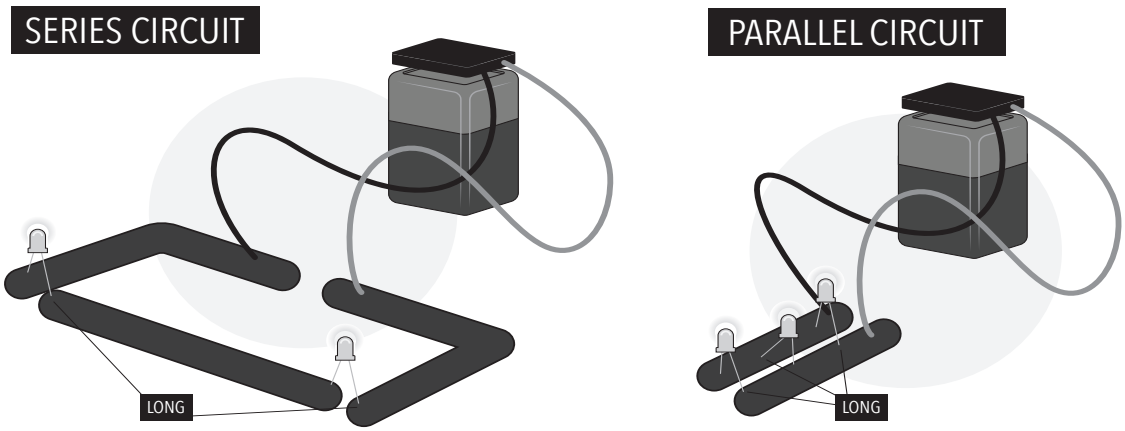
Introduction

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.

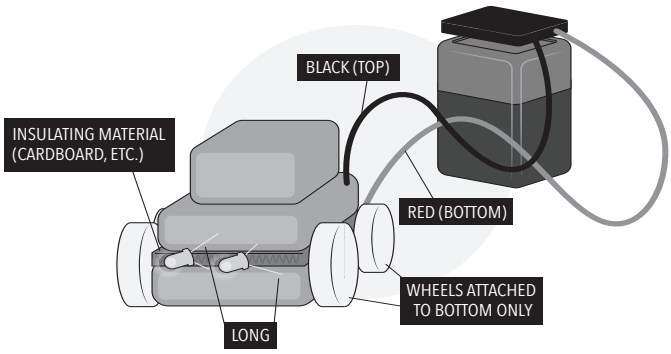
In this activity, students will use salt dough, which is a conductor, to design circuits which will transfer electrical energy. If they are successful, the electricity will be transformed to light and heat energy in a miniature LED bulb.

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.

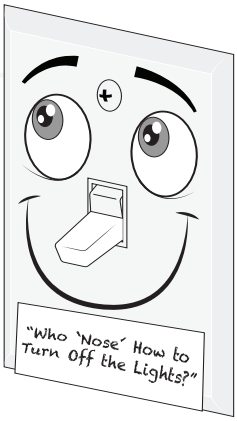


Discussion

- 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!



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

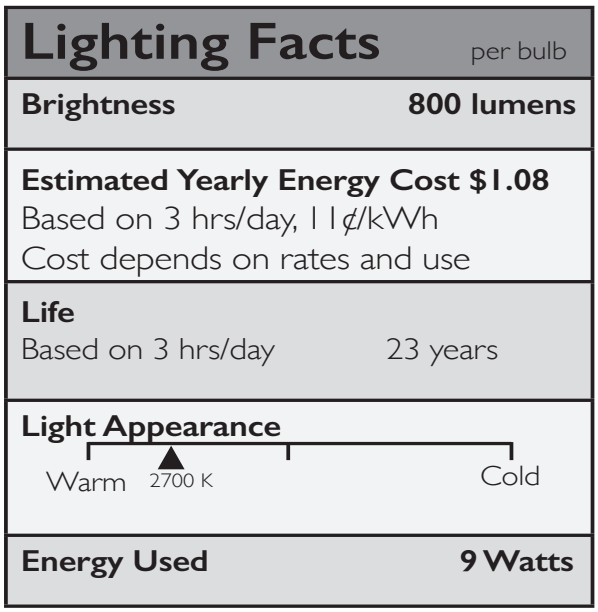
- What kinds of light bulbs are used in your home? How do they affect the way you live and work?
- What do you think the next great electrical invention will be?
- Thomas Edison said, "Genius is one percent inspiration and ninety-nine percent perspiration." What did he mean? How does his quote apply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



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.

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.

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 "yes" 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.

Be 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
Window coverings are open on cold, sunny days and closed on hot days.	T	F	NA
Window coverings are closed at night when heat is on.	T	F	NA
Thermostat is set at 68° F (20° C) or lower in winter.	T	F	NA
Air conditioning is set at 78° F (26° C) or higher in summer.	T	F	NA
Ducts are insulated in unheated/uncooled areas.	T	F	NA
Garage is insulated.	T	F	NA
Air filters on furnace and air conditioner are cleaned and changed regularly.	T	F	NA
Thermostat is adjusted at night.	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
Faucets and toilets do not leak.	T	F	NA
Showers and faucets are fitted with energy-efficient shower heads and aerators.	T	F	NA
Showers last no longer than 5 minutes.	T	F	NA
Toilets are low-flow, or tanks use water displacement devices.	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
Hot water pipes from water heater are insulated.	T	F	NA
If located in an unheated area, hot water heater is wrapped in an insulation blanket.	T	F	NA
Broom, not hose, is used to clean driveways and sidewalks.	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
Automatic air-dry is used with the dishwasher.	T	F	NA
Washing machine is usually run with a full load.	T	F	NA
Cold water is used in washing machine most of the time and is always used for rinses.	T	F	NA
Clothes dryer is usually run with a full load.	T	F	NA
Clothes are often hung up to dry.	T	F	NA
Refrigerator is set no lower than 37° F (3° C).	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
LED bulbs are used in at least one room.	T	F	NA
Security and decorative lighting is powered by solar energy.	T	F	NA
Light bulbs are kept dusted and clean.	T	F	NA
Sunlight is used whenever possible.	T	F	NA

Trash

Glass, cans and newspapers are recycled.	T	F	NA	Over-packaged 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, second-hand 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

Environment

Trees and bushes are maintained for wildlife shelter and food.	T	F	NA	Bird feeders or bird houses are maintained.	T	F	NA
				Native plants are used to decrease water use.	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?

Activity: Energy in Math

Objective
The 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 bedroom 4 hours a day, and there are three people living there, how many Watts will be used a day to light their room?
   - 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%

Be *watt*smart
Begin at h⌂me

Activity: Be *watt*smart, Begin at home Poster

Objective

The 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 showerhead.
    - 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

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

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

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

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 concepts of his or her science curriculum 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 *hew.nef1.org* and fill out an online worksheet. You will need to enter the teacher ID found on the paper worksheet.

  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!

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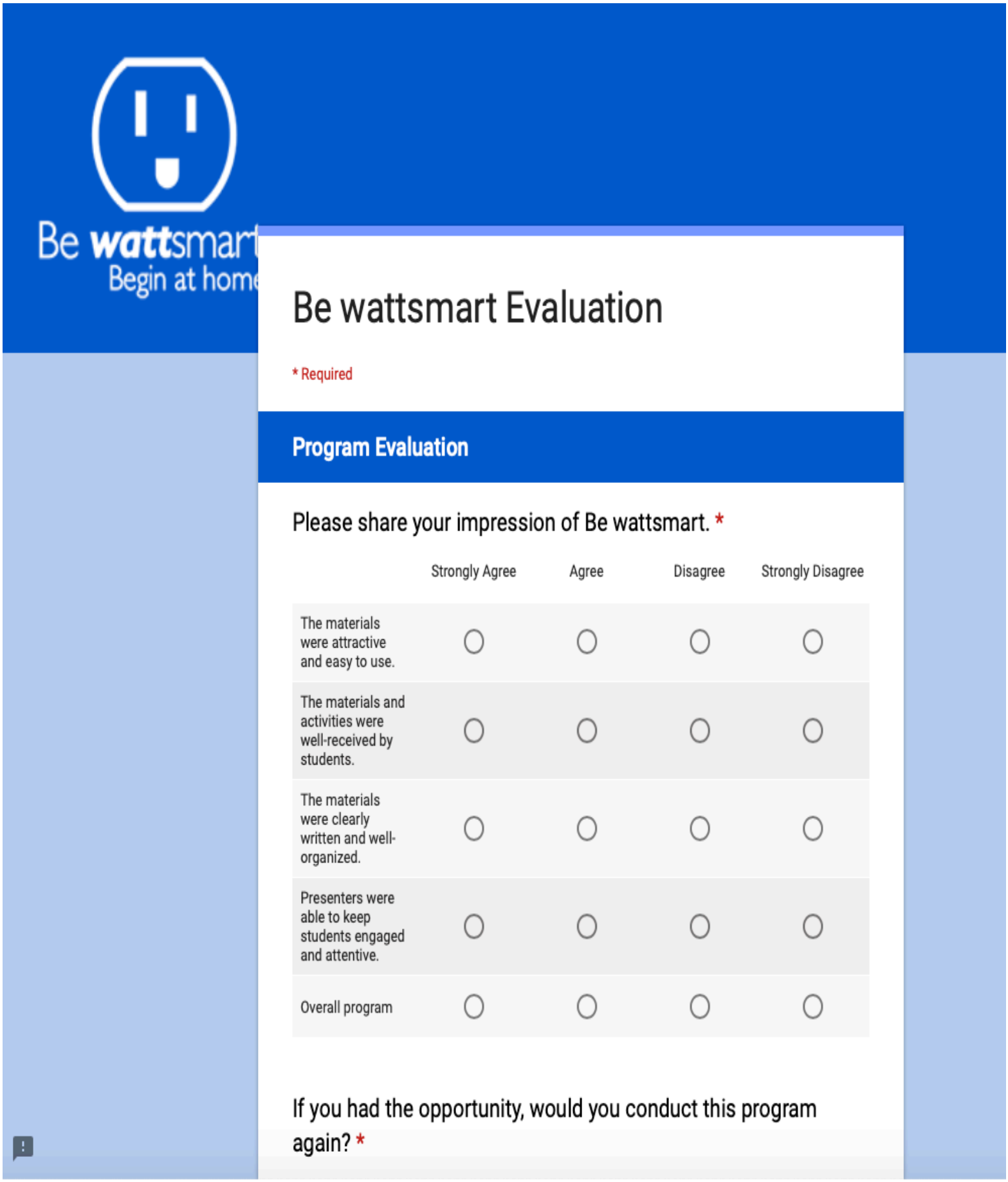


*Watt*smart **Pacific Power program**

Program Evaluation Summary

Educators' impressions of the program from 23 educators.

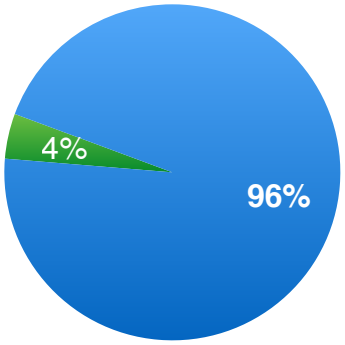
	Strongly Agree	Agree	Disagree	Strongly Disagree	
Materials were attractive and easy to use.	16	7	0	0	70% 30%
Materials and activities were well received by students.	17	6	0	0	74% 26%
Materials were clearly written and well organized.	19	4	0	0	83% 17%
Presenters were able to keep students engaged and attentive.	19	3	1	0	83% 13% 4%
Overall program	20	3	0	0	87% 13%

*Watt*smart **Pacific Power program**

Program Evaluation Summary

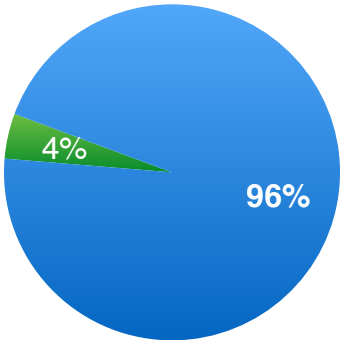
If you had the opportunity, would you conduct this program again?

	Yes	No
Mini-grant	22	1



Would you recommend this program to other colleagues?

	Yes	No
Mini-grant	22	1



In my opinion, the thing the students liked best about the materials/program was:
Active participation
All parts
I think the kids really liked the videos that were presented to them.
I think they liked watching the video of the girl.(sorry I can't remember her name)
Lingo and the interaction with the presenters
Lingo cards
LINGO, circuit stick, videos
Lingo, engaging, the nightlight reward
Presentation and night light
Students like getting the nightlight and then the mini-grant for special classroom supplies.
The demonstrations of current using the light up bar. Also the Lingo.
The hands on activities.
the hands on presentation
The hands-on activities
The position of the presentation when students go to volunteer.
The presentation of the transfer of energy and Lingo
The presenters were excellent
The videos at the end of the presentation.
They love playing Lingo and they love the light stick demo.
They loved participating either by helping with demonstrations or playing Lingo, and also liked watching the video.
when they demonstrated how electricity works.

In the future, one thing I would change would be:

an extra night light, a new student started that day, she attended watt smart but not enough night lights, one short
Give students more of an opportunity to be engaged (more time) for LINGO.
giving a little LINGO reward to the LINGO winners.
I still haven't received my night lights for the surveys being returned.
I think more should be done with the lingo cards, if we use them.
N/A I love this presentation and wouldn't change a thing.
Nothing - We loved the new videos and materials that you provided
Nothing- I love your presenters and the presentation!
nothing, it was awesome as usual
Presentation Format, needs to be more engaging
The new girl in the videos is so far "out there," that kids weren't really listening to her but more reacting like "I can't believe she said that." I don't mind the girl herself. I think what would be most effective is the girl slightly livening up Lineman Slim's old videos. She's just a little too goofy.
They liked the hands on stuff
To schedule a solid 1 hour block of time and not 45 minutes.
We were a bit rushed due to our homeroom schedule this year. Still, the presenters did a great job of making the program work in the abbreviated time.

Be ***watt***smart
Begin at h⌂me

Teacher ID: _____

Teacher Name: _____

Home Energy Worksheet

Student First Name: _____

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 degrees F or higher.
   ☐ Currently do ☐ Will do ☐ Neither

Water heating

9. Set the water heater temperature to 120 degrees F.
   ☐ Have done ☐ Will do ☐ Neither
10. Install a high-efficiency showerhead.
    ☐ 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 *watt*smart

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

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Home Energy Worksheet (Spanish)

Ser *watt*smart
Empieza en casa

Identificación del profesor(a): _____

Nombre del profesor(a): _____

Verificación de Energía Doméstica

Primer nombre del estudiante: _____

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 los filtros de aire de la calefacción limpios/reemplezarlos regularmente.
   ☐ 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 están 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 grados F o más.
   ☐ Lo hago ☐ Lo haré ☐ Ninguno

Calentadores de agua

9. Programar el calentador de agua a 120 grados 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 refrigerador antiguo 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 hago ☐ 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 eléctrico, un olla de cocimiento lento o un parrilla de aire libre en lugar del horno convencional.
    ☐ Lo hago ☐ Lo haré ☐ Ninguno

Reciba paga siendo *watt*smart

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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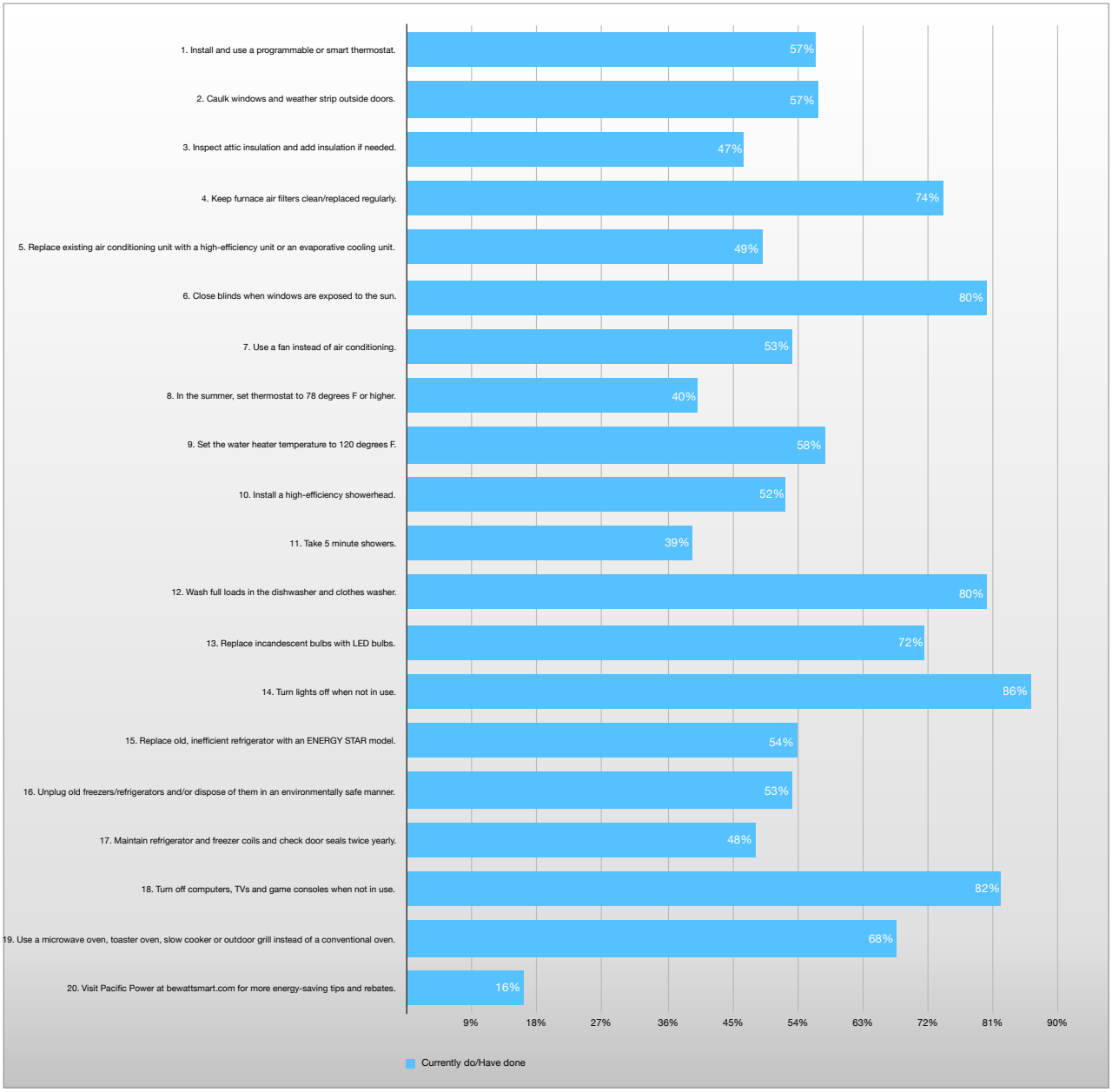
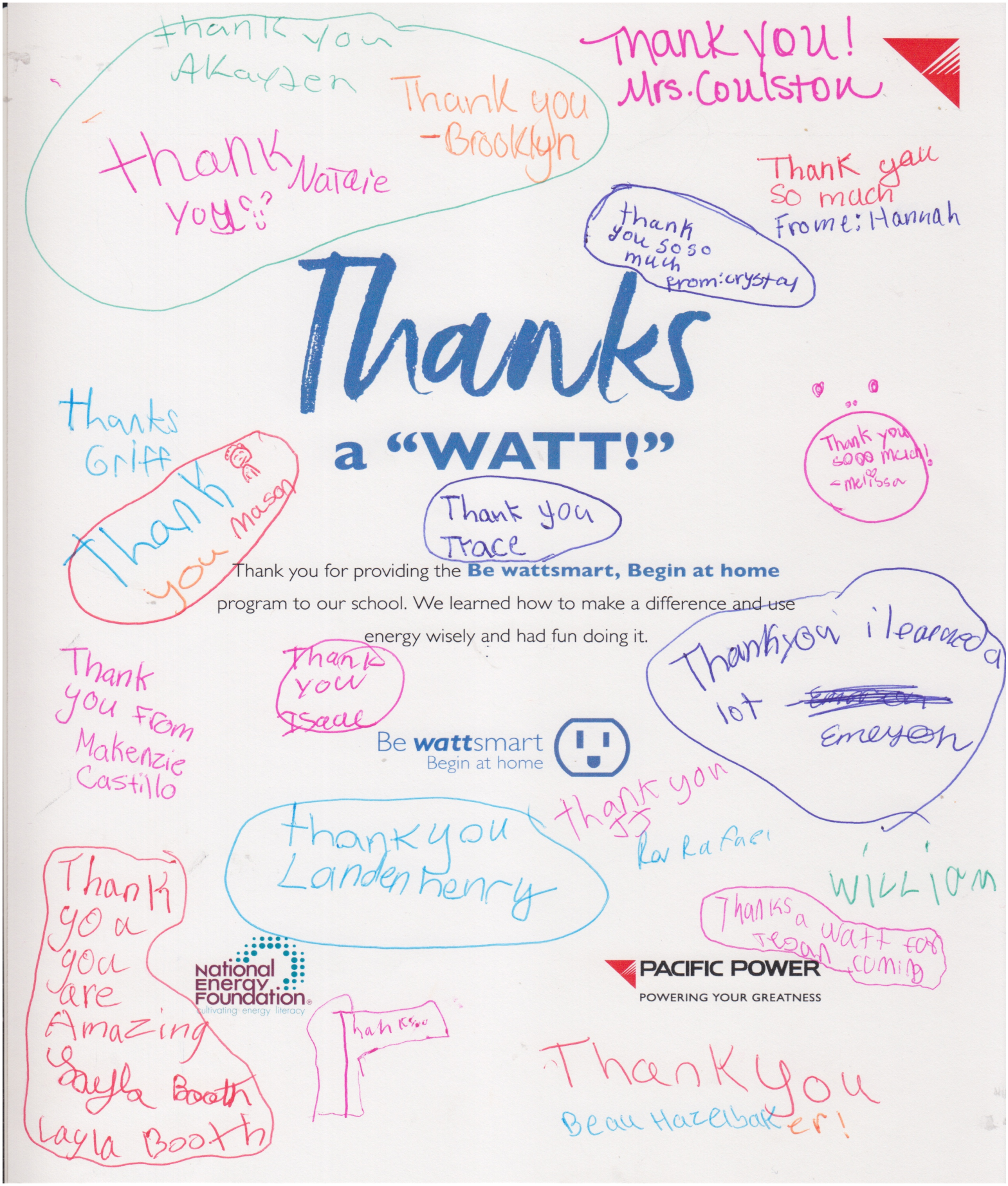
Home Energy Worksheet Summary – Pacific Power

Energy Efficient Activity	Currently do/Have done	Will do	Neither
1. Install and use a programmable or smart thermostat.	57%	18%	25%
2. Caulk windows and weather strip outside doors.	57%	23%	20%
3. Inspect attic insulation and add insulation if needed.	47%	21%	32%
4. Keep furnace air filters clean/replaced regularly.	74%	15%	11%
5. Replace existing air conditioning unit with a high-efficiency unit or an evaporative cooling unit.	49%	20%	30%
6. Close blinds when windows are exposed to the sun.	80%	12%	8%
7. Use a fan instead of air conditioning.	53%	20%	27%
8. In the summer, set thermostat to 78 degrees F or higher.	40%	23%	37%
9. Set the water heater temperature to 120 degrees F.	58%	20%	22%
10. Install a high-efficiency showerhead.	52%	23%	24%
11. Take 5 minute showers.	39%	28%	32%
12. Wash full loads in the dishwasher and clothes washer.	80%	8%	12%
13. Replace incandescent bulbs with LED bulbs.	72%	19%	9%
14. Turn lights off when not in use.	86%	11%	2%
15. Replace old, inefficient refrigerator with an ENERGY STAR model.	54%	24%	23%
16. Unplug old freezers/refrigerators and/or dispose of them in an environmentally safe manner.	53%	20%	27%
17. Maintain refrigerator and freezer coils and check door seals twice yearly.	48%	34%	18%
18. Turn off computers, TVs and game consoles when not in use.	82%	13%	5%
19. Use a microwave oven, toaster oven, slow cooker or outdoor grill instead of a conventional oven.	68%	17%	15%
20. Visit Pacific Power at bewattsmart.com for more energy-saving tips and rebates.	16%	65%	19%

Wise Energy Behaviors in Pacific Power Washington Homes



Sampling of *Thanks a "WATT" Cards*



We learned so much about how we can use electricity responsibly!
-Mrs. Kangas

Emmanuel

Alfredo

Alina

angel

Martin

Jackie

Thanks a "WATT!"

Hanjas

Brooklyn

Aloé

Graven

Kloell

Jandro

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.

Bruseda

Meah

Brianna

Donatin

mackenzie

Be wattsmart Begin at home

Bradley

Lallanie Mc

ariella

Natalee

Destiney

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Zakahi

Ricardo

Thank you so much for continuing to offer such a fun, engaging, and informative presentation! My students loved the presentation and Mr. and Mrs. Smith! They did a fantastic job!

-Hailey McCaffrey

Thanks a "WATT!"

Anthoy Alfredo Carlos

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.

Amy Lizet Benjamin Ariana Yosgalt Miley Francisco Munguia Jesus Roxy Jonathan Quijada Maria Emely Lozano

Be wattsmart Begin at home

YOS Mrs. McCaffrey's Class

Adams Elementary Zitlaly

Ismael Alexsair Jose ~~Mata~~ Brayan Brisia Victor Joshua Jazmine Sofi Dayana Flores Keyri

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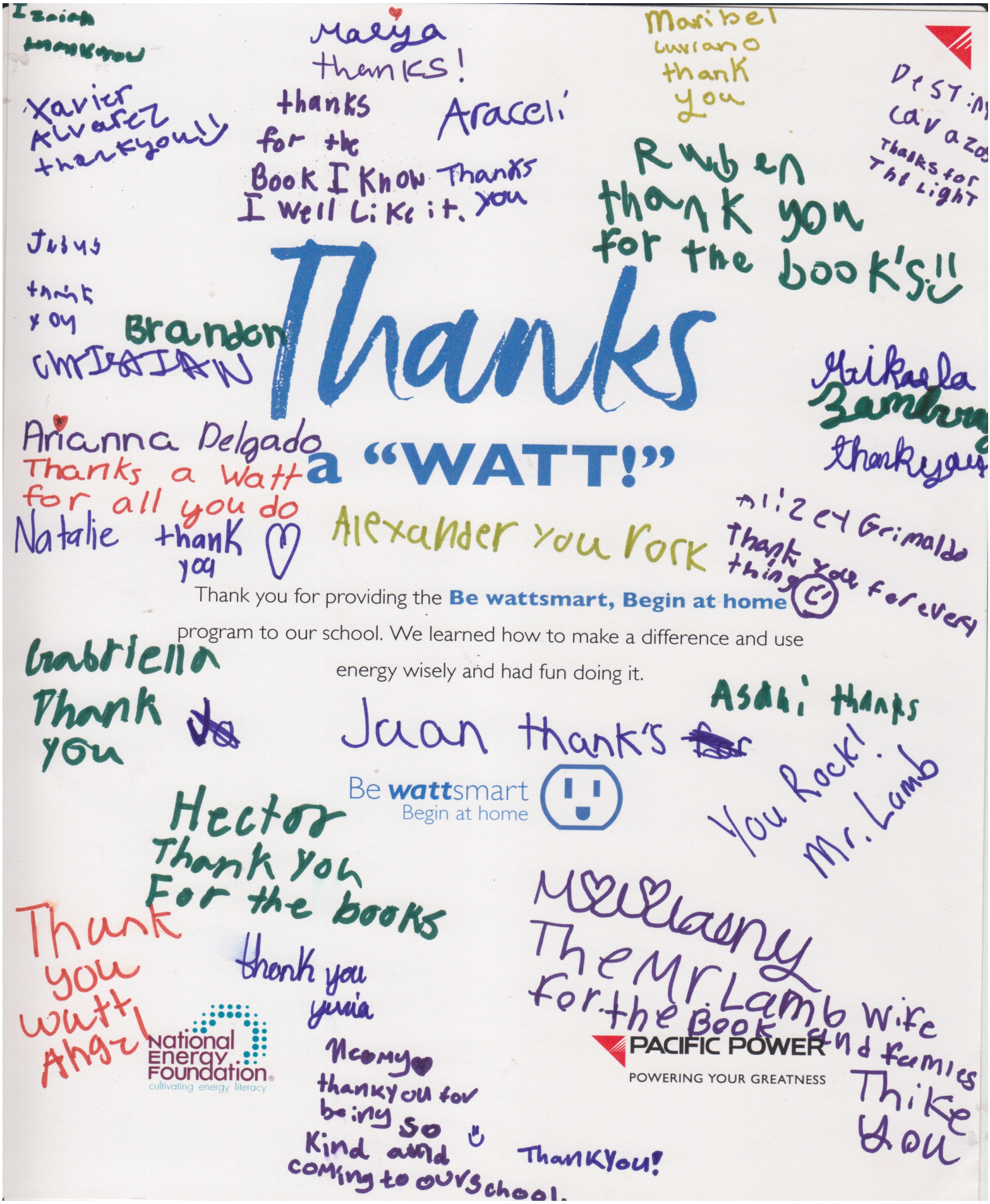

Renee

Monserrat thanks!

Willem

Daemon

it chang my life! - Tomas

thankyou Brandon!!

Omar thank you

Blake G. thank you for your time!

Thank you so much for taking time off your day to do the presentation! - Mace

Thanks a "WATT!"

Addison Thank you!

thankyou for taking your time to talk to us. - Bianca

Ryan

Guido

thanks

Thank you so much! Always enjoyable. Mrs. Strother

Adrianna thank you for your time

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.

Melia thank you for your time!

Be wattsmart Begin at home

Vihey

Frances thank you!

Tierra Thank you for your time. It Changed my life!

James thank you!!

Jasmin thank you!

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Alivia

Kiara Thank you.

thank you

Brayden thankyou

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Appendix 6
Washington Program Evaluations

Washington 2018 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 2018 and the third party evaluator who completed the evaluation. Program evaluations are available for review at www.pacificorp.com/es/dsm/washington.html

Program	Years Evaluated	Evaluator
Low Income Weatherization	2013 - 2015	Opinion Dynamics
Home Energy Reports	2016 - 2017	ADM
*watt*smart Business	2016 - 2017	Cadmus

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

Table 1
Low Income Weatherization Evaluation Recommendations

Evaluation Recommendations	Pacific Power Response
Pacific Power should continue to use the same Program implementers moving forward.	Continuing to partner with Blue Mountain Action Council, NW Community Action Center and Opportunities Industrialization Center of Washington. And, obtained additional agreement with Yakama Tribal Nation in mid-2018.
If it is a priority for Pacific Power to make sure it is recognized for its sponsorship of the Program, consider branding the agency staff who conduct the audits and installation services by wearing shirts with the Pacific Power name and logo.	Discussed logo shirts with legal staff, but not moving forward with this due to liability issues. The company would not have enough control over agency staff to be able to grant a license for them to use the Pacific Power logo.
Pacific Power take a historical look at participation amongst its low income population that likely has electric heat to determine how much of the market has been penetrated thus far. This exercise could also help to identify and target households that have not participated yet.	Over 7,700 homes have been served through the program to-date. We estimate that at least 90% or about 7,000 have installed electric heat. We don't ask for or store customer income data. We track energy assistance payments which are income based. A total of 6,980 households were identified as energy assistance recipients in 2018. We work with our partnering agencies and provide lists of energy assistance recipients with high kWh usage if requested.
Inquire with the implementing agencies, particularly with BMAC, to assess whether they need assistance in providing training for QCIs or auditors to ease the added costs of regulatory compliance.	Discussed with BMAC staff. They don't know how Pacific Power can assist with their QCI issues. Their concern is with the related requirements implemented by the WA State Commerce Department. For example, an employee that is a QCI inspector cannot fulfill other program tasks and so in smaller agencies this is a staffing issue.
Explore this innovating financing tariff (contained in appendix B of this report) that allowed a utility to address both structural and energy improvements through its low income weatherization program at no cost to the participant.	The program tariff allows Pacific Power to cover up to 15% of measure costs on home repairs. In CY2018 the agency billings included 4.4% related to repairs. They could have billed an additional $80,000 to cover these costs, but they have other grants that can pay for repairs. Additionally, there is no funding cap on this program. Because of these factors it has been determined that a financing tariff would not improve upon the program.

Table 2
Home Energy Reports Evaluation Recommendations

Evaluation Recommendations	Pacific Power Action Plan
Consider developing strategies to modify the control group to better-align with the treatment group on an annual or monthly basis. This may include "refilling" the control group with new households or removing control group households to create a new match. Selection of control group replacements at various points during the program, such as at the end of the end of the Legacy and Expansion waves, will help test validity. Such replacements can be chosen using propensity score matching, based on historic kWh usage.	Pacific Power and Bidgely are advocating against a refill of control group at this time for the following reasons. First, this was a recommendation to remediate declining statistical equivalence of the Legacy wave; however, on current inspection, we see that the Legacy treatment and control groups are still statistically equivalent in the pretreatment period. Second, adding users to just the control group may bias the results and create additional overhead in program administration in management of these groups. Moreover, Pacific Power and Bidgely are exploring re-randomizing and creating new treatment and control groups for the program year 2021 onwards, so taking steps to further prolong statistical equivalence is not critical at this juncture.
Where possible, tailor program recommendations to demographics. The Refill wave skews younger, with a lower homeownership rate and with 20% of respondents indicating an income less than $25,000 per year. Program materials sent to this wave should have messaging focused on tips more appropriate for renters and lower income households (e.g., focusing information on low-cost or no-cost efficiency options, rather than on higher -cost appliances).	The home energy reports and the web portal already incorporate a library of tips focused on low cost / no cost efficiency options that customers can easily implement. Examples include adjusting thermostat settings, cleaning of vents or appliance usage tips.
Consider cross-referencing treatment customers with known low income screening tools (such as Low Income Home Energy Assistance Program (LIHEAP) registration) to spur outreach for Pacific Power low income programs. These groups are to some extent pre-engaged with *watts*mart via the home energy report and could be targeted for appropriate income qualified programs.	As explained in response to No. 2, the home energy reports already promote low cost / no cost efficiency options that will be beneficial for any low income recipients receiving the reports for customers; with that said, Pacific Power and the vendor are exploring if any of the home energy report recipients are part of the Washington Low Income Bill Assistance (LIBA) program and if the current data feeds to the vendor have the ability to detect these customers. If so, the team will work on a strategy to try and promote low income programs to this population.

Table 3
*watt*smart Business Evaluation Recommendations

Evaluation Recommendations	Pacific Power Response
Savings: Increase the deemed savings for prescriptive HVAC Variable Frequency Drive (VFD) fan and pump motor projects. To match Cadmus' 2016 Variable Speed Drive Loadshape Project report. Supply Fan Motor - 2,033 kWh/yr/HP Return Fan Motor - 1,788 kWh/yr/HP Exhaust Fan Motor - 1,788 kWh/yr/HP	This recommendation has been reviewed and here is outcome of the review. The Company is required to use Regional Technical Forum (RTF) unit energy savings values where available (or explain why not). RTF has not published deemed values for VFDs applied to HVAC fan and pump motors; however the RTF's Advanced Rooftop Unit Control measure contains analysis that is applicable. Fan motor VFDs savings are being revised based on the HVAC VFD fan portion of the RTF analysis of the advanced rooftop unit controls unit energy savings measure where data for VFDs applied to fan motors could be separated from other advanced rooftop unit component savings.
Marketing: Consider the following opportunities and incorporate those that can be done cost effectively.	Due to cost-effectiveness considerations, some (but not all) of the recommendations can be implemented. See the responses below for each item.
Re-institute the Energy Insights newsletter or identify a similar vehicle to distribute case studies	The Company does not have plans to re-institute the Energy Insights newsletter at this time. Case study videos are in development in 2019 and will be hosted online and distributed via email with links to the videos.
Provide links in print ads, directing customers to case studies or other sources of more detailed information	The Company will take this recommendation under advisement.
Use images within the text of the program brochure to convey information visually as well as through text.	The Company will take this recommendation under advisement.
Format eblasts consistently to ensure customers identify them all with the program	Implemented. In 2018, the company launched a new brand look/feel. Our emails are deployed in templates to align with brand for consistency.
Issue eblasts throughout the year, concurrent with program changes.	We will take this recommendation under consideration.
Update case studies from 2014 if new information is available or create additional studies	We are creating video case studies in 2019 and have plans to replace some of the older ones. The video case studies will also be repurposed into a paper/handout case study.
Project Data: Establish one protocol for using the custom designation and apply it across Pacific Power's, the program administrators', and their subcontractors' project data.	Implemented. The measure library was updated to use the same field to designate the custom measures. Projects started prior to the update may still have inconsistencies in which field has the custom

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	designation. Once all projects started prior to the update are completed, the inconsistencies will be addressed.
Project Data: Include contact information for participants in the Instant Incentives offer, in the program participant database provided to the program evaluation team.	Implemented. Customer participant contact information (phone and/or email) is being consistently collected and uploaded into the company database and the report provided to the program evaluation team has been fixed to pull this data from the database.