



Appendix 1

Washington Cost Effectiveness

Pacific Power



Memorandum

Navigant estimated the cost-effectiveness for the overall energy efficiency portfolio and component sectors, based on 2017 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall energy efficiency portfolio and the two sector components.

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

Table 1 - Utility Inputs

Table 2 – Portfolio Level Costs 2017

Table 3 – NEEA Inputs 2017

Table 4 - Benefit/Cost Ratios by Portfolio Type

Table 5 – 2017 Total Portfolio Cost-Effectiveness Results

Table 6 – 2017 Total Portfolio Cost-Effectiveness Results (Including NEEA)

Table 7 – 2017 Total Portfolio Cost-Effectiveness Results (Including NEBs)

Table 8 – 2017 Total Portfolio Cost-Effectiveness Results (Including NEEA and NEBs)

Table 9 – 2017 C&I Energy Efficiency Portfolio Cost-Effectiveness Results

Table 10 – 2017 C&I Energy Efficiency Portfolio Cost-Effectiveness Results (Including NEEA)

Table 11 – 2017 Residential Energy Efficiency Portfolio Cost-Effectiveness Results

Table 12 – 2017 Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEEA)

Table 13 – 2017 Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEBs)

Table 14 – 2017 Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEEA and NEBs)

Table 15 – Home Energy Savings Non-Energy Benefits (2017)

Table 1 - Utility Inputs

Parameter	Value
Discount Rate	6.66%
Residential Line Loss	9.67%
Commercial Line Loss	9.53%
Industrial Line Loss	8.16%
Irrigation Line Loss	9.67%
Residential Energy Rate (\$/kWh) ¹	\$0.0906
Commercial Energy Rate (\$/kWh) ¹	\$0.0849
Industrial Energy Rate (\$/kWh) ¹	\$0.0694
Irrigation Energy Rate (\$/kWh) ¹	\$0.0843
Inflation Rate	1.90%

¹ Future rates determined using a 1.9% annual escalator.

Table 2 – Portfolio Level Costs 2017

Expense	Cost
School Energy Education	\$61,509
Outreach and Communication	\$229,735
Portfolio Evaluation	\$572,538
Portfolio Potential Study	\$9,488
Portfolio System Support	\$33,421
Total Costs	\$906,691

Table 3 – NEEA Inputs 2017

Sector	Savings at Meter (kWh)	NEEA Expenses (\$)
Residential	1,677,232	\$546,719
Industrial	874,904	\$285,188
Commercial	34,815	\$11,349
Total	2,586,952	\$843,255

Table 4 - Benefit/Cost Ratios by Portfolio Type

Measure Group	PTRC	TRC	UCT	RIM	PCT
Total Portfolio	1.82	1.66	2.76	0.65	3.38
Total Portfolio (Including NEEA)	1.78	1.62	2.60	0.63	3.51
Total Portfolio (Including NEBs)	2.01	1.84	2.76	0.65	3.66
Total Portfolio (Including NEEA & NEBs)	1.95	1.79	2.60	0.63	3.79
C&I Programs	2.10	1.91	3.57	0.72	3.32
C&I Programs (Including NEEA)	2.07	1.88	3.44	0.71	3.38
Residential Programs	1.57	1.43	2.13	0.53	3.54
Residential Programs (Including NEEA)	1.49	1.36	1.92	0.51	3.82
Residential Programs (Including NEBs)	2.21	2.07	2.13	0.53	4.51
Residential Programs (Including NEEA & NEBs)	2.06	1.93	1.92	0.51	4.80

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

Table 5 – 2017 Total Portfolio Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0446	\$15,546,562	\$28,348,883	\$12,802,321	1.82
Total Resource Cost Test (TRC) No Adder	\$0.0446	\$15,546,562	\$25,771,712	\$10,225,150	1.66
Utility Cost Test (UCT)	\$0.0267	\$9,325,852	\$25,771,712	\$16,445,860	2.76
Rate Impact Test (RIM)		\$39,769,948	\$25,771,712	-\$13,998,236	0.65
Participant Cost Test (PCT)		\$10,165,068	\$34,388,454	\$24,223,386	3.38
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000123720
Discounted Participant Payback (years)					1.66

Table 6 – 2017 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	\$0.0453	\$16,389,817	\$29,134,272	\$12,744,455	1.78
Total Resource Cost Test (TRC) No Adder	\$0.0453	\$16,389,817	\$26,485,702	\$10,095,885	1.62
Utility Cost Test (UCT)	\$0.0281	\$10,169,107	\$26,485,702	\$16,316,595	2.60
Rate Impact Test (RIM)		\$41,895,512	\$26,485,702	-\$15,409,810	0.63
Participant Cost Test (PCT)		\$10,165,068	\$35,670,763	\$25,505,695	3.51
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000127985
Discounted Participant Payback (years)					1.56

Table 7 – 2017 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	\$0.0446	\$15,546,562	\$31,200,372	\$15,653,810	2.01
Total Resource Cost Test (TRC) No Adder	\$0.0446	\$15,546,562	\$28,623,201	\$13,076,639	1.84
Utility Cost Test (UCT)	\$0.0267	\$9,325,852	\$25,771,712	\$16,445,860	2.76
Rate Impact Test (RIM)		\$39,769,948	\$25,771,712	-\$13,998,236	0.65
Participant Cost Test (PCT)		\$10,165,068	\$37,239,943	\$27,074,875	3.66
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000123720
Discounted Participant Payback (years)					1.66

Table 8 – 2017 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	\$0.0453	\$16,389,817	\$31,985,761	\$15,595,944	1.95
Total Resource Cost Test (TRC) No Adder	\$0.0453	\$16,389,817	\$29,337,191	\$12,947,374	1.79
Utility Cost Test (UCT)	\$0.0281	\$10,169,107	\$26,485,702	\$16,316,595	2.60
Rate Impact Test (RIM)		\$41,895,512	\$26,485,702	-\$15,409,810	0.63
Participant Cost Test (PCT)		\$10,165,068	\$38,522,252	\$28,357,184	3.79
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000127985
Discounted Participant Payback (years)					1.56

Table 9 – 2017 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	\$0.0396	\$10,171,833	\$21,334,984	\$11,163,151	2.10
Total Resource Cost Test (TRC) No Adder	\$0.0396	\$10,171,833	\$19,395,440	\$9,223,607	1.91
Utility Cost Test (UCT)	\$0.0211	\$5,428,707	\$19,395,440	\$13,966,732	3.57
Rate Impact Test (RIM)		\$26,939,493	\$19,395,440	-\$7,544,053	0.72
Participant Cost Test (PCT)		\$7,230,892	\$23,998,552	\$16,767,660	3.32
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000148319
Discounted Participant Payback (years)					2.44

Table 10 – 2017 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	\$0.0400	\$10,468,370	\$21,648,747	\$11,180,378	2.07
Total Resource Cost Test (TRC) No Adder	\$0.0400	\$10,468,370	\$19,680,679	\$9,212,310	1.88
Utility Cost Test (UCT)	\$0.0219	\$5,725,244	\$19,680,679	\$13,955,436	3.44
Rate Impact Test (RIM)		\$27,686,962	\$19,680,679	-\$8,006,282	0.71
Participant Cost Test (PCT)		\$7,230,892	\$24,449,484	\$17,218,592	3.38
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000143730
Discounted Participant Payback (years)					2.34

Table 11 – 2017 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	\$0.0486	\$4,468,038	\$7,013,899	\$2,545,861	1.57
Total Resource Cost Test (TRC) No Adder	\$0.0486	\$4,468,038	\$6,376,272	\$1,908,234	1.43
Utility Cost Test (UCT)	\$0.0325	\$2,990,453	\$6,376,272	\$3,385,819	2.13
Rate Impact Test (RIM)		\$11,923,764	\$6,376,272	-\$5,547,492	0.53
Participant Cost Test (PCT)		\$2,934,176	\$10,389,903	\$7,455,726	3.54
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000089073
Discounted Participant Payback (years)					0.82

Table 12 – 2017 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	\$0.0498	\$5,014,757	\$7,485,524	\$2,470,768	1.49
Total Resource Cost Test (TRC) No Adder	\$0.0498	\$5,014,757	\$6,805,022	\$1,790,266	1.36
Utility Cost Test (UCT)	\$0.0352	\$3,537,172	\$6,805,022	\$3,267,850	1.92
Rate Impact Test (RIM)		\$13,301,859	\$6,805,022	-\$6,496,837	0.51
Participant Cost Test (PCT)		\$2,934,176	\$11,221,279	\$8,287,103	3.82
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000100415
Discounted Participant Payback (years)					0.75

Table 13 – 2017 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	\$0.0486	\$4,468,038	\$9,865,388	\$5,397,350	2.21
Total Resource Cost Test (TRC) No Adder	\$0.0486	\$4,468,038	\$9,227,761	\$4,759,723	2.07
Utility Cost Test (UCT)	\$0.0325	\$2,990,453	\$6,376,272	\$3,385,819	2.13
Rate Impact Test (RIM)		\$11,923,764	\$6,376,272	-\$5,547,492	0.53
Participant Cost Test (PCT)		\$2,934,176	\$13,241,392	\$10,307,215	4.51
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000089073
Discounted Participant Payback (years)					0.82

Table 14 – 2017 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	\$0.0498	\$5,014,757	\$10,337,014	\$5,322,257	2.06
Total Resource Cost Test (TRC) No Adder	\$0.0498	\$5,014,757	\$9,656,511	\$4,641,755	1.93
Utility Cost Test (UCT)	\$0.0352	\$3,537,172	\$6,805,022	\$3,267,850	1.92
Rate Impact Test (RIM)		\$13,301,859	\$6,805,022	-\$6,496,837	0.51
Participant Cost Test (PCT)		\$2,934,176	\$14,072,768	\$11,138,592	4.80
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000100415
Discounted Participant Payback (years)					0.75

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

Table 15 – Home Energy Savings Non-Energy Benefits (2017)

Non-Energy Benefits	Non-Energy Benefits Water (\$/yr)	Non-Energy Benefits Other (\$/yr)	Measure Life	Quantity	Total Present Value Benefits
Appliances with NEBs	\$3,748	\$54	14.0	162	\$36,166
Energy Kits - DHW with NEBs	\$53,706	\$4,061	10.1	1,562	\$442,021
Energy Kits - Lighting with NEBs	\$0	\$1,027	12.0	395	\$8,860
HVAC with NEBs	\$0	\$5,486	16.7	1,354	\$57,879
Lighting with NEBs	\$0	\$267,059	12.0	359,958	\$2,306,564
Total HES NEBs	\$57,455	\$277,687	-	363,431	\$2,851,489



Memorandum

Navigant estimated the cost-effectiveness results for the Washington Home Energy Savings Program, based on 2017 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 2015 IRP west residential whole house 64%, west residential lighting 45%, west residential heating 17%, and west water heating – 53% decrements. The program passes the cost-effectiveness for all test except the RIM. The memo consists of the following tables.

- Table 1 - Home Energy Savings Inputs
- Table 2 – Home Energy Savings Annual Program Costs
- Table 3 – Home Energy Savings – Savings by Measure Category
- Table 4 - Benefit/Cost Ratios by Measure Category
- Table 5 – Home Energy Savings Program Level (without NEBs) Cost-Effectiveness Results
- Table 6 - Home Energy Savings Appliances Cost-Effectiveness Results
- Table 7 - Home Energy Savings Building Shell Cost-Effectiveness Results
- Table 8 - Home Energy Savings Energy Kits – DHW Cost-Effectiveness Results
- Table 9 - Home Energy Savings Energy Kits – Lighting Cost-Effectiveness Results
- Table 10 - Home Energy Savings HVAC Cost-Effectiveness Results
- Table 11 - Home Energy Savings Lighting Cost-Effectiveness Results
- Table 12 - Home Energy Savings Water Heating Cost-Effectiveness Results
- Table 13 - Home Energy Savings Whole Home Cost-Effectiveness Results
- Table 14 - Home Energy Savings Non-Energy Benefits by Measure
- Table 15 - Home Energy Savings Program (with NEBs) Cost-Effectiveness Results
- Table 16 - Home Energy Savings Appliances (with NEBs) Cost-Effectiveness Results
- Table 17 - Home Energy Savings Energy Kit – DHW (with NEBs) Cost-Effectiveness Results
- Table 18 - Home Energy Savings Energy Kit – Lighting (with NEBs) Cost-Effectiveness Results
- Table 19 - Home Energy Savings HVAC (with NEBs) Cost-Effectiveness Results
- Table 20 - Home Energy Savings Lighting (with NEBs) Cost-Effectiveness Results

Table 1 - Home Energy Savings Inputs

Parameter	Value
Discount Rate	6.66%
Residential Line Loss	9.67%
Residential Energy Rate (\$/kWh) ¹	\$0.0906
Inflation Rate	1.90%

¹ Future rates determined using a 1.9% 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	\$102	\$6,676	\$74	\$8,200	\$15,052	\$20,680
Building Shell	\$0	\$367	\$23,987	\$264	\$59,303	\$83,921	\$187,219
Energy Kits - DHW	\$0	\$3,125	\$103,042	\$2,253	\$20,147	\$128,568	\$20,147
Energy Kits - Lighting	\$0	\$124	\$4,079	\$89	\$2,291	\$6,583	\$2,291
HVAC	\$0	\$10,088	\$659,747	\$7,274	\$786,464	\$1,463,573	\$1,303,891
Lighting	\$0	\$26,450	\$113,780	\$19,074	\$514,269	\$673,573	\$1,300,421
Water Heating	\$0	\$449	\$29,358	\$324	\$36,918	\$67,048	\$46,482
Whole Home	\$0	\$348	\$22,731	\$251	\$29,000	\$52,329	\$53,045
Total	\$0	\$41,051	\$963,400	\$29,603	\$1,456,592	\$2,490,647	\$2,934,176

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	20,613	100%	20,613	100%	20,613	14
Building Shell	74,057	100%	74,057	100%	74,057	45
Energy Kits - DHW	630,974	100%	630,974	100%	630,974	10
Energy Kits - Lighting	24,980	100%	24,980	100%	24,980	12
HVAC	2,036,915	85%	1,731,378	100%	1,731,378	17
Lighting	5,340,901	85%	4,539,766	100%	4,539,766	12
Water Heating	90,640	89%	80,670	100%	80,670	13
Whole Home	70,180	100%	70,180	100%	70,180	27
Total	8,289,259	87%	7,172,617	100%	7,172,617	14

Table 4 - Benefit/Cost Ratios by Measure Category

Measure Group	PTRC	TRC	UCT	RIM	PCT
Appliances with NEBs	1.92	1.86	1.00	0.43	3.12
Appliances	0.60	0.55	1.00	0.43	1.37
Building Shell	0.43	0.39	1.00	0.38	1.03
Energy Kits with NEBs - DHW	6.38	6.12	2.68	0.57	46.69
Energy Kits - DHW	2.95	2.68	2.68	0.57	24.75
Energy Kits with NEBs - Lighting	3.97	3.74	2.39	0.55	14.38
Energy Kits - Lighting	2.63	2.39	2.39	0.55	10.51
HVAC with NEBs	1.08	0.98	1.29	0.56	2.13
HVAC	1.05	0.95	1.29	0.56	2.09
Lighting with NEBs	3.73	3.54	4.24	0.62	5.22
Lighting	2.15	1.96	4.24	0.62	3.44
Water Heating	0.80	0.73	0.83	0.39	2.40
Whole Home	0.94	0.86	1.25	0.42	2.49
Total with NEBs	2.20	2.06	2.14	0.58	3.76
Total	1.48	1.34	2.14	0.58	2.79

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	\$0.0573	\$3,968,232	\$5,861,021	\$1,892,790	1.48
Total Resource Cost Test (TRC) No Adder	\$0.0573	\$3,968,232	\$5,328,201	\$1,359,969	1.34
Utility Cost Test (UCT)	\$0.0360	\$2,490,647	\$5,328,201	\$2,837,554	2.14
Rate Impact Test (RIM)		\$9,216,961	\$5,328,201	-\$3,888,760	0.58
Participant Cost Test (PCT)		\$2,934,176	\$8,182,905	\$5,248,729	2.79
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000064100
Discounted Participant Payback (years)					2.30

Table 6 through Table 12 provides cost-effectiveness results without NEBs for all 8 measures.

**Table 6 - Home Energy Savings Appliances Cost-Effectiveness Results
 (Decrement - West Water Heating – 53%, Load Shape – Residential_ERWH_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1329	\$27,532	\$16,590	-\$10,942	0.60
Total Resource Cost Test (TRC) No Adder	\$0.1329	\$27,532	\$15,082	-\$12,450	0.55
Utility Cost Test (UCT)	\$0.0726	\$15,052	\$15,082	\$30	1.00
Rate Impact Test (RIM)		\$35,190	\$15,082	-\$20,108	0.43
Participant Cost Test (PCT)		\$20,680	\$28,338	\$7,658	1.37
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000003558
Discounted Participant Payback (years)					7.60

**Table 7 - Home Energy Savings Building Shell Cost-Effectiveness Results
 (Decrement - West Residential Whole House - 64%, Load Shape – WA_Single_Family_Heating)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1553	\$211,837	\$91,984	-\$119,853	0.43
Total Resource Cost Test (TRC) No Adder	\$0.1553	\$211,837	\$83,622	-\$128,215	0.39
Utility Cost Test (UCT)	\$0.0615	\$83,921	\$83,622	-\$299	1.00
Rate Impact Test (RIM)		\$217,487	\$83,622	-\$133,865	0.38
Participant Cost Test (PCT)		\$187,219	\$192,869	\$5,650	1.03
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000007336
Discounted Participant Payback (years)					n/a

**Table 8 - Home Energy Savings Energy Kits – DHW Cost-Effectiveness Results
 (Decrement - West Water Heating - 53%, Load Shape – Residential_ERWH_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0261	\$128,568	\$378,670	\$250,102	2.95
Total Resource Cost Test (TRC) No Adder	\$0.0261	\$128,568	\$344,245	\$215,677	2.68
Utility Cost Test (UCT)	\$0.0261	\$128,568	\$344,245	\$215,677	2.68
Rate Impact Test (RIM)		\$606,998	\$344,245	-\$262,752	0.57
Participant Cost Test (PCT)		\$20,147	\$498,577	\$478,430	24.75
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000065146
Discounted Participant Payback (years)					n/a

**Table 9 - Home Energy Savings Energy Kits – Lighting Cost-Effectiveness Results
(Decrement - West Residential Lighting - 45%, Load Shape – Residential_Lighting_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0293	\$6,583	\$17,301	\$10,718	2.63
Total Resource Cost Test (TRC) No Adder	\$0.0293	\$6,583	\$15,728	\$9,145	2.39
Utility Cost Test (UCT)	\$0.0293	\$6,583	\$15,728	\$9,145	2.39
Rate Impact Test (RIM)		\$28,381	\$15,728	-\$12,652	0.55
Participant Cost Test (PCT)		\$2,291	\$24,088	\$21,797	10.51
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000002613
Discounted Participant Payback (years)					n/a

**Table 10 - Home Energy Savings HVAC Cost-Effectiveness Results
(Decrement - West Residential Heating - 17%, 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	\$0.0997	\$1,981,001	\$2,079,056	\$98,055	1.05
Total Resource Cost Test (TRC) No Adder	\$0.0997	\$1,981,001	\$1,890,051	-\$90,950	0.95
Utility Cost Test (UCT)	\$0.0736	\$1,463,573	\$1,890,051	\$426,477	1.29
Rate Impact Test (RIM)		\$3,397,020	\$1,890,051	-\$1,506,969	0.56
Participant Cost Test (PCT)		\$1,303,891	\$2,719,911	\$1,416,019	2.09
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000219373
Discounted Participant Payback (years)					3.43

**Table 11 - Home Energy Savings Lighting Cost-Effectiveness Results
(Decrement - West Residential Lighting - 45%, Load Shape – Residential_Lighting_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0358	\$1,459,724	\$3,144,277	\$1,684,552	2.15
Total Resource Cost Test (TRC) No Adder	\$0.0358	\$1,459,724	\$2,858,433	\$1,398,709	1.96
Utility Cost Test (UCT)	\$0.0165	\$673,573	\$2,858,433	\$2,184,861	4.24
Rate Impact Test (RIM)		\$4,634,952	\$2,858,433	-\$1,776,518	0.62
Participant Cost Test (PCT)		\$1,300,421	\$4,475,648	\$3,175,227	3.44
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000366889
Discounted Participant Payback (years)					1.92

**Table 12 - Home Energy Savings Water Heating Cost-Effectiveness Results
(Decrement - West Water Heating - 53%, Load Shape – Residential_ERWH_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0996	\$76,612	\$61,238	-\$15,375	0.80
Total Resource Cost Test (TRC) No Adder	\$0.0996	\$76,612	\$55,671	-\$20,942	0.73
Utility Cost Test (UCT)	\$0.0872	\$67,048	\$55,671	-\$11,377	0.83
Rate Impact Test (RIM)		\$141,746	\$55,671	-\$86,075	0.39
Participant Cost Test (PCT)		\$46,482	\$111,616	\$65,134	2.40
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000016406
Discounted Participant Payback (years)					1.30

**Table 13 - Home Energy Savings Whole Home Cost-Effectiveness Results
(Decrement - West Res. Whole House - 64%, 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	\$0.0724	\$76,374	\$71,906	-\$4,468	0.94
Total Resource Cost Test (TRC) No Adder	\$0.0724	\$76,374	\$65,369	-\$11,005	0.86
Utility Cost Test (UCT)	\$0.0496	\$52,329	\$65,369	\$13,040	1.25
Rate Impact Test (RIM)		\$155,188	\$65,369	-\$89,819	0.42
Participant Cost Test (PCT)		\$53,045	\$131,859	\$78,814	2.49
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000008215
Discounted Participant Payback (years)					3.97

In addition to the energy benefits reported above, appliances, energy savings kits, HVAC and lighting in the Home Energy Savings program offer significant non-energy benefits (NEBs). Table 14 through Table 20 detail the non-energy benefits and cost-effectiveness results.

Table 14 - 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	\$3,748	\$54	162	14.0	\$3,802	6.66%	\$36,166
Energy Kits - DHW	\$53,706	\$4,061	1,562	10.1	\$57,768	6.66%	\$442,021
Energy Kits - Lighting	\$0	\$1,027	395	12.0	\$1,027	6.66%	\$8,860
HVAC	\$0	\$5,486	1,354	16.7	\$5,486	6.66%	\$57,879
Lighting	\$0	\$267,059	359,958	12.0	\$267,059	6.66%	\$2,306,564
Total NEBs	\$57,455	\$277,687	363,431	-	\$335,142	-	\$2,851,489

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

Table 15 - 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	\$0.0573	\$3,968,232	\$8,712,510	\$4,744,279	2.20
Total Resource Cost Test (TRC) No Adder	\$0.0573	\$3,968,232	\$8,179,690	\$4,211,459	2.06
Utility Cost Test (UCT)	\$0.0360	\$2,490,647	\$5,328,201	\$2,837,554	2.14
Rate Impact Test (RIM)		\$9,216,961	\$5,328,201	-\$3,888,760	0.58
Participant Cost Test (PCT)		\$2,934,176	\$11,034,395	\$8,100,218	3.76
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000064100
Discounted Participant Payback (years)					2.30

Table 16 - Home Energy Savings Appliances (with NEBs) Cost-Effectiveness Results (Decrement - West Water Heating - 53%, Load Shape – Residential_ERWH_7P)

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1329	\$27,532	\$52,756	\$25,224	1.92
Total Resource Cost Test (TRC) No Adder	\$0.1329	\$27,532	\$51,248	\$23,716	1.86
Utility Cost Test (UCT)	\$0.0726	\$15,052	\$15,082	\$30	1.00
Rate Impact Test (RIM)		\$35,190	\$15,082	-\$20,108	0.43
Participant Cost Test (PCT)		\$20,680	\$64,504	\$43,824	3.12
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000003558
Discounted Participant Payback (years)					7.60

Table 17 - Home Energy Savings Energy Kit – DHW (with NEBs) Cost-Effectiveness Results (Decrement - West Water Heating - 53%, Load Shape – Residential_ERWH_7P)

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0261	\$128,568	\$820,690	\$692,122	6.38
Total Resource Cost Test (TRC) No Adder	\$0.0261	\$128,568	\$786,266	\$657,698	6.12
Utility Cost Test (UCT)	\$0.0261	\$128,568	\$344,245	\$215,677	2.68
Rate Impact Test (RIM)		\$606,998	\$344,245	-\$262,752	0.57
Participant Cost Test (PCT)		\$20,147	\$940,598	\$920,450	46.69
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000065146
Discounted Participant Payback (years)					n/a

**Table 18 - Home Energy Savings Energy Kit – Lighting (with NEBs) Cost-Effectiveness Results
(Decrement - West Residential Lighting - 45%, Load Shape – Residential_Lighting_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0293	\$6,583	\$26,161	\$19,578	3.97
Total Resource Cost Test (TRC) No Adder	\$0.0293	\$6,583	\$24,589	\$18,005	3.74
Utility Cost Test (UCT)	\$0.0293	\$6,583	\$15,728	\$9,145	2.39
Rate Impact Test (RIM)		\$28,381	\$15,728	-\$12,652	0.55
Participant Cost Test (PCT)		\$2,291	\$32,949	\$30,658	14.38
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000002613
Discounted Participant Payback (years)					n/a

**Table 19 - Home Energy Savings HVAC (with NEBs) Cost-Effectiveness Results
(Decrement - West Residential Heating - 17%, 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	\$0.0997	\$1,981,001	\$2,136,935	\$155,934	1.08
Total Resource Cost Test (TRC) No Adder	\$0.0997	\$1,981,001	\$1,947,929	-\$33,071	0.98
Utility Cost Test (UCT)	\$0.0736	\$1,463,573	\$1,890,051	\$426,477	1.29
Rate Impact Test (RIM)		\$3,397,020	\$1,890,051	-\$1,506,969	0.56
Participant Cost Test (PCT)		\$1,303,891	\$2,777,789	\$1,473,898	2.13
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000219373
Discounted Participant Payback (years)					3.43

**Table 20 - Home Energy Savings Lighting (with NEBs) Cost-Effectiveness Results
(Decrement - West Residential Lighting - 45%, Load Shape – Residential_Lighting_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0358	\$1,459,724	\$5,450,840	\$3,991,116	3.73
Total Resource Cost Test (TRC) No Adder	\$0.0358	\$1,459,724	\$5,164,997	\$3,705,273	3.54
Utility Cost Test (UCT)	\$0.0165	\$673,573	\$2,858,433	\$2,184,861	4.24
Rate Impact Test (RIM)		\$4,634,952	\$2,858,433	-\$1,776,518	0.62
Participant Cost Test (PCT)		\$1,300,421	\$6,782,212	\$5,481,791	5.22
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000366889
Discounted Participant Payback (years)					1.92



Memorandum

Navigant estimated the cost-effectiveness results for the Washington Home Energy Reporting Program, based on 2017 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program.

Cost-effectiveness was tested using the 2015 IRP west residential whole house 64% load factor decrement. The program passes the cost-effectiveness for all the tests except the RIM and PCT tests.

Table 1 - Home Energy Reporting Inputs

Table 2 – Home Energy Reporting Annual Program Costs

Table 3 – Home Energy Reporting Savings by Measure Category

Table 4 - Benefit/Cost Ratios by Measure Category

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

Table 6 – HER Expansion Measure Cost-Effectiveness Results

Table 7 – HER Legacy + Refill Cost-Effectiveness Results

Table 1 - Home Energy Reporting Inputs

Parameter	Value
Discount Rate	6.66%
Residential Line Loss	9.67%
Residential Energy Rate (\$/kWh) ¹	\$0.0906
Inflation Rate	1.90%

¹ Future rates determined using a 1.9% annual escalator.

Table 2 – Home Energy Reporting Annual Program Costs

Measure Category	Engineering Costs	Utility Admin	Program Delivery	Program Development	Incentives	Total Utility Costs	Gross Customer Costs
Expansion	\$0	\$3,484	\$334,159	\$10,211	\$0	\$347,854	\$0
Legacy + Refill	\$0	\$3,510	\$138,156	\$10,287	\$0	\$151,952	\$0
Total	\$0	\$6,994	\$472,315	\$20,498	\$0	\$499,806	\$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
Expansion	6,090,309	100%	6,090,309	100%	6,090,309	2
Legacy + Refill	6,135,284	100%	6,135,284	100%	6,135,284	2
Total	12,225,593	100%	12,225,593	100%	12,225,593	2

Table 4 - Benefit/Cost Ratios by Measure Category

Measure Category	PTRC	TRC	UCT	RIM	PCT
Expansion	1.65	1.50	1.50	0.36	0.00
Legacy + Refill	3.81	3.46	3.46	0.42	0.00
Total	2.31	2.10	2.10	0.39	0.00

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0219	\$499,806	\$1,152,878	\$653,072	2.31
Total Resource Cost Test (TRC) No Adder	\$0.0219	\$499,806	\$1,048,071	\$548,265	2.10
Utility Cost Test (UCT)	\$0.0219	\$499,806	\$1,048,071	\$548,265	2.10
Rate Impact Test (RIM)		\$2,706,803	\$1,048,071	-\$1,658,732	0.39
Participant Cost Test (PCT)		\$0	\$2,206,997	\$2,206,997	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001028453
Discounted Participant Payback (years)					n/a

Table 6 and Table 7 provide cost-effectiveness results for both measures.

**Table 6 – HER Expansion Measure Cost-Effectiveness Results
 (Decrement - West Res. Whole House - 64%, 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	\$0.0306	\$347,854	\$574,318	\$226,464	1.65
Total Resource Cost Test (TRC) No Adder	\$0.0306	\$347,854	\$522,108	\$174,254	1.50
Utility Cost Test (UCT)	\$0.0306	\$347,854	\$522,108	\$174,254	1.50
Rate Impact Test (RIM)		\$1,447,293	\$522,108	-\$925,185	0.36
Participant Cost Test (PCT)		\$0	\$1,099,439	\$1,099,439	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001147274
Discounted Participant Payback (years)					n/a

**Table 7 – HER Legacy + Refill Cost-Effectiveness Results
 (Decrement - West Res. Whole House - 64%, 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	\$0.0133	\$151,952	\$578,560	\$426,607	3.81
Total Resource Cost Test (TRC) No Adder	\$0.0133	\$151,952	\$525,963	\$374,011	3.46
Utility Cost Test (UCT)	\$0.0133	\$151,952	\$525,963	\$374,011	3.46
Rate Impact Test (RIM)		\$1,259,510	\$525,963	-\$733,547	0.42
Participant Cost Test (PCT)		\$0	\$1,107,558	\$1,107,558	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000909633
Discounted Participant Payback (years)					n/a



Memorandum

Navigant estimated the cost-effectiveness results for the Washington Low Income Weatherization Program, based on 2017 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program.

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

Table 1 - Home Energy Savings Inputs

Table 2 - Low Income Weatherization Annual Program Costs

Table 3 - Low Income Weatherization Savings by Measure Category

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

Table 5 - Low Income Weatherization Non-Energy Benefits

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

Table 1 - Home Energy Savings Inputs

Parameter	Value
Discount Rate	6.66%
Residential Line Loss	9.67%
Residential Energy Rate (\$/kWh) ¹	\$0.0906
Inflation Rate	1.90%

¹ Future rates determined using a 1.9% 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	\$23,640	\$134,214	\$5,868	\$4,043	\$930,299	\$1,098,065	\$0
Total	\$0	\$23,640	\$134,214	\$5,868	\$4,043	\$930,299	\$1,098,065	\$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	276,750	76%	210,330	100%	210,330	30
Total	276,750	76%	210,330	100%	210,330	30

**Table 4 - Low Income Weatherization Program Level Cost-Effectiveness Results
 (Decrement - West Res. Whole House - 64%, 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	\$0.3304	\$1,098,065	\$229,692	-\$868,373	0.21
Total Resource Cost Test (TRC) No Adder	\$0.3304	\$1,098,065	\$208,811	-\$889,254	0.19
Utility Cost Test (UCT)	\$0.3304	\$1,098,065	\$208,811	-\$889,254	0.19
Rate Impact Test (RIM)		\$1,422,569	\$208,811	-\$1,213,758	0.15
Participant Cost Test (PCT)		\$0	\$1,254,803	\$1,254,803	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000099876
Discounted Participant Payback (years)					n/a

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

Table 5 - Low Income Weatherization Non-Energy Benefits

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

Table 6 - Low Income Weatherization Program (with NEBs) Level Cost-Effectiveness Results (Decrement - West Res. Whole House - 64%, 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	\$0.3304	\$1,098,065	\$589,740	-\$508,325	0.54
Total Resource Cost Test (TRC) No Adder	\$0.3304	\$1,098,065	\$568,859	-\$529,206	0.52
Utility Cost Test (UCT)	\$0.3304	\$1,098,065	\$234,536	-\$863,529	0.21
Rate Impact Test (RIM)		\$1,422,569	\$234,536	-\$1,188,033	0.16
Participant Cost Test (PCT)		\$0	\$1,285,620	\$1,285,620	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000097759
Discounted Participant Payback (years)					n/a



Memorandum

Navigant estimated the cost-effectiveness results for the Washington Wattsmart Business Program, based on 2017 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 2015 IRP west commercial cooling – 13%, west commercial lighting – 46%, west residential cooling – 4%, west water heating – 53%, west industrial – 44% decrements. The program passes PTRC, TRC, UCT and PCT cost-effectiveness tests. The memo consists of the following tables.

Table 1 - Utility Inputs

Table 2 – Annual Wattsmart Business Program Costs by Measure Category

Table 3 – Annual Wattsmart Business Program Savings by Measure Category

Table 4 - Benefit/Cost Ratios by Measure Category

Table 5 – Wattsmart Business Program Level Cost-Effectiveness Results

Table 6 - Wattsmart Business Additional Measures Cost-Effectiveness Results

Table 7 - Wattsmart Business Building Shell Cost-Effectiveness Results

Table 8 - Wattsmart Business Compressed Air Cost-Effectiveness Results

Table 9 - Wattsmart Business Energy Management Cost-Effectiveness Results

Table 10 - Wattsmart Business Food Service Equipment Cost-Effectiveness Results

Table 11 - Wattsmart Business HVAC Cost-Effectiveness Results

Table 12 - Wattsmart Business Irrigation Cost-Effectiveness Results

Table 13 - Wattsmart Business Lighting Cost-Effectiveness Results

Table 14 - Wattsmart Business Motors Cost-Effectiveness Results

Table 15 - Wattsmart Business Refrigeration Cost-Effectiveness Results

Table 1 - Utility Inputs

Parameter	Value
Discount Rate	6.66%
Commercial Line Loss	9.53%
Industrial Line Loss	8.16%
Irrigation Line Loss	9.67%
Commercial Energy Rate (\$/kWh) ¹	\$0.0849
Industrial Energy Rate (\$/kWh) ¹	\$0.0694
Irrigation Energy Rate (\$/kWh) ¹	\$0.0843
Inflation Rate	1.90%

¹ Future rates determined using a 1.9% 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	\$4,157	\$3,195	\$2,562	\$1,282	\$28,647	\$0	\$39,843	\$98,170
Building Shell	\$0	\$194	\$1,765	\$99	\$11,713	\$0	\$13,771	\$25,877
Compressed Air	\$6,118	\$7,111	\$26,807	\$2,930	\$58,710	\$0	\$101,676	\$216,813
Energy Management	\$75,999	\$8,820	\$0	\$3,160	\$10,209	\$0	\$98,188	\$41,962
Food Service Equipment	\$0	\$25	\$229	\$13	\$100	\$0	\$368	\$120
HVAC	\$0	\$3,379	\$28,577	\$1,737	\$33,506	\$0	\$67,198	\$96,565
Irrigation	\$6,242	\$7,353	\$70,306	\$3,582	\$57,662	\$0	\$145,145	\$193,129
Lighting	\$0	\$184,156	\$1,551,534	\$86,921	\$1,415,063	\$103,841	\$3,341,514	\$4,618,633
Motors	\$16,776	\$3,715	\$8,365	\$1,744	\$39,767	\$0	\$70,367	\$100,064
Refrigeration	\$292,871	\$160,553	\$204,087	\$60,739	\$832,389	\$0	\$1,550,639	\$1,839,559
Total	\$402,164	\$378,501	\$1,894,231	\$162,205	\$2,487,766	\$103,841	\$5,428,707	\$7,230,892

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	207,094	100%	207,094	100%	207,094	13
Building Shell	16,069	100%	16,069	100%	16,069	17
Compressed Air	473,237	93%	440,110	100%	440,110	15
Energy Management	510,472	100%	510,472	100%	510,472	3
Food Service Equipment	2,089	100%	2,089	100%	2,089	10
HVAC	280,547	100%	280,547	100%	280,547	14
Irrigation	578,561	100%	578,561	100%	578,561	11
Lighting	14,040,890	94%	13,198,437	100%	13,198,437	14
Motors	281,641	100%	281,641	100%	281,641	14
Refrigeration	9,811,528	100%	9,811,528	100%	9,811,528	15
Total	26,202,128	97%	25,326,548	100%	25,326,548	14

Table 4 - Benefit/Cost Ratios by Measure Category

Measure Category	PTRC	TRC	UCT	RIM	PCT
Additional Measures	1.34	1.22	3.35	0.70	1.84
Building Shell	1.18	1.08	2.18	0.98	1.10
Compressed Air	1.35	1.23	3.14	0.67	1.99
Energy Management	0.79	0.72	0.95	0.46	2.74
Food Service Equipment	3.17	2.88	3.04	0.60	13.20
HVAC	3.12	2.84	5.50	1.14	3.01
Irrigation	4.36	3.96	7.66	1.97	2.46
Lighting	1.57	1.42	2.79	0.61	2.87
Motors	1.68	1.53	2.84	0.63	2.88
Refrigeration	3.36	3.06	5.04	0.81	4.85
Total	2.10	1.91	3.57	0.72	3.32

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	\$0.0396	\$10,171,833	\$21,334,984	\$11,163,151	2.10
Total Resource Cost Test (TRC) No Adder	\$0.0396	\$10,171,833	\$19,395,440	\$9,223,607	1.91
Utility Cost Test (UCT)	\$0.0211	\$5,428,707	\$19,395,440	\$13,966,732	3.57
Rate Impact Test (RIM)		\$26,939,493	\$19,395,440	-\$7,544,053	0.72
Participant Cost Test (PCT)		\$7,230,892	\$23,998,552	\$16,767,660	3.32
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000148319
Discounted Participant Payback (years)					2.44

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

**Table 6 - Wattsmart Business Additional Measures Cost-Effectiveness Results
 (Decrement - West Industrial - 44%, 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	\$0.0571	\$109,366	\$146,714	\$37,348	1.34
Total Resource Cost Test (TRC) No Adder	\$0.0571	\$109,366	\$133,376	\$24,010	1.22
Utility Cost Test (UCT)	\$0.0208	\$39,843	\$133,376	\$93,534	3.35
Rate Impact Test (RIM)		\$191,895	\$133,376	-\$58,519	0.70
Participant Cost Test (PCT)		\$98,170	\$180,699	\$82,529	1.84
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000011154
Discounted Participant Payback (years)					4.76

**Table 7 - Wattsmart Business Building Shell Cost-Effectiveness Results
 (Decrement - West Commercial Cooling - 13%, Load Shape – WA_Small_Office_Space_Cool)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1514	\$27,935	\$33,058	\$5,123	1.18
Total Resource Cost Test (TRC) No Adder	\$0.1514	\$27,935	\$30,053	\$2,118	1.08
Utility Cost Test (UCT)	\$0.0747	\$13,771	\$30,053	\$16,282	2.18
Rate Impact Test (RIM)		\$30,587	\$30,053	-\$534	0.98
Participant Cost Test (PCT)		\$25,877	\$28,529	\$2,652	1.10
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000000078
Discounted Participant Payback (years)					13.30

**Table 8 - Wattsmart Business Compressed Air Cost-Effectiveness Results
 (Decrement - West Industrial - 44%, 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	\$0.0574	\$259,779	\$351,351	\$91,573	1.35
Total Resource Cost Test (TRC) No Adder	\$0.0574	\$259,779	\$319,410	\$59,632	1.23
Utility Cost Test (UCT)	\$0.0225	\$101,676	\$319,410	\$217,734	3.14
Rate Impact Test (RIM)		\$474,187	\$319,410	-\$154,777	0.67
Participant Cost Test (PCT)		\$216,813	\$431,222	\$214,409	1.99
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000025555
Discounted Participant Payback (years)					5.05

**Table 9 - Wattsmart Business Energy Management Cost-Effectiveness Results
 (Decrement - West Industrial - 44%, Load Shape – WA_Warehouse_CA_Refrigeration)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0931	\$129,941	\$102,809	-\$27,132	0.79
Total Resource Cost Test (TRC) No Adder	\$0.0931	\$129,941	\$93,463	-\$36,478	0.72
Utility Cost Test (UCT)	\$0.0703	\$98,188	\$93,463	-\$4,725	0.95
Rate Impact Test (RIM)		\$202,973	\$93,463	-\$109,510	0.46
Participant Cost Test (PCT)		\$41,962	\$114,995	\$73,032	2.74
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000090518
Discounted Participant Payback (years)					0.87

**Table 10 - Wattsmart Business Food Service Equipment Cost-Effectiveness Results
 (Decrement - West Water Heating - 53%, Load Shape – WA_Restaurant_Water_Heat)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0237	\$388	\$1,228	\$841	3.17
Total Resource Cost Test (TRC) No Adder	\$0.0237	\$388	\$1,116	\$729	2.88
Utility Cost Test (UCT)	\$0.0225	\$368	\$1,116	\$749	3.04
Rate Impact Test (RIM)		\$1,852	\$1,116	-\$735	0.60
Participant Cost Test (PCT)		\$120	\$1,584	\$1,464	13.20
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000000182
Discounted Participant Payback (years)					0.11

**Table 11 - Wattsmart Business HVAC Cost-Effectiveness Results
(Decrement - West Commercial Cooling - 13%, Load Shape – WA_Small_Office_Heat_Pump)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0462	\$130,257	\$406,398	\$276,142	3.12
Total Resource Cost Test (TRC) No Adder	\$0.0462	\$130,257	\$369,453	\$239,196	2.84
Utility Cost Test (UCT)	\$0.0238	\$67,198	\$369,453	\$302,255	5.50
Rate Impact Test (RIM)		\$324,041	\$369,453	\$45,413	1.14
Participant Cost Test (PCT)		\$96,565	\$290,348	\$193,784	3.01
Lifecycle Revenue Impacts (\$/kWh)					-\$0.0000008035
Discounted Participant Payback (years)					2.71

**Table 12 - Wattsmart Business Irrigation Cost-Effectiveness Results
(Decrement - West Residential Cooling - 4%, Load Shape – WA_Irrigation_General)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0582	\$280,612	\$1,222,834	\$942,222	4.36
Total Resource Cost Test (TRC) No Adder	\$0.0582	\$280,612	\$1,111,667	\$831,055	3.96
Utility Cost Test (UCT)	\$0.0301	\$145,145	\$1,111,667	\$966,522	7.66
Rate Impact Test (RIM)		\$563,480	\$1,111,667	\$548,188	1.97
Participant Cost Test (PCT)		\$193,129	\$475,997	\$282,867	2.46
Lifecycle Revenue Impacts (\$/kWh)					-\$0.0000123551
Discounted Participant Payback (years)					2.94

**Table 13 - Wattsmart Business Lighting Cost-Effectiveness Results
(Decrement - West Commercial Lighting - 46%, Load Shape – WA_Small_Office_Lighting & Streetlight_ALL-7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0486	\$6,545,085	\$10,245,253	\$3,700,169	1.57
Total Resource Cost Test (TRC) No Adder	\$0.0486	\$6,545,085	\$9,313,867	\$2,768,782	1.42
Utility Cost Test (UCT)	\$0.0248	\$3,341,514	\$9,313,867	\$5,972,352	2.79
Rate Impact Test (RIM)		\$15,197,008	\$9,313,867	-\$5,883,141	0.61
Participant Cost Test (PCT)		\$4,618,633	\$13,270,556	\$8,651,923	2.87
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001040983
Discounted Participant Payback (years)					3.05

**Table 14 - Wattsmart Business Motors Cost-Effectiveness Results
(Decrement - West Industrial - 44%, 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	\$0.0462	\$130,663	\$220,149	\$89,485	1.68
Total Resource Cost Test (TRC) No Adder	\$0.0462	\$130,663	\$200,135	\$69,472	1.53
Utility Cost Test (UCT)	\$0.0249	\$70,367	\$200,135	\$129,769	2.84
Rate Impact Test (RIM)		\$318,465	\$200,135	-\$118,330	0.63
Participant Cost Test (PCT)		\$100,064	\$287,865	\$187,802	2.88
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000020938
Discounted Participant Payback (years)					2.68

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0247	\$2,557,809	\$8,605,189	\$6,047,380	3.36
Total Resource Cost Test (TRC) No Adder	\$0.0247	\$2,557,809	\$7,822,899	\$5,265,090	3.06
Utility Cost Test (UCT)	\$0.0150	\$1,550,639	\$7,822,899	\$6,272,261	5.04
Rate Impact Test (RIM)		\$9,635,006	\$7,822,899	-\$1,812,107	0.81
Participant Cost Test (PCT)		\$1,839,559	\$8,916,756	\$7,077,197	4.85
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000299195
Discounted Participant Payback (years)					1.40



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.



Appendix 3

Home Energy Savings Retailers

Table of Contents

Participating Upstream/Midstream Lighting Retailers and Redemptions.....	3
Participating Upstream/Midstream Retailers and Redemptions	4
Downstream Retailers.....	5
HVAC Trade Ally	7
Manufactured Homes Trade Ally	8
Plumbing Trade Ally	9
Weatherization Trade Ally	9
Applications by Customer City and Measure Category	10

Table 1¹
Participating Upstream/Midstream Lighting Retailers and Redemptions

The Company worked with 14 lighting retailers in 2017 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	
Ace Hardware #15365	Kennewick	WA	x	
Bi-Mart #619	Walla Walla	WA	x	
Corner Grocery & Hardware	Yakima	WA	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	
Fred Meyer #163	Kennewick	WA	x	
Grigg's Department Store	Pasco	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	
Lowe's #249	Kennewick	WA	x	
Lowe's #3240	Yakima	WA	x	x
Lowes 2344	Pasco	WA	x	x
Roy's Ace Hardware #10640	Yakima	WA	x	x
Safeway #1123	Hood River	WA	x	
True Value (Helms)	Selah	WA	x	
True Value Hardware - L&G Ranch Supply	Walla Walla	WA	x	
True Value Hardware #5353	Selah	WA	x	x
Wal-Mart - Supercenter #2101	Kennewick	WA	x	
Wal-Mart - Supercenter #3380	Pasco	WA	x	
Wal-Mart - Supercenter #5078	Yakima	WA	x	x
Wal-Mart #2269	Yakima	WA	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 2017 participating Upstream/Midstream retailer and the product types that were redeemed at each location.

Retailer	City	State	Room Air Conditioners
Black's Appliance Audio & Video	Yreka	CA	x

Table 3
Downstream Retailers

Twelve **participating** retailers provided redemptions for downstream clothes washers, hybrid heat pump clothes dryers, self-installed heat pump water heaters, attic insulation, floor insulation, and smart thermostats.

Participating Retailer (Retailers who are actively enrolled in the program)	City	State	Clothes Washer	Hybrid Heat Pump Dryer	Heat Pump Water Heater, Self-installed	Insulation-Attic	Insulation-Floor	Smart Thermostat
Bemis Home Appliance & Tv Ctr	Yakima	WA	X					
Best Buy #590	Kennewick	WA						X
Best Buy #831	Yakima	WA	X					X
Elgin's Appliance Center	Milton-Freewater	WA	X					
Home Depot #4735	College Place	WA	X		X	X	X	X
Lowe's #3240	Yakima	WA	X	X	X	X	X	X
Lowe's of Kennewick	Kennewick	WA	X		X			X
Lowe's of Pasco	Pasco	WA	X		X			
Sears #2029	Union Gap	WA	X					
Sears #6914	Walla Walla	WA	X					
Target – Yakima	Yakima	WA						X
Walmart #2476	College Place	WA						X

Nineteen **non-participating** retailers provided redemptions for downstream clothes washers, evaporative coolers, heat pump water heaters, attic insulation, floor insulation, and smart thermostats. Some retailers are located outside Pacific Power's service territory. However, the customer resides within 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	Smart Thermostat
Amazon.com	Seattle	WA	X					X
Appliancesconnection.com	Brooklyn	NY	X					
Costco.com	N/A		X					
Dell.com	Round Rock	TX						X
George Morlan - Salem	Salem	OR			X			
Helliesen Lumber & Supply Company	Yakima	WA						
Home Depot #1512	Fort Collins	CO			X			
Home Depot #4014	Troutdale	OR	X					

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	Smart Thermostat
Home Depot #4727	Yakima	WA	X	X	X	X	X	X
Home Depot #4746	Richland	WA			X			
HomeDepot.com	N/A		X			X		X
Keller Supply Company #11	Union Gap	WA			X			
KIE Supply	Walla Walla	WA			X			
Lowe's #1108	Tigard	OR			X			
Lowe's Home Centers Inc.	Coeur D'Alene	ID			X			
Lowe's.com	N/A		X					X
Nest.com	Palo Alto	CA						X
Sears #1069	Yakima	WA	X					
Sears.com	N/A		X					

Table 4
HVAC Trade Ally

The Company worked with 34 HVAC trade allies. Some trade allies are located outside Pacific Power’s service territory. However, the customer resides within 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
Ackerman Heating & Air	Colfax	WA				X			
AEH Inc.	Kennewick	WA							X
All Seasons Heating & Air Conditioning	Yakima	WA				X	X		X
Allard Enterprises	Yakima	WA					X		
American Air Heating and Conditioning	Walla Walla	WA				X			X
AmeriCool Heating and Air Conditioning	Kennewick	WA					X		X
Apollo Sheet Metal Inc.	Kennewick	WA						X	X
Bos Refrigeration	Sunnyside	WA				X			
Campbell & Company	Pasco	WA		X	X	X	X	X	X
Chapman Heating & Air Conditioning Inc	Dayton	WA							X
CK Home Comfort Systems	Grandview	WA				X			
College Place Heating & Air Conditioning	College Place	WA				X	X	X	X
Comfort Pro's Heating & Air Conditioning	Yakima	WA							X
Dayco Inc	Kennewick	WA				X		X	
Delta Heating and Cooling, Inc.	Richland	WA				X			
Farwest Climate Control	Yakima	WA				X	X		X
Four Seasons HVAC	Yakima	WA				X			
Grassi Refrigeration	Walla Walla	WA							X
Mike's Heating & AC	Clarkston	WA							X
Miller & Team Heating & AC	Zillah	WA				X			X
Nico Enterprises, LLC	Walla Walla	WA							X
Panchos Heating & Cooling LLC	Kennewick	WA				X		X	
Paul's Air F/X	Yakima	WA							X
Platte Heating & AC	Yakima	WA							X
Quality Comfort	Yakima	WA							X
Roger L Gibson	Kennewick	WA					X		
Smith Insulation	Walla Walla	WA		X	X				
ThermAll Heating & Cooling Inc	Yakima	WA			X	X			

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
Thermex Valley Heating and AC	Yakima	WA				X			
Total Comfort Solutions, LLC	Walla Walla	WA	X			X	X		X
Vance Heating and AC	Yakima	WA				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 Manufactured Homes
Columbia Homes	Union Gap	WA	x	X
Gillespie Homes	Kennewick	WA		x
Home Energy Experts	Clearfield	UT		
Valley Quality Homes	Yakima	WA		x

**Table 6
Plumbing Trade Ally**

Table 6 lists 5 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
A-1 Plumbing & Emergency Rooter	Walla Walla	WA	X
Central Mechanical Services	Yakima	WA	X
Ellensburg Solar, LLC	Ellensburg	WA	X
Ray's Plumbing, Inc.	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
Don Jordan Energy Systems	Yakima	WA		X	X	X	
Intermountain West Insulation	Kennewick	WA		X	X	X	
K-5 Contracting, Inc.	Yakima	WA		X			
McKinney Glass Inc.	Yakima	WA					X
Probuild Northwest	Yakima	WA		X	X		
Smart Energy Today	Olympia	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 & Fixture Applications	% of HVAC Applications	% of Manufactured Homes Applications	% of Kits Applications
BROWNSTOWN	0.00%	0.00%	0.00%	0.00%	0.05%
BURBANK	1.18%	0.00%	1.69%	19.95%	1.07%
COLLEGE PLACE	7.36%	5.56%	4.32%	14.99%	2.86%
COWICHE	0.01%	0.62%	0.19%	0.00%	0.51%
DAYTON	1.55%	1.85%	1.31%	0.23%	1.43%
DIXIE	0.00%	0.00%	0.00%	0.00%	0.05%
GRANDVIEW	2.35%	1.85%	2.25%	8.19%	3.68%
GRANGER	0.01%	0.00%	2.06%	0.00%	0.56%
HARRAH	0.00%	0.00%	0.19%	0.12%	0.26%
LOWDEN	0.00%	0.00%	0.19%	0.00%	0.00%
MABTON	0.01%	0.00%	0.00%	0.00%	0.41%
MOXEE	0.05%	2.47%	1.69%	1.73%	2.71%
NACHES	1.14%	1.85%	1.50%	0.12%	2.04%
OUTLOOK	0.01%	0.00%	0.94%	0.00%	0.31%
PARKER	0.53%	0.00%	0.00%	0.00%	0.00%
POMEROY	0.01%	0.00%	0.56%	0.00%	0.46%
PRESCOTT	2.80%	0.00%	0.75%	1.38%	0.10%
SELAH	6.25%	9.26%	7.50%	1.15%	6.85%
SUNNYSIDE	4.31%	1.85%	1.69%	0.12%	4.09%
TIETON	0.21%	1.85%	0.94%	0.00%	0.77%
TOPPENISH	0.03%	1.23%	0.94%	0.12%	1.89%
TOUCHET	1.17%	0.62%	1.13%	3.23%	0.61%
UNION GAP	0.05%	0.62%	0.75%	5.07%	1.28%
WAITSBURG	2.31%	1.23%	0.56%	4.61%	0.56%
WALLA WALLA	38.26%	28.40%	35.27%	17.07%	16.96%
WALLULA	0.01%	0.00%	0.00%	1.38%	0.00%
WAPATO	0.04%	0.62%	0.94%	0.23%	2.50%
YAKIMA	29.49%	38.89%	30.96%	17.65%	45.73%
ZILLA	0.89%	1.23%	1.69%	2.65%	2.25%



Appendix 4

wattsmart 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, 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: 37 record(s) found

Company name	Contact information	Specialty	Projects completed	Distance (miles)
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		
Batteries Plus Bulbs - Kennewick Address: 321 N Columbia Center Blvd. Kennewick, WA 99336 Website: https://www.batteriesplus.com/	Phone: 509-783-3400 Name: Kristie Midilli Email: mgr250@batteriesplus.net	Lighting, Lighting instant incentives		
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		

wattsmart® Business Vendor Network



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	
BITS LIMITED Address: 700 N. Valley St, Suite B-41123 Anaheim, CA 92801 Website: http://www.bitsltd.net	Phone: 831-419-1627 Name: Scott Markshausen Email: kurt.markshausen@bitsltd.net	Lighting, Office equipment, Other Specialty	
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	7
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, Motors and VFDs	6
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, Motors and VFDs	
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	1
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, Irrigation, Lighting, Motors and VFDs	6
ecomodus, LLC Address: 5110 Tieton Drive Yakima, WA 98908 Website:	Phone: 509-307-4363 Name: Dan Richards Email: ecomodus@msn.com	Lighting	18
FGI Address: 733 Lake Street South, 1A Kirkland, WA 98033 Website: http://www.forevergreenindoors.com	Phone: 509-951-2290 Name: Kathleen Sullivan Email: ksullivan@forevergreenindoors.com	Lighting	

wattsmart® Business Vendor Network



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	
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	
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	2
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, Food service, HVAC - evaporative, HVAC - unitary, Lighting, Motors and VFDs, Office equipment, Other Specialty	
Linden Electric Address: 9401 Mieras Rd Yakima, WA 98901 Website: http://www.lindenelect.com	Phone: 509-575-1191 Name: Marvin Breshears Email: mb@lindenelect.com	Lighting	
Lumenal Lighting LLC Address: 21706 66th ave W Mountlake Terrace, WA 98043 Website: https://www.Lumenal.com	Phone: 425-224-2718 Name: Mike Mornoney Email: MMoroney@lumenal.com	Controls, Lighting	0
M & R Electric Inc Address: 3806 Oak Ave. Yakima, WA 98903 Website:	Phone: 509-952-8339 Name: Richard Corkins Email: rcorkins@charter.net	Controls, Lighting, Motors and VFDs, Office equipment, Small business lighting	1
M. Campbell & Company Address: 2828 W Irving St Pasco, WA 99301 Website: http://www.callcampbell.com	Phone: 509-545-9848 Name: Becky Tenny Email: beckyt@callcampbell.com	HVAC - unitary	1
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	14
North Coast Electric - Seattle Address: 2424 8th Ave S Seattle, WA 98134 Website: http://www.NorthCoastElectric.com	Phone: 206-442-9846 Name: Zack Boucher Email: zboucher@ncelec.com	Building envelope, Controls, Lighting, Motors and VFDs, Other Specialty	

wattsmart® Business Vendor Network



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 instant incentives	
Pacific Energy Concepts, LLC Address: 210 W 3rd St Vancouver, WA 98660 Website: http://www.pacificenergyconcepts.com/	Phone: Name: Victoria Marchenko Email: incentives@pecnw.com	Controls, Lighting	
Picatti Brothers Inc. Address: 2309 South 3rd Avenue Union Gap, WA 98901 Website: http://picatti.com/	Phone: 509-248-2540 Name: Mike Leppa Email: mikel@picatti.com	Lighting, Motors and VFDs	4
Platt Electric - Grandview Address: 100 Stover Loop Rd. Grandview, WA 98930 Website: https://www.platt.com/	Phone: 509-882-1616 Name: Rolando Solis Email: roly.solis@platt.com	Lighting, Lighting instant incentives	
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	11
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	68
Primary Electric and Design Address: 509 North 18th Ave Yakima, WA 98902 Website:	Phone: 509-823-4442 Name: Darek Merrill Email: darekmerrill@gmail.com	Lighting	2
Stoneway Electric Supply Address: 44 s Palouse St. Walla Walla, WA 99362 Website: http://www.stoneway.com	Phone: 509-522-1550 Name: Tom Vinti Email: Tom.Vinti@stoneway.com	Lighting, Lighting instant incentives	7
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 instant incentives, Motors and VFDs	2
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	8



wattsmart® Business Vendor Network

Tjs Address: 329 South 6th Street Sunnyside, WA 98944 Website:	Phone: 509-839-8840 Name: Brittan Brittan Moore Email: tjsref@hotmail.com	Appliances, Building envelope, Controls, Food service, HVAC - evaporative, HVAC - unitary, Motors and VFDs
Total Digital Systems Address: 13433 NE 20th St STE O Bellevue, WA 98005 Website: http://www.totaldigitalsystems.com	Phone: 425-533-0112 Name: Ken Kang Email: kyungk@totaldigitalsystems.com	Lighting
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 - unitary, Motors and VFDs
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 12
Yakima Air Compressor Address: 2535 S. 12th Ave Yakima, WA 98903 Website: http://www.wedonthaveone.com	Phone: 509-453-5059 Name: Evan Bohannon Email: yakimaair@outlook.com	Compressed air, Motors and VFDs

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 1 st 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.





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.

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, 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 I 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.



Appendix 5

Communications

Energy Efficiency Communications 2017

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

TV

- [Washington summer 78-degree – English](#)
- [Washington fall 68-degree :30 – English](#)
- [Washington fall 68-degree :15 – English](#)
- [Washington winter 68-degree :30 – English](#)
- [Washington winter 68-degree :15 – English](#)

- [Washington summer 78-degree – Spanish](#)
- [Washington fall 68-degree :30 – Spanish](#)
- [Washington fall 68-degree :15 – Spanish](#)
- [Washington winter 68-degree :30 – Spanish](#)
- [Washington winter 68-degree :15 – Spanish](#)

- [Washington efficiency for business customers” Baker”](#)
- [Washington hidden savings for business customers “Vet”](#)

Radio

- [Washington Better :60 – English](#)
- [Washington Better :60 – Spanish](#)
- [Hidden Savings for business customers](#)
- [Well-oiled machine for business customers](#)

Print

- [Yakima summer – “Good”](#)
- [Yakima summer– “Helps](#)
- [Yakima summer 78-degrees – “Better”](#)
- [Yakima winter – “Good”](#)
- [Yakima winter – “Helps”](#)
- [Yakima winter – “Better”](#)
- [Walla Walla summer – “Good”](#)
- [Walla Walla summer– “Helps”](#)
- [Walla Walla summer 78-degrees – “Better”](#)
- [Walla Walla winter – “Good”](#)

- [Walla Walla winter – “Helps”](#)
- [Walla Walla winter – “Better”](#)
- [Spanish Eco-flower](#)
- [Spanish wattsmart Family](#)
- [Spanish summer “Bueno”](#)
- [Spanish summer “Ayuda”](#)
- [Spanish summer “Meyor”](#)
- [Spanish winter “Bueno”](#)
- [Spanish winter “Ayuda”](#)
- [Spanish winter “Meyor”](#)
- [Farm Bureau ad](#)
- [Ad to thank business customers and vendors](#) for being wattsmart last year
- [Newspaper ad \(b/w\) featuring business customer CPC International](#)
- [Color ad featuring business customer CPC International](#)
- [Newspaper ad \(b/w\) featuring Walla Walla Public Schools](#)
- [Newspaper ad \(b/w\) featuring Splash Express Car Wash](#)
- [Color ad featuring Splash Express Car Wash](#)
- [Newspaper ad \(b/w\) featuring Basel Cellars Estate Winery & Resort](#)
- [Newspaper ad \(b/w\) featuring The City of Selah](#)
- [Color ad featuring The City of Selah](#)
- [Newspaper ad featuring several business customers – Spring 2017](#)
- [Newspaper ad featuring several business customers – Fall 2017](#)

Digital Ads

- [Cooling – ceiling fan](#)
- [Cooling – 78-degree thermostat](#)
- [Being wattsmart is “good”](#)
- [Being wattsmart “helps”](#)
- [Being wattsmart is “better”](#)

- [“Hidden Savings for business” \(Static\)](#)
- [Big business, Small Business](#)
- [Bottom line](#)
- [Energy efficiency is GOOD for your bottom line and Washington](#)

Social

- [Winter wattsmart tips Facebook ads – January](#)
- [Cooling – ceiling fan](#)
- [Cooling – thermostat](#)
- [NEST Thermostat Promotion Facebook – residential – mobile](#)
- [NEST Thermostat Promotion Facebook – residential – desktop](#)
- [Facebook and YouTube – summer video thumbnail](#)
- [Facebook and YouTube – winter video thumbnail](#)
- [Facebook winter “good”](#)
- [Business on Facebook](#)

Inserts:

- [Home Energy Savings - January](#)

Press releases:

- [Colder Weather Can Bring Higher Bills in the Northwest – December 28, 2017](#)
- [Colder Than Average Winter in Store for Northwest – November 15, 2017](#)
- [Heat Wave: Tips from Pacific Power To Be Safe, Stay Cool and Use Less Energy – August 10, 2017](#)
- [Selah Named Pacific Power Business Partner of the Year for Energy Efficiency Leadership – July 24, 2017](#)
- [Get a Free wattsmart Starter Kit from Pacific Power – July 10, 2017](#)
- [Don’t Lose Money on the Biggest Myths in Saving Energy – June 23, 2017](#)

Newsletters:

- [January Voices](#)
- [March Energy Insights](#)
 - Walla Walla Winery toasts LEDs
 - Solar project enlightens school
 - The best of all energy
 - Building stronger communities
- [March Voices](#)
- [April Voices](#)

- [May Voices](#)
- [July Voices](#)
- [September Voices](#)
- [October Voices](#)
- [November Voices](#)

Direct mail:

- [wattsmart Starter Kit](#)
- [wattsmart Starter Kit – included with materials for School program](#)
- [Monthly low-income weatherization mailing](#)
- Mailing to irrigation customers encouraging application for incentives:
 - [Letter](#) – April
 - [Application](#) – April
 - [Letter](#) – October
 - [Application](#) – October

Emails:

- [wattsmart Starter Kit](#)
- [Thank you for being wattsmart last year - January](#)
- [Grocery/convenience store eblast 3/7/17](#)
- [wattsmart Business lighting 6/8/17](#)
- [HVAC Assessment 8/8/17](#)
- [HVAC Assessment \(mobile\) 9/20/17](#)
- [HBC Finance Offer webinar 10/26/17](#)
- [HVAC Assessment 10/31/17](#) and 11/17

Collateral:

- [Winter wattsmart handout](#)
- [Summer wattsmart handout](#)
- [wattsmart Business - overview](#)
- [wattsmart Business - brochure](#)
- [wattsmart Business – instant incentives for lighting](#)
- [wattsmart Business – HBC Finance Overview](#)

- [wattsmart Small Business lighting incentives](#)
- [wattsmart Business wastewater incentives](#)

2017

NEEF

BE WATTSMART,
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:

Janet Hatch

Program Director

National Energy Foundation

4516 South 700 East, Suite 100

Salt Lake City, UT 84107

March 20, 2018

Savings

Teacher ID: _____
 Teacher Name: _____

Be **wattsmart**
Begin at home

Home Energy Worksheet

Student First Name: _____

Heating

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

Cooling

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

Water heating

- Set the water heater temperature to 120 degrees F.
 Have done Will do Neither
- Install a high-efficiency showerhead.
 Have done Will do Neither
- Take 5 minute showers.
 Currently do Will do Neither

Lighting

- Wash full loads in the dishwasher and clothes washer.
 Currently do Will do Neither
- Replace incandescent bulbs with LED bulbs.
 Have done Will do Neither
- Turn lights off when not in use.
 Currently do Will do Neither

Refrigeration

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

Electronics

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



Cooking

- Use a microwave oven, toaster oven, crock pot or outdoor grill instead of a conventional oven.
 Currently do Will do Neither

Get paid for being wattsmart

- Visit Pacific Power at be wattsmart.com for more energy-saving tips and videos.
 Have done Will do Neither

WAT WA


Home Energy Worksheets

– Returned: 2,625 –
 – 65.03% –

Program Evaluation

Be **wattsmart**
Begin at home

Teacher Name: _____
 School: _____
 Sponsor: Pacific Power

 In an effort to improve our program, we would like your assessment of the wattsmart Begin at home. Please take a few minutes to fill out this evaluation form. Upon completion, please return the form in the postage-paid envelope along with the student Home Energy Worksheets you collected and the sponsor Thank a Watt® Card.

Please mark the box that best describes your opinion.

	Strongly Agree	Agree	Disagree	Strongly Disagree
The materials were attractive and easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The materials and activities were well-received by students.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The materials were clearly written and well-organized.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Students indicated that their parents supported the program.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presenters were able to keep students engaged and attentive.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



If you had the opportunity would you conduct this program again?
 Yes No

Would you recommend this program to other colleagues?
 Yes No

In my opinion, the thing students liked best about the materials/program was:

One thing I would change would be:

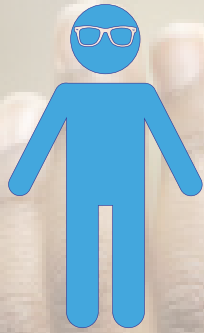
WAT WA

Teacher Packets

– Returned: 112 –
 – 71.33% –

Participants



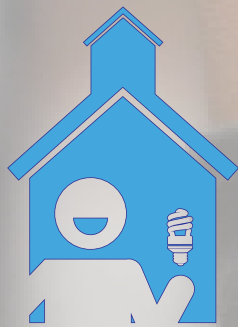
Students

– 4,036 –



Teachers

– 157 –



Schools

– 47 –

Table of Contents

Program Overview	1
Program Description	1
Program Administration	1
Building Collaborations	1
Program Implementation	1
Program Registration	1
Be wattsmart, Begin at home Presentation	1
Program Materials	2
Program Accomplishments – Fall 2017	2
Attachments	5
Fall 2017 Participating Schools	5
Program Promotions	7
Program Documents	9
<i>Teacher Evaluation</i>	50
<i>Teacher Evaluation</i> Compilation	51
<i>Home Energy Worksheet</i> (English)	56
<i>Home Energy Worksheet</i> (Spanish)	57
<i>Home Energy Worksheet</i> Summary – Pacific Power	58
Wise Energy Behaviors in Pacific Power Washington Homes	59
Sampling of <i>Thanks a “WATT” Cards</i>	60

Program Overview

Program Description

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

Program Administration

Be *wattsmart*, Begin at home is administered by NEF, 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 *wattsmart*, Begin at home energy efficiency education program conducted during the 2017 – 2018 school year.

Anne Lowe, Vice President – Operations, oversees program organization. Gary Swan, Vice President – Development, oversees contract accounting. Janet Hatch, Program Director, is responsible for overseeing the scope of work. Patti Clark, Program Manager, is responsible for implementing the scope of work. Megan Hirschi, Program Manager, oversees school enrollment and communication with teachers and is responsible for scheduling presentations. A team of trained and seasoned presenters brought the interactive, hands-on program to Washington Schools.

Building Collaborations

Washington Office of Superintendent of Public Instruction Learning Standards correlate well to the content of Be *wattsmart*, Begin at home. Teachers appreciate the collaborative efforts to align program components to their learning standards. Curriculum correlations were provided to teacher participants in their *Teacher Materials Folder* prior to the presentation date.

Program Implementation

During the month of May 2017 participating schools from the 2016 program were contacted and informed the registration for the 2017 program was available. In September 2017, a reminder email was sent to all priority unregistered 2016 participating schools. In August and September, Megan Hirschi made phone calls to all unregistered schools.

Program Registration

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

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

Be *wattsmart*, Begin at home Presentation

Be *wattsmart*, Begin at home presentations were given during the period of October 9th through November 10th 2017. 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 watched Slim the Lineman energy efficiency video vignettes. At the end of each short video, students learned a rhyme about Slim’s wise energy choice.

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

Program Materials

A *Parent Letter* was provided to explain the importance of *Be wattsmart, Begin at home*. In addition, students took home a *Student Guide* and *Home Energy Worksheet* to share with their families. Students who returned their worksheet received an Energy Star® rated nightlight featuring the PacifiCorp logo as a reward.

Educators were also given helpful energy educational materials. Each teacher participant was provided a custom *Be wattsmart, Begin at home* folder. The folder contained a custom *Teacher Guide* with additional information and activities to supplement and continue energy education in the classroom. Also in the folder were two NEF instructional posters, *Energy Efficiency in Action* 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*, the *Program Evaluation* 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 that teacher participants could 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 1, 2017 deadline.

Program Accomplishments – Fall 2017

- 52 *Be wattsmart, Begin at home* presentations completed at 47 schools (schools that had over 160 students were approved for two presentations).
- 1 school waitlisted
- 4,036 students and families reached
- 157 Washington teachers reached
- 65.03% student *Home Energy Worksheet* surveys return
- \$50 mini-grant checks delivered to 88 Washington teachers
- \$25 mini-grant checks delivered to 17 Washington teachers

Program Attachments – Fall 2017

- Fall 2017 Participating Schools
- Program Promotions
- Program Documents
 - Keynote Presentation
 - *Teacher Implementation Steps Flier*

- *Rewarding Results Flier*
- *Student Guide*
- *Teacher Guide*
- *Lingo Card*
- *Washington Core Curriculum Correlations*
- *Parent Letter*
- *Teacher Evaluation*
- *Teacher Evaluation Compilation*
- *Home Energy Worksheets*
- *Home Energy Worksheet Summary – Pacific Power*
- *Wise Energy Behaviors in Pacific Power Washington Homes*
- *Sampling of Thanks a “Watt” Cards*

Attachments

Fall 2017 Participating Schools

<u>School Name</u>	<u>School Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>
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
Camas Elementary	1010 S. Camas Avenue	Wapato	WA	98951
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 Castlevalle	Yakima	WA	98902
Dixie Elementary School	10520 E. Highway 12	Dixie	WA	99329
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
Garfield Elementary - Yakima	612 N. 6th Ave	Yakima	WA	98902
Gilbert Elementary	4400 Douglas Drive	Yakima	WA	98908
Grace Lutheran School	1207 S. 7th Ave	Yakima	WA	98902
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
Lincoln Elementary	309 North Alder	Toppenish	WA	98948
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
Naches Valley Elementary	151 Bonlow Drive	Naches	WA	98937
Nob Hill Elementary	801 South 34th Avenue	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
Roosevelt Elementary	120 N. 16th Avenue	Yakima	WA	98902

<u>School Name</u>	<u>School Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>
Satus Elementary	910 S. Camas Ave	Wapato	WA	98951
Selah Intermediate School	1401 W. Fremont Avenue	Selah	WA	98942
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
Waitsburg Elementary	184 Academy	Waitsburg	WA	99361
Washington Elementary	800 E. Jackson Avenue	Sunnyside	WA	98944
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 **wattsmart** Begin at home



Be wattsmart, Begin at home is a free energy education program sponsored by Pacific Power that is available to you in the fall of 2017. This program utilizes local presenters to focus on the Washington Office of Superintendent of Public Instruction Standards while showing students and teachers how wise energy actions make a difference. Here is what local teachers have to say about the program:

“ *The students loved seeing their peers be an electric circuit.* ”

“ *This presentation was a perfect connection to our science unit on electricity.* ”

Please join us in this important effort. You may qualify to receive a **mini-grant of up to \$50** depending upon participation.

- What:** A 45 - 60 minute educational presentation with **FREE** wattsmart energy education posters, activities and student materials
- When:** October 10 - November 10, 2017
- Where:** Your school
- Who:** Your school chooses either fourth- or fifth-grade, depending upon placement of learning standards
- How:** Enroll at bewattsmart.com/begin at your earliest convenience to ensure a spot or contact Megan Hirschi at megan@nef1.org



bewattsmart.com

Dear **Be wattsmart, Begin at home** 2016 program participant:

Thank you for participating in the **Be wattsmart, Begin at home** program. Pacific Power will once again be supporting teachers in educating students on required energy standards during the 2017-18 school year.

As a former program participant, you have the opportunity to enroll your fourth- or fifth-grade class in advance for the fall 2017 **Be wattsmart, Begin at home** program.

The 45 - 60 minute school presentations include **FREE** wattsmart energy education posters, activities and student materials. They will be scheduled during the weeks of **October 10 - November 10, 2017**. Teachers may qualify to receive a mini-grant of up to \$50 depending upon participation.






Register soon at bewattsmart.com/begin to ensure your 2017 participation or email megan@nef1.org.

Thank you.

Program Documents

Keynote Presentation

Be **watt**smart,
Begin at home



PACIFIC POWER

What we will do today.

Learn about natural resources.

Learn how we make and use energy.

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

Play energy LINGO.



What is **ENERGY?**



ENERGY is the
ability to do
WORK.

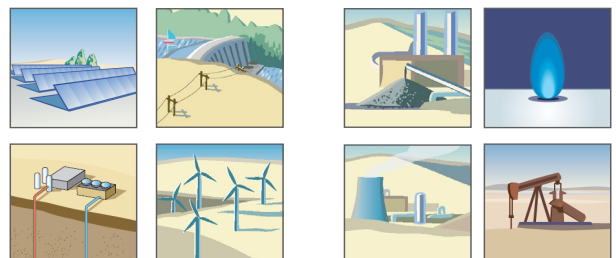


Natural resources

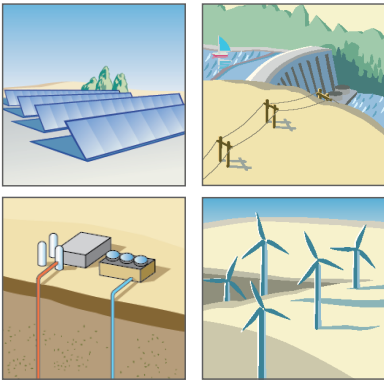
A **natural resource** is anything we use that comes from the earth or the sun.



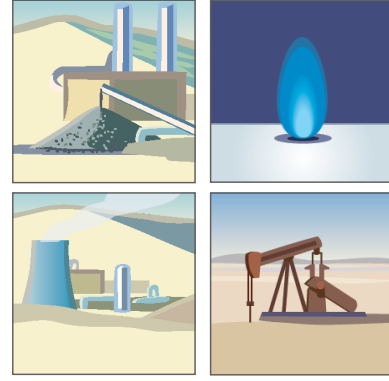
Renewable and nonrenewable resources



Renewable resources



Nonrenewable resources



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.



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**
- A secondary energy source. **Electricity**
- Something useful from the earth or the sun. **Natural resource**



Pacific Power

Electric generation by energy source

Coal 58.85%



Renewables 17.08%



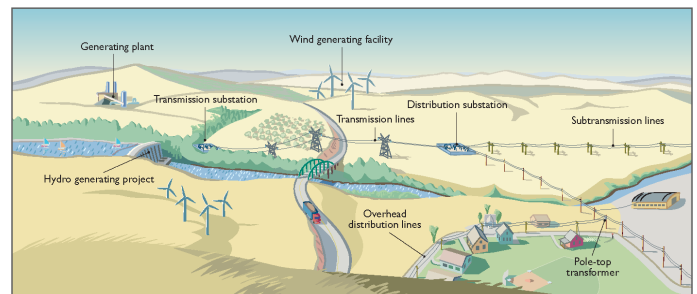
Natural gas 14.76%



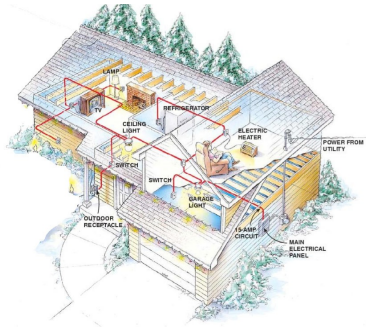
Other sources 9.31%



Electric generation



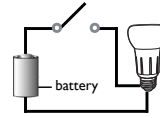
What is a circuit?



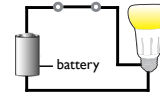
Let's make a circuit.

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

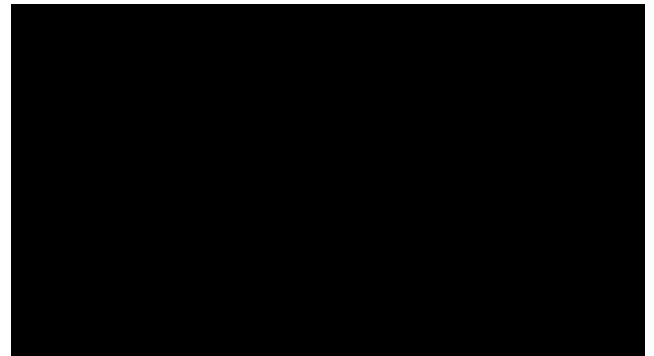
- Using less energy to accomplish the same amount of work.

Technology

- Install energy-efficient products, appliances and devices.

Behavior

- Use less energy through wise behaviors that conserve energy.

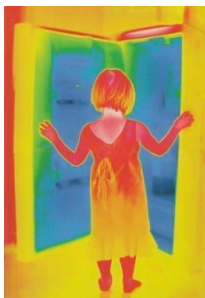


Know what you want before you open the refrigerator.

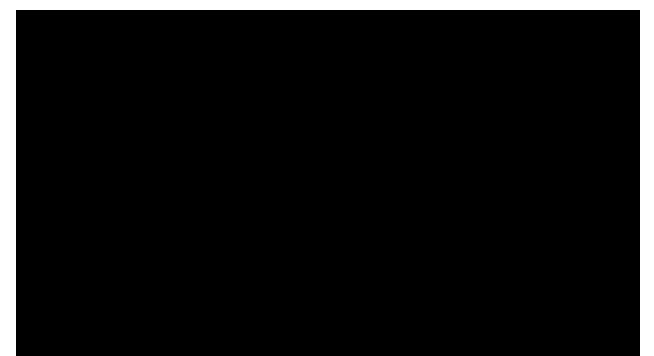


Refrigerators and freezers

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



Decide what you want to eat quickly!



Use LEDs





Turn off the TV when you leave the room.



Electronics

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

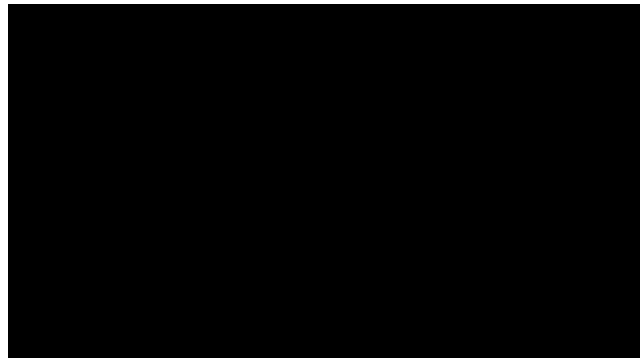


• Turn off TVs, computers and game consoles when not in use.

• Unplug the thug. Beware of **phantom loads**.



• Use advanced power strips to reduce phantom load.



Turn off the lights when you leave the room.



Lighting

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



Turn off the lights when you leave a room.

Replace standard bulbs with **LED** (light-emitting diode) light bulbs.

Let daylight shine in.



Let's LINGO

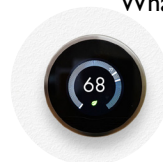
Find the words on your LINGO board that match these definitions:

- 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**



Home heating and cooling

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



- Use a fan instead of an air conditioner.
- Install a smart or programmable thermostat.
- Change furnace filters.
- Insulate your home and seal air leaks.



Water heating

What can you do to be **wattsmart**?

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



Dishwashers and laundry

What can you do to be **wattsmart**?



- Run these appliances only when full.
- Use low energy settings.
- Clean the lint filter on your dryer with each load.



Cooking

What can you do to be **wattsmart**?



- Use a microwave oven when possible.



- Use lids to shorten **cooking** time.



The 3 Rs

What can you do to be **wattsmart**?

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



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 **Water heater** comfortable shower.
- To use less of something. **Reduce**



What have we done today?

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



Engage

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

Complete the *Home Energy Worksheet* and return it to receive an energy-efficient nightlight.

Sign the *Thanks A “Watt” Card* and your teacher will mail it along with your worksheet and the teacher’s *Program Evaluation*.



YOU can make a difference when you are **wattsmart!**

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





Teacher Program Implementation Steps

1. Verify that you have received each of the following:
 - *Teacher Materials Folder*
 - Your **Be wattsmart, Begin at home** *Student Booklet*
 - Your **Be wattsmart, Begin at home** *Teacher Guide*
 - *Program Evaluation*
 - *Sponsor Thank You Card*
 - *Teacher mini-grant announcement*
 - *Self-addressed postage-paid envelope*
 - *Instructional posters*
 - *Home Energy Worksheets* for you and your students
 - **Be wattsmart, Begin at home** student booklets
 - *Set of Parent Letters*
 - *wattsmart* nightlights (student incentive for returning the *Home Energy Worksheet*)
 - *wattsmart Starter Kit Fliers*
2. Distribute to each student a:
 - **Be wattsmart, Begin at home** student booklet
 - *Home Energy Worksheet*
 - *Parent Letter*
3. Reward each student who returns a completed *Home Energy Worksheet* with a *wattsmart* nightlight.
4. Complete the *Program Evaluation* form.
5. Have each student sign the *Thank You Card* to Pacific Power.
6. Mail in the self-addressed postage-paid envelope:
 - *Completed Home Energy Worksheets*
 - *The Thank You Card*
 - *The Program Evaluation* form

To thank you for postmarking your envelope by December 1, 2017, you will receive a mini-grant for classroom use.

80% or greater return of registered students' *Home Energy Worksheets* = \$50

50 – 79% return of registered students' *Home Energy Worksheets* = \$25

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

Be **watt**smart

Begin at home



Dear Parent(s):

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 an assembly 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 return the **Home Energy Worksheet** to their teacher.
- Order a **wattsmart Starter Kit**

Thank you for being wattsmart and for your participation!

What's inside?

This booklet is divided into three sections that will help you:

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.

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.

What does it mean to be **watt**smart?

- Being wattsmart is all about taking steps to save energy – which in turn can help you save money.
- Pacific Power's wattsmart programs and incentives can help customers become more energy efficient in their homes and businesses and that's good for their wallets and the environment.



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
- Manufacturing
- 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.

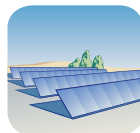


Natural Gas is usually captured alongside oil deposits and is a major source for electrical generation.



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

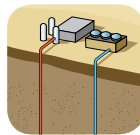
Renewable examples are:



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.



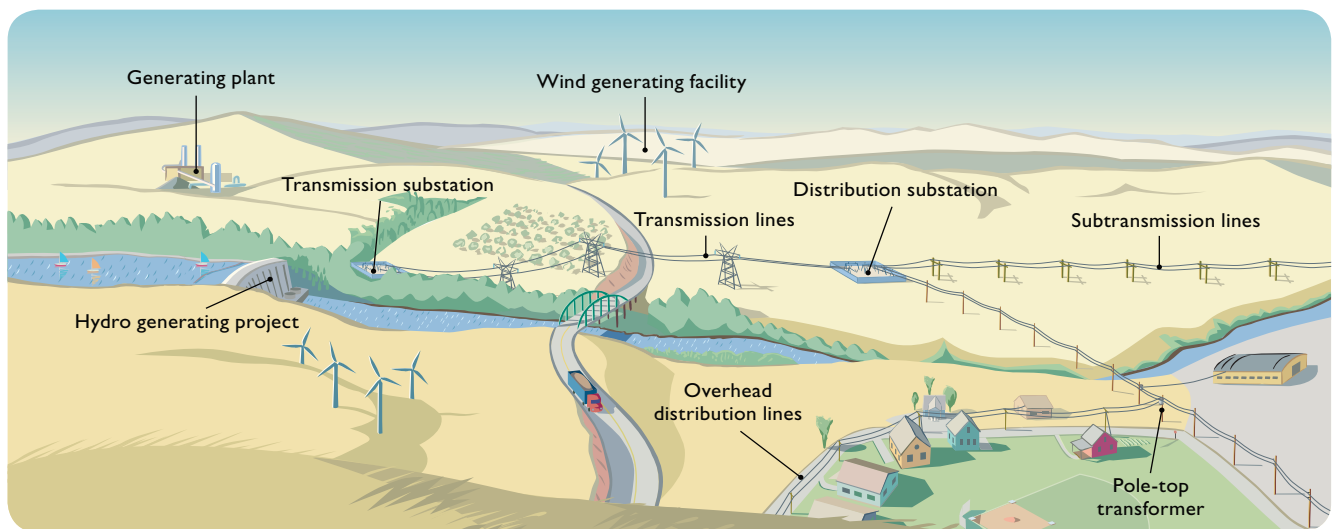
Electricity is the most abundant **secondary energy resource** used. It is the flow of electrical power or charge. It occurs in nature as lightning and static electricity. A generator uses energy resources to create mechanical energy that is then converted into electrical energy.

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 resource	Pacific Power (2016 basic fuel mix)*	United States (U.S. EPA, 2013 data)
Coal	58.85%	39%
Natural gas	14.76%	27%
Renewables	17.08%	12%
Hydroelectric	5.58%	7%
Wind	8.97%	4%
Biomass	0.44%	1%
Geothermal	0.41%	--
Solar	1.68%	0%
Nuclear	0.00%	19%
Other/misc.	9.31%	3%
Total*	100%	100%

*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.

wattsmart tips to lower your energy use and 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 blinds on winter days to let the warmth in.
- Small room fans are an energy-efficient alternative to air conditioning.
- Inspect and replace weather stripping and caulking in your home.
- 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 near windows when possible.
- 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.



Safety note: Burned out CFLs, which contain a small amount of mercury, should be disposed of properly. To locate a collection site in your area, or to learn what to do if a CFL breaks, visit earth911.com.



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.
- The coils in the back or bottom of your refrigerator and freezer should be kept as clean as possible.

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 clothesline whenever possible.

Cooking

- Use a microwave oven, toaster oven or crock pot 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.






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

An individual with a combined electric and heating fuel bill of \$2,500 per year could save 20 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.

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

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

- In Table 2, multiply the numbers in Column A by the given amounts in Column B. Place the answers in Column C.
- Add the numbers in Column C to get the total approximate cost of electricity for lighting your home.
- 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.

	A	B	C
	Number of bulbs from Table 1	Annual cost of electricity for one bulb	Annual cost of electricity for lighting
Incandescent		× \$3.84	
CFL		× \$0.84	
LED		× \$0.48	
TOTAL			

- 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.
- 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.

	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

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

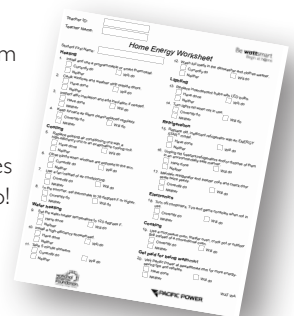
Cost figures are for an individual bulb (60 Watt incandescent), the lumens equivalent CFL (13 Watts) and LED (7 Watts) each used for 2 hours each day for 30 days. EEI Typical Bills and Rates Report, Winter 2016 (12 months ending 2015).

Be **watt**smart – it's up to you

Together with your parent(s), complete the separate **Home Energy Worksheet**. Return it to your classroom teacher and 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



bewattsmart.com



wattsmart is registered in U.S. Patent and Trademark Office.

Be *watt*smart Begin at home

TEACHER GUIDE



Welcome to Be **watt**smart, Begin at home

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

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

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

Table of Contents

STEM Correlations.....	2
Section One: Energy Efficiency	
Energy Challenge.....	3
Conservation Cookie.....	4
Pass the Sack.....	5
Energy Tickets.....	6
The Search for Energy.....	8
Section Two: Resources You Can Use Efficiently	
Energy Challenge.....	9
Where Do Fossil Fuels Come From?.....	10
Energy for Electricity.....	11
Electrical Generation Poster.....	13
Section Three: Be wattsmart, Begin at home	
Energy Challenge.....	14
Insulation Tests.....	15
How Bright Is Your Light?.....	16
Energy in Math.....	17
Be wattsmart, Begin at home Poster.....	19

About Pacific Power

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

About the National Energy Foundation

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

Permission to Reprint NEF hereby grants permission to any teacher conducting a course of instruction in a recognized public or private institute of learning to reproduce any portion of this publication for classroom use only. No portion of this publication may be reproduced for purposes of profit or personal gain. © 2017, National Energy Foundation

All Rights Reserved No part of this publication may be reproduced or transmitted, in any form or by any means, without the written permission of NEF. Printed in the United States of America. wattsmart is registered in the U.S. Patent and Trademark Office.

STEM Correlations

STEM education is an approach to teaching and learning that integrates the content and skills of science, technology, engineering and mathematics. Some of the skills include: problem-solving, innovation, invention, inquiry, logical reasoning, critical thinking, technological literacy, communication tools, research tools, design and modeling, data analysis and probability, collaboration and real world connection. This chart correlates *Teacher Guide* activities to STEM skills and behaviors.

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
Conservation Cookie	X			X										X	X	X	X
Pass the Sack	X	X		X													
Energy Ticket	X	X		X			X							X	X	X	X
The Search for Energy	X	X	X	X										X		X	X
Where Do Fossil Fuels Come From?	X	X	X				X							X	X		
Energy for Electricity	X	X	X	X			X										
Insulation Tests	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X
How Bright Is Your Light?	X	X	X				X		X					X		X	X
Energy in Math														X		X	X

Section One:

Energy Efficiency

Objective: Identify and explain types of natural resources, conservation and energy efficiency.

Vocabulary:

Natural resource: A material source of wealth, such as timber, fresh water or a mineral deposit that occurs in a natural state and has economic value.

Renewable resource: A natural resource that is capable of being renewed or is replaceable such as energy from the sun or wind.

Nonrenewable resource: A natural resource that is not capable of being renewed, replaced or takes a very long time to replace, such as fossil fuels.

Fossil fuel: A combustible material created naturally beneath the earth's surface over a long period of time from the remains of plants and animals. Examples include coal, natural gas and oil.

Conservation: The protection, preservation, management, or restoration of natural resources such as forests, soil and water.

Energy efficiency: Using less energy to accomplish the same amount of work.

Classroom Activities:

- "Conservation Cookie"
- "Pass the Sack"
- "Energy Tickets"
- "The Search for Energy"

Energy Challenge

Discussion Idea: Embodied energy in a glass of milk.

Objective: Trace the energy and resources needed to make a common product.

Review the steps that it takes to produce a glass of milk and bring it to the consumer.

- Feeding and raising a cow
- Milking a cow
- Packaging
- Refrigeration
- Transportation of milk (dairy to warehouses to store to home)

Discuss with Your Class:

1. What natural resources go into making and transporting a glass of milk?
2. The energy used to make and transport a product is called **embodied energy**.
3. What embodied energy sources are involved in producing and transporting milk?
4. How can understanding embodied energy in our daily lives encourage us to be energy-efficient?



Conservation Cookie

Objective:

To demonstrate the results of conservation of a resource.

Pre-activity Discussion:

- What is conservation?
- Why is conservation so important?

Materials:

- Two cookies (or other food item) for each person
- One watch or clock with a second hand for timing
- Computer or graph paper to graph results

STEM Connection

Science

- Science as Inquiry
- Personal and Social Perspectives

Math

- Numbers and Operations
- Measurement
- Data Analysis and Probability
- Connection to the Real World

Procedure:

1. Tell students that this is the first of two rounds. In each round, they will be eating a cookie, which represents our natural resources. They are to stand at their desk and you say to eat the cookie as they normally would, then when the cookie has been completely swallowed, sit down. The activity will work better if you ask students NOT to put the entire cookie in their mouth at one time, to take at least two bites!
2. Give each student a cookie, with instructions not to eat it until you say. Start the watch and tell the students to eat the cookie as they would normally eat it. At 30 second intervals, count the number of students standing and record this data.
3. Individually or as a class, graph this data using a line graph.
4. Tell students they will now practice conservation with a second cookie. To represent conservation, students will only take a bite from their cookie when you say "BITE." Just as before, they will stand, take bites the same size they took last time, and sit after the entire cookie has been swallowed.
5. Pass out a second cookie to each student.
6. Start the watch and have everyone take a "BITE" and then wait 30 seconds. Record the number of students standing and again say "BITE." Repeat this procedure until almost everyone has finished his or her second cookie.
7. On the same graph used for the first cookie, add a second line graph for the conservation cookie.



Discussion:

- Compare the two graphs. If desired, have students calculate the slope of each graph from 0 to 30 seconds and from 30 seconds to 1 minute. How do the slopes vary over time and between graphs? What does a change in slope represent?
- Discuss the term "conservation" and its effects on our natural resources. Can we control how rapidly we use water or energy by conserving it? Water and energy are some of the most important things we use in our lives. If they are used up quickly, and all at once, we will not have enough left for the future.

Pass the Sack

Objective:

To demonstrate the difference between renewable and nonrenewable resources and the need for conservation of resources.

Materials:

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

STEM Connection

Science

- Science as Inquiry
- Energy Sources, Forms and Transformations
- Personal and Social Perspectives

Procedure:

1. Count out enough candy so that there is one piece per student (some of each type of candy – perhaps 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 candy to run out before everyone gets some!
2. Tell students you will be demonstrating how resources get used over time by playing “Pass the Sack.” Show students the sack and tell them 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 of the types 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 that 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 (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 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 to the bag periodically.)
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. Point out that natural gas, coal and oil companies are looking harder for more resources as supplies dwindle.
8. Now plan to pass out the remaining candy. Should rules be established? Do oil, coal and natural gas companies have rules (regulations) that they must follow to find resources? Should there be rules and regulations on how much oil, coal and natural gas people use? How would students get resources if they could not leave their desks? How do the students' social decisions influence the availability of candy?

Energy Tickets

Objective:

See how energy decisions affect our standard of living and our quality of life. This will help students realize how important it is to use energy efficiently.

Materials Needed:

- Energy Tickets – 25 per student
- Box to collect tickets (toll box)

STEM Connection

Science

- Science as Inquiry
- Energy Sources, Forms and Transformations
- Personal and Social Perspectives

Technology

- Problem-solving and Decision-making Tools

Math

- Numbers and Operations
- Measurement
- Data Analysis and Probability
- Connection to the Real World

Procedure:

1. Before class begins, copy a page of tickets from the master on page 8 for each student. Alternatively, you may use preprinted tickets available from retail stores.
2. Introduce the game to the students by listing several places the students use energy in the school, for example, in the classroom: lights, computers and heaters.
3. Provide each student with 25 Energy Tickets, and instruct them to write their name on all of their Energy Tickets.
4. Every time a student uses energy, have them write how the Energy Ticket was used on the back and put the ticket in the toll box. If they use heated water, it will cost two tickets, because they are using both energy and water. It also costs two tickets if they waste energy unnecessarily. For example, leaving lights or a computer on when not in use wastes energy.

5. Keep a record of how many tickets the students have left each day.
6. Optional: look at how the tickets were used and create a graph of tickets used for different categories (sharpening pencils or using computers, for example) out of the tickets deposited in the box.

Discussion:

- What would happen if there was a real energy shortage in the community and families were issued a certain number of Energy Tickets?
- What if after they used them, all of their electricity and gas were shut off?
- What would they do to adjust their use of energy?
- What are other alternate sources of energy?

Language Arts Connection:

- Quick write – Describe one thing you could do to reduce your personal energy usage.
- Creative writing – Write a story about life after our nonrenewable energy sources are gone.

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

ENERGY TICKET
This ticket allows
one energy use.
_____ student name

The Search for Energy

Objective:

To learn the difference between renewable and nonrenewable resources.

Materials Needed:

- About 1/4 cup seed beads (solar energy)
- Colored beads in the following proportions: 84 percent black beads (about 250 beads) for coal; 16 percent red (about 50 beads) for uranium; 2 percent white (about 7 beads) for natural gas; 1 percent blue (about 4 beads) for oil. These proportions approximately reflect the nonrenewable energy reserves in the U.S.
- Optional: large bed sheet or tarp to place beads on for easy cleanup

STEM Connection

Science

- Science as Inquiry
- Energy Sources, Forms and Transformations
- Science and Technology
- Personal and Social Perspectives

Math

- Numbers and Operations
- Data Analysis and Probability
- Connection to the Real World

Procedure:

1. Divide the class into five equal groups. Each group will be a company going after a particular resource. The beads represent reserves of the various energy resources. Have students gather in a large circle around the sheet or other area where you will place the beads.
2. Scatter the large beads plus a spoonful of "solar" beads on the sheet so they are well spread out. Explain that this exercise shows how the amount of available 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 available resources change after each trial. Tell each group that they will have 30 seconds to pick up as many beads possible of their color, then you will stop and look at how things are changing. It is NOT a race! After checking for understanding, start timing.

4. After 30 seconds, have the groups stop and count the beads they have gathered. Record the results in a data table. If some groups have collected all of their available resource, point out that the resource is now depleted and they are unemployed. You can allow the students to join another group. Collect the beads students picked up in the first trial.
5. Scatter another spoonful of solar energy, helping students realize that since solar is a renewable resource, there is the same amount of it each time you look, whereas the fossil fuels are being depleted. Repeat the search period so students can get more beads.
6. Stop after 30 seconds and have the group count and record the beads collected again. Note that there are fewer fossil fuels found in the second round. Students have to look harder to find what is left. The solar count is slowly but surely catching up with the fossil fuels. Repeat with additional trials as needed.
7. Create a multi-line graph of the number of beads collected each trial. This can be done by individual students or as a class. Note that the nonrenewable resources decrease until they are depleted but the solar increases steadily.

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 one resource? Why do some deposits go unused?

Section Two:

Resources You Can Use Efficiently

Objective:

To discuss and identify various resources students use every day.

Vocabulary:

Electricity: The flow of electric charge used as power.

Green energy: Electricity produced by renewable energy sources that are nonpolluting, or that pollute very little.

Natural gas: A fossil fuel that is a mixture of gases occurring in underground deposits.

Classroom Activities:

- “Where Do Fossil Fuels Come From?”
- “Energy for Electricity”
- “Electrical Generation Poster”

Energy Challenge

Discussion Idea:

What natural resources can you save by recycling?

Optional Activity:

1. Have students keep track of each paper product that they use during one day with tally marks.
2. Compare amounts of paper used by students in the class. Ask students if they were surprised by the amount of paper they used.
3. Based on their usage of paper in one day, have students estimate how much paper they would use in a week, a month and a year.
4. Discuss the difference between reducing, reusing and recycling.
 - Reduce – using less of something
 - Reuse – using something again
 - Recycle – making something into another new item
5. Brainstorm several ways that paper use can be reduced, that paper can be reused and how paper can be recycled in your community.
6. Tell students that recycling 1 ton of paper saves the energy equivalent of 1,024 gallons of gasoline. Recycling just four aluminum cans saves enough energy to power a laptop for almost 21 hours. (EPA, 2017)



Where Do Fossil Fuels Come From?

Objective:

This activity investigates the production of natural gas and oil from ancient life. This activity models this process.

Materials per Student Group:

- A clear container to represent the ocean
- Sand or dirt
- Baking soda “plankton”
- Vinegar (20 percent) and water (80 percent) “ocean” mixture
- Cup or scoop
- Safety goggles

NOTE: You may do this as a demonstration, or have students do it in small groups.

STEM Connection

Science

- Science as Inquiry
- Energy Sources, Forms and Transformations
- Science and Technology

Technology

- Problem-solving and Decision-making Tools

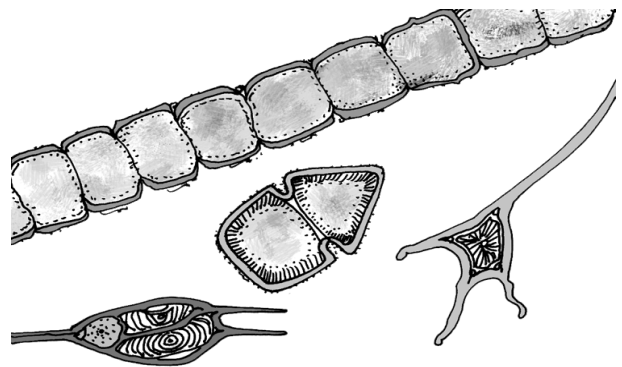
Math

- Numbers and Operations
- Measurement

Procedure:

1. Explain to students that you will be showing them a model of how oil and natural gas form in the ocean. A very similar process takes place on land with plants to form coal.
2. Have students wear safety goggles to avoid splashing vinegar water in their eyes. It is harmless but uncomfortable.
3. Have students sprinkle a small amount of sand to cover the bottom of the container. The ocean floor is covered with sediments and the sand represents these sediments.
4. Next, have students sprinkle “plankton” over the sand, liberally covering the bottom of the container. This represents plankton (microscopic life plant and animal-like creatures called protists) that have died and settled to the bottom of the ocean.

5. Explain that over time, sediments are deposited on the ocean floor. Students should completely cover the plankton with sand. (You can gently push the sand around with your hands to simulate the pressure and weight the overlaying sediments have on the plankton.)
6. The ocean has water in it, so pour some of the vinegar/water (ocean mixture) into the container. Bubbles and foam begin to appear. You can see the bubbles bursting and can hear the gas being released to the air. Point out that this is a sign of a chemical change.



Discussion:

- Discuss with students that natural gas in the ocean is produced much in the same way as you have modeled, but that the process takes MANY years. In the ocean the plankton is buried under miles and miles of sediments which caused the weight of those sediments to “cook” the plankton under high temperature and pressure. The heat and pressure changes the plankton into oil and natural gas. Natural gas floats on top of the oil produced.
- Discuss how this model is different from real life. The gas produced in the experiment is carbon dioxide rather than natural gas, and since our container is open, the gas escapes into the air. In the ocean, there are usually impermeable layers that keep natural gas and oil trapped beneath the surface until we drill down and release it.

Energy for Electricity

Objective:

Trace the flow of energy from a natural resource to electricity in our homes.

STEM Connection

Science

- Science as Inquiry
- Energy Sources, Forms and Transformations
- Science and Technology
- Personal and Social Perspectives

Technology

- Research Tools

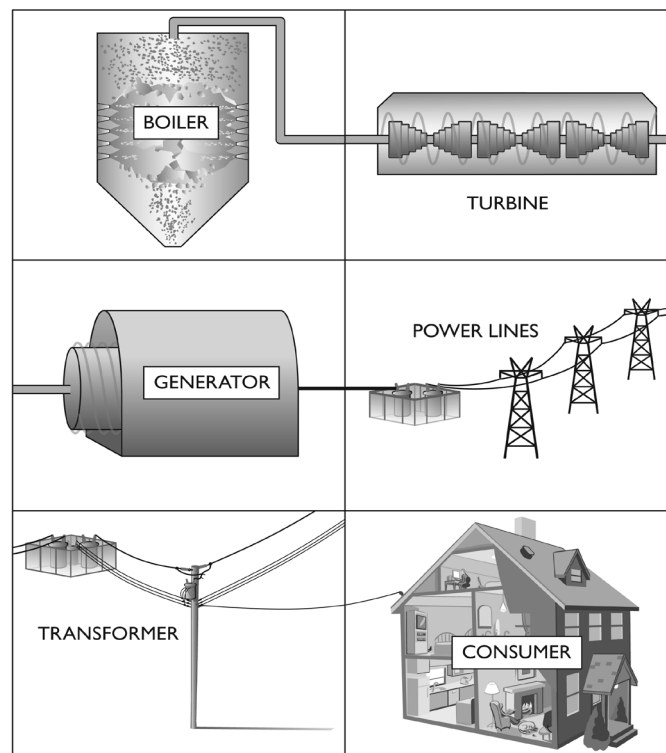
Procedure:

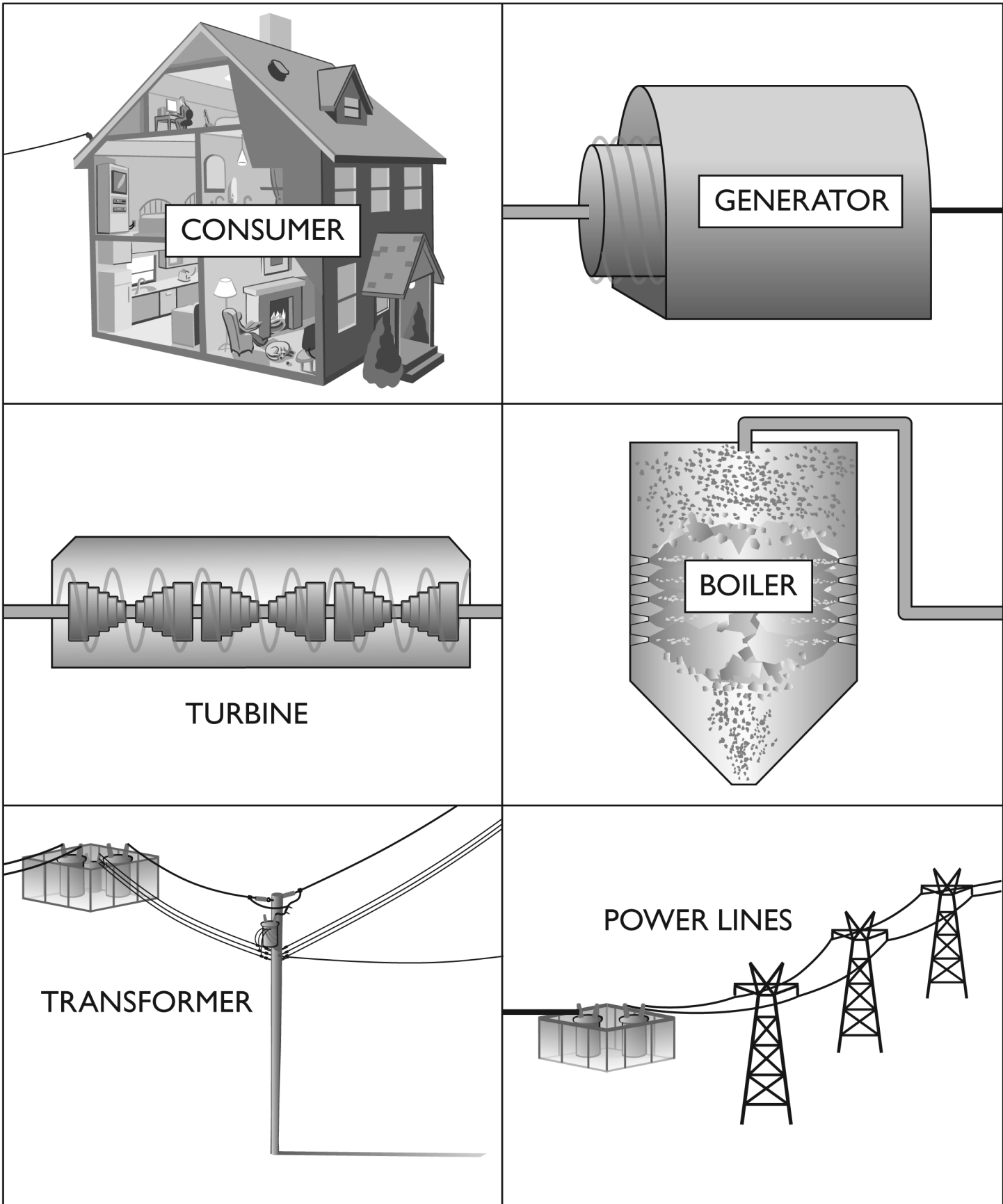
1. Ask students how their lives would be different without electricity. Where does electricity come from?
2. Pass out a copy of the “Electrical Generation Puzzle” found on the following page. Have students cut each part of the puzzle (transformer, turbine, generator, boiler, power lines and consumer) into separate pieces. Then, have them take

a few minutes to put the puzzle pieces in order from the first to the last step of the process of electrical generation.

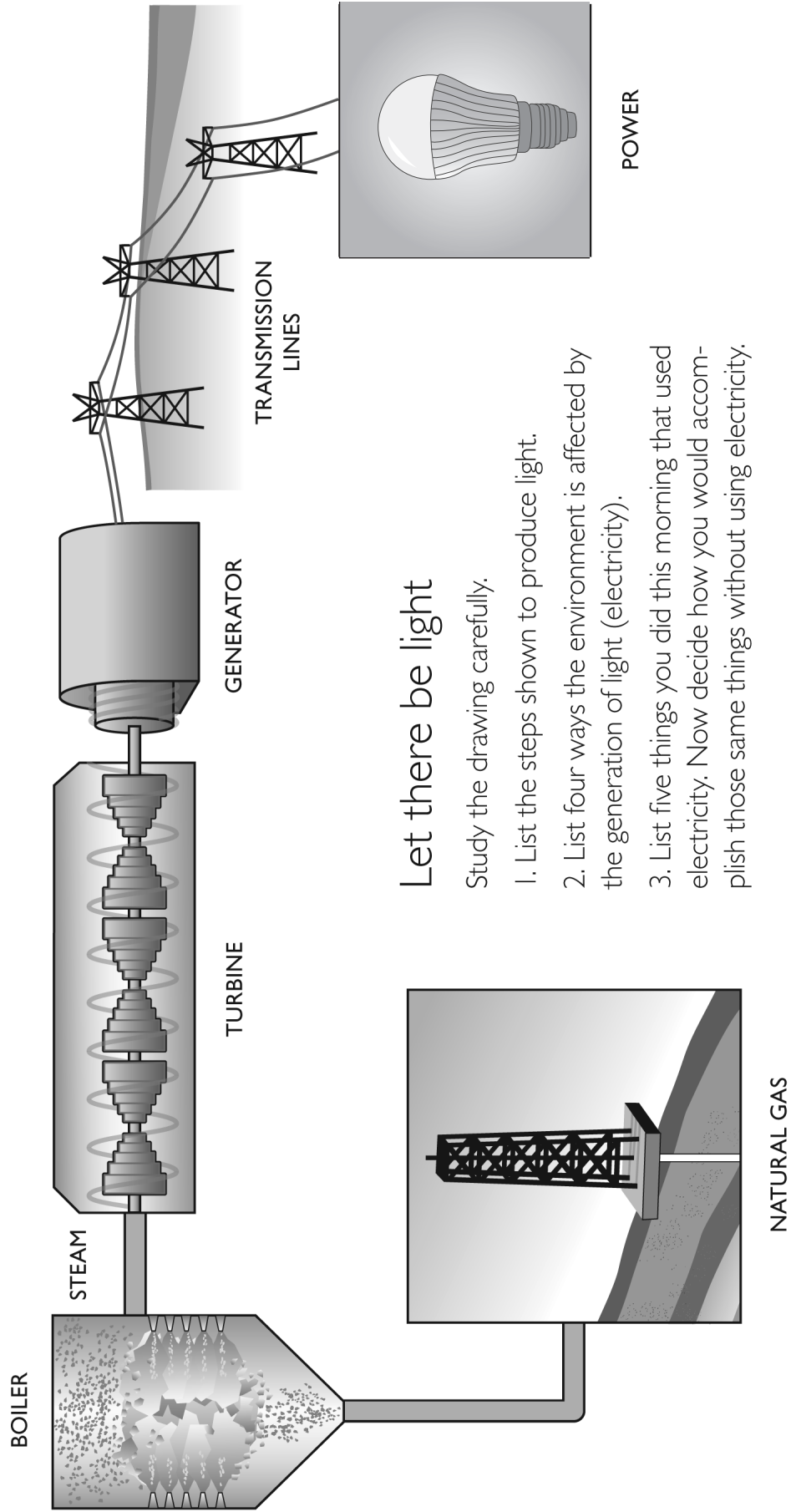
3. Go through each puzzle piece, explaining the process of each step:
 - Boiler – converts chemical energy from fuel (fossil fuels, biomass, hydrogen) to thermal energy, changing water to steam
 - Turbine – turned by steam, converting thermal energy to mechanical energy
 - Generator – turned by turbine, rotating coil of wire in a magnetic field, converts mechanical energy to electrical energy
 - Power lines – transmit electrical energy at several thousand Volts
 - Transformer – step-up transformers along the power lines increase voltage periodically; step-down transformers on poles or in yards reduce the voltage to a safe level for use
 - Consumer – converts electrical energy into many forms to run lighting and appliances

Completed puzzle for teacher reference





Electrical Generation



Let there be light

Study the drawing carefully.

1. List the steps shown to produce light.
2. List four ways the environment is affected by the generation of light (electricity).
3. List five things you did this morning that used electricity. Now decide how you would accomplish those same things without using electricity.

Section Three:

Be **watt**smart, Begin at home

Objective:

To apply the principles of energy efficiency at home by changing habits.

Vocabulary:

Shell: The floors, windows, doors, walls and roof of a building that form a barrier between the indoor and outdoor environment.

Convection: Heat transfer in a gas or liquid by currents that circulate from one region to another. Convection works because heated fluids or gases expand, and since they are less dense, rise through the cooler materials around them.

Conduction: Heat transfer in a solid or liquid without any motion or flow of matter in the material. Heat is transferred by the motion of molecules and electrons. Higher speed particles from the warmer areas collide with slower ones from the cooler areas, causing a transfer of energy to the slower particles.

Radiation: Heat transfer between objects via electromagnetic waves. Photons traveling at the speed of light transfer the heat energy, so the objects do not have to be in contact with each other for heat to be transferred. Radiation can travel through space.

Insulation: A barrier that minimizes the transfer of heat energy from one material to another by reducing the effects of conduction, convection and/or radiation.

Classroom Activities:

- “Insulation Tests”
- “How Bright Is Your Light?”
- “Energy in Math”
- “Be wattsmart, Begin at home Poster”

Energy Challenge

Discussion:

- What changes does your school need to make to save energy?

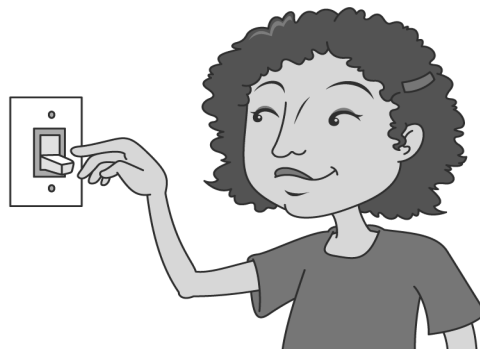
Optional Activity:

- Have students tour the school building to fill out the following checklist:

	Yes	No
1. Are outside doors weather stripped?	_____	_____
2. Are windows caulked to prevent air leaks?	_____	_____
3. Are lights turned off when no one needs them?	_____	_____
4. Is electrical equipment turned off when not in use?	_____	_____
5. Are faucets in bathrooms and kitchen areas free of leaks?	_____	_____

Discussion Idea:

- In which of the five areas does your school need the most improvement? How could students assist in making a change?



Insulation Tests

Objective:

To demonstrate the different types of materials that can be used for insulation.

Materials:

- Thermometer
- Graduated cylinder or measuring cup
- Large jug of water
- Large board or tray
- Baby food jars with lids (one for each material being tested)
- Insulation materials to test: gloves, socks of different materials, other types of clothing, plastic foam, paper, aluminum foil, leaves, etc.

STEM Connection

Science

- Science as Inquiry
- Energy Sources, Forms and Transformations
- Science and Technology
- Personal and Social Perspectives

Technology

- Research Tools
- Problem-solving and Decision-making Tools

Engineering

- Design and Modeling
- Invention and Innovation
- Test Design and Troubleshooting
- Use and Maintain

Math

- Numbers and Operations
- Measurement
- Data Analysis and Probability
- Connection to the Real World

Procedure:

1. On a piece of paper, list all of the materials being tested.
2. Using the jug of water, fill each jar with 120 mL (1/2 cup) of water.
3. Measure the temperature of the water in each jar to make sure they are the same, then put on the lids.
4. Wrap all but one of the jars with the materials being tested. Label the unwrapped jar "control."
5. Place each jar on the large board or tray.
6. Carry the board or tray outside and leave it there.
7. Create a data table to record the beginning and ending temperature of the water in each jar.
8. After a pre-determined amount of time has passed, measure the new temperature of each jar and record the ending temperatures in the data table.
9. Calculate the change in temperature for each jar and add it to the data table. Graph the temperature change for each jar in a bar graph.

Discussion:

- What materials made the best/worst insulators?
- Could you use these to keep your home warm in the winter or cool in the summer?
- What materials are used in homes for insulation? (fiberglass, blown-in insulation, polyurethane foam, etc.)
- What do good insulating materials have in common? How does insulation work? (They have large pore spaces that block conduction of heat through surfaces.)

Language Arts Connection:

Quick write – Based on the information in your data table, give recommendations for insulating a tree house.

How Bright Is Your Light?

Objective:

To demonstrate which lighting sources are the most energy efficient.

Materials:

- Various light bulbs (incandescent, CFL and LED)
- Lamp or light socket
- Thermometer

STEM Connection

Science

- Science as Inquiry
- Energy Sources, Forms and Transformations
- Science and Technology

Technology

- Research Tools

Engineering

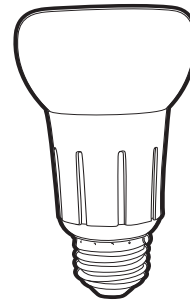
- Historical Perspective

Math

- Numbers and Operations
- Data Analysis and Probability
- Connection to the Real World

Procedure:

1. Ask students what electrical item is used most often in any building and can also account for a lot of wasted energy (lights).
2. Put each light bulb in the lamp and leave it on for five minutes. Hold a thermometer at a distance from, not touching, the bulbs. Record the temperatures. Which bulb produces the most heat?



3. Not all light sources are created equal. Some are much more energy-efficient than others. The least efficient light bulbs are incandescents. These bulbs were invented by Thomas Edison and have changed very little in the last 100 years. Incandescent bulbs get very hot when they are turned on because about 90 percent of the energy that goes into an incandescent bulb is given off as heat instead of light.

By contrast, the compact fluorescent light, or CFL, uses 75 percent less energy because it gives off less heat. A CFL can last up to 10 times longer. LED bulbs are even more efficient, using 75 – 85 percent less energy than traditional incandescent bulbs and can last 25 times longer.

Discussion:

- Does your family use energy-efficient CFLs or LEDs? How can heat from an incandescent bulb cause further energy waste during the summer?

Energy in Math

STEM Connection

Math

- Numbers and Operations
- Data Analysis and Probability
- Connection to the Real World

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 percent 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%

Energy in Math - Answer Key

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 percent 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%

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

Materials:

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

Instructions:

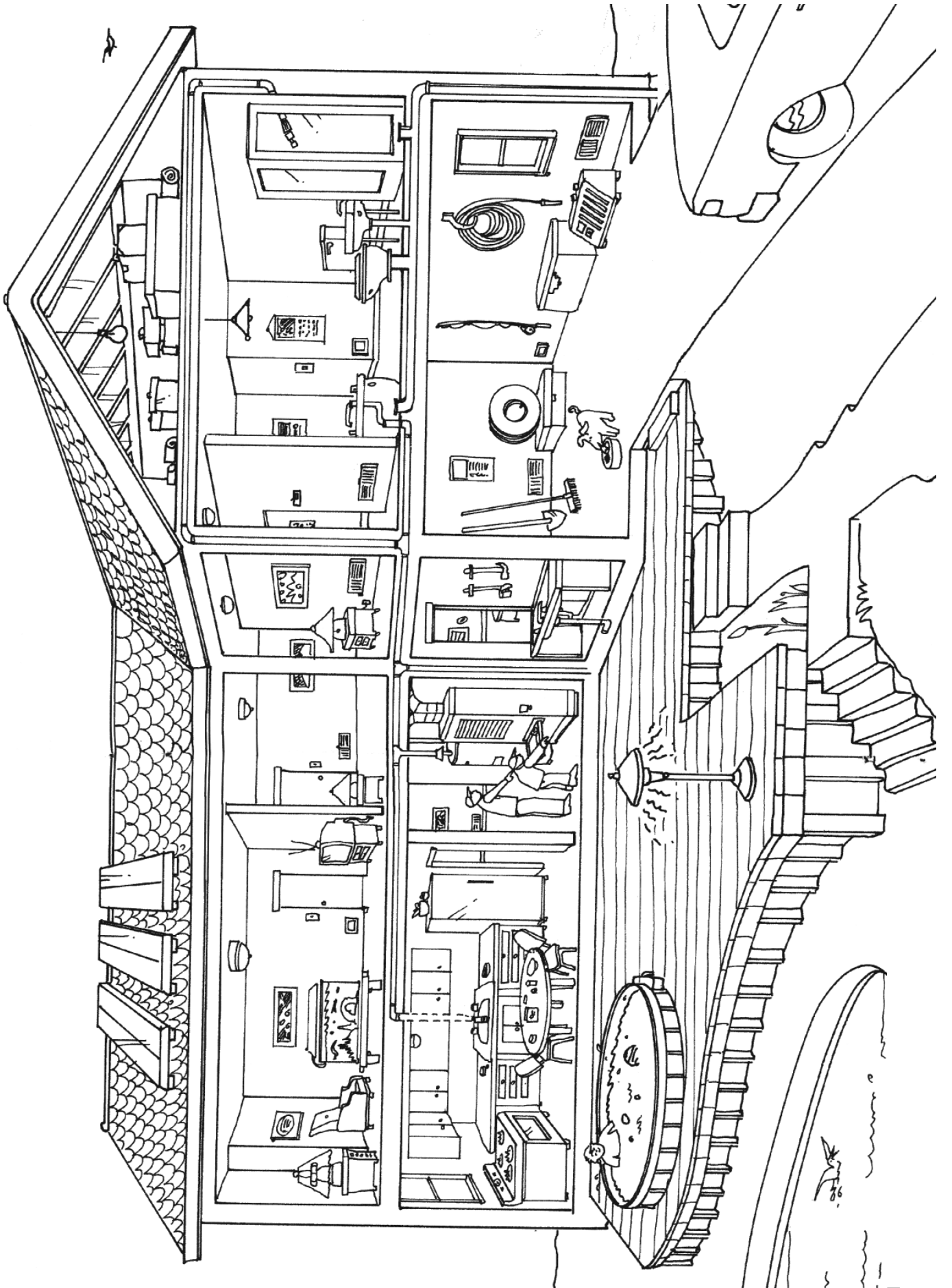
- Add or color the items below. You may want to do different items each day as you cover different topics: electricity, natural gas, water, etc.
- Add a bicycle.
- Add some recycling bins in the garage.
- Add some trees to shade the house.
- Add a ceiling or floor fan to the home for cooling.
- Put a blue star (for ENERGY STAR® products) on the refrigerator, television and furnace.
- Color the energy-efficient shower head.
- 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.

Language Arts Connection:

Quick write – Write a brief description of the things your family has done to improve the energy efficiency of your home. Add items that you will encourage your family to do in the future.

Social Studies Connection:

- Choose one natural resource used for energy and create a T-chart or Venn diagram comparing the positive and negative effects of the use of this resource on the physical environment.
- The more efficient your home is, the smaller your carbon footprint. Your carbon footprint is the total amount of carbon dioxide (CO₂) and other greenhouse gases you generate annually. The lower your footprint, the better!





Be **watt**smart
Begin at home



bewattsmart.com



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

<http://print-bingo.com>

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

<http://print-bingo.com>

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

<http://print-bingo.com>

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

<http://print-bingo.com>

Be wattsmart, Begin at home		Science (NextGen)		Social Studies	Math (Common Core)	Language Arts (Common Core)	
		PS3-4 Energy	ESS3-4 Earth and Human Activity	EALR 1	Number & Operations in Base Ten	Reading	Writing
Washington 4 th Grade Correlations		Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat and electric currents.	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.	Understands civic involvement.	Operations with multi-digit whole number & with decimals to hundredths.	Reading for information, speaking and listening.	Writing for effective communication.
		Activities					
Teacher Guide Activities	Energy Challenge - Embodied Energy		ESS3-4-1, ESS3-4-2, ESS3.A	1.4.1		SL.4.1	
	Conservation Cookie		ESS3-4-1, ESS3-4-2, ESS3.A	1.4.1	4.OA.A.1, 4.MD.A.2	SL.4.1	
	Pass the Sack		ESS3-4-1, ESS3-4-2, ESS3.A	1.4.1		SL.4.1	
	Energy Ticket		ESS3-4-1, ESS3-4-2, ESS3.A			SL.4.1	W.4.3
	The Search for Energy		ESS3-4-1, ESS3-4-2, ESS3.A	1.4.1	4.OA.A.1, 4.NBT.B.4-5, 4.MD.A.2	SL.4.1	
	Energy Challenge - Recycling		ESS3-4-2, ESS3.A	1.4.1		SL.4.1	
	Where Do Fossil Fuels Come From?		ESS3-4-1			SL.4.1	
	Energy for Electricity	PS3-4-1, PS3-4-2, PS3.D				SL.4.1	W.4.3
	Energy Challenge - Energy Efficient	PS3-4-2		1.4.1	4.MD.A.2	SL.4.1	
	Insulation Tests	PS3-4-2, PS3.D			4.OA.A.1, 4.MD.A.2	SL.4.1	W.4.3
	How Bright Is Your Light?	PS3-4-2, PS3.D	ESS3-4-2		4.MD.A.2	SL.4.1	
	Energy in Math		ESS3-4-2		4.OA.A.3, 4.NBT.B.4-5		
	Be <i>watt</i> smart, Begin at home Poster		ESS3-4-2	1.4.1		SL.4.1	W.4.3
Student Activities	Presentation Information		ESS3-4-1, ESS3-4-2, ESS3.A	1.4.1		RI.4.6	
	Student Booklet		ESS3-4-1, ESS3-4-2, ESS3.A	1.4.1	4.NBT.B.5	RI.4.6	
Posters	<i>Energy Efficiency in Action Poster</i>	PS1-5-3	ESS3-4-1, ESS3-4-2, ESS3.A	1.4.1		RI.4.6	
	<i>Electricity Serves Our Community Poster</i>		ESS3-4-1, ESS3-4-2, ESS3.A	1.4.1		RI.4.6	

Be wattsmart, Begin at home		Science (NextGen)			Social Studies	Math (Common Core)	Language Arts (Common Core)	
		PS1-5 Physical Sciences	PS3-5 Energy	ESS3-5 Earth and Human Activity	EALR 1	Number & Operations in Base Ten	Reading	Writing
Washington 5 th Grade Correlations		Make observations and measurements to identify materials based on their properties.	Use models to describe that energy in animals' food was once energy from the sun.	Support, obtain and combine information about ways individual communities use science ideas to protect the earth's resources and environment.	Understands civic involvement.	Operations with multi- digit whole number & with decimals to hundredths	Reading for information, Speaking and Listening	Writing for effective communication
		Activities						
Teacher Guide Activities	Energy Challenge - Embodied Energy		PS3-5-1	ESS3-5-1, ESS3.C	1.4.1		SL.5.1	
	Conservation Cookie	PS1-5-3		ESS3-5-1, ESS3.C	1.4.1	5.G.A.2	SL.5.1	
	Pass the Sack			ESS3-5-1, ESS3.C	1.4.1		SL.5.1	
	Energy Ticket		PS3-5-1	ESS3-5-1, ESS3.C		5.G.A.2	SL.5.1	W.4.3
	The Search for Energy	PS1-5-3	PS3-5-1	ESS3-5-1, ESS3.C	1.4.1	5.G.A.2	SL.5.1	
	Energy Challenge - Recycling			ESS3-5-1, ESS3.C	1.4.1		SL.5.1	
	Where Do Fossil Fuels Come From?		PS3-5-1	ESS3-5-1, ESS3.C			SL.5.1	
	Energy for Electricity						SL.5.1	W.4.3
	Energy Challenge - Energy Efficient				1.4.1	5.G.A.2	SL.5.1	
	Insulation Tests	PS1-5-3				5.G.A.2	SL.5.1	W.4.3
	How Bright Is Your Light?	PS1-5-3				5.G.A.2	SL.5.1	
	Energy in Math					5.NBT.B.5		
	Be watt smart, Begin at home Poster			ESS3-5-1, ESS3.C	1.4.1			W.4.3
Student Activities	Presentation Information			ESS3-5-1, ESS3.C	1.4.1		RI.5.6	
	Student Booklet			ESS3-5-1, ESS3.C	1.4.1	5.NBT.B.5	RI.5.6	
Posters	<i>Energy Efficiency in Action Poster</i>	PS1-5-3		ESS3-5-1, ESS3.C	1.4.1		RI.5.6	
	<i>Electricity Serves Our Community Poster</i>			ESS3-5-1, ESS3.C	1.4.1		RI.5.6	

Be **wattsmart** Begin at home



Dear Parent(s):

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*
- *wattsmart Starter Kit Flier*

Please take a moment to read through this informative booklet with your child. Then, fill out the *Home Energy 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!



bewattsmart.com

Teacher Evaluation

Program Evaluation

Be **watt**smart
Begin at home

Teacher Name:

School:

Sponsor: Pacific Power



Be **watt**smart
Begin at home

In an effort to improve our program, we would like your assessment of Be **watt**smart, Begin at home. Please take a few minutes to fill out this evaluation form. Upon completion, please return the form in the postage-paid envelope along with the student *Home Energy Worksheets* you collected and the sponsor *Thanks a "Watt!" Card*.

Please mark the box that best describes your opinion.

	Strongly Agree	Agree	Disagree	Strongly Disagree
The materials were attractive and easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The materials and activities were well-received by students.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The materials were clearly written and well-organized.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Students indicated that their parents supported the program.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presenters were able to keep students engaged and attentive.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

Yes No

Would you recommend this program to other colleagues?

Yes No

In my opinion, the thing students liked best about the materials/program was:

One thing I would change would be:

WAT WA

Teacher Evaluation Compilation

wattsmart Pacific Power program

Program Evaluation Summary

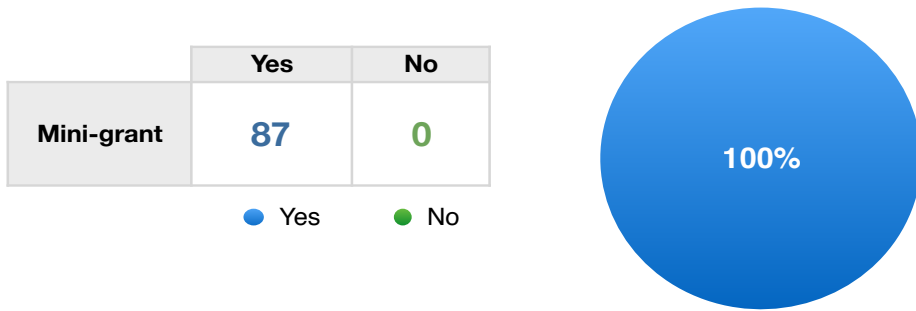
Educators' impressions of the program from 87 educators.

	Strongly Agree	Agree	Disagree	Strongly Disagree	
Materials were attractive and easy to use	62	25	0	0	
Materials/ activities were well received by students	68	19	0	0	
Materials were clearly written and well organized	70	17	0	0	
Students indicated that their parents supported the program	39	46	1	0	
Presenters were able to keep the students engaged and attentive	67	20	0	0	

wattsmart **Pacific Power program**

Program Evaluation Summary

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



Would you recommend this program to other colleagues?



In my opinion, the thing the students liked best about the materials/program was:

Being able to be actively involved in the presentation.
Being able to be part of the demonstrations model.
Being able to volunteer (being picked) to demonstrate.
Connecting the information to what they learned in their science.
Creating a human circuit by holding hands was their favorite.
Energy stick and being able to participate with their peer. They enjoyed the bing game
Everything went wonderful!
Going home and learning about all the energy they are using at home and learning about their family can be more energy efficient.
Great presenters!
Great presenters! My students like the participation activities. Thanks for coming!
Hands on activities and the LINGO game.
Hands on aspect of the presentation. The model of how energy is produced.
Hands on experiments. Thanks again! Great as always.
Human electric circuit
Interactive activities during the presentation
Kids love to participate in the activities especially the circuit!
Learned how we get power in different ways, circuit demonstration, learning how electricity travels
Learning from outside experts.
Lingo and the bulb night light
Lingo and the night lights
Lingo game
LINGO is always fun! Being a participant and part of the presentation keeps the students engaged!
Lingo, lineman slim, human circuit. I loved it! Keep it just as it is!
Love how this coincided with our electric circuit unit
My students enjoyed the program. They were really interrested in the LED light bulb. They learned a lot of new information about energy, power, and how to conserve energy.
My students really enjoyed the presentation. The presenters did an amazing job.
Participating in the activities
Playing Lingo and the parts were you need volunteers to demonstrate
Posters and Dove Tails with up and coming science program.
Students always like the hands on demonstrations.
Students liked the LINGO game, night lights, and participation of students during the presentation.
That it was hands on - all students were engaged!
That it was interactive and it was something different than/special compared to a "normal" school day.
The activities.
The closed circuit demonstration. The Smith's are awesome presenters!
The demonstrations and the Lingo activity.
The demonstrations with props
The demonstrations with the students involved.
The electricity stick human circle/circuit. They like the energy Lingo and like the videos of the Lineman. Super good presenters. Keep up the good work! Please come back.
The engagement with the presenters.
The engaging games in the presentation.
The hands on activites like the human conductor.
The hands on activity/demonstration for how the circuit worked
The hands on learning activities.
The hands-on experiments/demonstrations! Night lights!
The human circuit example.
the human circuit was a hit! The whole presentation was awesome. I would not change any part of it.
The interactive activities like the open and closed circuit.
The interactive activities. We love this program!
The interactive parts of the presentation.
The kids enjoyed playing LINGO.
The knowledge of the presenters and the hands on activities.
The LINGO cards.
The LINGO game and actively participating and modeling.
The LINGO game and interesting facts in the presentation. They also thought it was fun to get the nighlights.
The night light.
The night lights and the human circuit.

In my opinion, the thing the students liked best about the materials/program was:

The offer of the night light.
The posters.
The presenters kept 100 4th graders engaged for an hour... not an easy thing to do. They were wonderful!
The presenters! Steve and Ariene Smith were great with the kids! They put the ideas and vocabulary in kid friendly terms so the kids could understand. They have great rapport with kids as well.
The slideshow, bingo, light stick, and hands on activities.
The student involvement!
The student-led presentation kept kids highly engaged.
The students enjoy them coming in and doing the presentation.
The students enjoyed having the opportunity to participate during the presentation! They also enjoyed the LINGO game.
The students liked the connection to what we are doing in class.
The videos the presenters showed and the energy stick.
They always like the participation parts.
They enjoyed applying the concepts learned into the Lingo game.
They enjoyed the experiments, especially the human circuit
They enjoyed the LINGO and student participation. Great information. It goes well with our science unit.
They enjoyed the powerpoint presentation and night lights. Most of all, they enjoyed participating with the presenters.
They enjoyed your activities and games during the presentation. Well connected to our learning in science class.
They liked the LINGO game, night lights, and the presentation.
They love the bingo game!
They loved being selected to complete a circuit demonstration.
They loved getting the lightbulbs and the night lights.
They loved the electric stick!
They really enjoyed Lingo and the human circuit!
understanding the concept of conductor, insulator, circuit and conserving energy
When the speaker talks about the different ways electricity comes to our homes.

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

Adding a microphone for the presenters as our acoustics in our cafeteria is not the greatest.
All material provided should be in english and spanish
Enteract more with students. You don't have to stick to the script.
I don't remember the "wattsmart" name being explained. Both presenters used excellent teaching strategies. One presenter's manner was too preschoolish for grades 1-7 even though the content was level appropriate.
I think the students would have a greater science knowledge and vocabulary if the presentation was later in the school year.
I would add games to the presentation and a powerpoint demonstration.
I'm not sure how you would address this, but some parents were suspicious of free products. Thought it was a scam.
Just keep the hands on activites.
More hands on activities
More hands on presentations. The female presenter was good, but difficult to hear at times.
More interaction and examples.
More materials in Spanish like the booklet.
More student engagement or do something with lingo
More time for questions. Thank you so much!
Nothing at this time.
Nothing, it was well done! Thank you.
Nothing! It's a great program.
Nothing.
Nothing.
Nothing.
Nothing.
Nothing.
Nothing.
Nothing. I thought it was a great presentation.
Offer it more throughout the year. I would love to have this presentation during our electrical circuits unit!
Perhaps add a new feature as it seems to be the same program!
Present to smaller groups. One class at a time.
Print Spanish on the back of the surveys. Do multiple presentations in a day, so each class can have their own because three classes in one classroom doesn't work well.
Provide copies of the home energy worksheets in Spanish.
Provide us with extra surveys. Students are very poor at getting them to their parents.
Smaller group presentations - 100+ kids to watch and pay attention fo ran hour on the floor is difficult. Would love to see the presentations in class rooms or in a smaller grouping.
The more engaged the students, the better. The presenters could walk around a little more as they present. That is an easy thing that helps the kids with short attention spans keep focused.
The presentation was a little long.
The presentation was a little too much adults talking and not enough interaction for the kids.
This program is awesome!
Time of year, have it closer to our electric circuit unit/kit
We enjoyed the presentation! No change!
We need clearer instructions for the surveys in Spanish. Many students struggled to explain the sruvey to their parents. It was difficult to get them back because of this.

Home Energy Worksheet (English)

Teacher ID:

Teacher Name:

Be **wattsmart**
Begin at home

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 incandescent 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, crock pot 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

WAT WA



Home Energy Worksheet (Spanish)

Ser **watt**smart
😊 Empieza en casa

Nombre del profesor(a):

Verificación de la Energía Doméstica

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 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/reemplazados regularmente.
 Lo hago Lo haré Ninguno

Enfriamiento

5. Reemplazar la unidad de aire acondicionado existente por una unidad de alta eficiencia o un enfriador evaporativa.
 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 incandescentes 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 modelo de ENERGY STAR®.
 Lo he hecho Lo haré Ninguno
16. Desenchufar viejos refrigeradores/congeladores y/o desecharlos de una manera ambientalmente segura.
 Lo he hecho Lo haré Ninguno
17. Mantener las bobinas del refrigerador y del congelador e inspeccionar el sello de las puertas dos veces al año.
 Lo hago Lo haré Ninguno

Electrónicos

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

Cocinar

19. Usar un horno microonda, un horno 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 wattsmart

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

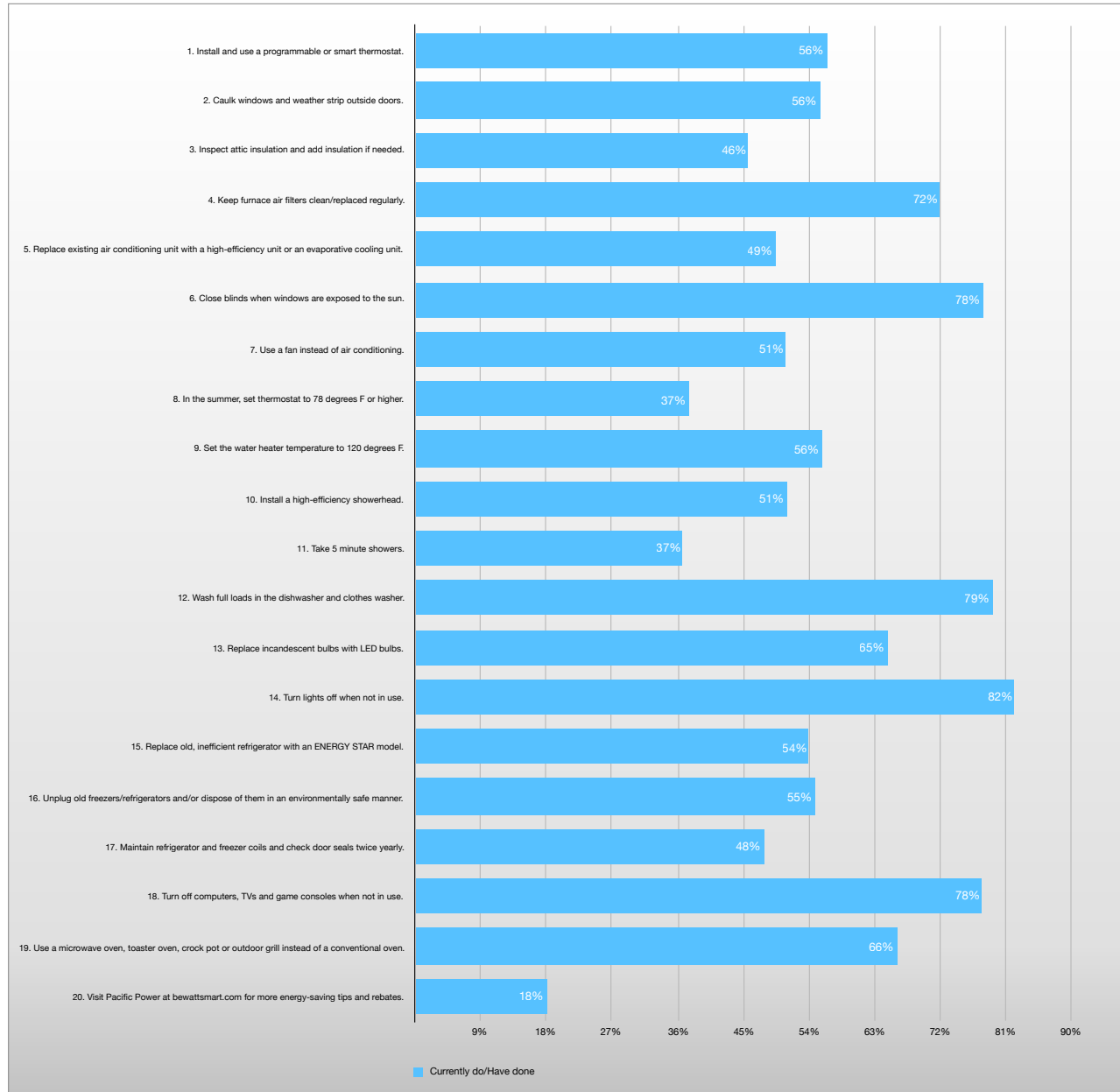


Home Energy Worksheet Summary – Pacific Power

Energy Efficient Activity	Currently do/Have done	Will do	Neither
1. Install and use a programmable or smart thermostat.	56%	18%	26%
2. Caulk windows and weather strip outside doors.	56%	26%	19%
3. Inspect attic insulation and add insulation if needed.	46%	23%	31%
4. Keep furnace air filters clean/replaced regularly.	72%	15%	13%
5. Replace existing air conditioning unit with a high-efficiency unit or an evaporative cooling unit.	49%	21%	30%
6. Close blinds when windows are exposed to the sun.	78%	13%	10%
7. Use a fan instead of air conditioning.	51%	20%	29%
8. In the summer, set thermostat to 78 degrees F or higher.	37%	24%	38%
9. Set the water heater temperature to 120 degrees F.	56%	22%	22%
10. Install a high-efficiency showerhead.	51%	26%	23%
11. Take 5 minute showers.	37%	32%	32%
12. Wash full loads in the dishwasher and clothes washer.	79%	9%	12%
13. Replace incandescent bulbs with LED bulbs.	65%	24%	11%
14. Turn lights off when not in use.	82%	14%	4%
15. Replace old, inefficient refrigerator with an ENERGY STAR model.	54%	22%	24%
16. Unplug old freezers/refrigerators and/or dispose of them in an environmentally safe manner.	55%	20%	25%
17. Maintain refrigerator and freezer coils and check door seals twice yearly.	48%	37%	15%
18. Turn off computers, TVs and game consoles when not in use.	78%	17%	6%
19. Use a microwave oven, toaster oven, crock pot or outdoor grill instead of a conventional oven.	66%	18%	16%
20. Visit Pacific Power at bewattsmart.com for more energy-saving tips and rebates.	18%	63%	19%

Wise Energy Behaviors in Pacific Power Washington Homes

Wise Energy Behaviors in Pacific Power Washington Homes



Sampling of Thanks a "WATT" Cards

Elysha

TiA R.

Thank you for the presentation it took your time! - Brynn ☺

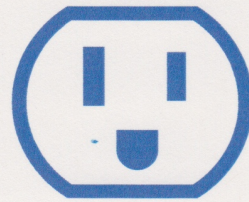
Madison C.

Joyie. M

Graciee

Thanks for the presentation! I learned a lot

Be **watt**smart
Begin at home



max.T

Shelby ☺

CONOR A

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.

Thanks a "WATT!"

Cohen

Olivia
Carol

Thank you once again for providing my students with a wonderful program.

Martha KALIB ☺
Verdora JAZZELLE ☺

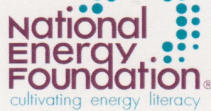
Mari Spencer
4th Grade
T.H.E.

Jessica.T

Max.S

Garrett. G

Benjamin.L



bewattsmart.com

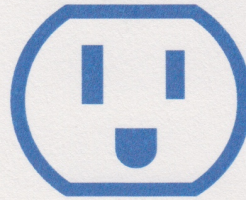
Efrain

thank you so much
for the electrifying
presentation!

Ms. Krueger's
Class ☺

Dominica
Katherine

Be **wattsmart**
Begin at home



Dacelin

Noah Brandes

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.

Thanks a "WATT!"

PT
JESUS cristian

Isael

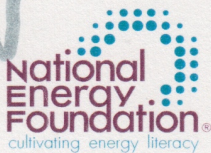
Ethan
Ramiro

Brianna
Andy

MaleyahAnn.M
Arlet h. Z
PACIFIC POWER

Camr

Vialexis



bewattsmart.com

Peighton
Hayson ☺

Kierra thx ☺

Kadence ☺☺

Brock ☺

ISAAC ☺ Yuliana* ☺

Madalyn
♥ ☺

Be **watt**smart
Begin at home



June ☺♥
thanks
for teaching
me! ♥

Ainsley ☺

Logy thx

Haiden
☺

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.

Wentt
Thank
you for
Loving me

Thanks a "WATT!"

Ellie ♥

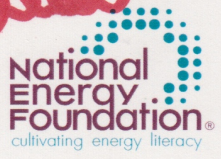
Garrett Hill ★
Thank you for
coming to our
school, come again
Camden ☺

Ieanna McElathen ♥
☺

Elizabeth

Paddy

Miley Zahler
Thank you
for helping me
save energy. ☺♥



bewattsmart.com

Kaylee
 Mrs. Weeks
 Gabriela
 Luis
 Mary
 Abigail
 Melissa
 Karen
 Jazelle
 Damian
 Aubrey
 Enrique
 Cecylia
 Viviana
 Muelh

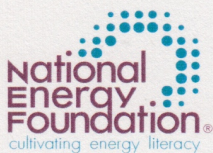
Be **wattsmart**
Begin at home



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.

Thanks a "WATT!" Rosmary

Devante
 Oscar
 Ruth
 Noe
 Anaci
 Mario
 Isaac
 Emily
 Beiza
 Jewelza



bewattsmart.com

Effen

Kiley
Margaret
Natalie

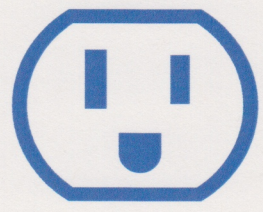
Jaxon

Genesis

Lucas

Jon

Be **wattsmart**
Begin at home



Mrs. Dinger

Jace

Ivan Farias

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.

Katherine

Thanks a "WATT!"

Savannah
Bryan

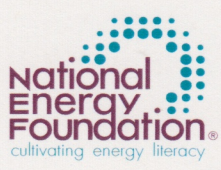
Jaouquin

JOEY

Mason

Vazlyn

michelle



bewattsmart.com



Appendix 6

Washington Program Evaluations

Washington 2017 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 2017 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
Home Energy Savings	2015 - 2016	Cadmus
<i>wattsmart</i> Business	2014 – 2015	Cadmus

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

Table 1
Home Energy Savings Evaluation Recommendations

Evaluation Recommendations	Pacific Power Response
<p>For wattsmart kits, have the program administrator collect kit participant phone numbers and e-mail addresses for kit program survey data collection activities. This information was not available during the evaluation.</p>	<p>As of April 18, 2017, the kit vendor, Energy Federation, Inc. (EFI) requires participant contact information in order to fulfill a kit request.</p>
<p>To quantify the lift of upstream lighting point-of-sale data, track dates and locations for all merchandising and product placement the program is responsible for. Providing model numbers, store locations, dates, and display types (e.g., end caps, pallet displays) allows more precise estimates of program-generated sales lift.</p>	<p>In 2017, the program administrator updated processes for tracking merchandising and product placement information. A Promotion and Activity Tracker was generated to keep tabs on precisely when SKUs have promotional activity and the data points recommended in the evaluation.</p>
<p>For the lighting savings, Cadmus used a recent RTF workbook (2016) to derive evaluated savings, creating a misalignment between the reported and evaluated savings. Cadmus recognizes program planning and the release of new RTF workbooks may not always align. Where feasible and applicable, use the latest RTF workbook.</p>	<p>Addressed in measure development for the 2018/2019 biennium. RTF workbooks current as of September 2017 were used. In addition, in a change from prior biennial periods, updates will be made on January 1, 2019 using RTF updates as of October 1, 2018.</p>
<p>Non-lighting participants reported (27%) long application processing times greater than 8 weeks. To help resolve long wait times, provide customers and contractors with clear, concise directions via applications and the website regarding submittal requirements specific for each measure. Monitor training and performance of administrator staff managing incentive processing. Review incentive payment timeframes compared to those at the end of 2016 to determine whether the number of projects paid in less than four weeks are increasing or those paid in more than eight weeks are decreasing.</p>	<p>During 2017, the program administrator streamlined internal processes and reduced the total process time (application received to check cut date) by 24 calendar days compared to 2016. As part of January 1, 2018 program changes, applications and website content were revised and further streamlined with a goal of further reducing processing time.</p>

Table 2
wattsmart Business Evaluation Recommendations

Evaluation Recommendations	Pacific Power Action Plan
Consider adding an HVAC interactive effect factor consistent with the Non-Residential Lighting Standard Protocol approved on December 14, 2016.	HVAC interactive effects have been added to the program lighting tool after enabling this with a program change.
Consider increasing the deemed savings for prescriptive HVAC VFD fan and pump motor projects.	The deemed savings for HVAC VFD fan and pump motors is under evaluation.
Consider additional training to participating motor service centers to provide a more accurate estimate for motor installation times (rather than always entering six months from the time of service). After delivering the training or new instructions, the program should review applications and track estimated reinstall dates to ensure motor service centers provide more reliable estimates and better understand when savings may be realized.	Recommendation was not implemented due to complexity, regional alignment and small impacts of recommendation on the program overall. Motors can be rewound and placed in inventory to be readily available when the motor in service needs replacement. In these situations, the motor service center cannot predict when a motor currently in service at the customer facility will fail and the rewound motor installed. The motor service centers are managed by the Green Motors Practices Group for the region (and beyond). It is important for Pacific Power's incentive requirements to be consistent with others in the region. The program is using Regional Technical Forum deemed savings for this measure. By implementing the current design, the program accepts the evaluation risk that a rewound motor may not be installed for a period of time.
Continue enhancing the existing, customer-facing vendor search tool. This could include a rating system of participating contractors for various measure categories, based on the quality of work performed and including ratings from program participants (an arrangement similar to Yelp).	Continued to enhance the customer facing vendor search tool. Began assessing vendor performance using a survey completed after the vendor completes an installation. There are plans to make feedback and links to other information (as recommended) available in a new "learn more" area of the vendor search. Added a premium tier in 2018 to identify the highest performing vendors in the vendor search. Pacific Power visited the recommended Energy Trust of Oregon website.
Assess the size of any data exchange inconsistencies and associated impacts between the implementer's database and DSMC, and identify the most appropriate solution.	Beginning in 2016, Nexant began using the same database software as Pacific Power and has modeled measure validations to match the Pacific Power database (DSMC). Improvement to the batch upload process continues to be a priority and revised upload processes/policies have been or will be developed as applicable to program implementation.
While an account management approach may not prove cost-effective in the SBL delivery channel, consider methods for increasing direct contact from Pacific Power or implementer staff.	Plans are in place to provide more direct to customer small business lighting marketing including site visits/lighting audits performed by or with program representatives.

<p>To increase participation, talk to contractors, vendors and distributors to gain insights into how much they have penetrated their small business target market and to determine what additional resources Pacific Power could provide to help them increase outreach to customers without an active ongoing project.</p>	<p>In 2017, a direct customer mailer campaign was launched and a contractor/utility co-branded program marketing brochure was developed for contractors to leave behind with customers. After these efforts the SBL program began to see more participation.</p> <p>In addition to continuing a direct mailing campaign, plans are in place to provide more direct to customer SBL marketing through site visits/lighting audits.</p>
<p>If additional program growth is desired in any of the program delivery channels, consider performing a comprehensive marketing effectiveness assessment to both evaluate the impact of existing marketing and outreach activities, and to investigate how to better reach and motivate these customers.</p>	<p>Further efforts regarding the implementation of this recommendation is highly impacted by the savings targets assigned to the implementation team. As noted in the cell below, "Effective marketing can help achieve this goal. At this time there are no plans to create additional marketing goals..." Any additional marketing and market penetration plans will be considered as a method to achieve the delivery channel savings goals. If achieving exact savings targets is not an issue additional market research and evaluation can be performed as recommended.</p>
<p>Program Marketing and Outreach: 1) Create delivery channel-specific marketing goals, objectives, and Key Performance Indicators (KPIs) to ensure that each delivery channel performs as needed. 2) Communicate KPIs, goals, and objectives together on the calendar; so all parties remain aware of performance indicators. 3) Use a diverse mix of marketing touchpoints in the communication strategies.</p>	<p>1) Each delivery channel has a goal (could be called a key performance indicator) to meet a specific share of the biennial conservation target cost-effectively. Effective marketing can help achieve this goal. At this time, there are no plans to create additional marketing goals and key performance indicators by delivery channel. 2) Parties remain aware of their goals with the existing structure. 3) Parties make use of a diverse mix of marketing touchpoints.</p>
<p>Program Marketing and Outreach for SBL: Diversify marketing touchpoints beyond the approved trade ally network to encourage business owners to reach out to contractors.</p>	<p>Plans are in place to provide more direct to customer SBL marketing, such as social media campaigns and adding a "request a free lighting assessment" button to the small business website.</p>
<p>Program Marketing and Outreach for Custom Analysis: Develop an email blast or direct-mail communication similar to the email blasts used for the 2015 LED Instant Incentive marketing campaign.</p>	<p>In general, custom analysis is needed for larger, more complex customers. The primary method to approach these customers is by direct personal contact. These customers may also be included in email blasts, but the focus is something common to most customers such as lighting with a mention that the program includes more than lighting. Email blasts will continue.</p>
<p>Messaging and Calendar: 1) Create marketing messages targeted to specific delivery channels, but that remain in line with overall program key marketing messages. 2) Slightly space out newspaper and radio ads to accommodate more marketing time. Move email blasts closer to the year's start, right after the busy holiday season ends. 3) During January and February, extend lighting's paid media campaigns;</p>	<p>1) Marketing to specific delivery channels is always integrated with key program messages and branding. 2) The company's will implement this recommendation. 3) The company's will implement this recommendation.</p>

during May and June, extend HVAC's paid media campaign to take advantage of slow periods.	
Savings Considerations: Consider adding an HVAC interactive effect factor consistent with the Non-Residential Lighting Standard Protocol approved on December 14, 2016.	HVAC interactive effects have been added to the program lighting tool after enabling this with a program change.