



Washington Annual Report on Conservation Acquisition

January 1, 2019 – December 31, 2019



Final

June 1, 2020



 **PACIFIC POWER**
A DIVISION OF PACIFICORP

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List of Abbreviations and Acronyms

BPA	Bonneville Power Administration
CHP	Combined Heat and Power
CPA	Conservation Potential Assessment
CEE	Consortium for Energy Efficiency
DSM	Demand-side Management
Schedule 191	Schedule 191 System Benefits Charge Adjustment
EM&V	Evaluation, Measurement & Verification
GWh	Gigawatt-hour(s)
HVAC	Heating, Ventilation and Air Conditioning
IRP	Integrated Resource Plan
kWh	Kilowatt-hour
MW	Megawatt
MWh	Megawatt-hour
NEEA	Northwest Energy Efficiency Alliance
NEF	National Energy Foundation
NTG	Net-to-Gross
PCT	Participant Cost Test
PTRC	PacifiCorp Total Resource Cost test
RIM	Ratepayer Impact Measure test
RTF	Regional Technical Forum
RVT	Resource Value Test
SWAG	Statewide Advisory Group
TRC	Total Resource Cost test
UCT	Utility Cost Test
VFD	Variable-Frequency Drive

Executive Summary

PacifiCorp is a multi-jurisdictional electric utility providing retail service to customers in Washington, California, Idaho, Oregon, Utah, and Wyoming. PacifiCorp dba Pacific Power & Light Company (Pacific Power or Company) serves approximately 132,290 customers in Washington. The Company works with its customers to reduce the need for investment in supply side resources and infrastructure by reducing energy consumption and peak demand through cost effective energy efficiency programs.

The Company is required to comply with the requirements of the Energy Independence Act (also known as I-937) codified in RCW19.285 and WAC 480-109. This report provides information on the Company's 2019 activities and expenditures related to pursuing all conservation in accordance with the I-937 framework, including Washington Utilities and Transportation Commission (Commission) orders and administrative rules.

In 2019, the Company offered four energy efficiency programs in Washington and received energy savings and market transformation benefits through its affiliation with the Northwest Energy Efficiency Alliance (NEEA). The Company recovers expenditures associated with these programs through the System Benefits Charge Adjustment, Schedule 191.

This report also provides details on Schedule 191 revenue for the performance period from January 1, 2019, through December 31, 2019. The Company, on behalf of its customers, invested \$9.4m in energy efficiency information, services, and incentives during the reporting period. The investment yielded approximately 42 gigawatt-hours (GWh) in first year savings¹ and approximately 6.9 megawatts (MW) of energy efficiency savings related capacity reductions.² Net benefits over the life of the individual measures are estimated at \$816k.³

As shown in Table 1, the portfolio was cost effective based on three of the five standard cost effectiveness tests for the reporting period, including the Total Resource Cost test + 10% adder (PTRC), Utility Cost Test (UCT) and Participant Cost Test (PCT). The Total Resource Cost Test (TRC) was less than 1.0 due to overall benefits being lower than the total costs. Project costs used in the cost tests were adjusted downward to account for the Transportation Improvement Board (TIB) Relight Washington funding⁴ for customer costs beyond utility incentives for 14 LED streetlight projects completed in 2019. The ratepayer impact measure test was less than 1.0, indicating near-term upward pressure was placed on the price per kilowatt-hour (kWh) given a reduction in sales.

¹ Gross reported savings at the generation.

² See Energy Efficiency section for explanation on how the capacity contribution savings values are calculated.

³ See Appendix 1 – Table 8 - 2019 Total Portfolio Cost Effectiveness Results (including NEEA and NEIs) – Total Resource Cost Test (PTRC) + Conservation Adder.

⁴ TIB funding comes from the state of Washington's gas tax and is collected from fuel purchasers who are not PacifiCorp customers and is treated in a comparable manner to tax credits; i.e., removed from costs. TIB funding of \$1,101,801 was provided to customers for the 14 projects. The Company's reported project costs were \$1,090,888 and incentives paid totaled \$103,486. Measure costs were adjusted downward by \$987,402 (\$1,090,888 minus \$103,486).

Table 1
Cost Effectiveness for the Portfolio⁵

Benefit / Cost Test	B/C Ratio with NEEA & NEIs	B/C Ratio without NEEA Inc. NEIs
PacifiCorp Total Resource Cost Test (PTRC) plus 10% ⁶	1.06	0.94
Total Resource Cost (TRC) Test ⁷	0.97	0.86
Utility Cost Test (UCT) ⁸	1.32	1.20
Participant Cost Test (PCT) ⁹	3.56	3.04
Ratepayer Impact Cost Test (RIM) ¹⁰	0.37	0.36

All cost effectiveness calculations assume a net-to-gross (NTG) of 1.0, consistent with the Northwest Power and Conservation Council's methodology. Portfolio level cost effectiveness includes portfolio costs such as the Process and Impact Evaluations, Class 2 demand-side management (DSM) Potentials Assessment, End Use Load Research and the DSM system database. Consistent with the Northwest Power and Conservation Council's methodology, the Company includes quantifiable non-energy benefits at the portfolio and program level. *Low Income Weatherization* is not included in the portfolio or sector-level cost effectiveness analysis per WAC 480-109-100(10)(b). Appendix 1 provides 2019 cost effectiveness performance.

⁵ Ratios include select quantifiable and directly attributable Non-Energy Impacts, but excludes costs as outlined in the Company's EM&V Framework (e.g. Class 1 & 3 of the potential study).

⁶ The PTRC includes the 10 percent conservation benefit and risk adder in addition to quantifiable and directly attributable non-energy benefits. PTRC is consistent with the Northwest Power Council's cost effectiveness methodology and complies with the cost effectiveness definition (RCW 80.52.030(7)).

⁷ The TRC compares the total cost of a supply side resource to the total cost of energy efficiency resources, including costs paid by the customer in excess of the program incentives. The test is used to determine if an energy efficiency program is cost effective from a total cost perspective.

⁸ The UCT compares the total cost incurred by the utility to the benefits associated with displacing or deferring supply side resources.

⁹ The PCT compares the portion of the resource paid directly by participants to the savings realized by the participants

¹⁰ The RIM examines the impact of energy efficiency expenditures on non-participating ratepayers overall. Unlike supply-side investments, energy efficiency programs reduce energy sales. Reduced energy sales can lower revenue requirements while putting upward pressure on rates as the remaining fixed costs are spread over fewer kilowatt-hours

Compliance

An external conservation advisory group of stakeholders is required to be maintained and used by the Company to advise it about conservation issues including program designs, incentive levels, third party evaluations, program marketing, and pilots. WAC 480-109-110 provides the scope of issues for the advisory group. The Company refers to its conservation advisory group as the Washington DSM Advisory Group. Meetings are typically held at the Commission offices in Lacey and include a call-in number so stakeholders can participate remotely.

In compliance with I-937, the Company continuously reviews and updates, as appropriate, the conservation programs and portfolio to adapt to changing market conditions. Steps taken to adaptively manage the conservation programs during 2019 are included within program specific sections of this report. In the *Home Energy Savings* program, a new online incentive application platform was deployed including a provision to tie to the Company's Single Sign On (SSO) capability and the incentive for heat pump dryers was increased to help offset the previously available NEEA incentives. In the *Wattsmart Business* program, changes were made to improve program cost effectiveness such as implementing the dual baseline methodology in alignment with the Regional Technical Forum's Non-Residential Lighting Retrofits standard protocol.

Pilot projects are implemented when appropriate and are expected to be cost effective within the current or immediately subsequent biennium as long as the overall portfolio remains cost effective. The Company, after consultation with its DSM Advisory Group, offers initiatives or offers within two programs: *Home Energy Savings* and *Wattsmart Business*. This focus is administratively efficient and uses existing program awareness—both important considerations in the Company's rural territory. To further leverage other efforts, the Company has linked its pilot efforts with regional work supported by NEEA whenever possible.

Regulatory Activities

During the 2019 reporting period, the Company filed a number of compliance and/or informational reports, updates, and requests with the Commission and Department of Commerce in support of Company DSM programs. The following is a list of those filings:

- February 27, 2019 – Schedule 191-System Benefits Charge adjustment, Advice 19-01, Docket UE-190134, to decrease Schedule 191 by approximately \$1.5 million (from \$12.3m to \$10.8m).
- May 31, 2019 – Washington Annual Report on Conservation Acquisition for 2018 (Docket UE 171092). The report provides details on program results and activities.
- May 31, 2019 – 2018-2019 Conservation Report to Department of Commerce (Docket UE-171092). The report detailed the Company's progress in meeting the targets established in RCW 19.285.070 and WAC 194-37-060 (EIA requirements).
- July 29, 2019 – 2018 Washington State-Wide Conservation Advisory Group Activities Report (Docket UE-171092).
- November 1, 2019 – Pacific Power's 2020-2021 Biennial Conservation Plan in Docket UE-190908.

Advisory Group Activities

At least four times per year, the Company seeks input regarding its energy efficiency programs from its Washington DSM Advisory Group. This group includes representatives from a variety of constituent organizations. In addition to the DSM Advisory Group meetings, in 2019, the Company participated in one Statewide Advisory Group (SWAG) meeting. The Company collaborated with its DSM Advisory Group throughout 2019 on the following matters:

June 27, 2019

- Start 2020-2021 target setting process
- Legislative Impacts
- New delivery contracts (Home Energy Savings and outsourced portion of Wattsmart Business) highlights
- Provided an update for on-bill financing targeted to owned manufactured homes on leased space analysis/challenges
- Other updates – Yakama Power, Yakima Energy Fair, and more

August 23, 2019

- Review of portfolio, conservation forecast and underlying assumptions
- Adjustments to date:
 - Home Energy Reports
 - High efficiency Combined Heat and Power
- Review codes/standards analysis work
- Review of the NEEA/Conservation Potential Assessment comparison

- Review list of the Regional Technical Forum (RTF) adjustments being analyzed
- Review proxy portfolio impacts on production efficiency economics
- Review proxy decrement approach to generate avoided costs for cost effectiveness assessment

September 20, 2019

- Latest version of the P-18 proxy portfolio
- RTF adjustments completed since last meeting
- Distribution efficiency forecast
- Adjustments/forecasts from last meeting
- Proposed target
- Preliminary business plan and cost effectiveness
- Proposed pilots

December 18, 2019

- Review of the 2020 communications and outreach plan
- Review the draft petition for excess conservation
- Conservation Potential Assessment (CPA) scope of work
- Program delivery updates
 - Street lights
 - Kits for Low Income
- Other updates
 - Electrification
 - System Benefit Charge

Statewide Advisory Group Meetings

In addition to the DSM Advisory Group meetings, the Company participated in the last scheduled Statewide Advisory Group (SWAG) meeting on January 24, 2019. This meeting was focused on achieving a consensus on a framework for performance incentives for delivering savings beyond the commission approved target. Language from the Statewide Advisory Group charter is provided below.

1. Discuss potential performance incentives:

“(…) the Company suggests conducting a workshop in a statewide collaborative setting. This may be a useful exercise and Staff proposes a joint advisory group meeting halfway through the biennium to discuss this, as well as any other common issues.”¹¹

¹¹ Commission Staff Comments Regarding Electric Utility Conservation Plans; Dockets: UE-171087, UE-171091, UE-171092 [P.10]. The utility cited is Puget Sound Energy. The Company was in agreement with the suggestion.

After the January meeting, joint work on writing the final Washington State-Wide Conservation Advisory Group Activities Report was conducted via conference calls and email exchanges. The finished report was filed with the WUTC on July 29, 2019 and presented to the Commission during the August 8, 2019 open meeting.

DSM Expenditures

System Benefits Charge Balancing Account Summary

DSM activities are funded through Schedule 191, the System Benefits Charge Adjustment collections. Expenditures are charged as incurred and collected through Schedule 191. The balancing account is the mechanism used for managing the revenue collected and expenses incurred in the provision of DSM resources. The balancing account activity for 2019 is outlined in Table 2. The end of year balance in the balancing account, on an accrual basis, was an over-collection of \$3,719,063.

Table 2
System Benefit Charge Balancing Account Summary

Month	Deferred Expenditures	Revenue collected	Accumulative Balance	Monthly Net Accrued Costs	Accrual Basis Accumulative Balance
18-Dec			\$ (2,839,716)	\$ 249,540	\$ 1,839,248
19-Jan	\$ 503,544	\$ (1,139,914)	\$ (3,476,086)	\$ (234,588)	\$ (2,710,206)
19-Feb	\$ 535,534	\$ (1,185,002)	\$ (4,125,554)	\$ (66,436)	\$ (3,426,109)
19-Mar	\$ 873,253	\$ (1,157,273)	\$ (4,409,574)	\$ 181,318	\$ (3,528,812)
19-Apr	\$ 622,377	\$ (829,425)	\$ (4,616,622)	\$ (149,621)	\$ (3,885,481)
19-May	\$ 631,162	\$ (706,614)	\$ (4,692,075)	\$ 159,213	\$ (3,801,720)
19-Jun	\$ 777,942	\$ (776,126)	\$ (4,690,259)	\$ (19,284)	\$ (3,819,189)
19-Jul	\$ 443,931	\$ (886,854)	\$ (5,133,182)	\$ 568,319	\$ (3,693,794)
19-Aug	\$ 435,674	\$ (924,564)	\$ (5,622,072)	\$ 77,646	\$ (4,105,038)
19-Sep	\$ 389,954	\$ (911,399)	\$ (6,143,517)	\$ 330,396	\$ (4,296,086)
19-Oct	\$ 1,684,449	\$ (795,171)	\$ (5,254,238)	\$ (910,665)	\$ (4,317,472)
19-Nov	\$ 650,515	\$ (904,660)	\$ (5,508,383)	\$ 167,313	\$ (4,404,304)
19-Dec	\$ 1,088,980	\$ (1,084,611)	\$ (5,504,014)	\$ 680,872	\$ (3,719,063)
2019 Total	\$ 8,637,314¹²	\$ (11,301,612)		\$ 1,034,023	

Column Explanations:

Deferred Expenditures: Monthly expenditures for all program activities posted in 2019, including funding for the Northwest Energy Efficiency Alliance.

Revenue Collected: Revenue collected through Schedule 191, System Benefits Charge Adjustment.

Accumulative Balance: A running total of account activities on a “cash” basis. A negative accumulative balance means cumulative revenue exceeds cumulative expenditures; positive accumulative balance means cumulative expenditures exceed cumulative revenue.

¹² The variance between table 2 and Executive Summary is due to the table being based on calendar year. Some 2019 expenditures posted to the General Ledger in 2020.

Monthly Net Accrued Costs: Two accrual entries are made each month for expenditures of energy efficiency programs. One estimates the incurred cost not yet processed, and the other reverses the estimate from the previous month. The amount shown here is the net of the two entries.

Accrual Basis Accumulative Balance: Current balance of account including accrued costs.

Planning Process

Integrated Resource Plan

The Company develops a biennial integrated resource plan (IRP) as a means of balancing cost, risk, uncertainty, supply reliability/deliverability and long-run public policy goals.¹³ The plan presents a framework of future actions to ensure the Company continues to provide reliable, reasonably priced service to customers. Energy efficiency and peak management opportunities are incorporated into the IRP based on their availability, characteristics and costs.

PacifiCorp divides energy efficiency and peak management resources into four general classes:

- **Class 1 DSM—Resources from fully dispatchable or scheduled firm capacity product offerings/programs**—Class 1 DSM programs are those for which capacity savings occur as a result of active Company control or advanced scheduling. Once customers agree to participate in a Class 1 DSM program, the timing and persistence of the load reduction is involuntary on their part within the agreed upon limits and parameters of the program. Program examples include residential and small commercial central air conditioner load control programs that are dispatchable, and irrigation load management and interruptible or curtailment programs (which may be dispatchable or scheduled firm, depending on the particular program design or event noticing requirements).
- **Class 2 DSM—Resources from non-dispatchable, firm energy and capacity product offerings/programs**—Class 2 DSM programs are those for which sustainable energy and related capacity savings are achieved through facilitation of technological advancements in equipment, appliances, lighting and structures, or repeatable and predictable voluntary actions on a customer's part to manage the energy use at their facility or home. Class 2 DSM programs generally provide financial or service incentives to customers to improve the efficiency of existing or new customer-owned facilities through: (1) the installation of more efficient equipment, such as lighting, motors, air conditioners, or appliances; (2) upgrading building efficiency through improved insulation levels, windows, etc.; or (3) behavioral modifications, such as strategic energy management efforts at business facilities and home energy reports for residential customers. The savings endure (are considered firm) over the life of the improvement or customer action. Program examples include comprehensive commercial and industrial new and retrofit energy efficiency programs, comprehensive home improvement retrofit programs, strategic energy management and home energy reports.
- **Class 3 DSM—Resources from price responsive energy and capacity product offerings/programs**—Class 3 DSM programs seek to achieve short-duration (hour by hour) energy and capacity savings from actions taken by customers voluntarily, based on a financial incentive or signal. Program examples include time-of-use pricing plans, critical peak pricing plans, and inverted block tariff designs. As a result of their voluntary nature,

¹³ Information on the Company's integrated resource planning process can be found at the following address:
<http://www.pacifiCorp.com/es/irp.html>

participation tends to be low and savings are less predictable, making Class 3 DSM resources less suitable to incorporate into resource planning, at least until their size and customer behavior profile provide sufficient information for a reliable diversity result (predictable impact) for modeling and planning purposes. Savings typically only endure for the duration of the incentive offering and, in many cases, loads tend to be shifted rather than being avoided. The impacts of Class 3 DSM resources may not be explicitly considered in the resource planning process; however, they are captured naturally in long-term load growth patterns and forecasts.

- **Class 4 DSM—Non-incented behavioral-based savings achieved through broad energy education and communication efforts**—Class 4 DSM programs promote reductions in energy or capacity usage through broad-based energy education and communication efforts. The program objectives are to help customers better understand how to manage their energy usage through no-cost actions such as conservative thermostat settings and turning off appliances, equipment and lights when not in use. The programs are also used to increase customer awareness of additional actions they might take to save energy and the service and financial tools available to assist them. Class 4 DSM programs help foster an understanding and appreciation of why utilities seek customer participation in Classes 1, 2 and 3 DSM programs. Similar to Class 3 DSM resources, the impacts of Class 4 DSM programs may not be explicitly considered in the resource planning process; however, they are captured naturally in long-term load growth patterns and forecasts. Program examples include Company brochures with energy savings tips, customer newsletters focusing on energy efficiency, case studies of customer energy efficiency projects, and public education and awareness programs.

Class 1 and 2 DSM resources are included as resource options in the resource planning process. Class 3 and 4 DSM actions are not considered explicitly in the resource planning process, however, the impacts are captured naturally in long-term load growth patterns and forecasts.

As technical support for the IRP, the Company engages a third-party consultant to conduct a DSM Potential Assessment (Potential Assessment).¹⁴ The study primarily seeks to develop reliable estimates of the magnitude, timing and cost of DSM resources likely available to PacifiCorp over the 20-year planning horizon of the IRP. The main focus of the Potential Assessment is on resources with sufficient reliability characteristics that are anticipated to be technically feasible and considered achievable during the IRP's 20-year planning horizon. By definition, the estimated achievable technical potential is the energy efficiency potential that may be achievable to acquire during the 20-year planning horizon prior to cost effectiveness screening.

The achievable technical potential of Class 2 (energy efficiency) resources for Washington by sector is shown in Table 3. The 2017 Potential Assessment indicates that approximately nine

¹⁴ PacifiCorp's Demand-side Resource Potential Assessments can be found at <http://www.pacifiCorp.com/es/dsm.html>.

percent of the achievable technical potential for the Company, excluding Oregon¹⁵, is available within its Washington service area.¹⁶

Table 3
Washington Energy Efficiency Achievable Technical Potential by Sector¹⁷

Sector	Cumulative GWh in 2036	Percent of Baseline Sales for the Sector
Residential	347	20%
Commercial	403	22%
Industrial	73	13%
Irrigation	14	8%
Street Lighting	5	41%

Demand-side resources vary in their reliability, load reduction and persistence over time. Based on the significant number of measures and resource options reviewed and evaluated in the Potential Assessment, it is impractical to incorporate each as a stand-alone resource in the IRP. To address this issue, Class 2 DSM measures and Class 1 DSM programs are bundled by cost for modeling against competing supply-side resource options which reduces the number of discrete resource options the IRP must consider to a more manageable number.

Cost Effectiveness

The Company evaluates program implementation cost effectiveness (both prospectively and retrospectively) under a variety of tests to identify the relative impact and/or value (*e.g.*, near-term rate impact, program value to participants, etc.) to customers and the Company. Program cost effectiveness is performed using a Company specific modeling tool, created by a third party consultant. The tool is designed to incorporate PacifiCorp data and values such as avoided costs, and assesses the costs and benefits of DSM resource programs from different stakeholder perspectives, including participants and non-participants, based on four tests described in the Standard Practice Manual (TRC, UCT, PCT and RIM) as well as an additional fifth test, PTRC. Washington utilizes the PTRC as the primary cost effectiveness test.

As specified in WAC 480-109-100 (8) “A utility’s conservation portfolio must pass a cost effectiveness test consistent with that used in the Northwest Conservation and Electric Power Plan. A utility must evaluate conservation using the cost effectiveness test consistent with those used by the council and as required by the commission except as provided by WAC 480-109-100 (10).

The Northwest Power and Conservation Council’s Seventh Power Plan provides information on cost effectiveness on page G-11 of Appendix 6. “The Council uses the total resource net levelized cost (TRC net levelized cost) for its analysis of the cost of the conservation measures, which is

¹⁵ Oregon energy efficiency potentials assessments are performed by the Energy Trust of Oregon.

¹⁶ <http://www.pacificorp.com/es/dsm/dpssm.html> Volume 1, Table 2-1, PacifiCorp Demand-Side Resource Potential Assessment for 2017-2036.

¹⁷ Volume 2, Tables 4-4, 4-6, 4-8, 4-10, 4-11, PacifiCorp Demand-Side Resource Potential Assessment for 2017-2036.

similar to the Societal Cost Test outlined in the National Action Plan for Energy Efficiency¹⁸ and the California Standard Practice Manual.”

The National Energy Efficiency Screening project published the National Standard Practice Manual (NSPM)¹⁹ to provide a comprehensive framework for assessing the cost effectiveness of energy efficiency resources. The NSPM provides guidance that incorporates lessons learned over the past 20 years, responds to current needs, and addresses and takes into account the relevant policies and goals of each jurisdiction undertaking efficiency investments. The NSPM presents an objective and neutral Resource Value Framework that can be used to define a jurisdiction’s *primary* cost effectiveness test, which is referred to as a Resource Value Test (“RVT”).

The PacifiCorp Total Resource Cost (PTRC) test results in the Navigant analysis include the 10 percent Conservation Adder and quantifiable non-energy benefits and is analogous to the Societal Cost Test (SCT) referenced by the Council.

In combination with WAC rules and in approving Pacific Power’s 2018-2019 Biennial Conservation Plan,²⁰ the WUTC has established cost effectiveness tests for Pacific Power to use in planning for and pursuing conservation resources. Per the definition above from the NSPM, the Total Resource Cost test, as modified by the Northwest Power and Conservation Council and referred to as the PTRC by Pacific Power, *is* the current RVT for Washington investor-owned utilities.

¹⁸ <https://www.epa.gov/sites/production/files/2015-08/documents/cost-effectiveness.pdf>

¹⁹ https://nationalefficiencyscreening.org/wp-content/uploads/2017/05/NSPM_May-2017_final.pdf

²⁰ Docket UE-171092, Order 01 Attachment A (8) (January 12, 2018).

Energy Efficiency Programs

The Company offered energy efficiency programs to all major customer sectors: residential, commercial, industrial, and agricultural. The Company's energy efficiency portfolio included four programs: *Home Energy Savings*, Schedule 118; *Home Energy Reports*; *Low Income Weatherization*, Schedule 114; and *Non-Residential Energy Efficiency (Wattsmart Business)*, Schedule 140. The Company also helps fund NEEA. In addition to the energy efficiency programs, the Company, on behalf of customers, invested in outreach and education for the purpose of promoting the efficient use of electricity and improving program performance. Results for 2019 are provided in Table 4.

Table 4
Washington Results January 1, 2019 – December 31, 2019

Program	kWh/Yr Savings (at site)	kWh/Yr Savings (at generator)	Systems Benefits Charge Expenditures
Low Income Weatherization	166,912	183,052	\$ 530,233
Home Energy Savings	5,758,893	6,315,778	\$ 2,509,871
Home Energy Reports	8,366,413	9,175,445	\$ 233,392
Total Residential Programs	14,292,218	15,674,276	\$ 3,273,496
Wattsmart Business	20,786,950	22,726,682	\$ 4,453,677
Northwest Energy Efficiency Alliance	3,718,676	4,075,438	\$ 878,492
Total	38,797,844	42,476,396	\$ 8,605,664
		Process & Impact Evaluation	\$ 181,846
		Class 2 Potential Study	\$ 18,851
		End Use Load Research	\$ 34,382
		Portfolio DSM Central	\$ 259,277
		Outreach and Communication	\$ 293,275
		Total Portfolio Level Expenditures	\$ 787,631
		Total System Benefits Charge expenditures	\$ 9,393,295

In 2019, the Company delivered preliminary results of 42,476 MWh in first year energy savings at generation against the 2019 Business Plan. Changes between forecasted and actuals are detailed below.

- Home Energy Savings results were approximately 17 % less than forecast with the shortfall being directly attributable to the distribution of energy savings kits. Lighting and non-lighting results were well aligned with the forecast.
- Wattsmart Business: 2019 savings were lower than forecasted in the 2019 Annual Conservation Plan. These lower savings are primarily due to lower savings from the industrial sector which was partially made up by higher savings in the commercial and irrigation sectors. For the industrial sector, approximately 2 million kWh of refrigeration project savings was moved from 2019 to the 2020 forecast as of the end of 2019 for a variety of customer reasons including budget and timeline extension needed for installation.
- NEEA: Actual savings reporting from NEEA (using the same methodology and baselines used to establish the original forecast) indicate that savings are up by approximately 16 % when compared to the 2019 forecast. NEEA indicated the ENERGY STAR computers, Consumer Products and Commercial Code initiatives delivered greater savings than originally forecast.

Key Changes in the Expenditure Forecast

- The 2019 annual conservation plan budget for low income weatherization was developed assuming matching funds would not be available and Pacific Power would need to pay 100% of the costs. Matching funds were actually available for the vast majority of the projects (~85%) and most homes were treated with Pacific Power paying 50% of the costs. As a result the actual expenditures for 2019 were approximately half of the forecast while homes treated and energy savings were approximately equal to the forecast.
- Expenditures for delivery of Home Energy Reports were less than the 2019 Annual Conservation Plan forecast. The primary reason for the variance is the split between paper and email reports. Paper reports are more expensive to deliver than email. A higher portion of the reports were delivered via email than originally forecast which reduced expenditures.
- Wattsmart Business expenditures were less than the 2019 Annual Conservation Plan forecast in alignment with the lower savings. Incentives and program delivery expenses were lower than forecast.

Consistent with requirements under WAC 480-109-120 (3)(b)(ii) and (iii), Table 5 provides a comparison of the Company's 2019 Business Plan filed on November 15, 2018, to actual 2019 program performance.

Table 5
Washington 2019 Annual Conservation Plan compared to Actual

Program	2019 PacifiCorp Washington Annual Conservation Plan			2019 PacifiCorp Washington DSM Actual		
	kWh/Yr Savings (at site)	kWh/Yr Savings (at generation)	Estimated Systems Benefit Expenditures	kWh/Yr Savings (at site)	kWh/Yr Savings (at generation)	Systems Benefits Charge Expenditures
Low Income Weatherization	152,592	167,348	\$ 1,051,000	166,912	183,052	\$ 530,233
Home Energy Savings	6,921,106	7,590,377	\$ 2,515,615	5,758,893	6,315,778	\$ 2,509,871
Home Energy Reports	-	-	\$ 305,469	8,366,413	9,175,445	\$ 233,392
Total Residential Programs	7,073,698	7,757,725	\$ 3,872,084	14,292,218	15,674,276	\$ 3,273,496
Wattsmart Business	26,779,081	29,194,058	\$ 6,465,030	20,786,950	22,726,682	\$ 4,453,677
Northwest Energy Efficiency Alliance	3,202,542	3,615,747	\$ 861,752	3,718,676	4,075,438	\$ 878,492
TOTAL	37,055,321	40,567,530	\$ 11,198,866	38,797,844	42,476,396	\$ 8,605,664
Process & Impact Evaluation	-	-	\$ -	-	-	\$ 181,846
Class 2 Potential Study	-	-	\$ -	-	-	\$ 18,851
School Energy Education	-	-	\$ 60,000	-	-	\$ -
Portfolio Support Summary	-	-	\$ 573,284	-	-	\$ 259,277
End use load research						\$ 34,382
Outreach and Communication	-	-	\$ 250,000	-	-	\$ 293,275
Total System Benefits Charge Expenditures	-	-	\$ 12,082,150	-	-	\$ 9,393,295

Estimated Peak Contributions

The Company estimates its capacity reduction during PacifiCorp's system peak period from the 2019 energy efficiency portfolio. An energy-to-capacity conversion factor, developed from Class 2 DSM selections in the 2017 IRP, is used to translate 2019 energy savings to estimated demand reduction during the system peak as shown in Table 6. The use of this factor in the MW calculation assumes that the energy efficiency resources acquired through the Company's programs have the same average load profile as those energy efficiency resources selected in the 2017 IRP.

Table 6
Estimated Peak Contribution

Description	Value
First year Energy Efficiency program MWh savings acquired during 2019 (@ Generator)	42,476
Conversion factor: Coincident MW/MWh	0.000162842
Estimated coincident peak MW contribution of 2019 Energy Efficiency acquisitions	6.92

Direct Benefits to Customers

Estimates of direct benefits to customers delivered from 2019 expenditures are provided in Table 7. This additional metric to assess program impacts is consistent with conversations between Commission Staff and the Company that occurred during the preparation of prior conservation plan(s) and reports. Direct benefits are in addition to the benefits all customers receive through implementation of cost effective energy efficiency resources; lower energy costs.

Table 7
2019 Direct Benefits to Customers

Program or Initiative	Expenditures	Direct Benefit to Customers	Direct Benefit to Customers
Low Income Weatherization	\$ 530,233	\$ 441,492	83%
Home Energy Savings	\$ 2,509,871	\$ 1,407,990	56%
Home Energy Reports	\$ 233,392	\$ -	0%
Total Residential Programs	\$ 3,273,496	\$ 1,849,482	56%
	\$ -	\$ -	
Wattsmart Business	\$ 4,453,677	\$ 2,522,353	57%
Northwest Energy Efficiency Alliance	\$ 878,492	\$ 624,100	71%
TOTAL	\$ 8,605,664	\$ 4,995,935	58%
Process & Impact Evaluation	\$ 181,846		
Class 2 Potential Study	\$ 18,851		
Portfolio Support Summary	\$ 259,277		
End use load research	\$ 34,382		
Outreach and Communication	\$ 293,275		
Total System Benefits Charge Expenditures	\$ 9,393,295		

Notes:

Low Income Weatherization: In 2019 payments to community action agencies for measure installation were classified as incentives. The value can be found in the cost effectiveness tables included in Appendix 1.

Home Energy Savings: Customer incentives, upstream, mid-stream and mail by request buy downs are included in the direct benefit to customer calculation. This information is provided in the incentives column for the Home Energy Savings program in Appendix 1.

WattsMart Business: Customer incentives (\$2,020,412) and expenditures for customer site specific energy engineering (\$485,356) and inspections (\$16,586) are included in the direct benefit to customer calculation.

NEEA: Company subtracted \$21,302 in internal management costs and then applied the 70% estimate provided by staff to NEEA funding to calculate the direct benefit to customers.

Pilot Projects

The Company offers pilot projects to residential and nonresidential sectors. This section briefly describes the pilots underway in the biennial period and key activities that occurred in 2019

On-Bill Financing for residential customers

- **Purpose:** Reduce upfront cost barrier to participation in residential energy efficiency programs by offering on-bill financing for 2019-2020. The residential offer complements the third party financing already in place for our business customers.
- **Costs:** Start-up costs of \$30,000 will be paid in 2019 and included as a residential program expenses and recovered through the tariff rider. Pacific Power internal on-going loan administration costs were not assessed in 2018. When internal costs are assessed, they will be included as a program expense and recovered through the tariff rider.
- **Size:** Expected to be 150-200 loans for the 2018-2019 period.
- **Implementation:** Build upon experience from Oregon using a specialized firm, Craft3, to operate as funder and loan administrator for Home Energy Savings program participants. Similar to Oregon, Pacific Power will provide on-bill servicing functions. Financing will be available for the net (after incentives) costs of equipment eligible for incentives through HES program. There will not be a utility service disconnect option for collection or security purposes. Partial payments will be applied to the utility bill first giving Pacific Power payment priority.
- **Marketing:** The offer will be marketed primarily through contractors and the Home Energy System program administrator. Craft3 will identify and train contractors. Marketing and screening will be put in place to help insure customers eligible for low income services are directed to the community action agencies instead of participating in the loan offer.
- **2019 activity:** Group and individual training conducted with trade allies and Craft3 in Yakima and Walla Walla. Training included information on services for income qualified customers. There were 153 applications received; 109 approved, 97 active loans (funded and billing), 38 applications declined and 18 applications withdrawn. Exploration of an offer for owned manufactured homes on rented space is on-going

Heat pump dryers

- **Purpose:** Increase stocking, sales and incentive applications for heat pump dryers within Pacific Power's territory. Equipment eligibility aligns with NEEA's Qualified Products List (QPL).
- **Costs:** Additional administrative budget of approximately \$6,000. Included in Home Energy Savings program delivery costs for the biennial period.
- **Size:** Twelve to 24 units.
- **Implementation:** Home Energy Savings program team in combination with NEEA. The initiative focuses was on smaller retailers with faster decision processes and is a continuation of the work started in 2017. Continue the work in partnership with NEEA to secure preferred pricing and expedited shipping.
- **Marketing:** Continue sales training and enhanced outreach to smaller independent retailers. Provide a sales performance incentive fund (SPIF) and pay participating sales associates \$50 for every qualifying model sold.
- **2019 activity:** The NEEA incentive was not continued. To compensate, the incentive was increased to \$600 starting on January 1, 2020. A total of six heat pump dryer applications were received in 2019.

Manufactured Homes Targeted Delivery

- **Purpose:** Increase installation of energy efficiency measures within existing manufactured homes.
- **Costs:** To be determined from Request for Proposal (RFP) responses and cost effectiveness analysis.
- **Size:** To be determined from RFP responses and cost effectiveness analysis.
- **Implementation:** An RFP process was issued within Home Energy Savings program. Proposals were evaluated for cost effectiveness inside proposed (2018-2019) Home Energy Savings program.
- **Marketing:** Third party(s) if selected through RFP process, program administrator, installing contractors and park owners.
- **2019 activity:** Proposal evaluation did not reveal any compelling opportunities beyond what is currently available in the current program. Continued focus on duct sealing. Program field staff engaged with and encouraged HVAC trade allies that offered promotional pricing for ductless heat pump installations in manufactured homes. In 2019, 488 manufactured homes participated in the duct sealing direct install program.

Residential Deep Energy Retrofit

- **Purpose:** Increase comprehensive projects (multiple energy using systems) in existing residential homes.
- **Costs:** Up to \$20,000 for contractor engagement, project pre-qualification, pre/post modeling and high touch engagement during project including verification/close-out. Included in HES program delivery budgets for the biennial period.
- **Size:** One to four completed projects.
- **Implementation:** Establish a baseline model based on prior metered utility consumption and target improvements that will save 40-60 percent of total usage which translates into approximately 8,800 kWh delivered primarily from heating, cooling and water heating

improvements. Add a customer incentive of up to \$5,000 to the existing Home Energy Savings program.

- **Marketing:** Work with general contractor to identify existing homes where customers are prepared to make substantial improvements to the systems using or affecting the majority of the energy consumption in the home. The customer incentive is designed to offset a portion of the project costs which are estimated to be \$15,000 to \$30,000 depending on the size and site conditions of the home.
- **2019 activity:** No projects were completed in 2018 or 2019 and after consultation with few key contractors, the measure was removed from the program on January 1, 2020.

Geo-Targeted Energy Efficiency

- **Purpose:** Focus on increasing participation in specific geographical area(s) where additional value, such as possible infrastructure investments has been identified. This is a continuation of work begun in 2017.
- **Costs:** Additional administrative costs of approximately \$16,000 included in the program delivery budgets for the biennial period.
- **Size:** Approximately 5,800 customers.
- **Implementation:** The effort will focus on the Yakima area and installed projects will be tracked. A kWh to kilowatt (kW) calculator using existing load shapes was completed. This calculator allows the Company's field engineering team to start looking for hourly capacity impacts of the installed energy efficiency projects.
- **Marketing:** Increase frequency of existing program tactics including direct mail, trade ally engagement and personal selling.
- **2019 activity:**
 - In 2019, five business projects totaling 191,565 kWh in annual savings were completed in the geo-targeted areas with additional projects identified for potential installation in future years. 2019 projects are estimated to provide summer capacity reductions of 19.5 kW. Winter capacity reductions for these projects are estimated at 13.2 kW.
 - Outreach also targeted residential customers with direct mail and program administrator field staff outreach to multi-family owners. In 2019, 65 projects totaling 100,176 kWh in annual savings were completed. 2019 projects are estimated to provide summer capacity reductions of 9 kW. Winter capacity reductions for these projects are estimated at 34.1 kW.

Non-Residential Lighting Controls

- **Purpose:** Increase installation of lighting controls as part of business customer lighting retrofit projects.
- **Costs:** Included in program delivery budgets
- **Size:** Up to 15 projects
- **Implementation:** Leverage the Northwest Energy Efficiency Alliance's Luminaire Level Lighting Control (LLLC) initiative including vendor training support.

- **Marketing:** NXT Level training and good/better/best communications, continuing and improving lighting controls training for vendors, providing outreach coordinator feedback on lighting controls to approved Wattsmart Business Vendors on projects..
- **2019 activity:**
 - **Contractor/Vendor Training:**
 - On March 12 and 13, 2019, Pacific Power hosted the annual vendor trainings in Yakima and Walla Walla. There was a hands-on lighting controls session focusing on advanced networked lighting control products. Vendors were able to interact with the product and use the app to program and commission the controls. Between the two locations, 60 vendors attended.
 - On June 5, 2019, Pacific Power co-hosted a hands-on Advanced Networked Lighting Controls course in Kennewick at Benton PUD. This effort was in collaboration with NEEA's LLLC Initiative, the Seattle Lighting Design Lab and BPA. There were 11 Pacific Power trade allies representing eight Wattsmart Business Vendors in attendance.
 - **Contractor Incentive:** In 2019, Pacific Power developed a limited time \$/fixture Contractor Incentive for advanced networked lighting controls that was promoted and offered throughout 2019. Contractors face up-front costs of time and money to obtain manufacturer certification(s) to install advanced lighting controls products. A contractor incentive (focused on the vendor's first projects only) along with the vendor support provided by the program could boost participation.
 - **Savings results:** Approximately 96 completed lighting projects with savings from controls totaling approximately 2.1 million kWh/year. There was one project including advanced networked lighting controls. The program paid out a contractor incentive of \$2,400 to a Wattsmart Business contractor who installed advanced networked lighting controls on a qualifying project.

Manufactured Homes

To support regional efforts in providing information about underserved markets or hard-to-reach segments, the Company has included information about its manufactured homes participation. The information provided in Table 8 below and shows its historical manufactured home customers who have participated in the Company's *Low Income Weatherization* and *Home Energy Savings* programs.

Table 8
Participation by Manufactured Home Residents

	2014	2015	2016	2017	2018	2019
Low Income Weatherization homes	40	44	49	45	41	7
Home Energy Savings participants	256	1,028	403	954	872	648
Appliances	34	10	10	4	8	2
Duct Sealing	197	187	12	795	492	488

	2014	2015	2016	2017	2018	2019
Heat Pump	24	26	18	79	90	67
Heat Pump Water Heater	4	-	1	3	-	-
Kits	-	817	362	73	282	42
Lighting	12	17	1			-
Lighting buy down	72,646	86,318	54,508	50,953	33,936	34,791
Weatherization	30	8	3	1	4	2

Home Energy Experts was hired by the program administrator to conduct outreach and seal ducts at no cost to manufactured home residents.

Almost 1,500 mailers were sent to customers to generate interest and secure appointments, and 486 homes received the direct install offering. Residents in another two manufactured homes had their ducts sealed using a contractor they selected and paid.

In 2019, 67 heat pump installations were completed in manufactured homes by nine contractors. The manufactured home installations include upgrades to more efficient equipment and converting electric furnaces to heat pumps.

Information on all participants except the lighting buy down was compiled by matching customer identifiers (concatenated service location and agreement numbers) of participants with the same information in residential customer accounts bearing the manufactured home dwelling code flag.

Information about the portion of lighting buy down participants who reside in manufactured homes follows the same calculation used in prior years and uses information from the general population survey from the latest evaluation.²¹

The Company also analyzed manufactured home customers who are also participants in the *Home Energy Reports* program. Table 9 below provides information on current 2019 behavioral program (*Home Energy Reports*) participation by manufactured home residents.

Table 9
Home Energy Reports Participation by Manufactured Home Residents

	Recipient	Control	Total
Legacy	1,555	1,506	3,061
Expansion	2,635	836	3,471
Refill	218	224	442

²¹ In 2019, manufactured home customers purchased approximately fourteen percent of the units receiving incentives in the buy down channel. This is the same percentage as used in prior years. The methodology is included in this footnote. Lighting buy down information was compiled from survey information from the draft 2017-2018 Home Energy Savings evaluation. Customer prior year purchases for both CFLs and LEDs were added to arrive at a per-home purchase that was assumed to apply equally to all manufactured homes (approximately 15,300) and calculate an estimate of total purchases for manufactured homes. Manufactured home customers purchased approximately fourteen percent of the units receiving incentives in the buy down channel.

Information on the behavioral program participation was compiled in 2019 in the same manner (matching customer account number information) as described above for energy efficiency program participation.

In addition, the Advisory Group agreed that income data used to help categorize participants would also be useful for the regional efforts described above. Further, providing income information is not a program participation requirement and that available third party data would be used. Accordingly, this information is included in Table 10. The information in Table 10 uses zip code information for all *Home Energy Savings* program participants and those participants residing in manufactured homes as well as income information from the US Census Bureau. This comparison does not illustrate a strong correlation between lower income levels and manufactured home participation. Alternately stated, it appears program participation by manufactured home residents is similar to overall program participation by zip code/income level. Similar information was included in last year's report and 2019 was added for this report.

Table 10
Manufactured Home Income Data

ZIP Code	Median Household Income - US Census Bureau American Community Survey	Project Count - All DSM Projects 2014 - 2019	% Total DSM Projects	Project Count - MANUFACTURED Projects 2014 - 2019	% Total Manufactured Projects
98948	\$43,106	323	1%	27	1%
98932	\$47,302	292	1%	18	0%
98944	\$43,434	1,183	5%	142	3%
98947	\$9,697	252	1%	42	1%
98901	\$38,579	2,125	8%	531	12%
98951	\$44,729	550	2%	62	1%
98930	\$46,188	996	4%	217	5%
98902	\$41,432	3,439	14%	313	5%
98603	\$61,528	2	0%	0	0%
98935	\$40,096	140	1%	19	0%
98952	\$45,139	34	0%	9	0%
98938	\$76,053	92	0%	14	0%
99347	\$52,173	233	1%	26	1%
99343	\$59,968	0	0%	0	0%
98933	\$51,442	45	0%	11	0%
99328	\$46,406	484	2%	48	1%
98953	\$65,614	514	2%	82	2%
98923	\$52,803	88	0%	14	0%
99350	\$56,713	8	0%	2	0%
98903	\$47,215	1,552	6%	689	15%
99348	\$41,912	166	1%	36	1%
98937	\$55,870	527	2%	71	2%
99301	\$61,029	0	0%	0	0%
98936	\$56,769	486	2%	139	3%
98942	\$60,100	1,624	6%	258	6%
99324	\$42,708	1,080	4%	367	8%
99362	\$52,537	4,366	17%	537	12%
99361	\$60,588	278	1%	91	2%
98908	\$58,801	3,605	14%	552	12%
99360	\$82,344	128	1%	37	1%
99323	\$71,907	452	2%	315	7%
98921	\$28,594	37	0%	9	0%
99329	\$46,250	22	0%	10	0%
98950	\$88,036	3	0%	0	0%
98939	data not available	11	0%	1	0%
99363	data not available	23	0%	16	0%
98920	data not available	1	0%	1	0%

Residential Programs

The residential energy efficiency portfolio is comprised of three company programs: *Home Energy Savings*, *Home Energy Reports*, *Low Income Weatherization*, and *funding for NEEA*. As shown in Table 11, the residential portfolio was cost effective based on three of the five standard cost effectiveness tests for the reporting period. The RIM test was less than 1.0, indicating near-term upward pressure was placed on the price per kilowatt-hour (kWh) given a reduction in sales.

Table 11
Cost Effectiveness for Residential Portfolio²²

Benefit / Cost Test	B/C Ratio with NEEA & NEIs	B/C Ratio without NEEA Inc. NEIs
PTRC	1.03	0.76
TRC	0.96	0.71
UCT	1.22	0.86
PCT	3.13	2.29
RIM	0.36	0.30

Individual program performance, program management and program infrastructure is provided on the following pages.

²² Excludes *Low Income Weatherization* and includes select quantifiable and directly attributable non-energy benefits.

Home Energy Savings

The *Home Energy Savings* program provides access to and incentives for more efficient products and services installed or received by customers residing in newly constructed homes, existing homes, multi-family housing units or manufactured homes. 2019 cost effectiveness results were lower than prior years, primarily the result of fewer energy savings kits being delivered to customers. Energy savings kits are some of the most cost effective measures and contribute substantial non-energy impacts to the portfolio²³. Delivery of energy savings kits was temporarily suspended in 2019 to accommodate the start-up of the new Nexant fulfillment system and the ramp down of the legacy fulfillment system. As a result, the program was only cost effective based on the PCT which indicates the bill savings are greater than the customer costs as shown in Table 12 below.

Table 12
Cost Effectiveness for Home Energy Savings²⁴

Benefit / Cost Test	B/C Ratio
PTRC	0.68
TRC	0.64
UCT	0.75
PCT	1.85
RIM	0.30

Program participation by measure category is provided in Table 13.

Table 13
Eligible Program Measures (Units)

Measure Category	Total kWh/Yr Savings @ Site	Total Incentive	Total Quantity
Appliances	17,208	\$ 8,300	111
Building Shell	178,025	\$ 80,096	301,316 (sq. ft)
Energy Kits	349,304	\$ 9,278	830
HVAC	2,279,506	\$ 848,775	1,107
Lighting	2,662,335	\$ 305,540	207,227
Water Heating	27,775	\$ 8,900	20
Whole Home	244,739	\$ 147,100	79
Grand Total	5,758,893	\$ 1,407,990	

²³ Appendix 1 – table17 (Home Energy Savings non-energy benefits).

²⁴ Includes quantifiable and directly attributable non-energy impacts.

Program Management

The Company program manager who is responsible for the program in Washington is also responsible for the *Home Energy Savings* program in California and *Home Energy Reports* program in Washington.

For each program and in each state the program manager is responsible for the cost effectiveness of the program, contracting with the program administrator monitoring program performance and compliance, and recommending changes in measures, incentives, or delivery requirements as set out in the tariff and/or posted on the Company's website.

In 2018, the Company issued a Request for Proposal to re-procure services for *Home Energy Savings* program in California and Washington. The Request for Proposal also included an outsourced portion of *Wattsmart* Business currently performed by Nexant and Cascade to allow for potential economies of a single contractor delivering for both programs. Selection and contracting was complete in 2019 and Nexant was selected to replace CLEAResult as administrator of the Home Energy Savings program. The transition between program administrators occurred over approximately 6 month, primarily during Q2 and Q3 and was designed to minimize disruption to customers, trade allies and participating retailers.

Program Administration

The *Home Energy Savings* program is administered by Nexant. Nexant is responsible for the following:

- Retailer and trade ally engagement – Nexant identifies, recruits, supports, and assists retailers to increase the sale of energy efficient lighting, appliances and electronics. Nexant enters into promotion agreements with each lighting manufacturer and retailer for the promotion of discounted lighting equipment. The agreements include specific retail locations, lighting products receiving incentives and not-to-exceed annual budgets. Weatherization and HVAC trade allies engaged with the program are provided with program materials, training, and regular updates.
- Inspections – Nexant recruits and hires inspectors to verify on an on-going basis the installation of measures. A summary of the inspection process is in Appendix 2.
- Incentive processing and call-center operations – Nexant receives all requests for incentives, determines whether the applications are completed, works directly with customers when information is incorrect or missing from the application and processes the application for payment.
- Program specific customer communication and outreach – A summary of the communication and outreach is outlined in the Communication, Outreach and Education section.

Program Changes

Planned changes went into effect January 1, 2019 as part of the adaptive management strategy for aligning the Home Energy Savings program during the 2018-2019 biennium with updated planning assumptions, market conditions and pilot expectations. Namely:

- Updated unit energy savings and equipment eligibility to align with Regional Technical Forum (RTF) information available as of October 1, 2018.
- Increased incentive for heat pump dryers to \$600 to support the pilot.
- Qualification of smart thermostats was broadened to equipment listed on the ENERGY STAR qualified products list.
- The highest tier (4) for heat pump water heaters was dropped since it is now part of the Tier 3 based on the most recent RTF workbook.
- Added options for offering limited time stocking or completion payments to contractors and/or distributors for selected measures. These payments were included in the program delivery budget.

Adaptive Management

The Company made substantial changes through an adaptive management approach which included the following 2019 activities:

- New program website was launched in June 2019 as part of the transition to Nexant. The new web site incorporates updated Company branding and provides links to incentive applications and customer support. The web site also includes the on-line ordering capability for the Energy Savings kits.
- Trade Ally Connect, a new on-line portal focused on trade allies was launched as part of the transition to Nexant. This platform hosts all Home Energy Saving tools and resources. Portal content is tailored by sector and state. Vendors who participate in incentive offers from Home Energy Savings and Wattsmart Business have access to resources for both programs in Trade Ally Connect. As Vendors join the Wattsmart Vendor Network via the application in the portal, their company is added to the Find A Trade Ally tool, a resource for customers searching for contractors in their area.
- The Program introduced an online incentive center where customers and approved trade allies can submit applications online. This new tool works directly with Pacific Power's database system allowing for a more streamlined application and processing path. Either a customer or a contractor can apply and the system is tailored to only show measures each customer and contractor is eligible for. Additionally, customers and contractors are now able to track their incentive application status online in real time.

- At the end of 2019, the Program announced a planned request for proposals for the creation of a manufactured homes contractor network in Washington. This network will be able to provide specialized products and services to residential customers residing in or plan to reside in manufactured homes in Pacific Power's Washington service area.
- The Washington Home Energy Guide transitioned from a platform hosted by EnergySavvy to a new platform hosted by Bidgely.
- Continued implementing New Home Whole Home Performance Path application submittals through the NEEA's AXIS platform. In 2019, 64 new homes were certified through the Whole Home Performance Path program.
- In 2019, trade allies were engaged in several field activities, including trainings in Yakima and Walla Walla in September. These trainings introduced trade allies to the new Program Administrator, shared important program information and introduced newly available tools. Program Administrator conduct several territory visits through 2019 to build relationships with vendors, conduct inspections and conduct on-site trainings of trade allies.
- Program Administrator connected with participating retailers over a total of 220 employee interactions in 2019. Additionally, there were 158 customer interactions through in-store promotions and site visits. An event hosted by participating lighting manufacturer Megalite participate in holiday fair in December, delivering \$35,000 in lighting incentives.

Infrastructure

Multiple retailers and trade allies help deliver energy efficient products on behalf of the Company. The list of participating and non-participating retailers and trade allies by delivery channel and measure is provided in Appendix 3.

Home Energy Reports

The *Home Energy Reports* program is a behavioral program designed to decrease participant energy usage by providing comparative energy usage data for similar homes located in the same geographical area. Additionally, the report provides the participant with information on how to decrease their energy usage. Equipped with this information, participants can modify behavior or make structural equipment, lighting, or appliance modifications to reduce their overall electric energy consumption.

Reports were initially provided to approximately 13,500 customers (referred to as “legacy” group). The number of participants decreased over time due to customer attrition from general customer churn (customer move-outs)²⁵ and customers requesting to be removed from the program. In 2014, the program was expanded to 38,500 additional customers (referred to as “expansion” group).²⁶ Another group of customers (referred to as “legacy refill” group) were added in January 2015 to offset attrition and lower energy savings than expected from the initial legacy group.²⁷

In 2018, the Company transitioned the Home Energy Report delivery contract from OPower/Oracle to Bidgely. Starting in 2018 and continuing through 2019, customers in the same treatment groups received either paper or email reports that included a breakdown of electricity usage by appliance category and comparison of their energy use to other similar homes. Paper reports are mailed to customers on a bi-monthly schedule. Email reports are sent on a monthly basis. All participants may request an electronic version delivered via email and have access to a web portal containing the same information about their usage, usage by appliance category, and past usage provided in the report. The web portal also contains other functions such as the ability for customers to update their home profile (for more accurate comparisons) and suggestions on more ways to save energy around their home. Results are shown in Table 14.

Table 14
Cost Effectiveness for *Home Energy Reports*

Benefit / Cost Test	Benefit/Cost Ratio
PTRC	2.33
TRC	2.12
UCT	2.12
PCT	n/a
RIM	0.29

²⁵ At the end of 2019 approximately 7,776 customers in the legacy group were still participating and receiving home energy reports.

²⁶ At the end of 2019, approximately 20,985 customers in the expansion group were still participating and receiving home energy reports.

²⁷ At the end of 2019, approximately 2,858 customers in the legacy refill group were still participating and receiving home energy reports.

Program savings by group is provided in Table 15.

Table 15
Program Savings

Home Energy Reports Group	Total kWh/Yr Savings @ Site
Legacy	4,356,942
Expansion	3,841,913
Refill	167,558
Grand Total	8,366,413

Consistent with planning assumptions used to establish the conservation target and business plan a two year measure life is used to assess costs effectiveness. The Home Energy Reports savings included in the table above are first year reported savings achieved. Any incremental savings for 2019 will be included in the 2018-2019 Biennial Conservation Report.

Program Management

The Company program manager overseeing program activity in Washington is also responsible for the *Home Energy Savings* program in California and Washington. For each program in each state, the program manager is responsible for the cost effectiveness of the program, contracting with the program administrator, monitoring program performance and compliance, and recommending changes measures, incentives or delivery requirements as set in the tariff or posted on the Company's website.

Program Administration

The *Home Energy Reports* program is administered by Bidgely. Bidgely's software creates individualized energy reports for utility customers that analyze their energy usage, disaggregates energy use into end uses and offers recommendations on how to save energy and money by making small changes to their energy consumption.

In 2020, the program participants including both control and treatment groups will be re-randomized in order to expand the program, bring reports to new customers, and do so cost effectively. A key element of this cost effective expansion will be increased digitization of the program, or in other words, sending more email reports than before.

Low Income Weatherization

The *Low Income Weatherization* program provides energy efficiency services through a partnership between the Company and local non-profit agencies to residential customers who meet income-eligible guidelines. Services are provided at no cost to the program participants. Cost effectiveness for the *Low Income Weatherization* program was not included in the portfolio or sector-level analysis per WAC 480-109-100 (10)(b).

In 2019, 87 homes were treated, saving 166,912 kWh (at site). Total homes treated, as well as the type and frequency of specific energy efficiency measures installed in each home, is provided in Table 16.

Table 16
Eligible Program Measures (Units)

Participation – Total # of Completed/Treated Homes	87
Number of Homes Receiving Specific Measures	
Aerators	33
Attic Ventilation	44
Caulk/Weather-stripping	44
Ceiling Insulation	52
Ductless Heat Pump	20
Duct Insulation	29
Floor Insulation	55
LED Light Fixtures	5
LED Light Bulbs	67
Ground Cover	50
Infiltration	68
Repairs	25
Replacement Refrigerators	6
Showerheads	26
Thermal Doors	5
Timed Thermostat	4
Wall Insulation	10
Water Heater Blankets	1
Water Heater Replacement	13
Water Pipe Insulation and Sealing	51
Windows	7

Program Management

The Company program manager overseeing program activity in Washington is also responsible for the *Low Income Weatherization* programs in California, Idaho, Utah, and Wyoming; the bill discount programs;²⁸ and energy assistance programs.²⁹ For each program in each state, the program manager is responsible for the cost effectiveness of the energy efficiency programs, partnerships, and agreements in place with local agencies that serve income eligible households, establishing and monitoring program performance and compliance, and recommending changes in the terms and conditions set out in the tariff.

Program Administration

The Company has long-term partnerships in place with three local non-profit agencies to provide weatherization services to income-qualifying households throughout its Washington service territory. These agencies include Blue Mountain Action Council located in Walla Walla, Northwest Community Action Center in Toppenish, and Opportunities Industrialization Center of Washington in Yakima. The Company entered into an agreement for these services with the Yakama Nation Housing Authority in July 2018.

The leveraging of Company funding along with Washington Match Maker Program funds allows the agencies to provide these energy efficiency services to more households at no cost to participating customers. The Company provides rebates to partnering agencies for 50 percent of the cost of services while Match Maker funds are available, and will cover 100 percent of costs when these state funds are depleted. In 2019, 68 homes were funded at 50% and 13 at 100%. In April 2019, Agencies received additional Match Maker funds from 2017-2019 Match Maker program cycle from Washington Department of Commerce and shifted back to 50% reimbursement of Pacific Power funds. Match Maker program funding for 2019-2021 were released to agencies in third quarter and agencies remained at 50% of Pacific Power funds through the end of 2019. Participants qualify if they are homeowners or renters residing in single-family homes, manufactured homes, or apartments. Over 7,800 homes have been completed with Pacific Power funding since the program's inception in the mid-1980s.

By contract with the Company, the agencies are responsible for the following:

- Income Verification – Agencies determine participant income eligibility based on Washington Department of Commerce guidelines. Households interested in obtaining weatherization services apply through the agencies. The income guidelines can be viewed on the Washington Department of Commerce website³⁰.

²⁸ The Low Income Bill Program (LIBA) in Washington bill discount program provide reduced rate to income eligible households and program criteria.

²⁹ The federally funded Low Income Home Energy Assistance Program (LIHEAP) helps low income households with heating costs. Programs are administered by state agencies through designated local agencies in Washington, California, Idaho, Oregon, Utah and Wyoming. PacifiCorp offers a donation program and matches every dollar donated 2 to 1. Collected funds are sent to designated local agencies that provide energy assistance in Washington, California, Idaho, Oregon, Utah, and Wyoming.

³⁰ <http://www.commerce.wa.gov/wp-content/uploads/2018/03/v.1.1-2018WALowIncomeEligibilityGuidelines.pdf>

- Energy Audit – Agencies use a U.S. Department of Energy approved audit tool or priority list to determine the cost effective measures to install in the participant's homes (audit results must indicate a savings to investment ratio of 1.0 or greater).
- Installation of Measures – Agencies install the energy efficiency measures.
- Post Inspections – Agencies inspect 100 percent of completed homes. A sample of 5 -10 percent are inspected by a Pacific Power inspector. See Appendix 2 for verification summary.
- Billing Notification – Agencies are required to submit a billing to Company within 90 days after job completion. A homeowner agreement and invoice form indicating the measures installed and associated cost is submitted on each completed home.

Northwest Energy Efficiency Alliance

The Northwest Energy Efficiency Alliance (NEEA) is a non-profit corporation that works collaboratively with its funders and other strategic market partners to accelerate the innovation and adoption of energy-efficient products, services, and practices. NEEA is supported by BPA, Energy Trust of Oregon, and more than 100 Northwest utilities, including Pacific Power.

Program performance for 2019 is being reported based on NEEA's results for Pacific Power of 3,719 MWh (at site). Consistent with the reporting convention approved in Docket UE-132047 the savings represent Pacific Power's portion of Total Regional Savings less the Company's local program savings

Program Administration

The Company has a representative on the NEEA board of directors as well as representatives on each of the sector advisory committees, residential, commercial and industrial.

Non-Residential Program

The Non-Residential Energy Efficiency program is promoted to the Company's commercial, industrial and irrigation customers as Wattsmart Business.

The Wattsmart Business program³¹ is intended to maximize the efficient use of electricity for new and existing non-residential customers through the installation of energy efficiency measures and energy management protocols. Qualifying measures are any measures which, when implemented in an eligible facility, result in verifiable electric energy efficiency improvements.

The program was cost effective in 2019 based on four of the five cost-effectiveness tests as shown in Table 17. The RIM test was less than 1.0, indicating near-term upward pressure was placed on the price per kilowatt-hour (kWh) given a reduction in sales.

Table 17
Cost Effectiveness for Wattsmart Business

Benefit / Cost Test	B/C Ratio with NEEA & NEIs	B/C Ratio without NEEA inc NEIs
PTRC	1.20	1.17
TRC	1.09	1.07
UCT	1.61	1.61
PCT	3.89	3.60
RIM	0.39	0.40

³¹ The program brochure is available at https://www.pacificpower.net/content/dam/pcorp/documents/en/pacificpower/savings-energy-choices/wattsmart-business/washington/WA_wattsmartBusiness_Brochure.pdf. Program detail (in addition to the program tariff, Schedule 140) maintained on the Company website is available at https://www.pacificpower.net/content/dam/pcorp/documents/en/pacificpower/savings-energy-choices/wattsmart-business/washington/WA_wattsmartBusiness_Incentive_tables_information.pdf.

Program performance by sector and measure category is provided in Table 18 and 19.

Table 18
Program Performance by Sector

Sector	Total kWh/Yr Savings @ Site	Total Incentive	Total kW Savings @ Site	Total Projects
Commercial	16,634,791	\$ 1,658,706	1,732	334
Industrial	3,139,561	\$ 222,475	182	31
Irrigation	1,012,597	\$ 139,231	123	29
Grand Total	20,786,950	\$ 2,020,412	2,037	394

Table 19
Program Performance by Measure Category

Measure Category	Total kWh/Yr Savings @ Site	Total Incentive	Total kW Savings @ Site	Total Projects
Additional Measures	52,690	\$ 7,904	-	1
Building Shell	51,989	\$ 17,096	-	4
Compressed Air	1,152,222	\$ 124,266	34	11
Energy Management	3,270,087	\$ 65,402	136	8
Food Service Equipment	22,071	\$ 1,600	3	3
HVAC	548,423	\$ 106,188	45	37
Irrigation	1,098,082	\$ 153,950	139	32
Lighting	10,919,095	\$ 1,024,234	1,485	269
Motors	450,367	\$ 57,484	91	7
Refrigeration	3,221,924	\$ 462,288	104	22
Grand Total	20,786,950	\$ 2,020,412	2,037	394

Services and incentives offered through the Wattsmart Business program include:

- Typical Upgrades included in Incentive Lists: Incentives for listed lighting, HVAC, irrigation and other equipment upgrades that increase electrical energy efficiency and exceed energy code requirements.
- Custom analysis: Offers energy analysis studies, services and incentives for more complex projects.
- Energy Management: Provides expert facility and process analysis and incentives to help lower energy costs by optimizing customer's energy use.
- Enhanced incentives for small businesses: Provides enhanced incentives for lighting upgrades installed by an approved Wattsmart Small Business Contractor at an eligible existing small business customer facility.
- Midstream/Lighting Instant Incentive: Provides instant, point-of-purchase incentive for qualifying LED lamps sold through participating distributors. Customers purchasing lamps from non-participating suppliers can apply for incentives after purchase.

- Energy Project Manager Co-funding: Available to customers who commit to an annual goal of completing energy projects resulting in at least 1,000,000 kWh/year in energy savings.
- Project Financing: Pacific Power teamed with National Energy Improvement Fund, an energy efficiency project financing firm, to provide customers with access to third party financing options for instances where funds for project implementation are not available from within the customer's organization.

Program Management

The Company program manager overseeing program activity in Washington is also responsible for the Wattsmart Business program in California. For each state the program manager is responsible for the cost effectiveness of the program, identifying, and contracting with the program administrators through a competitive bid process, program marketing, establishing and monitoring program performance and compliance, and recommending changes in the terms and conditions of the program set out in the tariff and/or posted on the Company's website.

In 2018, the Company issued a Request for Proposals to re-procure services for the outsourced portion of Wattsmart Business currently performed by Nexant and Cascade Energy as described below. The Request for Proposal also included *Home Energy Savings* to allow for potential economies of a single contractor delivering for both programs. Selection and contracting with Nexant and Cascade Energy was complete in 2019. Nexant is now also delivering the *Home Energy Savings* program, allowing consolidation of some administrative functions and the residential and non-residential trade ally networks.

In December 2018, the Company issued a Request for Proposals to potentially outsource the project manager portion of Wattsmart Business as described below. The decision was made in 2019 to outsource this work and selection and contracting with Cascade Energy was complete in 2019. The transition from an in-house project manager working with a pre-contracted network of consultants (including Cascade Energy and others) took place starting in August 2019.

Program Administration

The program includes several delivery channels, including Trade Ally, Small Business Enhanced Incentive Offer, Midstream/Lighting Instant Incentive, and Project Manager (managed account) delivery.

Trade Ally

In this channel, the program is primarily marketed through local trade allies who receive support from one of two program administrators. The Company contracts with Nexant, Inc. (Nexant) and Cascade Energy (Cascade) for trade ally coordination, training, application processing and project facilitation services for commercial measures and industrial/agricultural measures, respectively.

Nexant and Cascade are responsible for the following:

- Trade ally engagement – identify, recruit, train, support and assist trade allies to increase sales and installation of energy efficient equipment at qualifying business customer facilities.
- Incentive processing and administrative support – handle incoming inquiries as assigned, process incentive applications, develop and maintain simplified analysis tools and provide program design services, evaluation and regulatory support upon request.
- Direct customer outreach and project facilitation for smaller customer projects.
- Inspections – verify on an on-going basis the installation of measures. A summary of the inspection process is in Appendix 2.

Small Business Enhanced Incentive Offer

In this channel, the program is primarily marketed through local contractors approved specifically for this offer who receive support from the program administrator, Nexant. Nexant is responsible for the following:

- Management of approved contractors – identify, recruit, contract with, train, support, and assist contractors to increase sales and installation of energy efficient lighting equipment at qualifying small business customer facilities.
- Incentive processing and administrative support – handle incoming inquiries as assigned, process incentive applications, develop and maintain simplified analysis tool and provide program design services, evaluation and regulatory support upon request.
- Inspections – verify on an on-going basis the installation of measures. A summary of the inspection process is in Appendix 2 to this report.

Midstream/Instant Incentive Offer

In this channel, the program is primarily marketed through distributors approved specifically for this offer who receive support from the program administrator, Nexant. The program is also marketed through installation contractors, who also receive support from Nexant. Nexant is responsible for the following:

- Management of approved distributors – identify, recruit, contract with, train, support, and assist distributors to increase sales of energy efficient lighting equipment at qualifying business customer facilities.
- Incentive processing and administrative support – handle incoming inquiries as assigned, process incentive applications, and provide program design services, evaluation and regulatory support upon request.
- Inspections – verify on an on-going basis the installation of measures at eligible customer facilities. A summary of the inspection process is in Appendix 2 to this report.

Project Manager (managed account delivery)

In this channel, Cascade Energy, working with the Company's internal project manager, manages a subset of more complex projects. The team works directly with the customer or through the

Company's regional business managers³² to identify projects and provide program services and incentives or refer project leads to the appropriate channel identified above.

Infrastructure

To help increase and improve the supplier and installation contractor infrastructure for typical energy efficient equipment and services, the Company established and continues to develop and support trade ally networks for lighting, HVAC and motors/VFDs. This work includes identifying and recruiting trade allies, providing program and technical training and providing sales support on an ongoing basis.

Participating vendors sign a Wattsmart Business participation agreement and are listed as Wattsmart Business Vendors in the Find a Vendor search on the Company's website. In addition to the formal Wattsmart Business vendor networks, other trade allies such as irrigation vendors are identified and supported on an ongoing basis.

The current searchable list of trade allies who have applied and been approved as participating Wattsmart Business vendors is available on the Company website³³ and included as Appendix 4 to this report. In most cases, customers are not required to select a vendor from these lists to receive an incentive.³⁴

The total number of participating trade allies is currently 43. The current count of participating trade allies by technology are in Table 20.

Table 20
Participating Trade Allies³⁵

Lighting	HVAC	Motors and VFD	Irrigation	Small Business – approved contractors	LED Instant Incentive – approved distributors, e-commerce retailers
36	8	19	1	4	6 distributors, 14 branch locations and 4 e-commerce retailers

³² Regional business managers are responsible for directly working with Washington commercial and industrial/ag customers.

³³ Searchable participating vendor lists are available from the Company website. Direct link to the "Find a Vendor" search tool: <https://pacificpower.tradeally.com/>

³⁴ For the Wattsmart Small Business enhanced incentives, customers are required to choose one of the approved contractors for this offer.

³⁵ Some trade allies may participate in more than one technology so the count of unique participating firms is less than the total count provided.

Program Changes

The Company made programmatic changes once in 2019 in addition to announcing changes for 2020. Effective January 1, 2019, changes were made to:

- Improve program cost effectiveness by
 - a. Adopting the RTF's non-residential lighting dual baseline savings and cost calculation methodology for lighting retrofits and small business lighting
 - b. Removing measures updated by the RTF that are no longer cost effective.
- Update measures to align with RTF and CEE changes
- Streamline program participation processes for customers and trade allies
- Make other minor administrative changes.

Adaptive Management

The Company made substantial changes through an adaptive management approach. The following bullets summarize the changes.

- **Strategic Energy Management Cohorts**

In May 2018, Pacific Power partnered with the Bonneville Power Administration (BPA) to jointly provide a water conservation coaching cohort for water supply entities in the Yakima and Tri-Cities areas of Washington. These customers, who are served by different utilities, met for five workshops through June of 2019 to learn about strategic energy management (SEM) best practices for pumping optimization and water conservation. Pacific Power worked with our customers participating in the SEM engagement to identify specific actions for each customer site that would result in energy savings with a focus on low cost improvements. Pacific Power helped our customers prioritize these opportunities and develop a plan for implementation over a two year period ending in June 2021. Pacific Power is expected to report energy savings for the first year of engagement in June 2020.

Many of the City entities participating in the water SEM were interested in doing a similar engagement for the waste water portion of their business. Pacific Power is currently soliciting interest with our customers for a separate SEM engagement for waste water entities with joint collaboration with BPA utilities. The structure of the waste water SEM will be identical to that described for the water SEM with workshops and targeted site work for customers. This engagement is expected to start in June 2020³⁶.

- **LED Street Light Upgrades for Small Communities** – All 18 small communities served by Pacific Power and eligible for the Washington Transportation Improvement Board's Relight Washington funding received LED upgrades for their company owned street lights between late 2018 and early 2020. Installation of 646 LED street light upgrades was complete for one community in late 2018. In 2019, 3,432 street lights in 14 communities were upgraded

³⁶ Note these plans were made before the COVID-19 pandemic.

to LED. Installations for the remaining 397 lights in three communities will be complete in 2020, resulting in a total of 4,475 lights upgraded. The total annual energy savings for all eighteen communities is 2.7 million kWh and total Wattsmart Business incentives is \$143,669. Feedback from the communities has been very positive.

- **Yakima Energy Fair** – Pacific Power hosted a successful energy fair in Yakima on June 26, 2019. The event was targeted for local area small businesses and included presentations on energy efficiency as well as other offerings such as Blue Sky and electric vehicles. There was an electric vehicle ride and drive event held on site at the end of the event. As part of promoting the event, customers were invited to request an assessment to identify savings opportunities at their business. 72 energy efficiency assessments were completed both before and after the event. 62 people attended the event (excluding program staff).
- **Targeted Small Business Campaign** – This campaign provides approved Wattsmart Small Business Vendors who signed a Non-Disclosure agreement (in addition to the vendor participation agreement already on file) with refined customer lists (containing business name, address, phone number only) to more effectively connect with customers eligible for the small business enhanced incentives. Prior to providing the specially developed customer lists, postcards are mailed to each customer on the list to introduce them to the program and let them know a Vendor will be contacting them. The intent of this initiative is to improve the efficiency of approved vendor's sales processes and boost small business participation. In 2019, postcards were sent to 55 small businesses³⁷ and lists were provided to vendors for follow-up. This resulted in 12 new project starts and 4 projects with total annual savings of 199,592 kWh completed in 2019. Pacific Power Wattsmart Business Vendor co-branded shirts were made available in 2019. The shirts provided significant help in promoting vendor credibility with small business customers.
- **eLearning Platform** - In addition to seven courses that were launched in 2018, nine new courses were added to the eLearning platform for Wattsmart Business vendors in 2019:
 1. Lighting Products Safety Concerns and Valid Certifications
 2. Advanced Networked Lighting Controls
 3. Introduction to HVAC
 4. Programmable Smart Thermostats
 5. Ductless Heat Pumps
 6. Wattsmart Advanced Exterior Dimming
 7. Lighting Incentive Program Path Part 1
 8. Lighting Incentive Program Path Part 2
 9. DesignLights Consortium Networked Lighting Controls Training Course (8-course module developed by the DesignLights Consortium that is hosted on the Pacific Power Wattsmart Learning Center platform)

³⁷ The postcards have been mailed in four separate waves starting in late 2018 to a total of 70 small businesses with each wave going to a small number of eligible customers (about 15 customers per contractor). Once the contractor follow-up contacts were complete and the contractor was able to do more follow-ups, another wave was mailed to the next small group of eligible customers.

Vendors can take advantage of the eLearning Platform anywhere they have a connected device. Program outreach staff will continue to work with vendors to engage them with the platform and obtain ideas for relevant and timely new courses.

In Washington, there are 25 registered users on the platform with 25 course completions and 98 assigned courses and 19 in-process courses.

- **Advanced Rooftop Unit Control (ARC)** – In 2019, the program continued to offer a vendor incentive³⁸ aimed at mechanical Wattsmart Business vendors to promote and install the ARC measure at Pacific Power businesses. The vendor incentive was promoted in Wattsmart Business Vendor network communications and field staff promoted the incentive in their regular outreach. In 2018, Young's heating and Cooling received three of the five available gift cards. Although the two remaining gift cards were not claimed in 2019, there is a project moving forward at a large customer facility for which the vendor may be eligible for the incentive in 2020. In 2019, All Seasons Heating and Air Conditioning sent two employees through training at Transformative Wave and they are now certified to install the ARC measure. (Young's heating and cooling staff in Walla Walla became certified by Transformative Wave in 2018.)

During the March 2019 Wattsmart Business Vendor training, contractors were given an in-depth look at an ARC retrofit project that was videoed during an actual in-field installation. Attendees got to see how controls optimize existing inefficient Rooftop Unit (RTU) technology and were able to witness immediate real-time savings. Additionally, four ARC Manufacturers exhibited at the event and answered questions from attendees.

To further promote ARC to customers and Vendors, a promotional video³⁹ was created in late 2019, which highlights the benefits of the technology and features a case study of a PacifiCorp customer and Wattsmart Business Vendor.

- **Premium Tier** – In 2019, Stusser Electric in Yakima and Consolidated Electric Supply in Sunnyside were the two vendors that were recognized as Pacific Power's Wattsmart Business Premium Vendors. Vendor performance is assessed on a quarterly basis in the Vendor Snapshot which also informs the trade ally if they qualified for Premium status. To be considered for Premium status, an approved Wattsmart Business Vendor has to complete a minimum number of projects in the past twelve months and hold a lighting credential such as the NEEA's NXT Level 1 Designation for both the company and an employee. Pacific Power established performance categories that align with program objectives to assess and rank lighting trade ally performance. In addition to project count and credentials, lighting vendors are also selected based on customer satisfaction, program satisfaction and project submission quality. The Premium Vendors come up first in the online Find-A-Vendor search results and their listing is highlighted so they stand out when someone searches for a lighting vendor. They are also given the opportunity to provide expanded information about their company in their online listing. As of the end of 2019, there were no Premium vendors listed

³⁸ \$100 Amazon gift card per ARC installed for first five units installed, limit of three gift cards per approved vendor

³⁹ The video is available here - https://wattsmartbusiness.com/pacificpower/wp-content/uploads/sites/8/WSB_ARC_PP_Final.mp4

and work is underway to review the Premium Tier initiative and vendors who have the highest potential to meet the requirements.

- **Formal feedback** - Scorecards were provided to approved lighting vendors each quarter in 2019 and program coordinators followed up to review the snapshots with each vendor. The main purpose is to provide vendors with a summary of their performance, help them with continuous improvement and inform them of positive customer comments received from customer surveys. Program coordinators work with individual vendors to address any negative comments. The Vendor Snapshot includes total number of projects, savings, incentives, and the vendor's standing in comparison to other vendors. Starting in 2020, these snapshots will be completed twice a year, however project counts will be updated quarterly into the portal.
- **New Trade Ally Portal** - At the end of 2019, a new Vendor portal, Trade Ally Connect, was launched. This platform hosts all Wattsmart Business vendor tools and resources such as program updates, training courses and marketing materials. Portal content is tailored by vendor expertise/technology, sector and state. Vendors who participate in incentive offers from Wattsmart Business and Home Energy Savings have access to resources for both programs in Trade Ally Connect.

Trade Ally Connect is the first of three new tools for Wattsmart Business Vendors. In 2020, an online incentive application portal and a new online assessment tool that will replace the current Excel-based lighting tool will be launched.

Communications, Outreach and Education

The Company uses earned media, customer communications, paid media, and program specific media to communicate the value of energy efficiency, and provide information regarding low-cost and no-cost energy efficiency measures. The Company endeavors to educate customers on the availability of technical assistance, services, and incentives with the overall goal to engage customers in reducing their energy usage.

Earned Media

Earned media is managed by the Company's external communications department in cooperation with the regional business managers located in Washington. "Earned media" generally refers to favorable television, radio, newspaper, or internet news coverage gained through press releases, media events, opinion pieces, story pitches, or other communication with news editors and reporters.

Customer Communications

As part of the Company's regular communications to its customers, newsletters and bill statement communications promote energy efficiency initiatives. The Company uses its website and social media, such as Twitter and Facebook, to communicate and engage customers on DSM offers and incentives.

Paid Media/Wattsmart campaign

In 2019, the Company deployed a Wattsmart advertising campaign in English and Spanish to inform and educate residential customers about the benefits energy efficiency contributes to the greater good in addition to saving money. The overall paid media objective is to effectively reach our customers through a multi-faceted campaign with programs aimed at specific customer groups and the unifying theme "Being Wattsmart saves me money, and it's good for Washington." This communication campaign aims to create awareness of the importance and benefits of being energy efficient, and to help increase participation in the Company's DSM programs.

Key strategies include:

- Implement an advertising campaign that features Wattsmart energy efficiency messaging and connect it to benefits for Washington.
- Promote customer conservation (behavioral changes) and increase participation and savings through the Company's Wattsmart DSM programs.
- Motivate customers in Washington to reduce consumption independently or to do so by participating in the Company's Wattsmart DSM programs.
- Educate customers on how these programs can help them save money on their utility bills, reduce energy consumption and to help Washington thrive.

- Demonstrate by example how business customers are saving energy and enjoying the benefits of being Wattsmart.

General Key Messages:

- Using energy wisely at home and in your business saves you money, and it's good for Washington.
- Surprising as it sounds, Pacific Power wants to help you use less energy.
- Pacific Power is your energy partner
 - We want to help you keep your costs down.
 - We offer Wattsmart programs and cash incentives to help you save money and energy in your home or business.
 - Being Wattsmart is good for your wallet, and for Washington, now and into the future.

To reach residential customers, the Company used TV, radio, social, print and digital. Large-scale typography along with beautiful scenic images of Washington was combined with footage of people taking small steps (changing lighting to LED lamps, adjusting smart thermostat setting) to save energy and money and to make a big difference for Washington and the environment, now and into the future.

To reach business customers a multi-media mix of TV, radio, social and digital were used to reach as many customers as possible with the greatest frequency. Table 21 outlines the Washington media channels used, the value of each channel, and the impressions achieved.

Table 21
2019 Media Channels

Communication Channel	Value to Communication Portfolio	2019 Placements
Television	Television has the broadest reach and works as the most effective media channel	874,800 residential impressions 1,385,100 business impressions
Radio	Given the cost relative to television, radio builds on communications delivered via television while providing for increased frequency of messages	717,480 residential impressions 886,885 business impressions
Newspaper/Magazine	Supports broadcast messages and guarantees coverage in areas harder to reach with broadcast	286,000 residential impressions
Online advertising	Digital display and Google Search	637,668 residential impressions and 8,592 search impressions 434,905 business impressions and 4,097 search impressions
Social Advertising	Advertising on Facebook, Hulu, YouTube and Pandora	236,619 residential impressions 790,840 business impressions

Communication Channel	Value to Communication Portfolio	2019 Placements
Twitter @PacificPower_WA	Awareness for early adopters regarding energy efficiency tips Tweets posted on a weekly basis	1,086 followers through December 2019
Facebook www.facebook.com/pacificpower	Awareness for early adopters regarding energy efficiency tips and a location to share information	23,084 fans through December 2019 (for all Pacific Power states)

The total number of impressions for the campaign in 2019 was 6,005,586.

Links to the Company's current portfolio of advertisements are included in Appendix 5. The audiences for these messages were prioritized as follows:

- Primary - Small and large business in Pacific Power's service area.
- Secondary - Households in Pacific Power's service area.

Program Specific

All energy efficiency program communications are branded under the Wattsmart umbrella to reinforce the campaign and to link changes in behavior to actions customers can take by participating in specific programs. Separate marketing activities administered by and specific to the programs ran in conjunction with the Wattsmart campaign in 2019.

Home Energy Savings

Information on the *Home Energy Savings* program is communicated to customers, retailers and trade allies through a variety of channels including social media, direct mail, email, newsletters and website.

The program team produced refreshed point-of-purchase collateral, incentive applications and launched a new customer website in 2019. The new website, Wattsmartsavings.net, offers improved content, functionality and navigation, along with an easy and seamless transition between Pacific Power's main website, pacificpower.net, and Wattsmartsavings.net.

Promotional efforts in Washington focused primarily on Wattsmart Starter Kits through a series of targeted customer emails and a bill insert.

In addition, the company sent a letter to customers living in manufactured homes with a duct sealing offer. Customers with electrically heated manufactured homes could qualify for free duct sealing through a local trade ally contractor.

Finally, the company worked with Doore Living, The Sustainable Living Center, American Air Heating and Cooling and Smith Insulation to celebrate its energy-efficiency project success on the Brookhaven Quarters multifamily housing property with an event, customer recognition and a press release.

A summary of outreach is displayed in Table 22

Table 22
Home Energy Savings Communication Impressions

Communications Channel	2019
Wattsmart Starter Kits Emails - May	11,020
Wattsmart Starter Kit Emails - November	49,057
Wattsmart Starter Kit bill insert	85,000
Manufactured homes duct sealing letter	500
Total	145,577

Home Energy Reports

Thousands of print and email Home Energy Reports were delivered to Washington customers in 2019. Pacific Power's new and improved website launch in July created a streamlined path for customers to access the Bidgely web platform for energy usage insights.

Wattsmart Business

In 2019, customer communications and outreach supported Wattsmart Business using radio, print, paid digital display and search advertising, digital video (OTT), direct mail, email and social media. This was in addition to customer direct contact by Company project managers and regional business managers, as well as trade ally partners and content on the Company's website.

During 2019, the Company used radio and print advertising to encourage customers to inquire about incentives for lighting and lighting controls, Eblasts and digital search ads directed viewers to the Company's website⁴⁰. Targeted direct mail was also sent to irrigation customers in the spring and fall to encourage energy-saving retrofits, Emails encouraged customers to reach out for free energy assessments for lighting. Repeated email communications focused on the benefits and incentives for HVAC assessments. Targeted direct mail was aimed at small business customers to generate interest in lighting upgrades and incentives.

One customer was recognized as Wattsmart Business Partners of the year, presented with a trophy, and announced in a press release. In 2019, the program garnered 1,682,478 impressions. A breakdown of impressions by media type is shown in Table 23

Table 23
Wattsmart Business

Communications Channel	2019 Impressions
Radio	1,096,150
Newspaper	159,825
Magazine	34,500
Digital Display	1,659,301
Digital Video (OTT)	236,472

⁴⁰ www.pacificpower.net/wasave

Communications Channel	2019 Impressions
Radio	1,096,150
Google Search	3,017
Social Media (Facebook)	573,282
Eblasts	6,040
Yakima Energy Fair Mail	8,536
Irrigation Direct Mail	4,951
WA Direct Business Mail	1,067
Small Business Direct Mail	55

Energy Education in Schools

The Company offers a Wattsmart Schools education program through the National Energy Foundation (NEF). The program is designed to develop a culture of energy efficiency among teachers, students, and families. The centerpiece is a series of one hour presentations with educational and entertaining video components as well as hands-on, large group activities for 4th and 5th grade students. Teachers are provided instructional materials for use in their classrooms, and students are sent home with a Home Energy Worksheet to explore energy use in their homes and to encourage efficient behaviors.

In 2019, NEF conducted presentations in Washington schools in the fall. Between September 1 and the first week of November 2019, the program met its outreach goals of reaching 3,567 students and 145 teachers with 47 school presentations and 53 percent of “Home Energy Worksheets”, which are used as part of a home energy audit activity, completed, and returned. The NEF 2019 Report can be found in Appendix 5.

Evaluations

Evaluations are performed by independent external evaluators to validate energy and demand savings derived from the Company's energy efficiency programs. Industry best practices are adopted by the Company with regards to principles of operation, methodologies, evaluation methods, definitions of terms, and protocols including those outlined in the National Action Plan for Energy Efficiency Program Impact Evaluation and the California Evaluation Framework guides.

A component of the overall evaluation effort is aimed at the reasonable verification of installations of energy efficient measures and associated documentation through review of documentation, surveys and/or ongoing onsite inspections.

Verification of the potential to achieve savings involves regular inspection and commissioning of equipment. The Company engages in programmatic verification activities, including inspections, quality assurance reviews, and tracking checks and balances as part of routine program implementation and may rely upon these practices in the verification of installation information for the purposes of savings verifications in advance of more formal impact evaluation results. A summary of the inspection process is included in Appendix 2.

Evaluation, measurement and verification tasks are segregated within the Company to ensure they are performed and managed by personnel who are not directly responsible for program management.

Information on evaluation activities completed or in progress during 2019 is summarized in the chart below. Summary of the recommendations are provided in Appendix 6. The evaluation reports are available at <https://www.pacificorp.com/environment/demand-side-management.html>

Table 24
2019 Evaluation Activities

Program / Activities	Years Evaluated	Evaluator	Progress Status
Home Energy Savings	2017-2018	ADM	Complete
WA Verification of Savings	2018-2019	AEG	In-process
Wattsmart Business	2018-2021	Cadmus	In-process
Home Energy Reports	2018-2019	Cadmus	In-process
Low Income Weatherization	2016-2017	ADM	In-process



Appendix 1

Cost Effectiveness



Memorandum

To: Nicole Karpavich and Alesha Pino, PacifiCorp

From: David Basak, Guidehouse

Date: May 26, 2020

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

Guidehouse estimated the cost-effectiveness for the overall energy efficiency portfolio and component sectors, based on 2019 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 the UCT and PCT tests. The memo consists of the following tables.

Table 1 – Utility Inputs
Table 2 – Portfolio Level Costs 2019
Table 3 – NEEA Inputs 2019
Table 4 – Benefit/Cost Ratios by Portfolio Type
Table 5 – Total Portfolio Cost-Effectiveness Results
Table 6 – Total Portfolio Cost-Effectiveness Results (Including NEEA)
Table 7 – Total Portfolio Cost-Effectiveness Results (Including NEBs)
Table 8 – Total Portfolio Cost-Effectiveness Results (Including NEEA and NEBs)
Table 9 – C&I Energy Efficiency Portfolio Cost-Effectiveness Results
Table 10 – C&I Energy Efficiency Portfolio Cost-Effectiveness Results (Including NEEA)
Table 11 – C&I Energy Efficiency Portfolio Cost-Effectiveness Results (Including NEBs)
Table 12 – C&I Energy Efficiency Portfolio Cost-Effectiveness Results (Including NEEA and NEBs)
Table 13 – Residential Energy Efficiency Portfolio Cost-Effectiveness Results
Table 14 – Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEEA)
Table 15 – Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEBs)
Table 16 – Residential Energy Efficiency Portfolio Cost-Effectiveness (Including NEEA and NEBs)
Table 17 – Home Energy Savings Non-Energy Benefits (2019)
Table 18 – Wattsmart Business Program Non-Energy Benefits (2019)

Table 1 – Utility Inputs

Parameter	Value
Discount Rate	6.57%
Residential Line Loss	9.67%
Commercial Line Loss	9.53%
Industrial Line Loss	8.16%
Irrigation Line Loss	9.67%
Residential Energy Rate (\$/kWh) ¹	\$0.0869
Commercial Energy Rate (\$/kWh) ¹	\$0.0794
Industrial Energy Rate (\$/kWh) ¹	\$0.0649
Irrigation Energy Rate (\$/kWh) ¹	\$0.0872
Inflation Rate	2.20%

¹ Future rates determined using a 2.20% annual escalator.

Table 2 – Portfolio Level Costs 2019

Expense	Cost
Portfolio DSM Central	\$255,404
Outreach and Communication (includes Education)	\$293,275
Portfolio Evaluation (Process and Impact)	\$181,846
Portfolio Potential Study	\$18,851
Portfolio System Support	\$3,873
End Use Load Research	\$34,382
Total Costs	\$787,631

Table 3 – NEEA Inputs 2019

Sector	Savings at Meter (kWh)	NEEA Expenses (\$)
Residential	2,155,902	\$509,305
Industrial	1,514,487	\$357,779
Commercial	48,287	\$11,407
Total	3,718,676	\$878,492

Table 4 – Benefit/Cost Ratios by Portfolio Type

Measure Group	PTRC	TRC	UCT	RIM	PCT
Total Portfolio	0.86	0.78	1.20	0.36	2.91
Total Portfolio (Including NEEA)	0.99	0.90	1.32	0.37	3.44
Total Portfolio (Including NEBs)	0.94	0.86	1.20	0.36	3.04
Total Portfolio (Including NEEA & NEBs)	1.06	0.97	1.32	0.37	3.56
C&I Programs	1.17	1.06	1.61	0.40	3.59
C&I Programs (Including NEEA)	1.19	1.09	1.61	0.39	3.88
C&I Programs (Including NEBs)	1.17	1.07	1.61	0.40	3.60
C&I Programs (Including NEEA & NEBs)	1.20	1.09	1.61	0.39	3.89
Residential Programs	0.57	0.51	0.86	0.30	2.01
Residential Programs (Including NEEA)	0.85	0.78	1.22	0.36	2.85
Residential Programs (Including NEBs)	0.76	0.71	0.86	0.30	2.29
Residential Programs (Including NEEA & NEBs)	1.03	0.96	1.22	0.36	3.13

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

Table 5 – Total Portfolio Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0561	\$12,173,422	\$10,504,782	-\$1,668,640	0.86
Total Resource Cost Test (TRC) No Adder	\$0.0561	\$12,173,422	\$9,549,802	-\$2,623,621	0.78
Utility Cost Test (UCT)	\$0.0368	\$7,984,571	\$9,549,802	\$1,565,231	1.20
Rate Impact Test (RIM)		\$26,751,880	\$9,549,802	-\$17,202,078	0.36
Participant Cost Test (PCT)		\$7,617,253	\$22,195,711	\$14,578,458	2.91
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000156979
Discounted Participant Payback (years)					1.53

Table 6 – 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	\$0.0503	\$13,051,914	\$12,907,614	-\$144,300	0.99
Total Resource Cost Test (TRC) No Adder	\$0.0503	\$13,051,914	\$11,734,194	-\$1,317,719	0.90
Utility Cost Test (UCT)	\$0.0341	\$8,863,062	\$11,734,194	\$2,871,132	1.32
Rate Impact Test (RIM)		\$31,601,926	\$11,734,194	-\$19,867,731	0.37
Participant Cost Test (PCT)		\$7,617,253	\$26,167,265	\$18,550,012	3.44
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000157923
Discounted Participant Payback (years)					1.36

Table 7 – 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	\$0.0561	\$12,173,422	\$11,465,500	-\$707,923	0.94
Total Resource Cost Test (TRC) No Adder	\$0.0561	\$12,173,422	\$10,510,519	-\$1,662,903	0.86
Utility Cost Test (UCT)	\$0.0368	\$7,984,571	\$9,549,802	\$1,565,231	1.20
Rate Impact Test (RIM)		\$26,751,880	\$9,549,802	-\$17,202,078	0.36
Participant Cost Test (PCT)		\$7,617,253	\$23,156,429	\$15,539,176	3.04
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000156979
Discounted Participant Payback (years)					1.53

Table 8 – 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	\$0.0503	\$13,051,914	\$13,868,332	\$816,418	1.06
Total Resource Cost Test (TRC) No Adder	\$0.0503	\$13,051,914	\$12,694,912	-\$357,002	0.97
Utility Cost Test (UCT)	\$0.0341	\$8,863,062	\$11,734,194	\$2,871,132	1.32
Rate Impact Test (RIM)		\$31,601,926	\$11,734,194	-\$19,867,731	0.37
Participant Cost Test (PCT)		\$7,617,253	\$27,127,983	\$19,510,730	3.56
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000157923
Discounted Participant Payback (years)					1.36

Table 9 – 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	\$0.0420	\$6,779,391	\$7,898,312	\$1,118,921	1.17
Total Resource Cost Test (TRC) No Adder	\$0.0420	\$6,779,391	\$7,180,284	\$400,892	1.06
Utility Cost Test (UCT)	\$0.0276	\$4,453,677	\$7,180,284	\$2,726,607	1.61
Rate Impact Test (RIM)		\$18,044,306	\$7,180,284	-\$10,864,022	0.40
Participant Cost Test (PCT)		\$4,346,127	\$15,611,041	\$11,264,914	3.59
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000202956
Discounted Participant Payback (years)					1.52

Table 10 – 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	\$0.0409	\$7,148,577	\$8,534,333	\$1,385,755	1.19
Total Resource Cost Test (TRC) No Adder	\$0.0409	\$7,148,577	\$7,758,484	\$609,907	1.09
Utility Cost Test (UCT)	\$0.0276	\$4,822,863	\$7,758,484	\$2,935,621	1.61
Rate Impact Test (RIM)		\$19,653,882	\$7,758,484	-\$11,895,398	0.39
Participant Cost Test (PCT)		\$4,346,127	\$16,851,431	\$12,505,304	3.88
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000194297
Discounted Participant Payback (years)					1.39

Table 11 – C&I Energy Efficiency 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	\$0.0420	\$6,779,391	\$7,946,891	\$1,167,500	1.17
Total Resource Cost Test (TRC) No Adder	\$0.0420	\$6,779,391	\$7,228,862	\$449,471	1.07
Utility Cost Test (UCT)	\$0.0276	\$4,453,677	\$7,180,284	\$2,726,607	1.61
Rate Impact Test (RIM)		\$18,044,306	\$7,180,284	-\$10,864,022	0.40
Participant Cost Test (PCT)		\$4,346,127	\$15,659,620	\$11,313,493	3.60
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000202956
Discounted Participant Payback (years)					1.52

Table 12 – C&I Energy Efficiency 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	\$0.0409	\$7,148,577	\$8,582,912	\$1,434,334	1.20
Total Resource Cost Test (TRC) No Adder	\$0.0409	\$7,148,577	\$7,807,063	\$658,486	1.09
Utility Cost Test (UCT)	\$0.0276	\$4,822,863	\$7,758,484	\$2,935,621	1.61
Rate Impact Test (RIM)		\$19,653,882	\$7,758,484	-\$11,895,398	0.39
Participant Cost Test (PCT)		\$4,346,127	\$16,900,010	\$12,553,883	3.89
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000194297
Discounted Participant Payback (years)					1.39

Table 13 – 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	\$0.0828	\$4,606,400	\$2,606,470	-\$1,999,930	0.57
Total Resource Cost Test (TRC) No Adder	\$0.0828	\$4,606,400	\$2,369,518	-\$2,236,882	0.51
Utility Cost Test (UCT)	\$0.0493	\$2,743,263	\$2,369,518	-\$373,745	0.86
Rate Impact Test (RIM)		\$7,919,944	\$2,369,518	-\$5,550,426	0.30
Participant Cost Test (PCT)		\$3,271,127	\$6,584,670	\$3,313,544	2.01
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000099021
Discounted Participant Payback (years)					1.54

Table 14 – 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	\$0.0603	\$5,115,705	\$4,373,281	-\$742,424	0.85
Total Resource Cost Test (TRC) No Adder	\$0.0603	\$5,115,705	\$3,975,710	-\$1,139,995	0.78
Utility Cost Test (UCT)	\$0.0383	\$3,252,569	\$3,975,710	\$723,141	1.22
Rate Impact Test (RIM)		\$11,160,413	\$3,975,710	-\$7,184,703	0.36
Participant Cost Test (PCT)		\$3,271,127	\$9,315,834	\$6,044,707	2.85
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000111246
Discounted Participant Payback (years)					1.33

Table 15 – 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	\$0.0828	\$4,606,400	\$3,518,609	-\$1,087,791	0.76
Total Resource Cost Test (TRC) No Adder	\$0.0828	\$4,606,400	\$3,281,657	-\$1,324,743	0.71
Utility Cost Test (UCT)	\$0.0493	\$2,743,263	\$2,369,518	-\$373,745	0.86
Rate Impact Test (RIM)		\$7,919,944	\$2,369,518	-\$5,550,426	0.30
Participant Cost Test (PCT)		\$3,271,127	\$7,496,809	\$4,225,682	2.29
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000099021
Discounted Participant Payback (years)					1.54

Table 16 – 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	\$0.0603	\$5,115,705	\$5,285,420	\$169,714	1.03
Total Resource Cost Test (TRC) No Adder	\$0.0603	\$5,115,705	\$4,887,849	-\$227,857	0.96
Utility Cost Test (UCT)	\$0.0383	\$3,252,569	\$3,975,710	\$723,141	1.22
Rate Impact Test (RIM)		\$11,160,413	\$3,975,710	-\$7,184,703	0.36
Participant Cost Test (PCT)		\$3,271,127	\$10,227,973	\$6,956,846	3.13
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000111246
Discounted Participant Payback (years)					1.33

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

Table 17 – Home Energy Savings Non-Energy Benefits (2019)

Non-Energy Benefits	Non-Energy Benefits Water (\$/yr)	Non-Energy Benefits Other (\$/yr)	Measure Life	Quantity	Total Present Value Benefits
Appliances	\$2,479	\$9	14	111	\$23,798
Building Envelope	\$0	\$1,883	45	301,316	\$28,801
Energy Kits - DHW	\$57,355	\$562	9	647	\$409,595
Energy Kits - Lighting	\$0	\$152	5	183	\$674
HVAC	\$0	\$15,031	15	1,107	\$149,945
Lighting	\$0	\$80,654	4	207,227	\$293,990
Water Heating	\$0	\$0	13	20	\$0
Whole Home	\$0	\$382	31	79	\$5,337
Total NEBs	\$59,834	\$98,674	11	510,690	\$912,139

Table 18 – Wattsmart Business Program Non-Energy Benefits (2019)

Non-Energy Benefits	Non-Energy Benefits Water (\$/yr)	Non-Energy Benefits Other (\$/yr)	Measure Life	Quantity	Total Present Value Benefits
Irrigation	\$0	\$4,914	14	4,352	\$47,004
Lighting	\$0	\$320	11	39,493	\$2,612
Total NEBs	\$0	\$5,234	14	43,845	\$49,616



Memorandum

To: Nicole Karpavich and Alesha Pino, PacifiCorp

From: David Basak, Guidehouse

Date: May 26, 2020

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

Guidehouse estimated the cost-effectiveness results for the Washington Wattsmart Business Program, based on 2019 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program and for the 10 measure categories.

Cost-effectiveness was tested using the 2017 IRP decrement for all measure categories. The program passes all cost-effectiveness tests except the RIM. 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 16 - Wattsmart Business Non-Energy Benefits by Measure
Table 17 - Wattsmart Business Program (with NEBs) Cost-Effectiveness Results
Table 18 - Wattsmart Business Irrigation (with NEBs) Cost-Effectiveness Results
Table 19 - Wattsmart Business Lighting (with NEBs) Cost-Effectiveness Results

Table 1 - Utility Inputs

Parameter	Value
Discount Rate	6.57%
Commercial Line Loss	9.53%
Industrial Line Loss	8.16%
Irrigation Line Loss	9.67%
Commercial Energy Rate (\$/kWh) ¹	\$0.0794
Industrial Energy Rate (\$/kWh) ¹	\$0.0649
Irrigation Energy Rate (\$/kWh) ¹	\$0.0872
Inflation Rate	2.20%

¹ Future rates determined using a 2.20% annual escalator.

Table 2 - Annual Wattsmart Business Program Costs by Measure Category

Measure Category	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Incentives	Inspection Cost	Total Utility Costs	Gross Customer Costs
Additional Measures	\$10,508	\$599	\$0	\$466	\$7,904	\$0	\$19,477	\$13,836
Building Shell	\$0	\$592	\$123	\$460	\$17,096	\$0	\$18,271	\$56,029
Compressed Air	\$31,044	\$24,131	\$175,180	\$10,189	\$124,266	\$0	\$364,810	\$213,276
Energy Management	\$116,479	\$109,493	\$57,819	\$28,916	\$65,402	\$0	\$378,108	\$85,250
Food Service Equipment	\$0	\$251	\$52	\$195	\$1,600	\$0	\$2,099	\$3,060
HVAC	\$11,010	\$12,621	\$130,829	\$4,849	\$106,188	\$0	\$265,498	\$221,486
Irrigation	\$87,649	\$5,157	\$92,125	\$9,710	\$153,950	\$0	\$348,590	\$403,661
Lighting	\$0	\$131,285	\$235,611	\$96,553	\$1,024,234	\$16,586	\$1,504,270	\$2,203,807
Motors	\$36,526	\$10,435	\$2,549	\$3,982	\$57,484	\$0	\$110,976	\$144,297
Refrigeration	\$192,138	\$38,798	\$719,863	\$28,490	\$462,288	\$0	\$1,441,577	\$1,001,425
Total	\$485,356	\$333,361	\$1,414,152	\$183,811	\$2,020,412	\$16,586	\$4,453,677	\$4,346,127

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	52,690	94%	49,529	100%	49,529	15
Building Shell	51,989	94%	48,870	100%	48,870	17
Compressed Air	1,152,222	96%	1,106,133	100%	1,106,133	15
Energy Management	3,270,087	100%	3,270,087	100%	3,270,087	3
Food Service Equipment	22,071	94%	20,747	100%	20,747	15
HVAC	548,423	100%	548,423	100%	548,423	12
Irrigation	1,098,082	100%	1,098,082	100%	1,098,082	14
Lighting	10,919,095	90%	9,827,185	100%	9,827,185	11
Motors	450,367	94%	423,345	100%	423,345	15
Refrigeration	3,221,924	100%	3,221,924	100%	3,221,924	15
Total	20,786,950	94%	19,614,324	100%	19,614,324	11

Table 4 - Benefit/Cost Ratios by Measure Category

Measure Category	PTRC	TRC	UCT	RIM	PCT
Additional Measures	1.14	1.04	1.36	0.41	3.88
Building Shell	0.59	0.54	1.69	0.46	1.18
Compressed Air	1.43	1.30	1.61	0.44	5.15
Energy Management	0.81	0.74	0.77	0.28	8.78
Food Service Equipment	3.42	3.11	5.28	0.52	6.78
HVAC	0.66	0.60	0.87	0.34	2.33
Irrigation	1.03	0.93	1.60	0.40	2.96
Irrigation with NEBs	1.10	1.01	1.60	0.40	3.08
Lighting	1.44	1.31	2.34	0.41	3.66
Lighting with NEBs	1.44	1.31	2.34	0.41	3.66
Motors	1.25	1.14	2.03	0.47	2.95
Refrigeration	0.95	0.86	1.18	0.39	3.42
Total	1.17	1.06	1.61	0.40	3.59
Total with NEBs	1.17	1.07	1.61	0.40	3.60

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	\$0.0420	\$6,779,391	\$7,898,312	\$1,118,921	1.17
Total Resource Cost Test (TRC) No Adder	\$0.0420	\$6,779,391	\$7,180,284	\$400,892	1.06
Utility Cost Test (UCT)	\$0.0276	\$4,453,677	\$7,180,284	\$2,726,607	1.61
Rate Impact Test (RIM)		\$18,044,306	\$7,180,284	-\$10,864,022	0.40
Participant Cost Test (PCT)		\$4,346,127	\$15,611,041	\$11,264,914	3.59
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000202956
Discounted Participant Payback (years)					1.52

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

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0473	\$25,409	\$29,085	\$3,675	1.14
Total Resource Cost Test (TRC) No Adder	\$0.0473	\$25,409	\$26,441	\$1,031	1.04
Utility Cost Test (UCT)	\$0.0363	\$19,477	\$26,441	\$6,963	1.36
Rate Impact Test (RIM)		\$65,187	\$26,441	-\$38,747	0.41
Participant Cost Test (PCT)		\$13,836	\$53,614	\$39,778	3.88
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000006369
Discounted Participant Payback (years)					1.50

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0990	\$57,204	\$33,910	-\$23,294	0.59
Total Resource Cost Test (TRC) No Adder	\$0.0990	\$57,204	\$30,827	-\$26,377	0.54
Utility Cost Test (UCT)	\$0.0316	\$18,271	\$30,827	\$12,556	1.69
Rate Impact Test (RIM)		\$67,518	\$30,827	-\$36,691	0.46
Participant Cost Test (PCT)		\$56,029	\$66,343	\$10,315	1.18
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000005318
Discounted Participant Payback (years)					12.31

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0379	\$453,820	\$647,529	\$193,709	1.43
Total Resource Cost Test (TRC) No Adder	\$0.0379	\$453,820	\$588,663	\$134,843	1.30
Utility Cost Test (UCT)	\$0.0304	\$364,810	\$588,663	\$223,853	1.61
Rate Impact Test (RIM)		\$1,339,175	\$588,663	-\$750,513	0.44
Participant Cost Test (PCT)		\$213,276	\$1,098,631	\$885,356	5.15
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000123356
Discounted Participant Payback (years)					1.04

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0442	\$397,957	\$322,077	-\$75,879	0.81
Total Resource Cost Test (TRC) No Adder	\$0.0442	\$397,957	\$292,797	-\$105,159	0.74
Utility Cost Test (UCT)	\$0.0420	\$378,108	\$292,797	-\$85,311	0.77
Rate Impact Test (RIM)		\$1,061,596	\$292,797	-\$768,798	0.28
Participant Cost Test (PCT)		\$85,250	\$748,889	\$663,639	8.78
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000632855
Discounted Participant Payback (years)					0.08

**Table 10 - Wattsmart Business Food Service Equipment Cost-Effectiveness Results
(Load Shape – WA_Miscellaneous_Mfg_General)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0158	\$3,559	\$12,183	\$8,624	3.42
Total Resource Cost Test (TRC) No Adder	\$0.0158	\$3,559	\$11,076	\$7,517	3.11
Utility Cost Test (UCT)	\$0.0093	\$2,099	\$11,076	\$8,977	5.28
Rate Impact Test (RIM)		\$21,246	\$11,076	-\$10,170	0.52
Participant Cost Test (PCT)		\$3,060	\$20,747	\$17,687	6.78
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000001672
Discounted Participant Payback (years)					0.87

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0753	\$380,796	\$252,777	-\$128,019	0.66
Total Resource Cost Test (TRC) No Adder	\$0.0753	\$380,796	\$229,798	-\$150,998	0.60
Utility Cost Test (UCT)	\$0.0525	\$265,498	\$229,798	-\$35,700	0.87
Rate Impact Test (RIM)		\$674,923	\$229,798	-\$445,126	0.34
Participant Cost Test (PCT)		\$221,486	\$515,614	\$294,127	2.33
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000091553
Discounted Participant Payback (years)					2.85

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0532	\$598,302	\$614,852	\$16,550	1.03
Total Resource Cost Test (TRC) No Adder	\$0.0532	\$598,302	\$558,956	-\$39,346	0.93
Utility Cost Test (UCT)	\$0.0310	\$348,590	\$558,956	\$210,366	1.60
Rate Impact Test (RIM)		\$1,390,999	\$558,956	-\$832,043	0.40
Participant Cost Test (PCT)		\$403,661	\$1,196,358	\$792,697	2.96
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000146582
Discounted Participant Payback (years)					2.67

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0322	\$2,683,843	\$3,864,265	\$1,180,422	1.44
Total Resource Cost Test (TRC) No Adder	\$0.0322	\$2,683,843	\$3,512,968	\$829,125	1.31
Utility Cost Test (UCT)	\$0.0180	\$1,504,270	\$3,512,968	\$2,008,698	2.34
Rate Impact Test (RIM)		\$8,536,740	\$3,512,968	-\$5,023,772	0.41
Participant Cost Test (PCT)		\$2,203,807	\$8,056,705	\$5,852,897	3.66
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001127508
Discounted Participant Payback (years)					1.52

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0431	\$197,789	\$247,645	\$49,856	1.25
Total Resource Cost Test (TRC) No Adder	\$0.0431	\$197,789	\$225,132	\$27,343	1.14
Utility Cost Test (UCT)	\$0.0242	\$110,976	\$225,132	\$114,156	2.03
Rate Impact Test (RIM)		\$479,749	\$225,132	-\$254,617	0.47
Participant Cost Test (PCT)		\$144,297	\$426,257	\$281,960	2.95
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000041850
Discounted Participant Payback (years)					2.78

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0567	\$1,980,714	\$1,873,989	-\$106,724	0.95
Total Resource Cost Test (TRC) No Adder	\$0.0567	\$1,980,714	\$1,703,627	-\$277,087	0.86
Utility Cost Test (UCT)	\$0.0413	\$1,441,577	\$1,703,627	\$262,049	1.18
Rate Impact Test (RIM)		\$4,407,171	\$1,703,627	-\$2,703,545	0.39
Participant Cost Test (PCT)		\$1,001,425	\$3,427,883	\$2,426,458	3.42
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000444362
Discounted Participant Payback (years)					2.12

In addition to the energy benefits reported above, irrigation and lighting measures in the Wattsmart Business program offer non-energy benefits (NEBs). Table 16 through Table 19 detail the non-energy benefits and cost-effectiveness results.

Table 16 - Wattsmart Business 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
Irrigation	\$0	\$4,914	4,352	14	\$4,914	6.57%	\$47,004
Lighting	\$0	\$320	39,493	11	\$320	6.57%	\$2,612

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

Table 17 - Wattsmart Business 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	\$0.0420	\$6,779,391	\$7,946,891	\$1,167,500	1.17
Total Resource Cost Test (TRC) No Adder	\$0.0420	\$6,779,391	\$7,228,862	\$449,471	1.07
Utility Cost Test (UCT)	\$0.0276	\$4,453,677	\$7,180,284	\$2,726,607	1.61
Rate Impact Test (RIM)		\$18,044,306	\$7,180,284	-\$10,864,022	0.40
Participant Cost Test (PCT)		\$4,346,127	\$15,659,620	\$11,313,493	3.60
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000202956
Discounted Participant Payback (years)					1.52

Table 18 - Wattsmart Business Irrigation (with NEBs) Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0404	\$598,302	\$660,819	\$62,517	1.10
Total Resource Cost Test (TRC) No Adder	\$0.0404	\$598,302	\$604,923	\$6,621	1.01
Utility Cost Test (UCT)	\$0.0235	\$348,590	\$558,956	\$210,366	1.60
Rate Impact Test (RIM)		\$1,390,999	\$558,956	-\$832,043	0.40
Participant Cost Test (PCT)		\$403,661	\$1,242,325	\$838,664	3.08
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000146582
Discounted Participant Payback (years)					2.67

Table 19 - Wattsmart Business Lighting (with NEBs) Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0336	\$2,683,843	\$3,866,877	\$1,183,034	1.44
Total Resource Cost Test (TRC) No Adder	\$0.0336	\$2,683,843	\$3,515,580	\$831,737	1.31
Utility Cost Test (UCT)	\$0.0189	\$1,504,270	\$3,512,968	\$2,008,698	2.34
Rate Impact Test (RIM)		\$8,536,740	\$3,512,968	-\$5,023,772	0.41
Participant Cost Test (PCT)		\$2,203,807	\$8,059,317	\$5,855,509	3.66
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001127508
Discounted Participant Payback (years)					1.52



Memorandum

To: Nicole Karpavich and Alesha Pino, PacifiCorp

From: David Basak, Guidehouse

Date: April 15, 2020

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

Guidehouse estimated the cost-effectiveness results for the Washington Home Energy Savings Program, based on 2019 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program and for the 8 measure categories.

Cost-effectiveness was tested using the 2017 IRP decrement for all measure categories. The program passes the cost-effectiveness for the PCT tests. 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 Building Shell (with NEBs) Cost-Effectiveness Results
Table 18 - Home Energy Savings Energy Kit – DHW (with NEBs) Cost-Effectiveness Results
Table 19 - Home Energy Savings Energy Kit – Lighting (with NEBs) Cost-Effectiveness Results
Table 20 - Home Energy Savings HVAC (with NEBs) Cost-Effectiveness Results
Table 21 - Home Energy Savings Lighting (with NEBs) Cost-Effectiveness Results
Table 22 - Home Energy Savings Whole Home (with NEBs) Cost-Effectiveness Results

Table 1 - Home Energy Savings Inputs

Parameter	Value
Discount Rate	6.57%
Residential Line Loss	9.67%
Residential Energy Rate (\$/kWh) ¹	\$0.0869
Inflation Rate	2.20%

¹ Future rates determined using a 2.20% annual escalator.

Table 2 - Home Energy Savings Annual Program Costs

Measure Category	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Incentives	Total Utility Costs	Gross Customer Costs
Appliances	\$0	\$111	\$4,202	\$76	\$8,300	\$12,689	\$49,504
Building Shell	\$0	\$1,147	\$43,467	\$790	\$80,096	\$125,501	\$364,948
Energy Kits - DHW	\$0	\$2,210	\$36,817	\$1,522	\$8,217	\$48,766	\$8,217
Energy Kits - Lighting	\$0	\$41	\$675	\$28	\$1,061	\$1,805	\$1,061
HVAC	\$0	\$14,686	\$556,574	\$10,116	\$848,775	\$1,430,151	\$2,221,439
Lighting	\$0	\$17,152	\$330,950	\$11,815	\$305,540	\$665,456	\$310,663
Water Heating	\$0	\$179	\$6,782	\$123	\$8,900	\$15,984	\$14,756
Whole Home	\$0	\$1,577	\$59,757	\$1,086	\$147,100	\$209,519	\$300,537
Total	\$0	\$37,101	\$1,039,224	\$25,556	\$1,407,990	\$2,509,871	\$3,271,127

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	17,208	100%	17,208	100%	17,208	14
Building Shell	178,025	100%	178,025	100%	178,025	45
Energy Kits - DHW	343,014	100%	343,014	100%	343,014	9
Energy Kits - Lighting	6,290	100%	6,290	100%	6,290	5
HVAC	2,279,506	80%	1,823,605	100%	1,823,605	15
Lighting	2,662,335	100%	2,662,335	100%	2,662,335	4
Water Heating	27,775	100%	27,775	100%	27,775	13
Whole Home	244,739	100%	244,739	100%	244,739	31
Total	5,758,893	92%	5,302,992	100%	5,302,992	11

Table 4 - Benefit/Cost Ratios by Measure Category

Measure Group	PTRC	TRC	UCT	RIM	PCT
Appliances	0.17	0.15	0.66	0.29	0.50
Appliances with NEBs	0.61	0.60	0.66	0.29	0.98
Building Shell	0.57	0.52	1.69	0.47	1.12
Building Shell with NEBs	0.64	0.59	1.69	0.47	1.19
Energy Kits - DHW	2.15	1.95	1.95	0.34	29.39
Energy Kits - DHW with NEBs	10.55	10.35	1.95	0.34	79.23
Energy Kits - Lighting	0.57	0.52	0.52	0.21	3.42
Energy Kits - Lighting with NEBs	0.94	0.89	0.52	0.21	4.06
HVAC	0.39	0.35	0.69	0.30	1.21
HVAC with NEBs	0.44	0.41	0.69	0.30	1.28
Lighting	0.51	0.47	0.47	0.20	3.85
Lighting with NEBs	0.95	0.91	0.47	0.20	4.79
Water Heating	0.62	0.56	0.77	0.30	2.31
Whole Home	0.74	0.67	1.16	0.41	1.77
Whole Home with NEBs	0.75	0.68	1.16	0.41	1.79
Total	0.47	0.43	0.75	0.30	1.57
Total with NEBs	0.68	0.64	0.75	0.30	1.85

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	\$0.1095	\$4,373,008	\$2,061,670	-\$2,311,338	0.47
Total Resource Cost Test (TRC) No Adder	\$0.1095	\$4,373,008	\$1,874,245	-\$2,498,763	0.43
Utility Cost Test (UCT)	\$0.0629	\$2,509,871	\$1,874,245	-\$635,626	0.75
Rate Impact Test (RIM)		\$6,230,948	\$1,874,245	-\$4,356,703	0.30
Participant Cost Test (PCT)		\$3,271,127	\$5,129,067	\$1,857,940	1.57
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000078865
Discounted Participant Payback (years)					4.23

Table 6 through Table 13 provides cost-effectiveness results without NEBs for all 8 measures.

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.3038	\$53,893	\$9,168	-\$44,725	0.17
Total Resource Cost Test (TRC) No Adder	\$0.3038	\$53,893	\$8,334	-\$45,558	0.15
Utility Cost Test (UCT)	\$0.0715	\$12,689	\$8,334	-\$4,354	0.66
Rate Impact Test (RIM)		\$29,220	\$8,334	-\$20,885	0.29
Participant Cost Test (PCT)		\$49,504	\$24,831	-\$24,673	0.50
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000003679
Discounted Participant Payback (years)					n/a

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1179	\$410,353	\$233,962	-\$176,391	0.57
Total Resource Cost Test (TRC) No Adder	\$0.1179	\$410,353	\$212,692	-\$197,660	0.52
Utility Cost Test (UCT)	\$0.0361	\$125,501	\$212,692	\$87,192	1.69
Rate Impact Test (RIM)		\$452,483	\$212,692	-\$239,791	0.47
Participant Cost Test (PCT)		\$364,948	\$407,078	\$42,130	1.12
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000013090
Discounted Participant Payback (years)					26.78

**Table 8 - Home Energy Savings Energy Kits – DHW Cost-Effectiveness Results
 (Load Shape – Residential_ERWH_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0194	\$48,766	\$104,763	\$55,997	2.15
Total Resource Cost Test (TRC) No Adder	\$0.0194	\$48,766	\$95,239	\$46,473	1.95
Utility Cost Test (UCT)	\$0.0194	\$48,766	\$95,239	\$46,473	1.95
Rate Impact Test (RIM)		\$282,017	\$95,239	-\$186,778	0.34
Participant Cost Test (PCT)		\$8,217	\$241,468	\$233,251	29.39
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000051268
Discounted Participant Payback (years)					n/a

**Table 9 - Home Energy Savings Energy Kits – Lighting Cost-Effectiveness Results
 (Load Shape – Residential_Lighting_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0651	\$1,805	\$1,024	-\$781	0.57
Total Resource Cost Test (TRC) No Adder	\$0.0651	\$1,805	\$931	-\$874	0.52
Utility Cost Test (UCT)	\$0.0651	\$1,805	\$931	-\$874	0.52
Rate Impact Test (RIM)		\$4,378	\$931	-\$3,448	0.21
Participant Cost Test (PCT)		\$1,061	\$3,635	\$2,573	3.42
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000001704
Discounted Participant Payback (years)					n/a

**Table 10 - Home Energy Savings HVAC Cost-Effectiveness Results
 (Load Shape – WA_Single_Family_Heat_Pump)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1418	\$2,802,814	\$1,088,071	-\$1,714,743	0.39
Total Resource Cost Test (TRC) No Adder	\$0.1418	\$2,802,814	\$989,156	-\$1,813,659	0.35
Utility Cost Test (UCT)	\$0.0724	\$1,430,151	\$989,156	-\$440,995	0.69
Rate Impact Test (RIM)		\$3,272,140	\$989,156	-\$2,282,984	0.30
Participant Cost Test (PCT)		\$2,221,439	\$2,690,764	\$469,325	1.21
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000375237
Discounted Participant Payback (years)					10.20

**Table 11 - Home Energy Savings Lighting Cost-Effectiveness Results
 (Load Shape – Residential_Lighting_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0700	\$670,580	\$344,363	-\$326,217	0.51
Total Resource Cost Test (TRC) No Adder	\$0.0700	\$670,580	\$313,057	-\$357,523	0.47
Utility Cost Test (UCT)	\$0.0695	\$665,456	\$313,057	-\$352,400	0.47
Rate Impact Test (RIM)		\$1,554,643	\$313,057	-\$1,241,586	0.20
Participant Cost Test (PCT)		\$310,663	\$1,194,727	\$884,063	3.85
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000766868
Discounted Participant Payback (years)					0.02

**Table 12 - Home Energy Savings Water Heating Cost-Effectiveness Results
(Load Shape – Residential_HPWH_7P)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0806	\$21,840	\$13,499	-\$8,342	0.62
Total Resource Cost Test (TRC) No Adder	\$0.0806	\$21,840	\$12,271	-\$9,569	0.56
Utility Cost Test (UCT)	\$0.0590	\$15,984	\$12,271	-\$3,712	0.77
Rate Impact Test (RIM)		\$41,235	\$12,271	-\$28,964	0.30
Participant Cost Test (PCT)		\$14,756	\$34,151	\$19,395	2.31
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000005498
Discounted Participant Payback (years)					2.45

**Table 13 - Home Energy Savings Whole Home Cost-Effectiveness Results
(Load Shape – WA_Single_Family_Heat_pump)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0882	\$362,957	\$266,821	-\$96,136	0.74
Total Resource Cost Test (TRC) No Adder	\$0.0882	\$362,957	\$242,564	-\$120,393	0.67
Utility Cost Test (UCT)	\$0.0509	\$209,519	\$242,564	\$33,045	1.16
Rate Impact Test (RIM)		\$594,832	\$242,564	-\$352,268	0.41
Participant Cost Test (PCT)		\$300,537	\$532,412	\$231,875	1.77
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000027937
Discounted Participant Payback (years)					8.17

In addition to the energy benefits reported above, appliances, building envelope, energy savings kits, HVAC, lighting, and whole home in the Home Energy Savings program offer significant non-energy benefits (NEBs). Table 14 through Table 22 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	\$2,479	\$9	111	14	\$2,488	6.57%	\$23,798
Building Envelope	\$0	\$1,883	301,316	45	\$1,883	6.57%	\$28,801
Energy Kits - DHW	\$57,355	\$562	647	9	\$57,917	6.57%	\$409,595
Energy Kits - Lighting	\$0	\$152	183	5	\$152	6.57%	\$674
HVAC	\$0	\$15,031	1,107	15	\$15,031	6.57%	\$149,945
Lighting	\$0	\$80,654	207,227	4	\$80,654	6.57%	\$293,990
Water Heating	\$0	\$0	20	13	\$0	6.57%	\$0
Whole Home	\$0	\$382	79	31	\$382	6.57%	\$5,337
Total NEBs	\$59,834	\$98,674	510,690	11	\$158,508	6.57%	\$912,139

The following table provides 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	\$0.1095	\$4,373,008	\$2,973,808	-\$1,399,200	0.68
Total Resource Cost Test (TRC) No Adder	\$0.1095	\$4,373,008	\$2,786,384	-\$1,586,624	0.64
Utility Cost Test (UCT)	\$0.0629	\$2,509,871	\$1,874,245	-\$635,626	0.75
Rate Impact Test (RIM)		\$6,230,948	\$1,874,245	-\$4,356,703	0.30
Participant Cost Test (PCT)		\$3,271,127	\$6,041,206	\$2,770,079	1.85
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000078865
Discounted Participant Payback (years)					4.23

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

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.3038	\$53,893	\$32,966	-\$20,927	0.61
Total Resource Cost Test (TRC) No Adder	\$0.3038	\$53,893	\$32,132	-\$21,761	0.60
Utility Cost Test (UCT)	\$0.0715	\$12,689	\$8,334	-\$4,354	0.66
Rate Impact Test (RIM)		\$29,220	\$8,334	-\$20,885	0.29
Participant Cost Test (PCT)		\$49,504	\$48,629	-\$875	0.98
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000003679
Discounted Participant Payback (years)					n/a

Table 17 - Home Energy Savings Building Shell (with NEBs) Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1179	\$410,353	\$262,763	-\$147,590	0.64
Total Resource Cost Test (TRC) No Adder	\$0.1179	\$410,353	\$241,494	-\$168,859	0.59
Utility Cost Test (UCT)	\$0.0361	\$125,501	\$212,692	\$87,192	1.69
Rate Impact Test (RIM)		\$452,483	\$212,692	-\$239,791	0.47
Participant Cost Test (PCT)		\$364,948	\$435,880	\$70,932	1.19
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000013090
Discounted Participant Payback (years)					26.78

Table 18 - Home Energy Savings Energy Kit – DHW (with NEBs) Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0194	\$48,766	\$514,358	\$465,592	10.55
Total Resource Cost Test (TRC) No Adder	\$0.0194	\$48,766	\$504,834	\$456,068	10.35
Utility Cost Test (UCT)	\$0.0194	\$48,766	\$95,239	\$46,473	1.95
Rate Impact Test (RIM)		\$282,017	\$95,239	-\$186,778	0.34
Participant Cost Test (PCT)		\$8,217	\$651,063	\$642,846	79.23
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000051268
Discounted Participant Payback (years)					n/a

Table 19 - Home Energy Savings Energy Kit – Lighting (with NEBs) Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0651	\$1,805	\$1,697	-\$108	0.94
Total Resource Cost Test (TRC) No Adder	\$0.0651	\$1,805	\$1,604	-\$201	0.89
Utility Cost Test (UCT)	\$0.0651	\$1,805	\$931	-\$874	0.52
Rate Impact Test (RIM)		\$4,378	\$931	-\$3,448	0.21
Participant Cost Test (PCT)		\$1,061	\$4,308	\$3,247	4.06
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000001704
Discounted Participant Payback (years)					n/a

Table 20 - Home Energy Savings HVAC (with NEBs) Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1418	\$2,802,814	\$1,238,016	-\$1,564,798	0.44
Total Resource Cost Test (TRC) No Adder	\$0.1418	\$2,802,814	\$1,139,101	-\$1,663,713	0.41
Utility Cost Test (UCT)	\$0.0724	\$1,430,151	\$989,156	-\$440,995	0.69
Rate Impact Test (RIM)		\$3,272,140	\$989,156	-\$2,282,984	0.30
Participant Cost Test (PCT)		\$2,221,439	\$2,840,709	\$619,270	1.28
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000375237
Discounted Participant Payback (years)					10.20

Table 21 - Home Energy Savings Lighting (with NEBs) Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0700	\$670,580	\$638,352	-\$32,228	0.95
Total Resource Cost Test (TRC) No Adder	\$0.0700	\$670,580	\$607,047	-\$63,534	0.91
Utility Cost Test (UCT)	\$0.0695	\$665,456	\$313,057	-\$352,400	0.47
Rate Impact Test (RIM)		\$1,554,643	\$313,057	-\$1,241,586	0.20
Participant Cost Test (PCT)		\$310,663	\$1,488,716	\$1,178,053	4.79
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000766868
Discounted Participant Payback (years)					0.02

Table 22 - Home Energy Savings Whole Home (with NEBs) Cost-Effectiveness Results

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0882	\$362,957	\$272,157	-\$90,800	0.75
Total Resource Cost Test (TRC) No Adder	\$0.0882	\$362,957	\$247,901	-\$115,056	0.68
Utility Cost Test (UCT)	\$0.0509	\$209,519	\$242,564	\$33,045	1.16
Rate Impact Test (RIM)		\$594,832	\$242,564	-\$352,268	0.41
Participant Cost Test (PCT)		\$300,537	\$537,749	\$237,212	1.79
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000027937
Discounted Participant Payback (years)					8.17



Memorandum

To: Nicole Karpavich and Alesha Pino, PacifiCorp
From: David Basak, Guidehouse
Date: April 15, 2020
Re: Cost-Effectiveness Results for the Home Energy Reporting Program - Washington

Guidehouse estimated the cost-effectiveness results for the Washington Home Energy Reporting Program, based on 2019 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program.

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

Table 1 - Home Energy Reporting Inputs
Table 2 - Home Energy Reporting Annual Program Costs
Table 3 - Home Energy Reporting Savings
Table 4 - HER Program Level Cost-Effectiveness Results

Table 1 - Home Energy Reporting Inputs

Parameter	Value
Discount Rate	6.57%
Residential Line Loss	9.67%
Residential Energy Rate (\$/kWh) ¹	\$0.0869
Inflation Rate	2.20%

¹ Future rates determined using a 2.20% annual escalator.

Table 2 - Home Energy Reporting Annual Program Costs

Measure Category	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Incentives	Total Utility Costs	Gross Customer Costs
HER Program	\$0	\$21,023	\$211,393	\$977	\$0	\$233,392	\$0

Table 3 - Home Energy Reporting Savings

Measure Category	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
HER Program	8,366,413	100%	8,366,413	100%	8,366,413	2

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0149	\$233,392	\$544,800	\$311,408	2.33
Total Resource Cost Test (TRC) No Adder	\$0.0149	\$233,392	\$495,273	\$261,881	2.12
Utility Cost Test (UCT)	\$0.0149	\$233,392	\$495,273	\$261,881	2.12
Rate Impact Test (RIM)		\$1,688,996	\$495,273	-\$1,193,723	0.29
Participant Cost Test (PCT)		\$0	\$1,455,604	\$1,455,604	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001472856
Discounted Participant Payback (years)					n/a



Memorandum

To: Nicole Karpavich and Alesha Pino, PacifiCorp
From: David Basak, Guidehouse
Date: April 15, 2020
Re: Cost-Effectiveness Results for the Low Income Weatherization Program - Washington

Guidehouse estimated the cost-effectiveness results for the Washington Low Income Weatherization Program, based on 2019 costs and savings estimates provided by PacifiCorp. This memo provides the cost-effectiveness results for the overall program.

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

Table 1 - Low Income Weatherization 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 - Low Income Weatherization Inputs

Parameter	Value
Discount Rate	6.57%
Residential Line Loss	9.67%
Residential Energy Rate (\$/kWh) ¹	\$0.0869
Inflation Rate	2.20%

¹ Future rates determined using a 2.20% annual escalator.

Table 2 - Low Income Weatherization Annual Program Costs

Measure Category	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Inspection Costs	Incentives	Total Utility Costs	Gross Customer Costs
Low Income Weatherization	\$0	\$21,496	\$61,620	\$364	\$5,260	\$441,492	\$530,233	\$0
Total	\$0	\$21,496	\$61,620	\$364	\$5,260	\$441,492	\$530,233	\$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	166,912	100%	166,912	100%	166,912	24
Total	166,912	100%	166,912	100%	166,912	24

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2163	\$530,233	\$152,138	-\$378,095	0.29
Total Resource Cost Test (TRC) No Adder	\$0.2163	\$530,233	\$138,307	-\$391,926	0.26
Utility Cost Test (UCT)	\$0.2163	\$530,233	\$138,307	-\$391,926	0.26
Rate Impact Test (RIM)		\$759,395	\$138,307	-\$621,088	0.18
Participant Cost Test (PCT)		\$0	\$670,654	\$670,654	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000063672
Discounted Participant Payback (years)					n/a

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

Table 5 - Low Income Weatherization Non-Energy Benefits

Non-Energy Benefit	Program Impact	Perspective Adjusted
Home Repair Costs	\$30,624.61	PTRC, TRC
Economic Benefit	\$402,976.97	PTRC, TRC
Arrearage	-\$2,436.00	PTRC, TRC, UCT, RIM
Payment Assistance	\$20,184.00	PTRC, TRC
Total	\$451,349.58	-

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

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2163	\$530,233	\$603,487	\$73,254	1.14
Total Resource Cost Test (TRC) No Adder	\$0.2163	\$530,233	\$589,657	\$59,424	1.11
Utility Cost Test (UCT)	\$0.2163	\$530,233	\$135,871	-\$394,362	0.26
Rate Impact Test (RIM)		\$759,395	\$135,871	-\$623,524	0.18
Participant Cost Test (PCT)		\$0	\$670,654	\$670,654	n/a
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000066711
Discounted Participant Payback (years)					n/a



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.

- 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.

- Clothes washers
- Evaporative coolers
- Freezers
- 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 to ensure the customer has not received a Kit within the last ten years.

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 the program administrator¹. 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 the managed account delivery provider (Cascade Energy)² for the in-house project manager/managed account delivery channel.

¹ In 2019, responsibility for these required inspections transitioned from a third party consultant to the program administrator.

² In 2019, responsibility for these inspections transitioned from energy engineering firms to the managed account delivery contract provider.

- 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

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Participating Upstream/Midstream Lighting Retailers and Redemptions

The Company worked with 45 lighting retailers in 2019 to promote efficient lighting. Table 1 lists the retailer and the type of redemption(s) provided.

Table 1¹
Participating Upstream/Midstream Lighting Retailers and Redemptions

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

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

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

Downstream Retailers

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

Table 2
Downstream Retailers

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

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

Table 3
Non-Participating Retailers

Redemptions from Non-Participating Retailer's (Retailer may not be located in the service territory)	City	State	Clothes Washer	Heat Pump Water Heater, Self-Installed	Smart Thermostat
Amazon.com	Seattle	WA			✓
Appliances Connection	Yakima	WA	✓		
BestBuy.com	N/A		✓		✓
Costco	Yakima	WA	✓		
Home Depot	Waitsburg	WA	✓		
Home Depot	Walla Walla	WA	✓		
Lowe's	Grandview	WA		✓	
Lowe's	Tieton	WA	✓		
Sears	College Place	WA	✓		
Sears	Zillah	WA	✓		

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

Table 4
HVAC Trade Ally

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

Trade Ally (Trade ally may be located outside of the territory)	City	State	Central Air Conditioner Equipment	Duct Sealing	Duct Sealing and Duct Insulation	Electric System to Heat Pump Conversion	Heat Pump to Heat Pump Upgrade	Heat Pump - PTCS Commissioning, Controls, and	Heat Pump, Ductless
Total Comfort Solutions, LLC	Walla Walla	WA	✓			✓	✓		✓
Vance Heating and AC	Yakima	WA	✓			✓	✓		✓
Young's Heating & Cooling, LLC	Walla Walla	WA				✓			✓

Table 5
Manufactured Homes Trade Ally

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

Plumbing Trade Ally

Table 6 lists 4 plumbing trade allies the Company worked with to promote efficient plumbing technologies.

Table 6
Plumbing Trade Ally

Trade Ally Name (Trade ally may be located outside of the territory)	City	State	Heat Pump Water Heaters
Campbell & Company	Pasco	WA	✓
Paul's Air F/X	Yakima	WA	✓
Rainwater		WA	✓
RossCo Plumbing	Yakima	WA	✓

Weatherization Trade Ally

Table 7 lists 6 weatherization trade allies the Company worked with.

Table 7
Weatherization Trade Ally

Trade Ally Name (Trade ally may be located outside of the territory)	City	State	Air Sealing	Insulation-Attic	Insulation-Floor	Insulation-Wall	Windows
Don Jordan Energy Systems	Yakima	WA		✓	✓		
Insul Homes	Yakima	WA		✓			
Intermountain West Insulation	Kennewick	WA		✓	✓	✓	
McKinney Glass Inc.	Yakima	WA					✓
RJ Weatherization & Insulation	Yakima	WA			✓		
Smith Insulation	Walla Walla	WA		✓	✓	✓	

Table 8
Applications by Customer City and Measure Category

Customer City	% of All Applications	% of Appliance Applications	% of HVAC Applications	% of Manufactured Homes Applications	% of Kits Applications
BUENA	0.13%	0.00%	0.00%	0.00%	0.36%
BURBANK	0.36%	0.00%	0.38%	0.18%	0.12%
COLLEGE PLACE	3.07%	4.90%	2.58%	0.73%	3.01%
COWICHE	0.27%	0.98%	0.10%	0.00%	0.48%
DAYTON	1.33%	1.96%	1.15%	0.00%	1.20%
DIXIE	0.09%	0.98%	0.10%	0.00%	0.00%
GRANDVIEW	2.84%	0.98%	1.72%	0.54%	4.46%
GRANGER	0.67%	0.98%	0.96%	0.00%	0.48%
HARRAH	0.09%	0.00%	0.00%	0.00%	0.24%
MABTON	0.18%	0.00%	0.10%	0.00%	0.24%
MOXEE	1.55%	0.98%	1.24%	0.91%	2.29%
NACHES	1.29%	1.96%	1.43%	0.36%	1.20%
OUTLOOK	0.40%	0.98%	0.48%	0.00%	0.24%
POMEROY	0.44%	0.98%	0.10%	0.18%	0.72%
PRESCOTT	0.22%	0.00%	0.19%	0.00%	0.12%
PROSSER	0.04%	0.00%	0.00%	0.00%	0.12%
SELAH	7.37%	6.86%	8.32%	6.72%	5.90%
SUNNYSIDE	2.62%	1.96%	1.24%	0.36%	4.82%
TIETON	0.93%	0.98%	0.57%	0.54%	1.45%
TOPPENISH	1.29%	0.98%	0.48%	0.018%	2.65%
TOUCHET	0.36%	0.98%	0.38%	0.36%	0.24%
UNION GAP	3.55%	0.98%	5.83%	9.44%	2.05%
WAITSBURG	1.02%	1.96%	0.96%	0.00%	0.60%
WALLA WALLA	17.55%	15.69%	13.38%	1.09%	17.71%
WALLULA	0.13%	0.00%	0.00%	0.00%	0.36%
WAPATO	0.98%	1.96%	0.57%	0.00%	1.45%
YAKIMA	49.40%	49.02%	56.21%	77.86%	44.94%
ZILLAH	1.82%	2.94%	1.53%	0.54%	2.53%



Appendix 4

wattsmart Business Vendor Network



Search at Tue Mar 24 2020 3 : 51 : 56 PM

Search Criteria:

Sector: Business

Specialties: Appliances, Building envelope, Compressed air, Controls - HVAC, Controls - Lighting, Farm and dairy, Food service, HVAC - evaporative, HVAC - unitary, Irrigation, Lighting, Lighting instant incentives, Motors and VFDs, Office equipment, Other Specialty, Small business lighting

Company Name:

Address, City or Zip Code:

Radius: 0

Business Types: ""

Service Locations: ["a0R2E00000JR8hZUAT"]

Search Result: 43 record(s) found

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

#	Name	Contact	Specialties
1	Young's Heating & Cooling LLC 878 Wallula Ave Walla Walla, WA 99362 https://youngsheating.com	Susan Fouste (509) 525-4328 mail@youngsheating.com	Controls - HVAC HVAC HVAC - evaporative HVAC - unitary Motors and VFDs
2	Stoneway Electric Supply 44 s Palouse St. Walla Walla, WA 99362 http://www.stoneway.com	Tom Vinti (509) 522-1550 tom.vinti@stoneway.com	Lighting instant incentives
3	Transformative Wave 1012 Central Ave S Kent, WA 98032 http://transformativewave.com/	Joe Schmutzler (253) 867-2333 joe.s@twavetech.com	Controls - HVAC HVAC - unitary Motors and VFDs
4	Online Store, LLC 1000 Westinghouse Drive STE 1 New Stanton, PA 15672 http://www.Lightup.com	Kerry H (724) 925-5645 keary.hoffman@onlinestores.com	Lighting Lighting instant incentives
5	North Coast Electric - Yakima 215 N 3rd Ave Building A Yakima, WA 98902 Yakima, WA 98902 http://www.northcoastelectric.com	Jay Claussner (630) 639-3084 jclaussn@nclec.com	Controls - Lighting Lighting Lighting instant incentives
6	Batteries Plus Bulbs -	Kristie Midili	Lighting

#	Name	Contact	Specialties
	Kennewick 321 N Columbia Center Blvd. Kennewick, WA 99336 https://www.batteriesplus.com/	(509) 783-3400 mgr250@batteriesplus.net	Lighting instant incentives
7	Smith Insulation 49 Wallula Ave Walla Walla, WA 99362	Jim McEwen (509) 529-7506 sii2ttk@gmail.com	Building envelope HVAC Insulation Manufactured Homes Multifamily New Construction Weatherization
8	Stusser Yakima 116 N. 2nd Ave. Yakima, WA 98902 https://www.www.com	Steve DiBenedetto (509) 453-0378 steved@stusseryakima.com	Lighting Lighting instant incentives Motors and VFDs
9	BidEnergy Inc. 1628 JFK Blvd, Ste 2100 Philadelphia, PA 19103 http://bidenergy.com	Timothy Mayo (215) 732-4480 tim.mayo@bidenergy.com	Appliances Building envelope Controls - Lighting Food service HVAC - evaporative HVAC - unitary Lighting Motors and VFDs Office equipment
10	ENERGY MANAGEMENT COLLABORATIVE 2890 Vicksburg Lane N PLYMOUTH, MN 55447 http://www.emcllc.com	NICK OLSEN (952) 542-7967 nolsen@emcllc.com	Controls - Lighting Lighting

#	Name	Contact	Specialties
11	Core Northwest LLC 1413 River Road Yakima, WA 98902 http://www.corenorthwest.com	Rod Cassel (509) 248-2673 rod@corenorthwest.com	Controls - Lighting Irrigation Lighting Motors and VFDs
12	Stoneway Electric Supply - Yakima 23 N. 3rd Ave Yakima, WA 98902 http://www.stoneway.com/	Tyler Hicks (509) 469-6154 tyler.hicks@stoneway.com	Controls - Lighting Lighting Lighting instant incentives Motors and VFDs
13	Bulbs 243 Stafford St Worcester, MA 1603 https://www.bulbs.com/contactus.aspx	Bulbs Bulbs customerservice@bulbs.com	Lighting Lighting instant incentives
14	Platt Electric Supply - Yakima 16 S. 1st Avenue Yakima, WA 98902 http://www.platt.com	Jeremy Sandino (509) 452-6444 jlsandino@platt.com	Controls - HVAC Controls - Lighting Lighting Lighting Lighting instant incentives Motors and VFDs Multifamily New Construction Other Specialty
15	Lumenal Lighting LLC 21706 66th Ave W Mountlake Terrace, WA 98043 https://www.Lumenal.com	Don Nielsen service@lumenal.com	Controls - Lighting Lighting

#	Name	Contact	Specialties
16	TJ's Refrigeration, Heating & Air 329 S 6th St Sunnyside, WA 98944 http://tjsrefrigerationheatingandair.com	Joe Tovar (509) 839-8840 tjsref@hotmail.com	Appliances Building envelope Controls - Lighting Food service HVAC HVAC - evaporative HVAC - unitary Lighting Motors and VFDs
17	North Coast Electric - Pasco 1928 W. A St Pasco, WA 99301 http://www.NorthCoastElectric.com	Zack Boucher (206) 442-9846 zboucher@ncelec.com	Building envelope Controls - Lighting Lighting Lighting instant incentives Motors and VFDs Other Specialty
18	KIE Supply 113 E Columbia Dr Kennewick, WA 99336 https://www.kiesupply.com	Leigh Kluthe (509) 582-5156 leigh@kiesupply.com	Controls - Lighting Lighting
19	Knobel's 801 Tennant Ln Yakima, WA 98901	Steve Soderstrom (509) 452-9157 knobelselectric@msn.com	Lighting Motors and VFDs Small business lighting
20	CED - Yakima 131 S 1st Ave YAKIMA, WA 98903	Dan Derosier (509) 248-0872 dan@cedyakima.com	Lighting Lighting instant incentives
21	Columbia Electric Supply 3211 Allen Rd Sunnyside, WA 98944 http://www.ces-sunnyside.com	Tye Kaple (509) 837-6033 tkaple@ces-sunnyside.com	Controls - Lighting Lighting Motors and VFDs

#	Name	Contact	Specialties
	de.com		
22	Walla Walla Electric 1225 W. Poplar Walla Walla, WA 99362 http://www.wwelectric.com	Spike Teal (509) 525-8672 spike@wwelectric.com	Controls - Lighting Lighting Lighting Motors and VFDs Multifamily New Construction Small business lighting
23	Conserve Energy 1045 Andover Park East #200 Tukwila, WA 98188 http://www.ezmetro.com	Mark Hansen (206) 409-4869 mark.hansen@ezmetro.com	Controls - HVAC Controls - Lighting Lighting Motors and VFDs Small business lighting
24	Platt Electric - Walla Walla 415 west main Walla Walla, WA 99362 https://www.platt.com	Robert Kinion (509) 522-0611 robert.kinion@platt.com	Lighting Lighting instant incentives
25	Batteries Plus Bulbs - Yakima 1731 South 1st Street Yakima, WA 98901 https://www.batteriesplus.com	Jessie Hottell (509) 571-1322 mgr654@batteiresplus.net	Lighting Lighting instant incentives
26	American Wholesale Lighting 1725 Rutan Dr Livermore, CA 94551 http://www.awlighting.com	Rianto Lie (510) 252-1088 rlie@awlighting.com	Lighting

#	Name	Contact	Specialties
27	Mint LED 1045 Andover Park East Seattle, WA 98188 http://www.mintled.com	Justin Canter (509) 954-7498 justin@mintled.com	Controls - HVAC Controls - Lighting HVAC - evaporative HVAC - unitary Lighting Motors and VFDs
28	Stoneway 630 Railroad St. Richland, WA 99352 http://www.stoneway.com	Tom Vinti (509) 943-4664 tom.vinti@stoneway.com	Lighting instant incentives
29	ShineRetrofits 1550 Larimer St Denver, CO 80202 https://www.shineretrofits.com/	Shine Retrofits (877) 643-4534 sales@shineretrofits.com	Lighting Lighting instant incentives
30	Forever Green Indoors 1314 S Grand Blvd, Ste 2, #127 Spokane, WA 99202 http://www.forevergreenindoors.com	Kathleen Sullivan (800) 630-7345 ksullivan@forevergreenindoors.com	Lighting
31	Lake Shore Electric, Inc. 9702 Tieton Drive Yakima, WA 98908 http://www.lakeshoreelectric.com	Bill Ross (509) 965-4281 billjr@lakeshoreelectric.com	Lighting Motors and VFDs
32	Batteries Plus Bulbs -	Michelle Russell	Lighting

#	Name	Contact	Specialties
	Walla Walla 632 S 9th Ave Walla Walla, WA 99362 https://www.batteriesplus.com/	(509) 924-6645 mrussell@batteriesplus.net	Lighting instant incentives
33	Leidos Engineering, LLC. 301 Plainfield Rd. Suite 310 Syracuse, NY 13212 https://energy.leidos.com/	Christopher Piechuta (855) 926-7543 amplify@leidos.com	Appliances Compressed air Controls - Lighting Food service HVAC - evaporative HVAC - unitary Lighting Motors and VFDs Office equipment Other Specialty
34	eledlights 7835 Wilkerson Court San Diego, CA 92111 https://www.eledlights.com/	Landon Landon (215) 607-6830 lights@eledlights.com	Lighting Lighting instant incentives
35	LED SUPPLY CO 12340 W Cedar Dr Lakewood, CO 80228 https://www.ledsupplyco.com/	Ian Skolnick orders@ledsupplyco.com	Lighting
36	Total Digital Systems 13433 NE 20th St STE O Bellevue, WA 98005 http://www.totaldigitalsystems.com	Ken Kang (425) 533-0112 kyungk@totaldigitalsystems.com	Lighting

#	Name	Contact	Specialties
37	ecomodus, LLC 5110 Tieton Drive Yakima, WA 98908	Dan Richards (509) 307-4363 ecomodus@msn.com	Lighting
38	CED - Richland 1920 Fowler St Richland, WA 99352	Dan Derosio (509) 737-8282 dan@cedyakima.com	Lighting instant incentives
39	All-Phase Electric, Inc. 2500 S 12th Ave Union Gap, WA 98903 http://allphaseelectric.org	Andrew Lea (509) 454-5093 andrew@allphaseelectric.org	Lighting Motors and VFDs
40	MH Electric Inc. P.O. Box 11224 Yakima, WA 98909	Walt Wenda (509) 452-6039 ww@mhelectricinc.com	Controls - Lighting Farm and dairy HVAC Lighting Lighting Motors and VFDs Small business lighting
41	McKinney Glass Inc. 2220 Goodman Road. Union Gap, WA 98903 http://mckinneyglass.com	Mike McKinney (509) 248-2770 mgmckinney@yvn.com	Building envelope Weatherization
42	Platt Electric - Grandview 100 Stover Loop Rd. Grandview, WA 98930 https://www.platt.com/	Rolando Solis (509) 882-1616 rolly.solis@platt.com	Lighting Lighting instant incentives
43	Columbia Electric	Daron Waldon	Lighting

#	Name	Contact	Specialties
	Supply - Walla Walla 932 N 13TH AVE Walla Walla, WA 99362 http://www.ced-columbia.com/	(509) 522-1419 dwalden@ces-ww.com	Motors and VFDs



Appendix 5

Communications

Energy Efficiency Communications 2019

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

TV

- [Washington winter 68-degree :30 – English](#)
- [Washington winter 68-degree :15 – English](#)
- [Washington winter 68-degree :30 – Spanish](#)
- [Washington winter 68-degree :15 – Spanish](#)
- [Washington summer 78-degree :30 – English](#)
- [Washington summer 78-degree :30 – Spanish](#)
- [Washington efficiency for business customers” Baker”](#)
- [Washington hidden savings for business customers “Vet”](#)
- [Washington efficiency “Apple King”](#)
- [Washington efficiency “Canoe Ridge Vineyard”](#)
- [Washington efficiency “Wray’s Marketfresh”](#)
- [Washington efficiency “Yakima Bindery”](#)

Radio

- [Washington Better :60 – English](#)
- [Washington Better :60 – Spanish](#)
- [Incentives for Lighting and lighting controls for businesses](#)
- [Washington efficiency “Apple King”](#)
- [Washington efficiency “Canoe Ridge Vineyard”](#)
- [Washington efficiency “Wray’s Marketfresh”](#)
- [Washington efficiency “Yakima Bindery”](#)

Print

- [Yakima spring – “Good”](#)
- [Walla Walla spring – “Good”](#)
- [Yakima summer 78-degrees – “Better”](#)
- [Walla Walla summer– “Helps”](#)
- [Walla Walla summer 78-degrees – “Better”](#)
- [Yakima winter – “Good”](#)
- [Walla Walla winter – “Good”](#)
- [Spanish spring “Bueno”](#)
- [Spanish winter “Bueno”](#)
- [Spanish summer “Bueno”](#)
- [Spanish summer “Mejor”](#)
- [Summer cooling 78-degrees thermostat](#)
- [Irrigation – color](#)
- [Ad to thank business customers and vendors for being Wattsmart last year](#)

- [LED Lighting and Controls for business b/w](#)
- [Washington efficiency “Canoe Ridge Vineyard”](#)
- [Washington efficiency “Apple King”](#)

Digital Ads

- [Winter Being Wattsmart is “good”](#)
- [Winter Being Wattsmart “helps”](#)
- [Winter Being Wattsmart is “better”](#)
- [Being Wattsmart is “good”](#)
- [Being Wattsmart “helps”](#)
- [Being Wattsmart is “better”](#)
- [Yakima Bindery](#)
- [Wray’s Marketfresh](#)
- [Canoe Ridge Vineyard](#)
- [Apple King](#)
- [Energy efficiency is GOOD for your bottom line and Washington - business](#)
- [Your business has the power to save - baker](#)

Social

- [Winter Wattsmart tips 68 degrees Facebook ads – English](#)
- [Winter Wattsmart tips 68 degrees Facebook ads – Spanish](#)
- [Cooling – ceiling fan](#)
- [Cooling – thermostat](#)
- [Yakima Bindery](#)
- [Wray’s Marketfresh](#)
- [Canoe Ridge Vineyard](#)
- [Apple King](#)

Press releases:

- [Henningsen Cold Storage named Pacific Power wattsmart\(R\) 2019 Business partner of the year](#)
- [Quick tips to beat the heat](#)

Newsletters:

- [January Connect newsletter](#)
- [April Connect newsletter](#)
- [July Connect newsletter](#)
- [October Connect newsletter](#)

Onserts:

- [Wattsmart Starter Kit onsert](#)

Direct mail:

- Mailing to irrigation customers encouraging application for incentives:
 - [Letter – February](#)
 - [Application – February](#)
 - [LESA flyer – February](#)
 - [Letter – October](#)
 - [Application – October](#)
 - [Pivot Flyer – October](#)
- [Manufactured homes duct sealing letter](#)
- [Yakima Energy Fair mailing flyer](#)
- [Washington direct business mailing](#)

Emails:

- [Wattsmart Starter Kit email](#)
- [Thank you for being Wattsmart last year - January](#)

Collateral:

- [Wattsmart Business – light midstream brochure](#)
- [Wattsmart Business – Small Business flyer](#)

2019

NEEF

**BE WATTSMART,
BEGIN AT HOME
WASHINGTON**

Program Report

Prepared for:



Ashley Rask

Communications Representative

PacifiCorp

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Portland, Oregon 97232

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Prepared by:

Patti Clark

Program Director

National Energy Foundation

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Salt Lake City, UT 84107

February 28, 2020

Savings

Teacher ID:
Teacher Name:
Student First Name:

Home Energy Worksheet

Heating

1. Heat and use a programmable or smart thermostat.
☐ Currently do ☐ Will do
☐ Neither

2. Seal windows and weather strip outside doors.
☐ Have done ☐ Will do
☐ Neither

3. Improve 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.
☐ Currently do ☐ Will do
☐ Neither

6. Close blinds when windows are exposed to the sun.
☐ Currently do ☐ Will do
☐ Neither

7. Use a fan instead of air conditioning.
☐ Currently do ☐ Will do
☐ Neither

8. In the summer, set thermostat to 78° F or higher.
☐ Currently do ☐ Will do
☐ Neither

Water Heating

9. Set the water heater temperature to 120° F.
☐ Have done ☐ Will do
☐ Neither

10. Install a high-efficiency shower head.
☐ Have done ☐ Will do
☐ Neither

11. Take 5 minute showers.
☐ Currently do ☐ Will do
☐ Neither

12. Wash full loads in the dishwasher and clothes washer.
☐ Currently do ☐ Will do
☐ Neither

Lighting

13. Replace inefficient bulbs with LED bulbs.
☐ Have done ☐ Will do
☐ Neither

14. Turn lights off when not in use.
☐ Currently do ☐ Will do
☐ Neither

Refrigeration

15. Replace old, inefficient refrigerator with an ENERGY STAR® model.
☐ Have done ☐ Will do
☐ Neither

16. Upgrade 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 keep yearly.
☐ Currently do ☐ Will do
☐ Neither

Electronics


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

Cooking

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

Get paid for being wattsmart!

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

 **PACIFIC POWER**
POWERING YOUR DREAMS

Submit online at
thinkenergy.org/wattsmart

Home Energy Worksheets

— Returned: 1,908 —

— 53% —

Teacher Packets

— Returned: 95 —

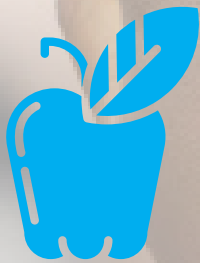
— 66% —

Participants



Students

– 3,567 –



Teachers

– 145 –



Schools

– 47 –

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Program Overview

Program Description

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

Program Administration

Be *wattsmart*, Begin at home is administered by NEF, a non-profit organization (established in 1976) 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 and energy safety. Concepts are taught through science, math, art, technology and writing. 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 2019 - 2020 school year.

Anne Lowe, Vice President – Operations, oversees program organization. Gary Swan, Vice President – Development, oversees contract accounting. Patti Clark, Program Director, is responsible for overseeing and implementing the scope of work and Megan Hirschi is responsible for scheduling the presentations. A team of trained and seasoned presenters brought the interactive, hands-on program to Washington schools from September 1 through November 1, 2019.

Building Collaborations

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

Yakima and Walla Walla Districts were contacted to clarify policy that mini-grant checks must be made payable to the school and not to individual teachers. Although teachers would prefer the grant money be made payable directly to them, it was determined that Washington State requires all incoming dollars to be deposited through the schools. In an effort to help teachers, mini-grant checks were mailed directly to the lead teacher followed by an email to the qualified teacher.

Program Implementation

During the month of May 2019 an invitation to register for the fall 2019 program was sent via email to all teachers that had participated in the 2018 program. In August and September, the program coordinator made phone calls to all unregistered schools. Teacher questions were addressed and highlights of the program content with an emphasis on how the program aligns with Washington content standards were reviewed.

Program Registration

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

After registration was qualified, a series of email communications with teachers, was sent automatically by the program registration website. The website calculated *Home Energy Worksheet* returns as well as earned gift card

levels and communicated this information to the participating teachers. Later communications were customized through programming to be sent only to teachers needing a reminder to return their program documents.

Be wattsmart, Begin at home Presentation

Be wattsmart, Begin at home presentations were given starting on September 1 and ending on November 1, 2019. The presentation featured a custom Keynote slideshow that brought energy concepts to the forefront of Washington education. The presentation focused on important concepts, such as natural resources, electrical generation, the energy mix used by Pacific Power to generate electricity and tips for energy efficiency in the home.

The presentation provided interactive activities that involved and engaged the audience. Students participated in making a human electrical circuit, during which they learned key core curriculum concepts such as insulators and conductors of electricity and electrical generation. Student volunteers used props to demonstrate the process of electrical generation for their classmates. All students reviewed material learned with an “Energy Lingo” review activity at designated points throughout the presentation. To help students remember energy efficiency tips, participants viewed “Caitlynn Power” energy efficiency video vignettes produced by PacifiCorp. The videos are always well received by both teachers and students. At the end of each short video, students learned a rhyme about Caitlyn’s wise energy choices to help them remember the efficiency concept.

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

Program Materials

A *Parent Letter* was provided in both English and Spanish 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 LED nightlight featuring the Pacific Power logo as a reward.

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

A program *Implementation Steps Flier* assisted teachers in carrying out the program. It also gave simple steps for successfully returning *Home Energy Worksheets* and the sponsor *Thanks a “Watt” Card* in the postage paid envelope provided in the *Teacher Materials Folder*. A *Rewarding Results Flier* gave information concerning the gift card teacher participants would receive for returning their student surveys. Educators received a \$50 mini-grant for an 80% return, or a \$25 mini-grant for a 50 – 79% return by the December 1, 2019 deadline.

Program Accomplishments – Fall 2019

- 47 Be wattsmart, Begin at home presentations
- 3,567 students and families reached
- 145 Washington teachers reached
- 53% student *Home Energy Worksheet* surveys return
- \$50 gift cards delivered to 74 Washington teachers
- \$25 gift cards delivered to 17 Washington teachers

Program Improvements - Fall 2019

- Updated all program materials
- Added a *Parent Letter* in Spanish
- New video vignettes entitled “Caitlin Power” produced by sponsor for presentation
- Added online *Home Energy Worksheet* option to program
- Created a program website for teachers and students thinkenergy.org/wattsmart/
- Uploaded “Caitlin Power” videos to website for teachers to access and use in the classroom
- Sent notification of mini-grants to each qualifying teacher
- Mailed mini-grant checks directly to lead teacher (checks were made payable to the qualified school as required by the State of Washington)

Program Attachments – Fall 2019

- Fall 2019 Participating Schools
- Program Promotions
- Program Documents
 - Keynote Presentation
 - *Teacher Implementation Steps Flier*
 - *Rewarding Results Flier*
 - *Student Guide*
 - *Teacher Guide*
 - Lingo Card
 - *Parent Letter*
- *Teacher Evaluation* Compilation
- *Home Energy Worksheet*
- *Home Energy Worksheet* Summary – Pacific Power
- Wise Energy Behaviors in Pacific Power Washington Homes
- Sampling of *Thanks a “Watt” Cards*

Attachments

Fall 2019 Participating Schools

Participating Schools	Address	City	State	Zip
Adams Elementary - Wapato	1309 S. Camas Avenue	Wapato	WA	98951
Adams Elementary - Yakima	713 S. 8th St.	Yakima	WA	98901
Ahtanum Valley Elementary	3006 S Wiley Rd	Yakima	WA	98903
Apple Valley Elementary	9206 Zier Road	Yakima	WA	98908
Arthur H. Smith Elementary	205 Fir Street	Grandview	WA	98930
Artz-Fox Elementary	805 Washington	Mabton	WA	98935
Barge-Lincoln Elementary	219 E. I Street	Yakima	WA	98901
Blue Ridge Elementary	1150 W. Chestnut	Walla Walla	WA	99362
Chief Kamiakin Elementary	1700 E. Lincoln Ave	Sunnyside	WA	98944
Christ the Teacher Catholic School	5508 W. Chestnut Ave	Yakima	WA	98908
Cottonwood Elementary	1041 S 96th Ave	Yakima	WA	98908
Davis Elementary	31 SE Ash St	College Place	WA	99324
Dayton Elementary	302 E Park Street	Dayton	WA	99328
Discovery Lab School	2810 Castlevale	Yakima	WA	98902
Dixie Elementary School	10520 US-12	Dixie	WA	99329
East Valley Elementary	1951 Beaudry Rd.	Yakima	WA	98901
Edison Elementary School	1315 E. Alder	Walla Walla	WA	99362
Garfield Elementary - 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
Green Park Elementary	1105 E Isaacs Street	Walla Walla	WA	99362
Harriet Thompson Elementary	1105 2nd Street	Grandview	WA	98930
Hoover Elementary	400 west Viola Avenue	Yakima	WA	98902
Lincoln Elementary	309 North Alder	Toppenish	WA	98948
Martin Luther King Elementary	2000 S 18th Street	Yakima	WA	98903
McClure Elementary - Grandview	811 W 2nd	Grandview	WA	98930
McClure Elementary - Yakima	1222 S 22nd Ave	Yakima	WA	98902
McKinley Elementary	621 S. 13th Ave	Yakima	WA	98902
Montessori School of Yakima	511 N 44th Avenue	Yakima	WA	98908
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	2807 West Lincoln	Yakima	WA	98902
Roosevelt Elementary - Yakima	120 N. 16th Avenue	Yakima	WA	98902
Roosevelt Elementary School - Granger	405 Bailey Ave	Granger	WA	98932
Satus Elementary	910 S. Camas Ave	Wapato	WA	98951
Sharpstein Elementary	410 S. Howard St.	Walla Walla	WA	99362
St Joseph-Marquette School	202 N 4th St	Yakima	WA	98901
Terrace Heights Elementary	101 N. 41st Street	Yakima	WA	98901
Union Gap School	3201 4th St	Union Gap	WA	98903
Valley View Elementary	515 Zillah Ave	Toppenish	WA	98948
Waitsburg Elementary	184 Academy Street	Waitsburg	WA	99361
Whitney Elementary	4411 W. Nob Hill Blvd.	Yakima	WA	98908
Wide Hollow Elementary	1000 S. 72nd Ave	Yakima	WA	98908
Zillah Intermediate	303 2nd Ave.	Zillah	WA	98953

Waitlisted Schools	Address	City	State	Zip
Green Park Elementary	1105 E Isaacs Street	Walla Walla	WA	99362

Program Promotions

[Subscribe](#)[Past Issues](#)[Translate ▼](#)

We invite you to reserve your school's participation in the Be **wattsmart**, Begin at home program for fall 2019. Click on "Yes, register me" below and you will be linked directly to the registration site. After you have registered, a coordinator will reach out to you with additional information.

["Yes, register me"](#)



Questions or concerns?
Contact Megan Hirschi

megan@nefl.org

| 1-800-616-8326 ext. 132

Offer available for teachers within the Pacific Power service area in Washington. Teachers must submit 80 percent or more of *Home Energy Worksheets* to earn the \$50 mini-grant.



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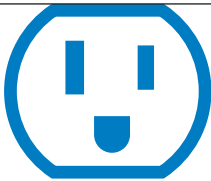
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National Energy Foundation · 4516 South 700 East · Suite 100 · Salt Lake City, UT 84107 · USA



You have the
power
to be **wattsmart**

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

Be wattsmart, Begin at home



Be **wattsmart**
Begin at home

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

Presentations begin in October 2019. Reserve your classroom's spot today at bewattsmart.com/begin.



Program Documents

Keynote Presentation



PACIFIC POWER
POWERING YOUR GREATNESS

We have the power to learn.

Learn about natural resources.
Learn how we make and use energy.
Learn how to use energy wisely by being **wattsmart**.
Play energy LINGO.




POWERING YOUR GREATNESS

What is **ENERGY**?

POWERING YOUR GREATNESS

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



POWERING YOUR GREATNESS

Natural resources

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




POWERING YOUR GREATNESS

Renewable resources




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Nonrenewable resources



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It's time to play Lingo!



There are many _____




The blue flame of _____
_____ nonrenewable resource.



Anything we use that comes from the earth or the sun is called a _____ resource.

Electricity



- The electricity we use is not a natural resource.
- It is made from natural resources.

POWERING YOUR GREATNESS

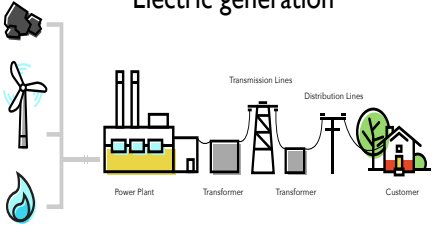
Pacific Power

Electric generation by energy source

Coal	56%
Renewables	19%
Natural gas	15%
Other sources	10%

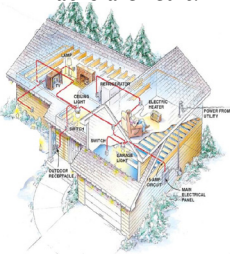
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Electric generation



POWERING YOUR GREATNESS

What is a circuit?

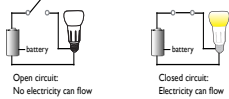


POWERING YOUR GREATNESS

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.



POWERING YOUR GREATNESS

Energy efficiency

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



Technology + Behaviors
to reduce energy use

POWERING YOUR GREATNESS



It's time to
play Lingo!

Energy efficiency
Energy efficiency is
to do the same amount
of work.

Renewable
Renewable
naturally replaced.

Nonrenewable
Nonrenewable
or not at all.

Oil
Oil
source used to produce
O_ _



Caitlynn Power

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Caitlynn Power

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Home efficiencies



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

- Decide what you want before opening the refrigerator.
- Use a fan instead of turning up the air conditioner

Remind your parents to:

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



POWERING YOUR GREATNESS

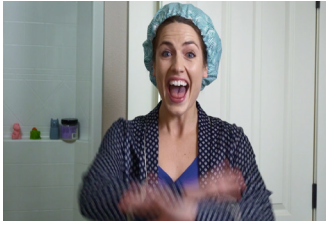
Water efficiencies

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

- Take shorter showers.
- Turn off the **water** when brushing teeth.
- Set your water heater to 120°F.
- Install an energy-efficient shower head.
- Make sure your dishwasher has a **full load** before you push the start button.



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

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POWERING YOUR GREATNESS



It's time to
play Lingo!



LED

A light that can last 25
times longer than an
incandescent. L _ _



Phantom Load

Electricity consumed by
an electronic device
even when it is turned
off in standby mode.
P _ _ _ _ _ L _ _ _



full load

Make sure you have a
full load before
starting your dishwasher.

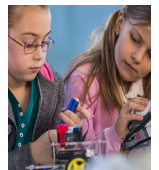


water

Try to fix a leaky faucet when
brushing your teeth.

What have we done today?

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



POWERING YOUR GREATNESS

Engage in energy efficiency

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

Complete the *Home Energy Worksheet*.

Sign the Thanks A "Watt" Card.



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you have the
power to be
wattsmart!

Visit thinkenergy.org/wattsmart
for further information about the program.

POWERING YOUR GREATNESS

Implementation Steps

1

Verify you have received:

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

2

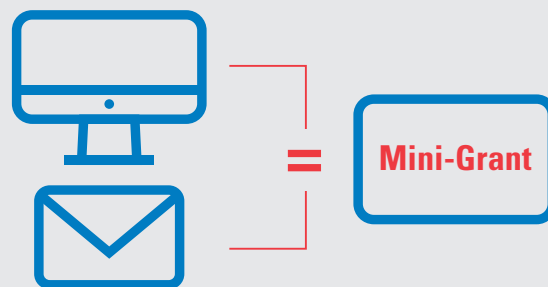
After the presentation, distribute to each student a:

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

3

Final steps:

- Reward students with a wattsmart nightlight when they complete their worksheet on paper or online at thinkenerg.org/wattsmart.
- Have each student sign the *Thank You Card* to Rocky Mountain Power.
- Home Energy Worksheets submitted online can be verified through the teacher portal (nefl.org/programs/teacher-lookup) with your Teacher ID.
- Mail completed paper Home Energy Worksheets and the *Thank You Card* in the self-addressed postage-paid envelope (found in your materials folder) by November 29, 2019.



Attention Teachers

Return your student *Home Energy Worksheets* and receive a **\$25 – \$50** mini-grant for classroom use, depending upon participation. Students may submit worksheets online or return the completed survey to you. See the *Implementation Steps* flier for additional *Home Energy Worksheet* online information.

80% or greater return of registered students' *Home Energy Worksheets* = \$50
50 – 79% return of registered students' *Home Energy Worksheets* = \$25

Postmark due date:
November 29, 2019

Offer open only to teachers participating in Be wattsmart, Begin at home. Certain restrictions may apply. Good while grant funding is in place. *Home Energy Worksheets* must be completed for eligibility. For more information, contact Megan Hirschi at megan@nefl.org.



Student Guide



PACIFIC POWER

POWERING YOUR GREATNESS

Dear Parents,

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

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

Thank you for being wattsmart and for your participation!

What's inside?

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

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

About Pacific Power

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

About the National Energy Foundation

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

I have the *power* to be **wattsmart**.

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



I have the power to *learn*.

The importance of energy:

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

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



Where does energy come from?

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

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

Nonrenewable examples are:



Coal is the most abundant nonrenewable energy source in the world. There is an estimated 129 year supply remaining.



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



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



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

Renewable examples are:



Solar is energy from the sun.



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

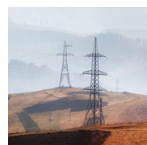


Geothermal is energy derived from the heat of the earth.



Hydropower is energy from water that generates electricity.

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



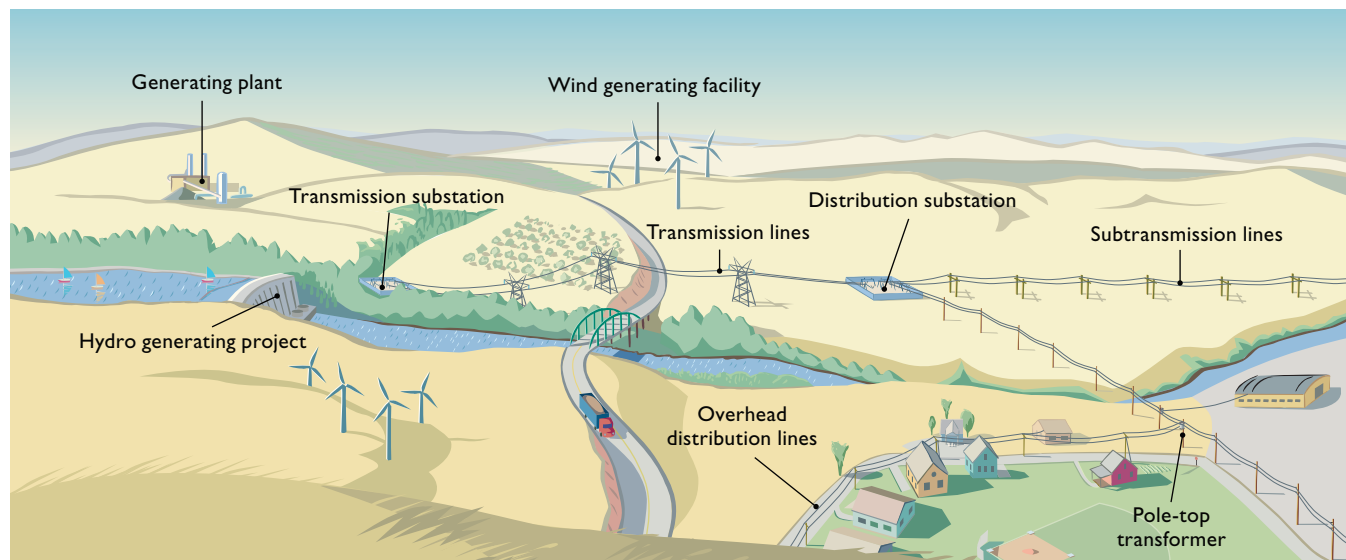
Electricity is the most abundant **secondary energy resource** used. It is the flow of electrical power or charge. It occurs in nature as lightning and static electricity. A generator uses energy resources to create mechanical energy that is then converted into electrical energy.

Energy efficiency

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

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

Using electricity



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

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

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

ELECTRICAL GENERATION

Energy Source	Pacific Power (2018 Basic Fuel Mix)*	United States (U.S. EPA, data)
Natural Gas	15.44%	35.1%
Coal	56.39%	27.4%
Nuclear	0.00%	19.3%
Petroleum	0.00%	.6%
Other/misc.	9.75%	.5%
Renewables (total)	18.42%	17.1%
Hydropower	5.15%	7%
Wind	8.80%	6.6%
Biomass	0.34%	1.5%
Solar	3.79%	1.6%
Geothermal	0.34%	0.4%

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

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

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

Home heating and cooling

- Install a programmable thermostat or smart thermostat. Set your thermostat to 78°F or higher in the summer and 68°F or lower in the winter.
- Make sure your house is properly insulated. If you have less than 6 inches of insulation in your attic, you would benefit from adding more.
- You can save 10% or more on your energy bill by reducing the air leaks in your home with caulking and weather stripping.
- To help your furnace run more efficiently and cost-effectively, keep your air filters clean.
- For windows with direct sunlight, close your blinds in the summer to keep the heat out. Open them on winter days to let the warmth in.
- Small room fans are an energy-efficient alternative to air conditioning.
- For information about energy-saving programs and cash incentives, visit wattsmart.com.



Water and water heating



- Check your faucets for leaks that can cost you hundreds of dollars each year.
- Install a water-efficient shower head and save as much as \$145 a year.
- Set the water heater at 120°F.
- Install faucet aerators to decrease water use.

Lighting

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



Electronics

- Turn off your computer and game consoles when not in use.
- Home electronics are made to turn on and off many times. Always turn them off to save energy.
- Electronics with the ENERGY STAR® label use as much as 60% less energy while providing the same performance.
- Beware of phantom loads which continue to draw electricity when they are plugged in but not in use. Examples are telephone chargers, electronic games and television sets.
- Use advanced power strips for household electronics. One button will turn off multiple appliances, which conserves electricity.



Refrigerators and freezers



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

Dishwashers

- Only run dishwashers when full and use the “air dry” or “no heat dry” settings.
- ENERGY STAR® dishwashers use at least 41% less energy than the federal minimum standard for energy consumption.

Laundry

- Buy a moisture sensitive dryer that automatically shuts off when clothes are dry.
- Use a drying rack whenever possible.

Cooking

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

Reduce

- Use less.
- Purchase products with little packaging.

Reuse

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

Recycle

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



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

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

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

The cost of lighting your home

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

- 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.

- 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.

- 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.

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

TABLE 1

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

TABLE 2

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

TABLE 3

	E	F	G
All CFLs		× \$1.08	
All LEDs		× \$0.60	

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

I have the *power* to be *wattsmart*.

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

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

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





Be **watt**smart
Begin at home



wattsmart.c^om



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Be **wattsmart**
Begin at home

Teacher Guide



PACIFIC POWER

POWERING YOUR GREATNESS

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 **watt**smart, 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 **watt**smart, Begin at home to meet your instructional needs. These tools include:

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

About Pacific Power

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

About the National Energy Foundation

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

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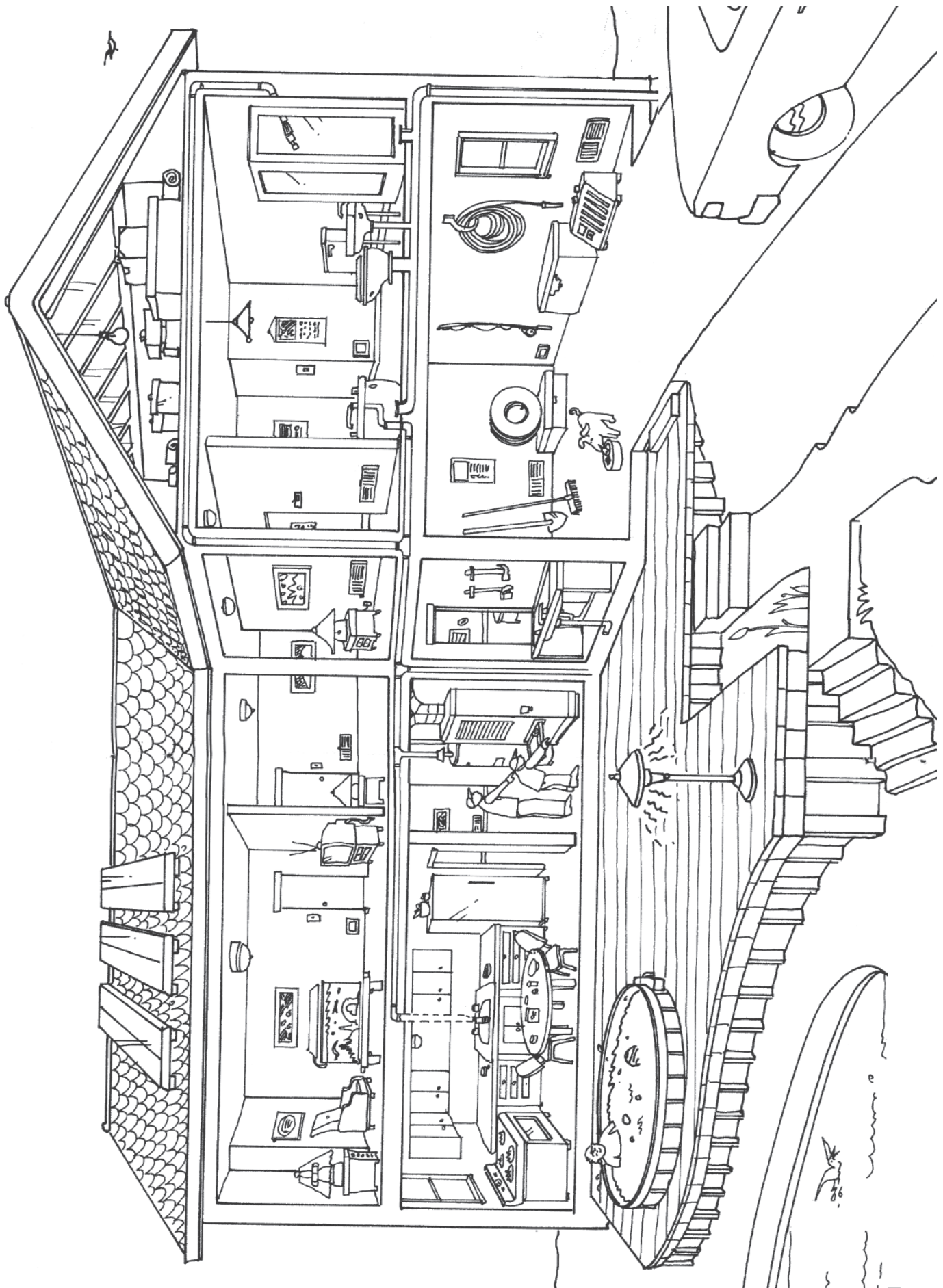


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STEM Connections	Science				Technology				Engineering				Math				
	Science as Inquiry	Energy Sources, Forms and Transformations	Science and Technology	Personal and Social Perspectives	Productivity Tools	Communication Tools	Research Tools	Problem-solving 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
Activity																	
Pass the Sack		•		•													
The Search for Energy	•	•	•	•										•		•	•
A Bright Idea!	•	•	•	•	•	•	•	•	•	•	•	•	•				
The Art of Circuits	•	•	•					•		•	•	•					•
Shine a Light on History		•	•	•		•	•	•	•		•						
Layered Lunch	•		•							•							
How Do You Rate?	•	•		•		•	•					•	•		•		•
Energy in Math														•	•	•	•
Be wattsmart, Begin at home Poster		•		•			•	•									•

Activity: Pass the Sack

Objective

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

Curriculum Focus

Science
Social Studies

Materials

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

Key Vocabulary

Nonrenewable resource
Renewable resource

Next Generation Science Correlations

4-ETS1 – 2
4-ESS3 – 1-2
4-ESS3.A
5-ETS1 – 2
5-ETS1 – 1
5-ESS3 – 1
MS-ESS3 – 4
MS-ESS3.A



Introduction

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

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



Procedure

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

6. Explain how our resources are like the candy. Which type was the nonrenewable? How could you tell? (No more was added to the bag once it was being passed around.) Which type was renewable? How could you tell? (It was added periodically to renew it.)
7. Point out that resources have limits just like the candy. Emphasize that many resources, such as fossil fuels, are nonrenewable and are being consumed faster than they are being replaced by nature. Discuss the fact that it would be more difficult for students to eat the candy if they had to search the room to find it instead of just taking it from the sack. Energy companies must seek resource deposits and obtain rights to drill or mine for them; they do not just magically appear.
8. Point out that renewable resources can also have limitations. They may not generate electricity as reliably as nonrenewable sources and the amount of energy produced may vary with weather and location.
9. Plan how to pass out the remaining candy.



Discussion

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



To Know and Do More

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

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

Activity: The Search for Energy

Objective

Students will learn the difference between renewable and nonrenewable resources.

Curriculum Focus

Math
Science
Social Studies

Materials

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

Key Vocabulary

Nonrenewable resources
Renewable resources

Next Generation Science Correlations

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



Introduction

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

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



Procedure

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

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

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

4. Scatter another handful of "solar energy," helping students realize that since the sun is a renewable resource, there is the same amount of it each time you look, whereas the nonrenewable fuels are being depleted. Repeat the search period so students can get more papers or popcorn.
5. Stop after 30 seconds and have the group count and record the papers and popcorn collected again. Note that there are fewer nonrenewable fuels found in the second round. Students have to look harder to find what is left. The solar count is slowly catching up with the nonrenewable fuels. Repeat with additional trials as needed.
6. Have groups create a bar chart or, for more advanced students, a multiline graph of the number of papers and popcorn collected each trial.



Discussion

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



To Know and Do More

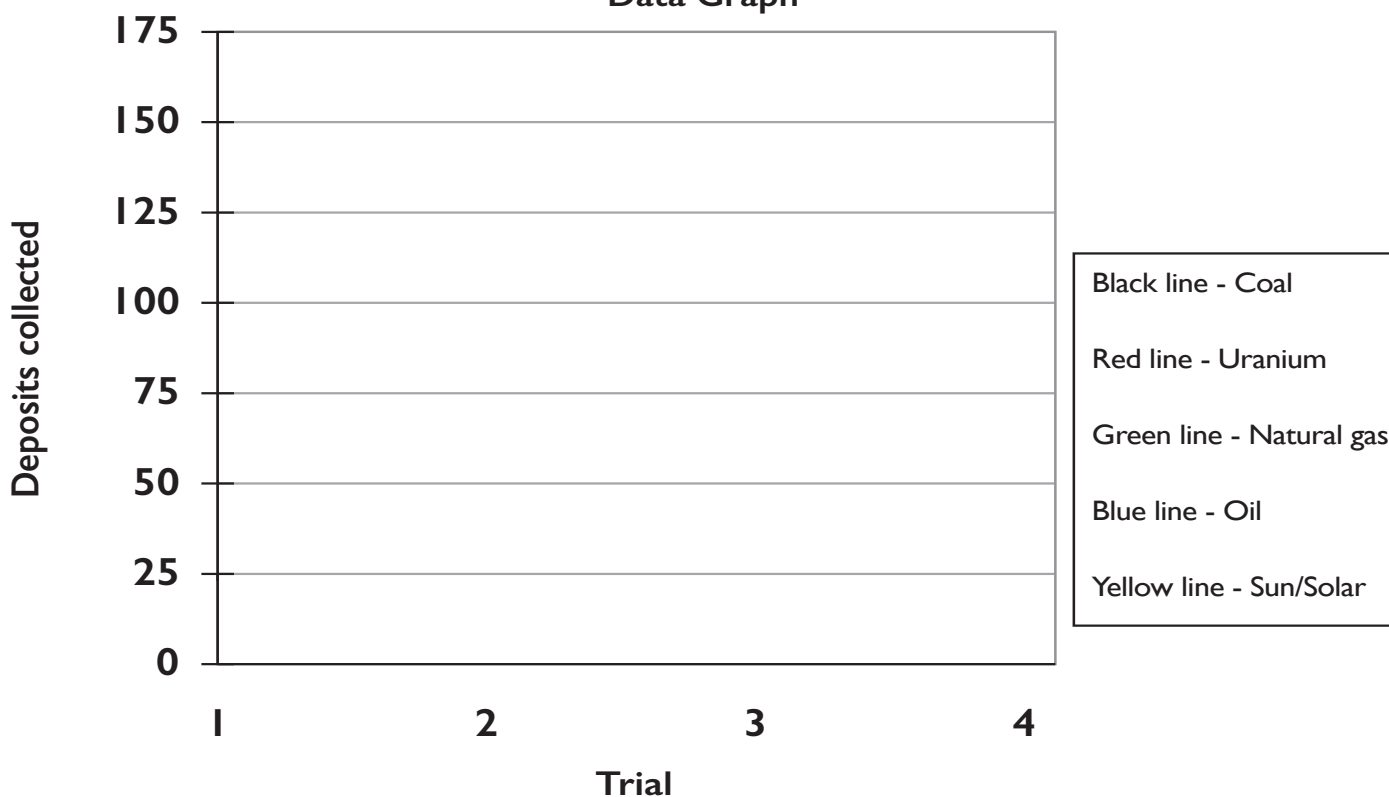
Add wind and water to the activity. Lead a discussion to be sure the students understand why you continued adding more sun, wind and/or water after each trial, but did not add more of the other papers. As a class, come up with a general outline of how to more effectively manage the resources that are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

Student Sheet: Data Table and Graph

Data Table

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

Data Graph



Activity: A Bright Idea!

Objective

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

Curriculum Focus

Science

Materials

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

Key Vocabulary

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

Next Generation Science Correlations

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



Introduction

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



Procedure

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

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

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



Discussion

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

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

Word choices:

potential

electrical

heat

kinetic

light

Answers:

1. electrical

2. kinetic

3. light, heat

4. potential



To Know and Do More

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

Wristwatch
Automobile
Cell phone

Tablet
Video game controller
TV remote control

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



Career Awareness Activity

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

Student Sheet: A Bright Idea!

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

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

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

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

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

4. How do you think a light switch works?

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

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

Using one battery, try to light up two lights.

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

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

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

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

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

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

7. Wash your hands when you are finished.

Activity: The Art of Circuits

Objective

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

Curriculum Focus

Science
Social Studies
Language Arts
Art

Materials

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

Key Vocabulary

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

Next Generation Science Correlations

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



Introduction

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

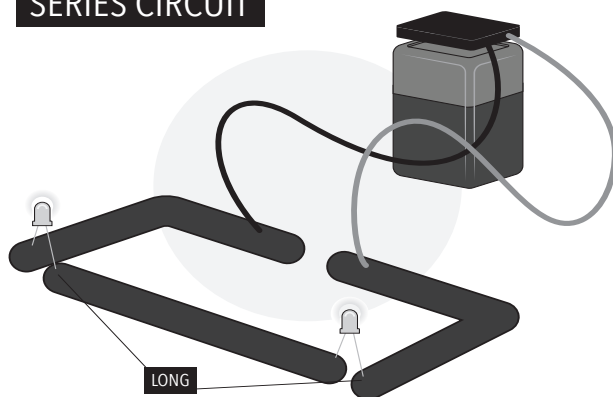
In this activity, students will use salt dough, which is a conductor, to design circuits which will transfer electrical energy. If they are successful, the electricity will be transformed to light and heat energy in a miniature LED bulb.



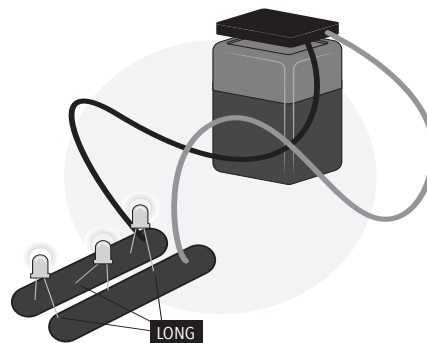
Procedure

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

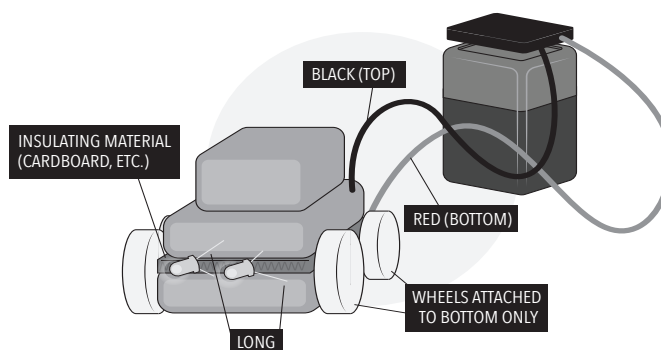
SERIES CIRCUIT



PARALLEL CIRCUIT



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



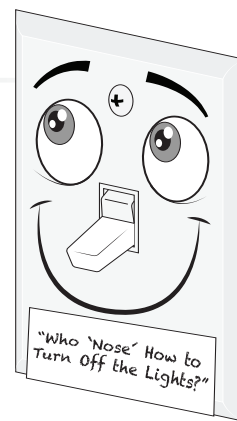
Discussion

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



To Know and Do More

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



Activity: Shine a Light on History

Objective

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

Curriculum Focus

Language Arts
Social Studies
Science

Materials per student group

- Copies of "Edison v. Holonyak"

Key Vocabulary

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

Next Generation Science Correlations

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



Introduction

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

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



Procedure

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



Discussion

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



To Know and Do More

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

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

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

Lighting Facts		per bulb
Brightness	800 lumens	
Estimated Yearly Energy Cost \$1.08		
Based on 3 hrs/day, 11¢/kWh		
Cost depends on rates and use		
Life	Based on 3 hrs/day	
	23 years	
Light Appearance		
<div>Warm<div><div></div><div>▲ 2700 K</div><div></div></div>Cool</div>		
Energy Used	9 Watts	

Activity: Layered Lunch

Objective

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

Curriculum Focus

Science
Art

Materials

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

Key Vocabulary

Permeable
Impermeable
Source rock

Next Generation Science Correlations

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



Introduction

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

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



Procedure

Using bread, almond butter and honey, create some edible models of rock layers.

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



Discussion

1. What do you think the honey represents?
2. Which layer do you think represents porous rock?
3. Which layer is the nonporous rock?
4. Did the honey seep into both slices of bread? Why or why not?
5. What do you predict would happen with a sandwich made with only almond butter?
6. How might the ingredients you used affect your results?
7. Draw the layers of your sandwich and use colored pencils or crayons to distinguish the different layers and write labels for each layer that includes: impermeable, permeable, natural gas, nonporous rock and porous rock.

Answers

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



To Know and Do More

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

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

Activity: How Do You Rate?

Objective

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

Curriculum Focus

Language Arts
Science
Social Studies

Materials

- Copies of "How Do You Rate?"

Key Vocabulary

Conservation
Efficiency
Environment
Natural resources
Quality of life

Next Generation Science Correlations

4-ESS3 – 1
5-ESS3 – 1
5-ESS3.C
MS-LS2 – 1
MS-ESS3 – 3
MS-ESS3.A



Introduction

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

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

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



Procedure

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

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

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



Discussion

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



To Know and Do More

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

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



Career Awareness Activity

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

Student Sheet: How Do You Rate?

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

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

Heating and Cooling

Windows and doors have good weather stripping.	T F NA	Ducts are insulated in unheated/uncooled areas.	T F NA
Window coverings are open on cold, sunny days and closed on hot days.	T F NA	Garage is insulated.	T F NA
Window coverings are closed at night when heat is on.	T F NA	Air filters on furnace and air conditioner are cleaned and changed regularly.	T F NA
Thermostat is set at 68° F (20° C) or lower in winter.	T F NA	An energy audit has been conducted from your local utility in the last 3 years.	T F NA
Air conditioning is set at 78° F (26° C) or higher in summer.	T F NA	Thermostat is adjusted at night.	T F NA
		Fireplace damper is closed when fireplace is not in use.	T F NA

Water

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

Appliances

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

Lighting

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

Trash

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

Transportation

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

Environment

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

Yard and Workshop

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

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

Total Points: _____

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

Activity: Energy in Math

Objective

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

Materials

- Student Worksheet
- Individual White Boards (optional)

Key Vocabulary

Watt

Common Core Correlations

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



Introduction:

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



Procedure:

1. Instruct students on the importance of learning to solve real world problems using their math skills. You may want to review some steps to solving word problems before beginning the first problem. The following questions might be useful to review:
 - Can you draw something to help you?
 - What can you draw?
 - What conclusions can you make from your drawing?
2. Pass out the worksheet.
3. Model the problem.
Have a pair of students work at the board while the others work independently or in pairs at their seats.
4. Calculate to solve and write a statement.
Give everyone two minutes to finish work on that question, sharing their work and thinking with a peer. All should write their equations and statements of the answer.
5. Assess the solution for reasonableness.
Give students one to two minutes to assess and explain the reasonableness of their solution.



Discussion/Debrief

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

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

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

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



To Know and Do More

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

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

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

Objective

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

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

Materials

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

Key Vocabulary

Carbon footprint
Recycle
Energy efficient

Common Core Correlations

Energy Sources, Forms and Transformation
Personal and Social Perspectives
Research Tools
Problem-solving and Decision-making Tools
Connection to the Real World



Introduction:

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



Procedure:

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



To Know and Do More

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



Lingo Card

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

<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>

Dear Parents,

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

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

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

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

- Visit thinkenergy.org/wattsmart and fill out an online worksheet. You will need to enter the teacher ID found on the paper worksheet.
or
- Fill out the paper worksheet and return it to your child's teacher. To thank you, Pacific Power will provide your child with a wattsmart nightlight.

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



Estimados padres,

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

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

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

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

- Visite thinkenergy.org/wattsmart para rellenar el formulario en línea. Necesitará entrar el número de identificación de su profesor que se encuentra en el formulario de papel.
- o
- Rellenar el formulario y devolverlo al profesor de su hijo. Para agradecerle, Pacific Power le proporcionará a su hijo una luz de noche.

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



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WA

Wattsmart Pacific Power program

Program Evaluation Summary

Educators’ impressions of the program from 16 educators.

	Strongly Agree	Agree	Disagree	Strongly Disagree	
Materials were attractive and easy to use.	14	2	0	0	<div> <div>88%</div> <div>13%</div> </div>
Materials and activities were well received by students.	14	2	0	0	<div> <div>88%</div> <div>13%</div> </div>
Materials were clearly written and well organized.	14	2	0	0	<div> <div>88%</div> <div>13%</div> </div>
Presenters were able to keep students engaged and attentive.	15	1	0	0	<div> <div>94%</div> <div>6%</div> </div>
Overall program	15	1	0	0	<div> <div>94%</div> <div>6%</div> </div>

Wattsmart Pacific Power program

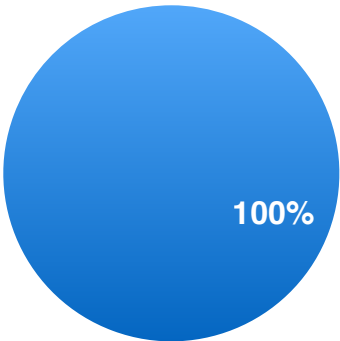
Program Evaluation Summary

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

Yes	No
16	0

● Yes

● No

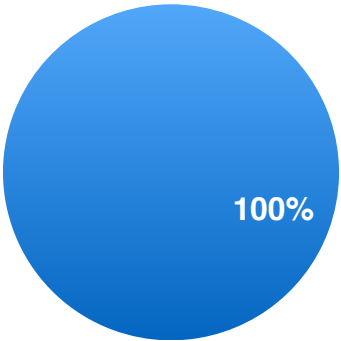


Would you recommend this program to other colleagues?

Yes	No
16	0

● Yes

● No



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

Fun way to learn and reinforce the information they already know about energy.
I believe the students liked the interactive parts of the program and materials the best.
LINGO
LINGO, the videos with the lady and her cow:)
The energy stick.
The hands on activity
the light
The presentation
The presentation was very interactive and liked the way the video/powerpoint were used.
The program kept their interest and the videos were crazy but they love crazy.
The videos as well as the interactive portions of the presentation.
They love the whole presentation. They especially like the part when they show humans are conductors of electricity.
They loved the experience with the conductor being their bodies.
They really enjoyed the interactive activities.

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

I liked Tex Wattsmart myself! But it is ALL GOOD!
I would add more interactive materials and parts to the program.
I wouldn't change a thing.
Maybe some follow up videos and handouts to continue teaching through out the year.
More student participation
Not having it at the end of the day, mid day is so much better.
Nothing. Love the updated videos!

Home Energy Worksheet (English)

Be **watt**smart
Begin at home

Teacher ID:

Teacher Name:

Student First Name:

Home Energy Worksheet

Heating

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

Cooling

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

Water heating

9. Set the water heater temperature to 120° F.
☐ Have done ☐ Will do
☐ Neither
10. Install a high-efficiency shower head.
☐ Have done ☐ Will do
☐ Neither
11. Take 5 minute showers.
☐ Currently do ☐ Will do
☐ Neither

12. Wash full loads in the dishwasher and clothes washer.
☐ Currently do ☐ Will do
☐ Neither

Lighting

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

Refrigeration

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

Electronics

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

Cooking

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

Get paid for being wattsmart

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



Submit online at
thinkenergy.org/wattsmart

Home Energy Worksheet (Spanish)

Identificación del profesor(a):

Nombre del profesor(a):

Primer nombre del estudiante:

Ser **wattsmart**
☺ Empieza en casa

Verificación de Energía Doméstica

Calefacción

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

Enfriamiento

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

Calentadores de agua

9. Programar el calentador de agua a 120° F.
☐ Lo he hecho ☐ Lo haré
☐ Ninguno
10. Instalar un cabezal de ducha de alta eficiencia.
☐ Lo he hecho ☐ Lo haré
☐ Ninguno
11. Tomar duchas de 5 minutos.
☐ Lo hago ☐ Lo haré
☐ Ninguno

12. Lavar cargas llenas en los lavaplatos y las lavadoras de ropa.
☐ Lo hago ☐ Lo haré
☐ Ninguno

Iluminación

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

Refrigerador

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

Electrónicos

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

Cocinar

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

Reciba paga siendo wattsmart

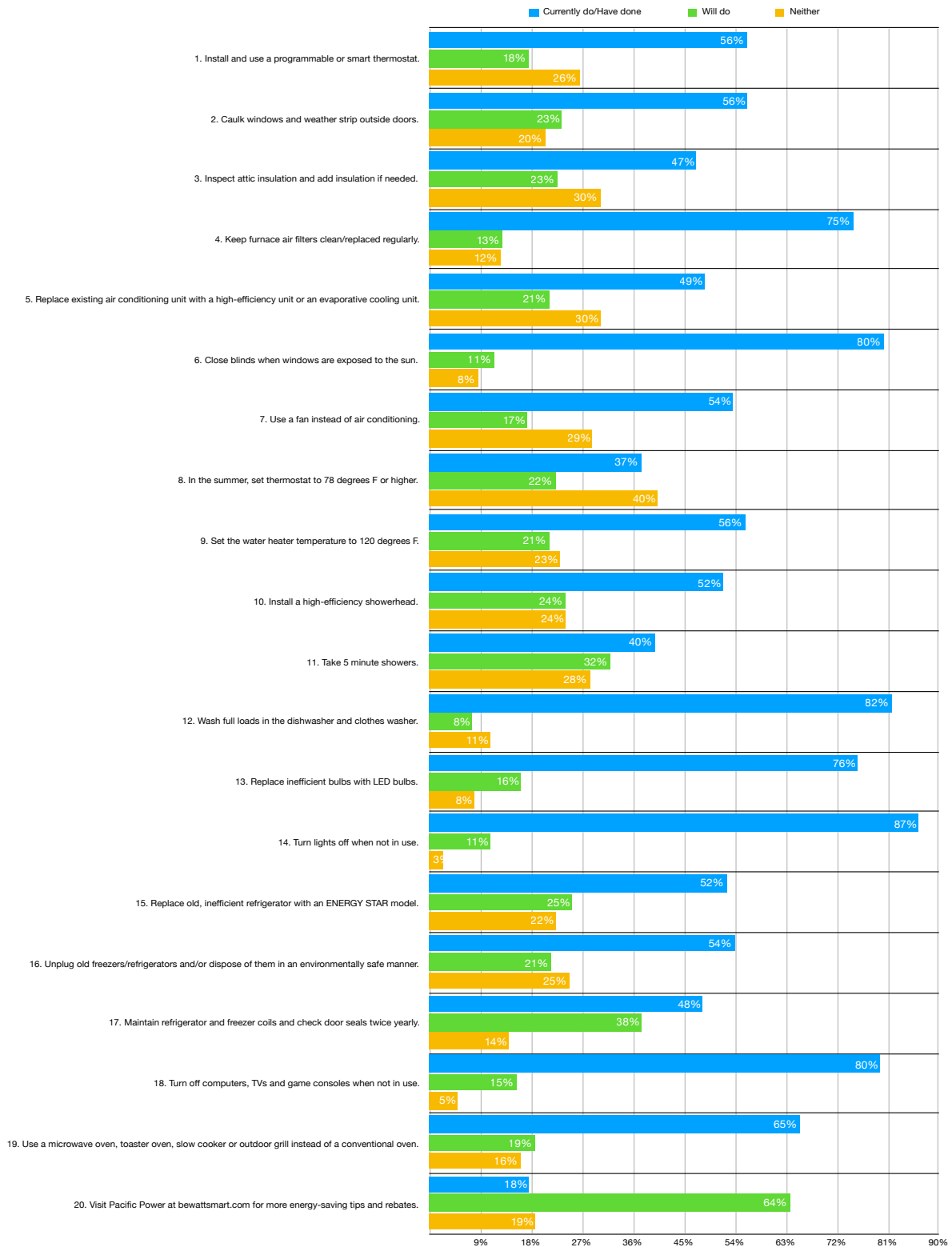
20. Visite Pacific Power en bewattsmart.com para obtener más consejos y rebajas de ahorro de energía.
☐ Lo he hecho ☐ Lo haré
☐ Ninguno



Enviar en línea a
thinkenergy.org/wattsmart

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%	23%	20%
3. Inspect attic insulation and add insulation if needed.	47%	23%	30%
4. Keep furnace air filters clean/replaced regularly.	75%	13%	12%
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.	80%	11%	8%
7. Use a fan instead of air conditioning.	54%	17%	29%
8. In the summer, set thermostat to 78 degrees F or higher.	37%	22%	40%
9. Set the water heater temperature to 120 degrees F.	56%	21%	23%
10. Install a high-efficiency showerhead.	52%	24%	24%
11. Take 5 minute showers.	40%	32%	28%
12. Wash full loads in the dishwasher and clothes washer.	82%	8%	11%
13. Replace inefficient bulbs with LED bulbs.	76%	16%	8%
14. Turn lights off when not in use.	87%	11%	3%
15. Replace old, inefficient refrigerator with an ENERGY STAR model.	52%	25%	22%
16. Unplug old freezers/refrigerators and/or dispose of them in an environmentally safe manner.	54%	21%	25%
17. Maintain refrigerator and freezer coils and check door seals twice yearly.	48%	38%	14%
18. Turn off computers, TVs and game consoles when not in use.	80%	15%	5%
19. Use a microwave oven, toaster oven, slow cooker or outdoor grill instead of a conventional oven.	65%	19%	16%
20. Visit Pacific Power at bewattsmart.com for more energy-saving tips and rebates.	18%	64%	19%

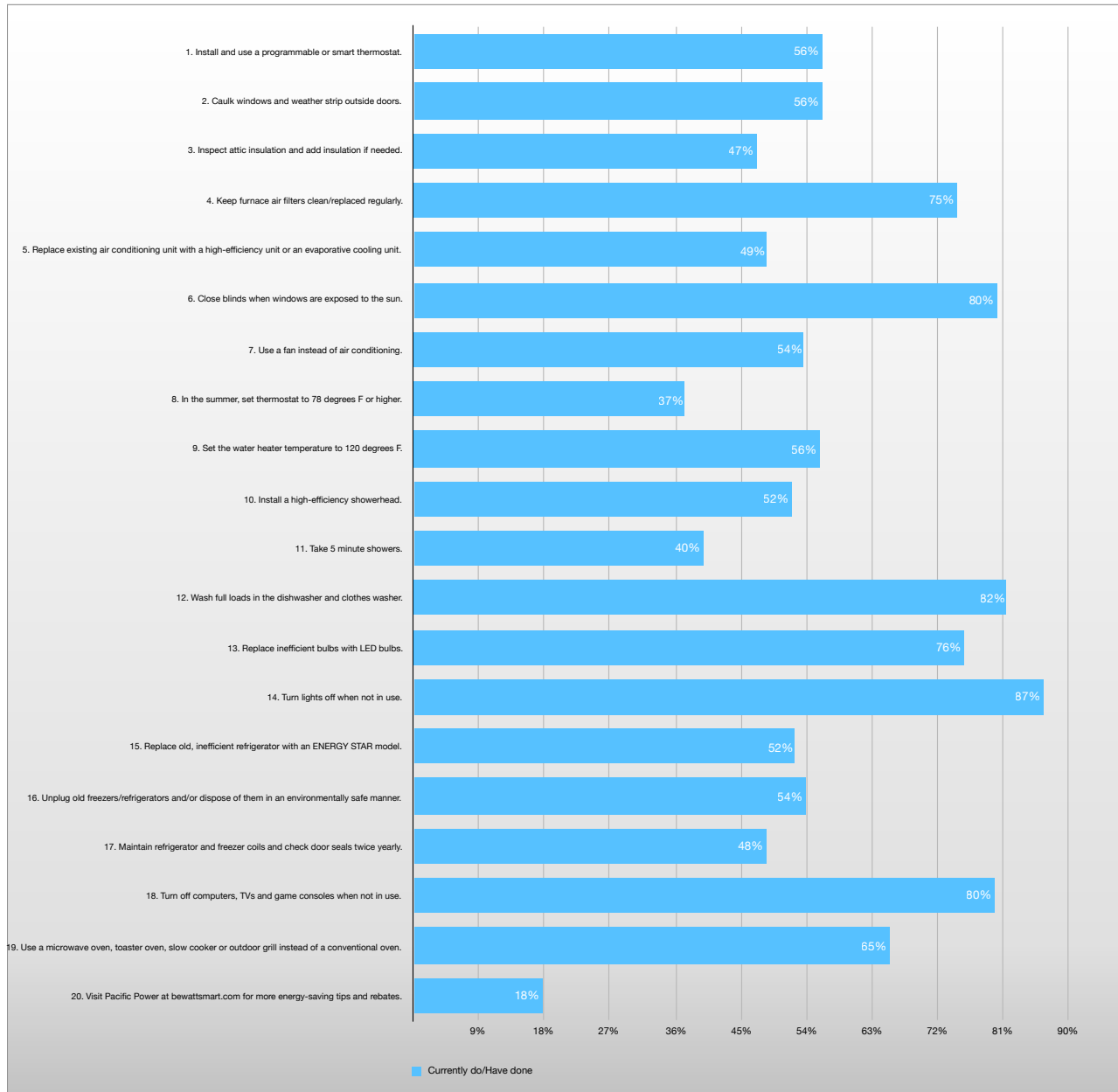


Data Numbers

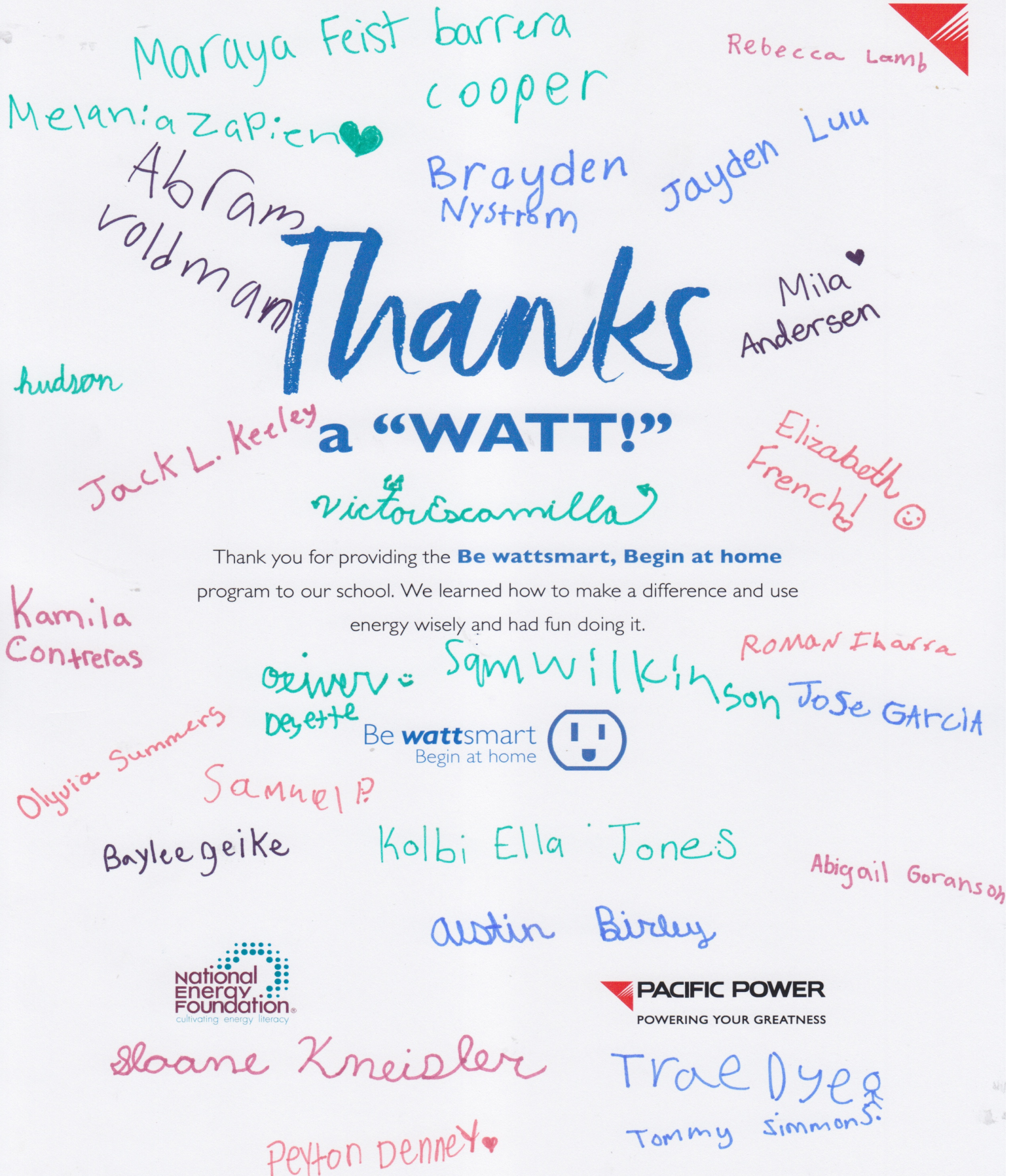
Energy Efficient Activity	Currently do/Have done	Will do	Neither	Total Responses
1. Install and use a programmable or smart thermostat.	1059	331	500	1890
2. Caulk windows and weather strip outside doors.	1054	440	381	1875
3. Inspect attic insulation and add insulation if needed.	878	419	561	1858
4. Keep furnace air filters clean/replaced regularly.	1397	240	232	1869
5. Replace existing air conditioning unit with a high-efficiency unit or an evaporative cooling unit.	909	395	567	1871
6. Close blinds when windows are exposed to the sun.	1521	214	160	1895
7. Use a fan instead of air conditioning.	1013	327	544	1884
8. In the summer, set thermostat to 78 degrees F or higher.	701	417	758	1876
9. Set the water heater temperature to 120 degrees F.	1050	398	435	1883
10. Install a high-efficiency showerhead.	980	451	455	1886
11. Take 5 minute showers.	753	604	537	1894
12. Wash full loads in the dishwasher and clothes washer.	1543	143	206	1892
13. Replace inefficient bulbs with LED bulbs.	1434	308	152	1894
14. Turn lights off when not in use.	1626	204	48	1878
15. Replace old, inefficient refrigerator with an ENERGY STAR model.	990	477	421	1888
16. Unplug old freezers/refrigerators and/or dispose of them in an environmentally safe manner.	1014	403	465	1882
17. Maintain refrigerator and freezer coils and check door seals twice yearly.	917	712	267	1896
18. Turn off computers, TVs and game consoles when not in use.	1514	290	95	1899
19. Use a microwave oven, toaster oven, slow cooker or outdoor grill instead of a conventional oven.	1236	351	303	1890
20. Visit Pacific Power at bewattsmart.com for more energy-saving tips and rebates.	333	1201	353	1887


Wise Energy Behaviors in Pacific Power Washington Homes

Wise Energy Behaviors in Pacific Power Washington Homes



Sampling of Thanks a "WATT" Cards



Kimberly ♡ thank you A Watt. 

Bodens
Emmanuel

alex
carla

ISAAC

Robel Garcia

Thanks

a "WATT!"

Ryker

Luis
Ismael

Jaytee

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 again
for teaching us
about energy and
how to conserve it.

Be **wattsmart**
Begin at home



thank you
Jonathan

Yeraldin
Dulce

nazir

el nuri



Thank you for
telling us that info
-Kaiser
PACIFIC POWER
POWERING YOUR GREATNESS

Loved the presentation a "watt"
-Angela

Ivan
Briceyda

Shereen

Alexia

Nevaeh

Quincy

Maley

Mason

Analek

Joselyn

Goby

Jacob

Sami

Thanks

Raul
Luna

Jesse.S

a "WATT!"

Micha

Roman

Aiden

Sayce

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.

Ivan

Sunny

Addie.G

Be **wattsmart**
Begin at home



Ian

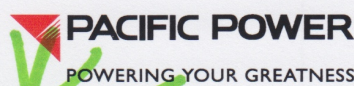
Hq ze

Ethan

Saxxy



Juan



Cloey

Thank you Mrs. Tamblyn

Nob Hill 4th grade Mrs. Tamblyn 2019-2020



For
Thank
you so
much for
the
light
bulbs

Thank for showing
us some cool stuff
Hannah
Thank for
showing
us some cool stuff
Hannah
Thank for
showing
us some cool stuff
Hannah

Hazel

Julian
Thank
you

William
Thank you

Thank you
for showing
us cool stuff
and teaching
us about
electricity

Thanks

a "WATT!"

Ms. Campeau (")

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.

Be **wattsmart**
Begin at home



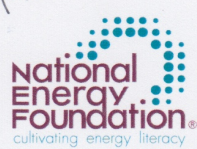
Elizabeth
Thank
you
Braelyn

Carter R3333!

I Set!

Johanna
Thank you for
helping us to
don't waste too
much light energy

Airanic
Thanks



National
Energy
Foundation
cultivating energy literacy



PACIFIC POWER
POWERING YOUR GREATNESS

Asiella
Thank you
for the Lesson
or water and save or planet.

Asiella
Thank you for the wonderful
Lesson



~~Wow~~ Even though I missed it, I'm glad you came! Thank you!
-Ashlynn Thornhill.

Thank you!
-Skye-
Love the
nightlights!



Thank you
so much!
We had Fun!
-Jenny-

Thank you for
coming on your
store or even
work time
you guys
are the
best.
-Jersey-

Thank you
-Ava

Thanks

a "WATT!"

Lillian
Fortier
Thank you
for coming!

Thanks For coming
Silas
WATTS MART

Thanks Josh

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.

Thank
you
for
coming
to
Dayton
Elementary
Reece

Be **wattsmart**
Begin at home



Thanks for
Coming
Jose

Thanks for coming

Love + thank you to coming



Nick Ferguson
thanks for coming



PACIFIC POWER
POWERING YOUR GREATNESS

Thank you
for coming
Anthony J

Thanks for coming! As
always the students had a
great time. Mrs. Richards



Appendix 6

Washington Program Evaluations

Washington 2019 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 2019 and the third party evaluator who completed the evaluation. Program evaluations are available for review at <https://www.pacificorp.com/environment/demand-side-management.html>

Program	Years Evaluated	Evaluator
Home Energy Savings Evaluation	2017-2018	ADM

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>To understand further how the RSAT tool accounts for leakage and how the store allocations relate to the Program Tracking Data, ADM recommends that the next evaluation of subsequent program years includes a full life-cycle review of the lighting contracts, including the participation agreements with the implementation contractor and a sample of all associated invoices. This would allow the evaluation to follow the life-cycle of the bulbs from the original agreement to final installation.</p>	<p>Additional information on the RSAT tool (used throughout the region) and the underlying methodology can be made available during the next evaluation cycle. This information would be provided by the third party responsible for the RSAT tool. If necessary, the participation agreements and a sample invoices can also be provided to help the next evaluator develop a more refined estimate of where the bulbs are likely to be installed.</p>
<p>The TRL files should specify the inputs to the lighting savings engineering calculation. This would increase the efficiency of the impact evaluation process and would be consistent with other PacifiCorp states' TRL files.</p>	<p>Engineering calculations used to support the lighting savings estimates are found in the RTF workbooks referenced in the TRL in the source document data fields. Since the workbooks were publicly accessible on the RTF web site (including archived versions), the decision to not replicate calculations publicly accessible was made to minimize the chance of errors and to manage administrative costs of program delivery. In response to this recommendation and to help minimize program evaluation costs during the evaluation cycle, more support will be provided to the selected evaluation firm to help them locate and understand the publicly accessible calculations should it be necessary. Washington's EIA requirement to utilize RTF savings estimates aren't necessarily conducive to aligning TRL files across other PacifiCorp states when other states may be using other data sources and calculation to estimate lighting savings.</p>
<p>ADM recommends that Pacific Power consider including only one showerhead in the Best Kit – 2 Bathroom Energy Kits, which could increase the overall ISR for showerheads.</p>	<p>This recommendation has been reviewed and included in the design of the upcoming energy saver kit campaigns. Additional screening questions will be added to the on-line order process to help insure the second showerhead is needed and installed.</p>
<p>In the next evaluation cycle, primary data should be collected regarding the use of wood as a supplemental heating source.</p>	<p>Pacific Power has been collecting information on the presence of wood heat in homes (via the heat pump application) since the beginning of 2018. This information is not currently included in the DSMC tracking system, so the evaluator was not aware of it. Wood heat and the impact savings are known to the RTF and accounted for during the savings estimation process. Application information on wood heat in homes is available and utilized during the program design and planning process and used to assess which RTF values (including ones that tie measure eligibility to the presence or absence of supplemental heat) are utilized for savings reporting. It may be possible to add data fields in DSMC to capture this data prior to</p>

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	the next evaluation cycle. At a minimum, communication early in the evaluation cycle about the availability of this data will be provided to the next evaluator.
If the whole homes measure category is expected to grow in subsequent program years, ADM will request the REM/Rate™ modeling files to further verify savings.	Pacific Power utilizes the regional BetterBuiltNW framework for their new homes offer in Washington. Information on each home (including REM/Rate modeling files) is uploaded to the AXIS data base. For the next evaluation cycle, early project communication will be provided to the evaluator about where this information is stored.