

2020-2021 California Wattsmart Business Program Evaluation

FINAL REPORT

December, 2022

Prepared for:
Pacific Power
825 NE Multnomah
Portland, OR 97232



Prepared by:

Cadmus

Ryan Hughes

Evan Talan

Camila Teagle-Alarcon

Andrew Carollo

Alex Chamberlain

Allie Marshall

David Molner

Steve Cofer

VuPoint Research

Table of Contents

Introduction	1
Objectives	2
Methods	2
Detailed Evaluation Findings	4
Impact Evaluation.....	4
Process Evaluation.....	8
Cost-Effectiveness	23
Conclusions and Recommendations	24
Appendix A. Gross Engineering Analysis Methodology	A-1
Appendix B. Cost-Effectiveness Methodology and Measure Strata Results	B-1

Table

Table 1. Evaluation Objectives and Activities	2
Table 2. Impact Steps to Determine Evaluated Gross and Net Savings.....	2
Table 3. California 2020 and 2021 Wattsmart Business Program Impact Sampling Summary	4
Table 4. California 2020 and 2021 Wattsmart Business Program Savings	5
Table 5. 2020 Wattsmart Business Program Savings.....	5
Table 6. 2021 Wattsmart Business Program Savings.....	5
Table 7. Measure Mapping	6
Table 8. 2020 and 2021 Wattsmart Business Program Net Savings	8
Table 9. California 2020 and 2021 Wattsmart Business Program Process Activity Sampling	8
Table 10. 2020 and 2021 Participant Survey Completes by Measure Category and Incentive Type	9
Table 11. 2020 and 2021 Evaluated Net Wattsmart Business Program Cost-Effectiveness Summary	23
Table 12. 2020 Evaluated Net Wattsmart Business Program Cost-Effectiveness Summary	23
Table 13. 2021 Evaluated Net Wattsmart Business Program Cost-Effectiveness Summary	23
Table A-1. Impact Steps to Determine Evaluated Gross and Net Savings	A-1
Table B-1. Wattsmart Business Program Benefits and Costs Included in Various Cost-Effectiveness Tests	B-2
Table B-2. California Wattsmart Selected Cost-Effectiveness Analysis Inputs	B-2
Table B-3. California Wattsmart Business End-Use Category Cost-Effectiveness Inputs	B-2
Table B-4. 2021 California Additional Measures Cost-Effectiveness	B-4

Table B-5. 2020 California Building Shell Cost-Effectiveness.....	B-4
Table B-6. 2020 California Farm and Dairy Cost-Effectiveness.....	B-4
Table B-7. 2020 and 2021 California Food Service Equipment Cost-Effectiveness	B-5
Table B-8. 2020 California Food Service Equipment Cost-Effectiveness	B-5
Table B-9. 2021 California Food Service Equipment Cost-Effectiveness	B-5
Table B-10. 2021 California HVAC Cost-Effectiveness	B-6
Table B-11. 2020 and 2021 California Irrigation Cost-Effectiveness.....	B-6
Table B-12. 2020 California Irrigation Cost-Effectiveness.....	B-6
Table B-13. 2021 California Irrigation Cost-Effectiveness.....	B-7
Table B-14. 2020 and 2021 California Lighting Cost-Effectiveness.....	B-7
Table B-15. 2020 California Lighting Cost-Effectiveness.....	B-7
Table B-16. 2021 California Lighting Cost-Effectiveness.....	B-8
Table B-17. 2020 and 2021 California Motors Cost-Effectiveness.....	B-8
Table B-18. 2020 California Motors Cost-Effectiveness.....	B-8
Table B-19. 2021 California Motors Cost-Effectiveness.....	B-9
Table B-20. 2020 California Refrigeration Cost-Effectiveness	B-9

Figures

Figure 1. Process Evaluation Research Areas and Questions	3
Figure 2. Awareness Sources	10
Figure 3. Who Completed the Application	11
Figure 4. Most Important Reason for Participating	11
Figure 5. Satisfaction with Program Components	12
Figure 6. Project Benefits.....	13
Figure 7. Satisfaction with Watts smart Business Program Components and Program Overall.....	15
Figure 8. Project Benefits.....	16
Figure 9. Awareness Source.....	18
Figure 10. Most Motivating Reasons to Make Energy-Efficient Upgrades	19
Figure 11. Most Motivating Reasons to Make More Energy-Efficient Purchases or Upgrades.....	20

Introduction

This report presents the 2020 and 2021 Wattsmart Business evaluation findings and a discussion of the Cadmus team's conclusions and recommendations. This evaluation report is intended to be viewed in conjunction with the California Wattsmart Business Evaluation Dashboard,¹ which provides further information on project-level results, trends, and historical performance.

Through its Wattsmart Business program, Pacific Power offers services and incentives to help commercial, industrial, and agricultural customers maximize the energy efficiency of their equipment and operations. These offerings are delivered through downstream, midstream, and direct install incentive mechanisms.

The 2020 and 2021 program reported gross electricity savings of 8,437,346 kWh. Pacific Power uses an outsourced delivery model for all demand-side management services. They contract with two program administrators—Cascade Energy and Resource Innovations—to implement all program offerings.

Pacific Power contracted with the Cadmus team (comprising Cadmus and VuPoint Research) to conduct impact and process evaluations of the 2020 and 2021 California Wattsmart Business program. This report includes details of our 2020 and 2021 program effectiveness and evaluation findings.

The Cadmus team evaluated three offerings:

- **Wattsmart Business (incentive list and custom analysis).** Through this offering, Pacific Power provides prescriptive incentives primarily for small and midsize customers, although large customers may also receive these incentives. These incentives—provided for irrigation, HVAC, lighting, motors, building shell, food service equipment, and refrigeration, along with energy analysis studies—are available to customers who submit an application directly or work with a Pacific Power trade ally. For large energy users or customers with projects that require custom analysis, Pacific Power targets incentives that generally offer multiple opportunities for energy efficiency upgrades. These custom incentives are for verified first-year energy savings resulting from the installation of qualifying capital equipment upgrades and energy management measures not covered by the prescriptive incentives. Pacific Power's implementers work with account managers, trade allies, and directly with interested customers to help identify energy efficiency opportunities and provide analysis and verification of custom savings.
- **Small Business Program Enhanced Incentive.** This offering is delivered through the trade ally network to provide enhanced lighting incentives for small business customers.
- **Midstream Lighting Instant Incentive.** Pacific Power offered instant point-of-purchase incentives for qualifying LED lamps and retrofit kits purchased from a participating lighting distributor. Customers who purchase from nonparticipating suppliers can apply for incentives after making the purchase.

¹ The Wattsmart Business Evaluation Dashboard is available on the website: <https://www.pacificorp.com/environment/demand-side-management.html>

Objectives

Table 1 lists the study objectives and evaluation activities.

Table 1. Evaluation Objectives and Activities

Pacific Power Evaluation Objectives	Participant Surveys	Partial Participant Surveys	Trade Ally Interviews	Desk Review	Phone Verification	Net-to-Gross Analysis	Cost-Effectiveness Analysis ^a	Reporting
Document and measure program effects	✓	✓	✓	✓	✓	✓		
Verify installation and savings	✓			✓	✓	✓		
Evaluate the program’s process and the effectiveness of delivery and efficiency	✓	✓	✓					
Understand the motivations of participants, nonparticipants, and trade allies	✓	✓	✓					
Provide data support for program cost-effectiveness assessments	✓			✓	✓	✓	✓	
Identify areas for potential improvements	✓	✓	✓	✓	✓	✓	✓	✓
Document compliance with regulatory requirements								✓

^a Cost-effectiveness was calculated by Guidehouse in 2020 and by AEG in 2021 using the approved California cost-effectiveness calculators.

Methods

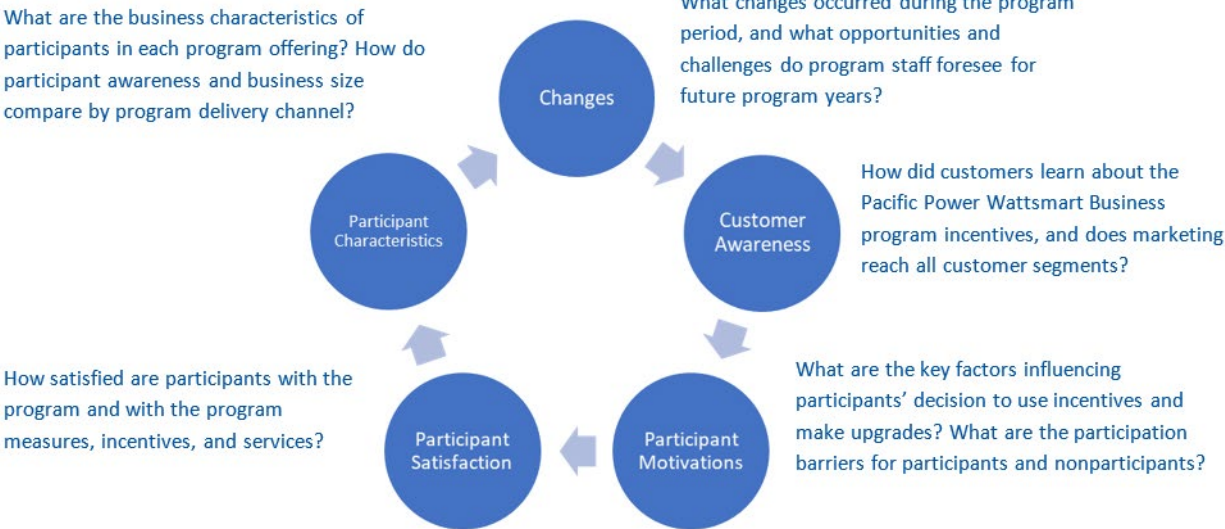
To evaluate energy impacts, the Cadmus team used desk reviews, phone verification, and surveys to analyses, net-to-gross (NTG) analysis, and program cost-effectiveness analysis inform the engineering (as shown in Table 2).

Table 2. Impact Steps to Determine Evaluated Gross and Net Savings

Savings Estimate	Step	Action
Evaluated Gross Savings	1	Tracking Database Review: Validate the accuracy of data in the participant database and verify that savings match annual reports
	2	Verification: Adjust savings based on actual installation rates
	3	Unit Energy Savings: Validate savings calculations (through engineering review, analysis, and meter data)
	4	Realization Rates: Extrapolate realization rates to the population, if applicable
Evaluated Net Savings	5	Attribution: Apply NTG adjustments

Figure 1 shows the process evaluation research areas and questions addressed through the process evaluation. The Cadmus team relied on online participant surveys, telephone partial participant surveys, and nonparticipant and trade ally interviews to assess program delivery and efficacy, bottlenecks, barriers, and opportunities for improvements.

Figure 1. Process Evaluation Research Areas and Questions



Detailed Evaluation Findings

This chapter provides detailed findings from the Cadmus team’s impact and process evaluation of the California Wattsmart Business program.

Impact Evaluation

To determine gross savings, the Cadmus team conducted verification and engineering analyses on a sample of 2020 and 2021 projects (see *Appendix A* for information on the impact evaluation methodology). To calculate net savings, the Cadmus team surveyed participants to inform freeridership and spillover and we surveyed nonparticipating businesses to inform nonparticipant spillover. Additional detail on project-level results across several years can be found in the Evaluation Dashboard.

Impact Analysis Sampling

Table 3 shows total projects, total projects sampled, sample distribution, associated energy savings, and the sample’s percentage of the savings for the 2020 and 2021 program years. Out of 579 unique projects, the Cadmus team evaluated 35 projects that represented 57% of the 2020 and 2021 program savings.

Table 3. California 2020 and 2021 Wattsmart Business Program Impact Sampling Summary

Strata	Unique Projects	Total Reported Savings (kWh) ^a	Unique Sampled Projects		Sample Reported Savings (kWh) ^a	Percentage of Reported Savings Sampled
			Random	Selected		
Irrigation	126	1,361,995	12	1	431,899	32%
Lighting	268	3,861,694	11	2	1,649,381	43%
Lighting: Small Business	168	550,970	8	1	90,965	17%
Other	17	2,662,687	4	4	2,654,473	100%
Total	579	8,437,346	35	8	4,826,718	57%

^a Totals in tables may not sum due to rounding.

Table 4 lists the evaluation findings, including number of projects, gross savings, precision, and net savings for the 2020 and 2021 program period. Overall, the Wattsmart Business program achieved a 98% gross realization rate in 2020 and 2021, though some variability occurred between measure categories. The impact evaluation achieved ±1.2% precision with 90% confidence overall. The Cadmus team calculated NTG of 79% using DEER NTG values, yielding evaluated net savings of 6,555,824 kWh. The *Measure Strata Findings* section describes specific details and findings per measure strata.

Table 4. California 2020 and 2021 Wattsmart Business Program Savings

Strata	Unique Projects	Reported Savings (kWh) ^a	Evaluated Gross Savings (kWh) ^a	Gross Realization Rate	Precision ^b	NTG	Evaluated Net Savings (kWh) ^a
Irrigation	126	1,361,995	1,226,808	90%	±3.7	74%	907,838
Lighting	268	3,861,694	3,829,190	99%	±2.3	87%	3,331,395
Lighting: Small Business	168	550,970	553,538	100%	±3.2	87%	481,578
Other	17	2,662,687	2,659,438	100%	±0.2	69%	1,835,012
Total	579	8,437,346	8,268,974	98%	±1.2	79%	6,555,824

^a Totals in tables may not sum due to rounding.

^b The measure category precision is based on 80% confidence, while the portfolio precision is based on 90% confidence.

Table 5 and Table 6 show impact evaluation findings by program year for 2020 and 2021, respectively.

Table 5. 2020 Wattsmart Business Program Savings

Strata	Unique Projects	Reported Savings (kWh)	Evaluate Gross Savings (kWh)	Realization Rate
Irrigation	45	721,863	615,882	85%
Lighting	179	3,090,492	3,120,856	101%
Lighting: Small Business	142	488,838	478,819	98%
Other	8	60,764	54,320	89%
Total^a	374	4,361,957	4,269,876	98%

^a Totals may not sum due to rounding.

Table 6. 2021 Wattsmart Business Program Savings

Strata	Unique Projects	Reported Savings (kWh)	Evaluated Gross Savings (kWh)	Realization Rate
Irrigation	81	640,132	610,927	95%
Lighting	89	771,202	708,334	92%
Lighting: Small Business	26	62,132	74,719	120%
Other	9	2,601,923	2,605,118	100%
Total^a	205	4,075,389	3,999,098	98%

^a Totals may not sum due to rounding.

Measure Strata Findings

The following sections provide a high-level summary of the findings in each measure strata. For additional detailed information on each sampled project, visit the Evaluation Dashboard. Pacific Power defines a measure as a specific measure type within a measure category. For example, one lighting project may have three different lighting measures, such as high-bay lighting, linear LEDs, and wall sconces. Within each of these three measure types, there will be several unit counts. The Cadmus team mapped the measure categories within Pacific Power’s measure database to four strata. Table 7 describes the measure mapping strategy.

Table 7. Measure Mapping

Measure Category	Program Name	Evaluation Strata
Irrigation	Wattsmart Business	Irrigation
Lighting	Wattsmart Business	Lighting
	Midstream Lighting	
	Lighting: Small Business	Lighting: Small Business
Motors	Wattsmart Business	Other
Refrigeration		
Building Shell		
Farm and Dairy		
Additional Measures		
HVAC		
Food Service Equipment		

Irrigation

During the 2020 and 2021 program years, Pacific Power provided incentives for 126 unique irrigation projects and reported 1,361,995 kWh in energy savings, which accounted for 16.1% of all reported energy savings. The Cadmus team evaluated 13 sampled projects and extrapolated results to the population, for a realization rate of 90.7% for the irrigation stratum.

The 13 sampled projects realized energy savings close to the reported savings (with three having realization rates of 93%, 99%, and 100%). Two of four projects with low realization rates (57% and 80%) reported higher savings than are determined by the Regional Technical Forum’s (RTF) irrigation hardware measure (v4.1, approved May 2018).² The Cadmus team also interviewed participants of two custom irrigation system upgrade projects: these respondents indicated lower overall water use due to weather conditions and crop selection decisions than were reported.

Lighting

During the 2020 and 2021 program years, Pacific Power provided incentives for 268 unique projects and reported 3,861,694 kWh in energy savings, which accounted for 45.8% of all reported program energy savings. The Cadmus team evaluated 13 sampled projects and extrapolated results to the population for a realization rate of 99.2% for the lighting stratum.

Pacific Power uses a prescriptive lighting calculator tool for lighting projects. For most projects, the Cadmus team found that the supporting documentation matched the lighting tool inputs. Hours of use, existing lighting equipment, and building type are all collected directly from customers. The evaluation team calculated savings for projects based on the methodology outlined in the RTF’s “Non-Residential Lighting Retrofits” standard protocol. The Cadmus team’s evaluated savings did not match Pacific Power’s reported savings for 11 of 13 projects. While evaluated savings were typically within 10% of report savings, differences may be due to the use of an HVAC interaction factor. However, because

² Regional Technical Forum. Accessed January 2021. “UES Measures.” <https://rtf.nwcouncil.org/measures>

lighting calculations were not visible, we were unable to determine the precise source of discrepancy between reported and evaluated savings.

Lighting: Small Business

During the 2020 and 2021 program years, Pacific Power provided incentives for 168 Lighting: Small Business measures and reported 550,970 kWh in energy savings, which accounted for 6.5% of all reported energy savings. The Cadmus team evaluated nine sampled projects and extrapolated results to the population for a realization rate of 105.5% for the Lighting: Small Business stratum.

Pacific Power uses a prescriptive small business lighting calculator tool for customers who participated in the Lighting: Small Business stratum. Similar to the traditional lighting projects, the Cadmus team found that the supporting documentation matched the lighting tool inputs, but our evaluated savings were typically higher than reported savings for most projects. Due to limited visibility in the reported calculations workbook, we were unable to determine a reason for the discrepancy.

Other

During the 2020 and 2021 program years, Pacific Power provided incentives for 17 measures among 14 unique projects in the “other” category and reported 2,662,687 kWh in energy savings, which accounted for 31.6% of all reported energy savings. The Cadmus team evaluated eight sampled projects and extrapolated results to the population for a realization rate of 99.9% for the “other” stratum. Among these projects, three custom projects accounted for 97% of the savings within the “other” stratum.

The three custom sampled projects represented 97% or 2,587,962 kWh of savings in this stratum. Our evaluation resulted in a realization rate of 100.1% of reported energy savings. While deviations from reported savings were found in three of the other five sampled projects, those deviations had a relatively low impact. For the one green motor rewind project, the Cadmus team determined evaluated savings using the customer-reported hours of operation while Pacific Power used a deemed value from the RTF green motor rewind measure for the reported savings. For another project involving savings for ENERGY STAR® cooking equipment, reported savings were based on a deemed value from the RTF, which is based on larger capacity cooking equipment and associated energy. The Cadmus team evaluated savings based on the incentivized equipment specifications.

Net-to-Gross

The Cadmus team determined evaluated net savings by reviewing Pacific Power’s annual report file that assigns a *California Database for Energy Efficient Resources* (DEER) NTG value to each project in the program tracking database. The team evaluated whether the most applicable DEER NTG values for each project type and appropriate year were assigned in the annual report file. We determined that the required DEER NTG values were correctly assigned for all records except for two lighting projects and one irrigation project in 2020 and 2021.

Table 8 shows the evaluated net energy savings by program strata for 2020 and 2021 combined. The team weighted NTG estimates by their evaluated gross program energy savings to arrive at the overall 79% NTG estimate and 6,555,824 kWh in net savings over the two-year period.

Table 8. 2020 and 2021 Wattsmart Business Program Net Savings

Strata	Evaluated Gross Savings (kWh)	NTG	Evaluated Net Savings (kWh)
Irrigation	1,226,808	74%	907,838
Lighting	3,829,190	87%	3,331,395
Lighting: Small Business	553,538	87%	481,578
Other	2,659,438	69%	1,835,012
Total^a	8,268,974	79%	6,555,824

^a Totals may not sum due to rounding.

Process Evaluation

The Cadmus team used primary data collection from several groups involved in the Wattsmart Business program to capture insights about how the program is meeting its objectives and serving Pacific Power customers, and where there may be opportunities to strengthen or expand the program.

Process Sampling

The Cadmus team surveyed participants and partial participants and interviewed trade allies and nonparticipants for the 2020 and 2021 evaluation, as shown in Table 9. Among the participant groups surveyed, the response rates were 18% for the prescriptive incentive list and custom analysis, 27% for Lighting: Small Business, 0% for midstream lighting instant incentives, and 44% for trade allies. Note that the number of responses may vary because not all respondents were asked each question due to survey branching and not all survey respondents provided responses to all questions.

Table 9. California 2020 and 2021 Wattsmart Business Program Process Activity Sampling

Program Name/Measure Category	Sampling Frame ^a	Target Completes	Achieved Completes
Incentive List and Custom Analysis			
Farm and Dairy	1	Census	1
HVAC	3		0
Irrigation	39		7
Lighting	52		8
Other ^b	7		2
Total Wattsmart Business	102		18
Lighting: Small Business	30	Census	8
Lighting: Midstream Instant Incentives	4	Census	0
Trade Ally	9	3	4
Participants	145	Census	30^c
Partial Participants	7	Census	2
Nonparticipants	2,913	200	198

^a The sampling frame was based on the number of unique customers with contact information (after removing duplicates).

^b "Other" includes appliances, building shell, food service, food service equipment, motors, oil and gas, and refrigeration measures.

^c This represents total completes across all program offerings (incentive list and custom analysis, Lighting: Small Business, and midstream lighting instant incentives).

Participant Experience

Participants in the Wattsmart Business program answered survey questions about their entry into the program, how they navigated identifying projects and submitting their applications, and their

satisfaction with various aspects of the program. Program participants include incentive list and custom analysis participants (n=18), Lighting: Small Business program participants (n=8), and trade allies (n=4).

Wattsmart Business Incentive List and Custom Analysis

The Cadmus team surveyed 18 incentive list and custom analysis participants representing nine measure categories. This included respondents who completed upgrades from the incentive list as well as respondents who completed custom incentives and worked with a certified vendor to address their needs. Table 10 shows the breakdown of respondents by measure category and incentive type.

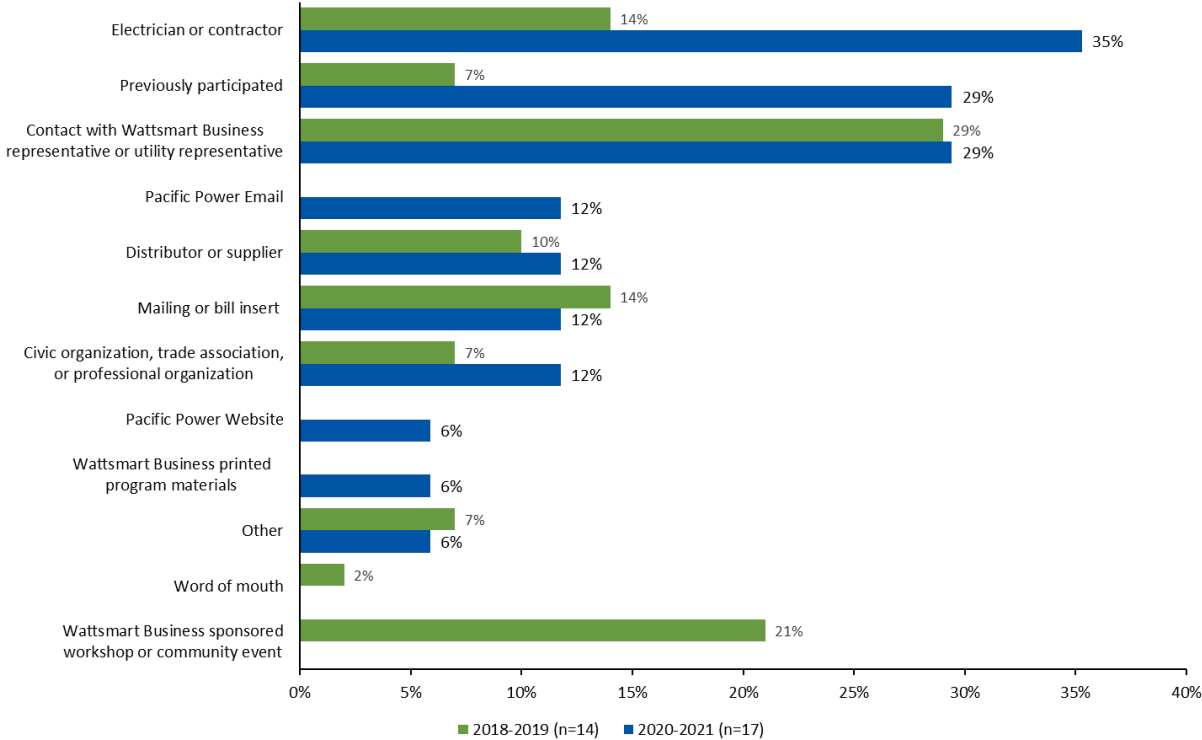
Table 10. 2020 and 2021 Participant Survey Completes by Measure Category and Incentive Type

Measure Category	Incentive List	Custom Analysis	Total
Irrigation	3	4	7
Lighting	5	3	8
Farm and Dairy	1	0	1
Refrigeration	0	1	1
Food Service Equipment	1	0	1
Total	10	8	18

Participant Experience

Respondents (n=17) reported that they most often learned about the Wattsmart Business program incentives through their electrician or contractor (35%), through previous participation (29%), or through contact with a Wattsmart Business representative or utility representative (29%). This is similar to the 2018 and 2019 results, when 29% of the respondents identified learning about the incentives through contact with a Wattsmart Business representative or utility representative (n=14). However, 2018 and 2019 respondents also identified learning about incentive through a Wattsmart Business-sponsored workshop or community event as the most common source of awareness (21%; n=14). Figure 2 shows the full results from 2018 and 2019 and 2020 and 2021 respondents.

Figure 2. Awareness Sources

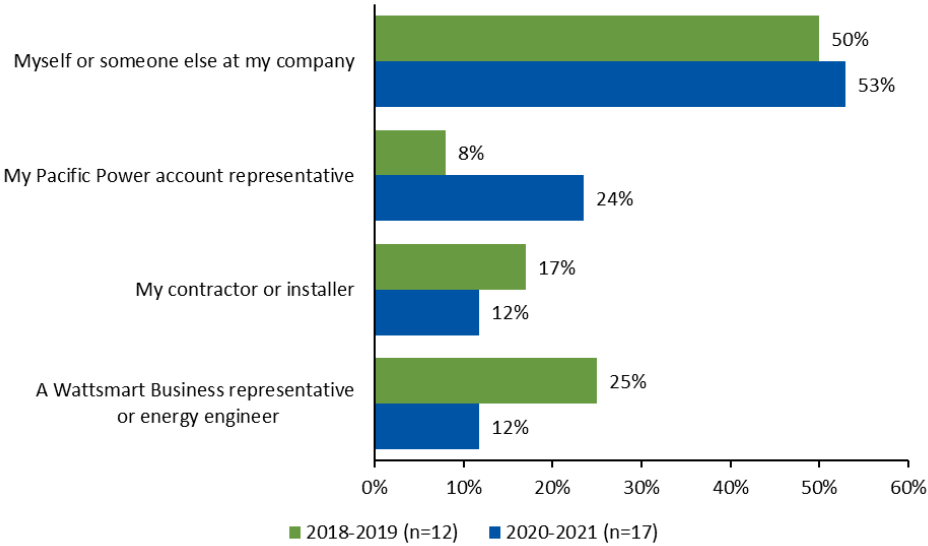


Source: Pacific Power 2020-2021 Wattsmart Business Program Participant Survey Question A3. Don't know and refused responses removed.

The 2020 and 2021 respondents reported that, on average, the incentive they received covered 20% of their project cost (n=15), which aligns with the 2018 and 2019 respondents (who reported that the incentive they received covered 24% of their project costs, on average; n=12).

Additionally, as shown in in figure 3, respondents most commonly continued to report that they or someone else at their company filled out their application.

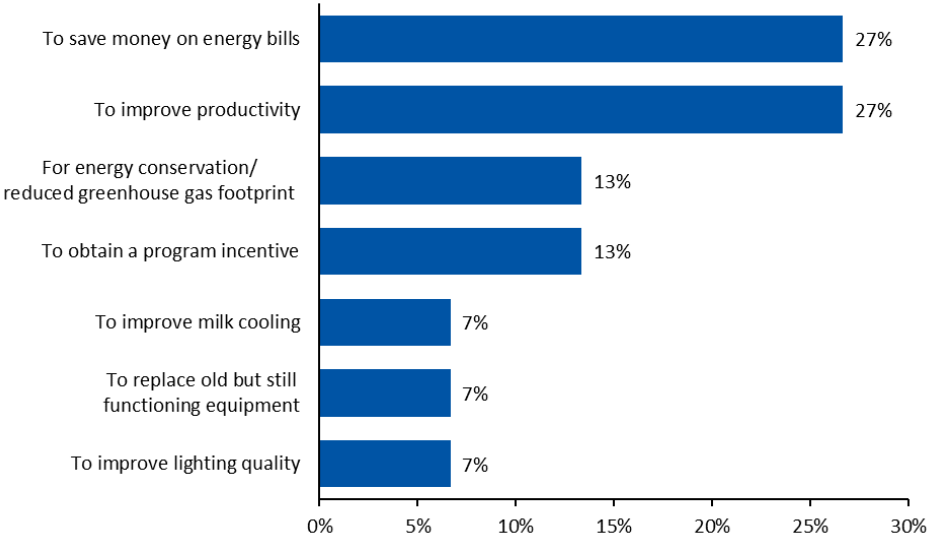
Figure 3. Who Completed the Application



Source: Pacific Power 2020-2021 Wattsmart Business Program Participant Survey Question B1. Don't know and refused responses removed.

Beginning with the Q3 wave of 2020 surveys, the Cadmus team asked Wattsmart Business participants what the most important reason was for their company participating. As shown in Figure 4, respondents (n=15) reported that the most important reason for participating was to save money on energy bills (27%) and to improve productivity (27%).

Figure 4. Most Important Reason for Participating

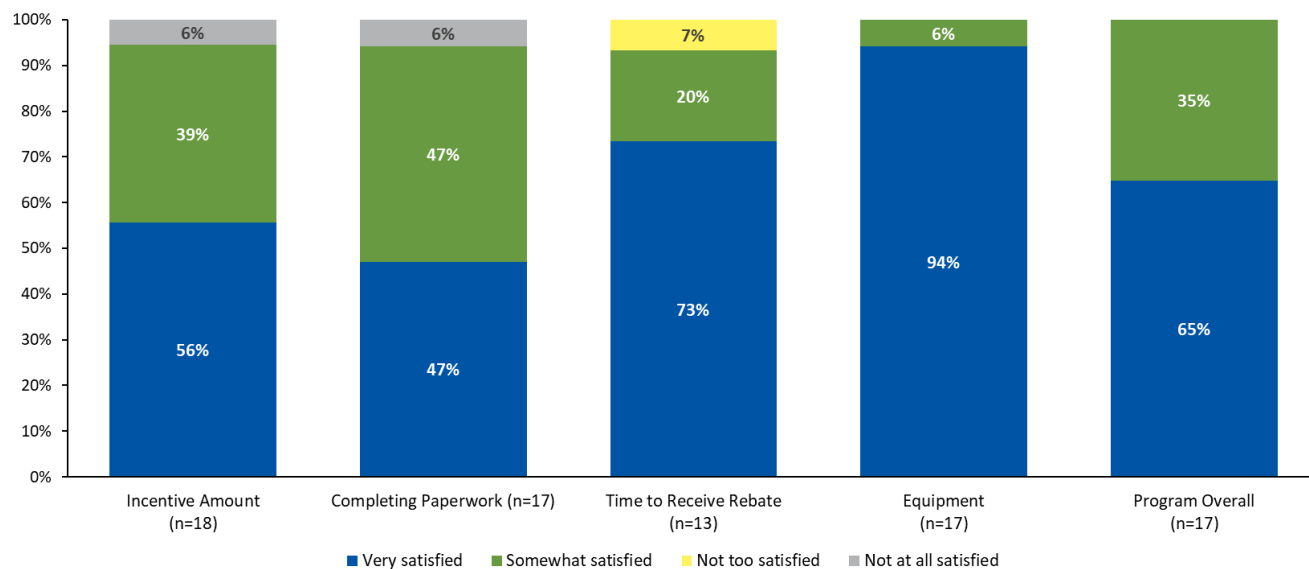


Source: Pacific Power 2020-2021 Wattsmart Business Program Participant Survey Question B1. Don't know and refused responses removed (n=15).

Participant Satisfaction

As shown in Figure 5, 94% of 2020 and 2021 participants were satisfied (either *very satisfied* or *somewhat satisfied*) with their incentive amount (n=17),³ up from 82% of the 2018 and 2019 survey respondents (n=11). Additionally, 93% of 2020 and 2021 participants were satisfied with the time it took to receive the rebate (n=17),⁴ which is slightly higher than the 88% of 2018 and 2019 survey respondents (n=8). All of the 2020 and 2021 participating respondents were satisfied with the other aspect of the program and with the program overall. This overall program satisfaction rating in 2020 and 2021 is higher than the rating in 2018 and 2019 (93%; n=14).

Figure 5. Satisfaction with Program Components



Source: Pacific Power 2020-2021 Wattsmart Business Program Participant Survey Questions B3, B5, B8, B13, and B16. Don't know and refused responses removed. Note that Completing Paperwork was asked on a scale using "easy" rather than "satisfied."

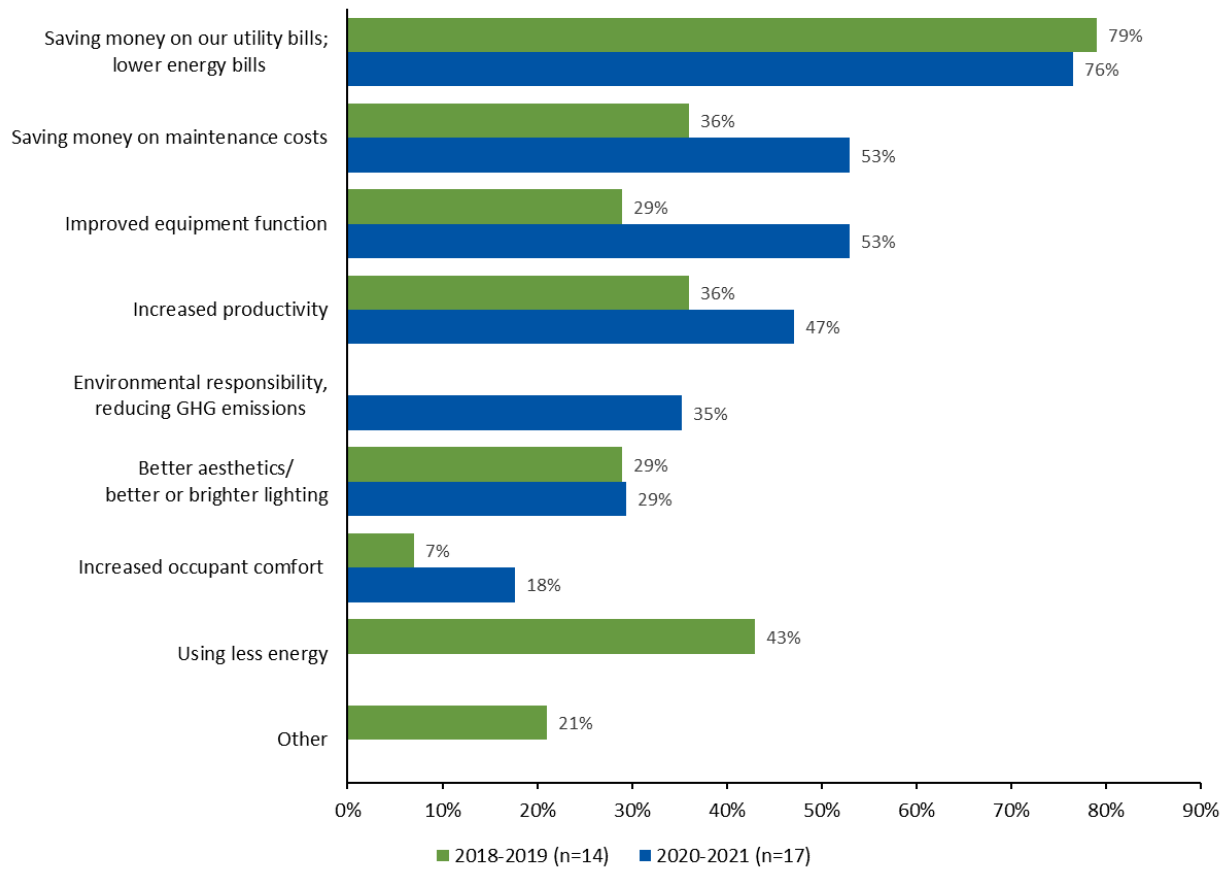
Project Benefits

Incentive list and custom analysis participants reported one or more benefits that their companies experienced from the project they completed. Most 2020 and 2021 respondents said benefits included saving money on utility bills (76%), similar to the 2018-2019 responses (79%). As shown in Figure 6, 2020 and 2021 participants also reported benefits such as saving money on maintenance costs, improved equipment function, and increased productivity. Across all respondents (n=17), 71% reported some benefit from their project other than energy cost savings.

³ Note that the number of responses may vary because not all respondents were asked each question due to survey branching and not all survey respondents provided responses to all questions.

⁴ Those who rated themselves as *not too satisfied* with the number of weeks to receive the rebate also said they did not know how many weeks would be acceptable.

Figure 6. Project Benefits



Source: Pacific Power 2020-2021 Wattsmart Business Program Participant Survey Question B14. Multiple responses allowed. Don't know and refused responses removed. Note that "Environmental responsibility, reducing GHG emissions" was a response option only 2020-2021 survey. Note that "Using less energy" was a response option only in 2018-2019 survey.

Firmographics

Seventy percent of respondents said their companies own the facility where the improvements were made, while 18% said they rent the facility and 12% said they had a separate arrangement (n=17). Additionally, 40% of respondents said their companies employ zero to 10 people, 13% said their companies employ between 11 and 25 people, 20% said their companies employ between 26 and 50 people, 13% said their companies employ between 101 and 200 people, and 13% said their companies employ between 201 and 500 people (n=15).

Respondents also identified the type of fuel source their facilities use for space and water heating. For space heating, 38% of respondents said their facility uses natural gas, 46% said they use electric sources, and 15% said they use additional sources (n=13). For water heating, 21% of respondents said they use natural gas sources, 64% said they use electric, and 14% said they use additional sources (n=14).

Lighting: Small Business

The Cadmus team surveyed eight customers who participated in the Lighting: Small Business program offering.

Participant Experience

Lighting: Small Business participants shared how they learned about the program incentives:

- Three of the eight respondents said they learned about the program incentives through their electrician or contractor.
- Two learned through the vendor, distributor, or supplier where they purchased the lighting.
- Two learned through another source.⁵
- One learned through contact with a Wattsmart Business representative or a Pacific Power representative.

When asked what the most important reason was their companies decided to participate in the program, five of eight respondents said to save money on energy, while two respondents said it was to obtain the program incentive and one respondent said it was to improve lighting quality.

Seven respondents reported that they received a detailed project proposal with estimated incentive and energy bill saving amounts after their free energy assessment. Respondents called out three key elements of the project proposal as being the most influential:

- Utility bill and energy-savings information (n=4)
- Project cost savings (n=2)
- Incentives for upgrades (n=1)

However, two respondents said there was other lighting equipment they wanted to install that was not offered in their project proposal. One of these respondents said they upgraded exterior lights to LED and the other said they would like to upgrade more lights in the back of the facility. One of the two respondents noted that they asked their installation contractor about installing exterior LED lights, but the contractor did not identify other Wattsmart Business incentives that may have been available.⁶

The Cadmus team also asked respondents how their companies' interest in or ability to complete energy efficiency projects was impacted by the COVID-19 pandemic. Four respondents said their company was not affected, while the other respondents reported that their ability to complete energy-efficient lighting projects was reduced in favor of other priorities and competing projects, as staff have less time to work on such projects or the companies do not prioritize buildings improvements because future use is uncertain.

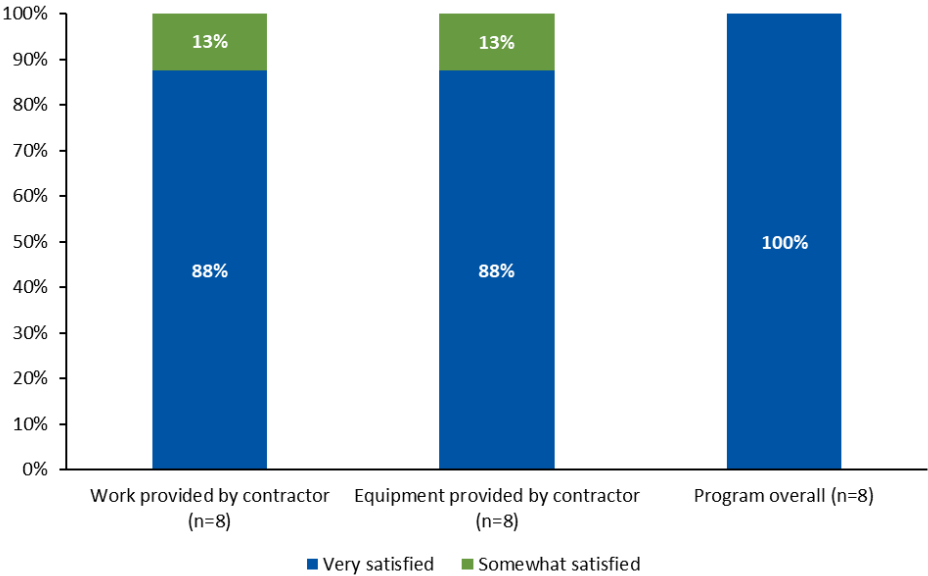
⁵ These respondents did to provide additional details of the source.

⁶ Pacific Power does offer a range of lighting incentives that are suitable for many exterior applications.

Participant Satisfaction

As shown in Figure 7, all participants were either *very satisfied* or *somewhat satisfied* with their contractor’s work and with the equipment they had installed. Correspondingly, all eight respondents were also satisfied with the program overall.

Figure 7. Satisfaction with Wattsmart Business Program Components and Program Overall

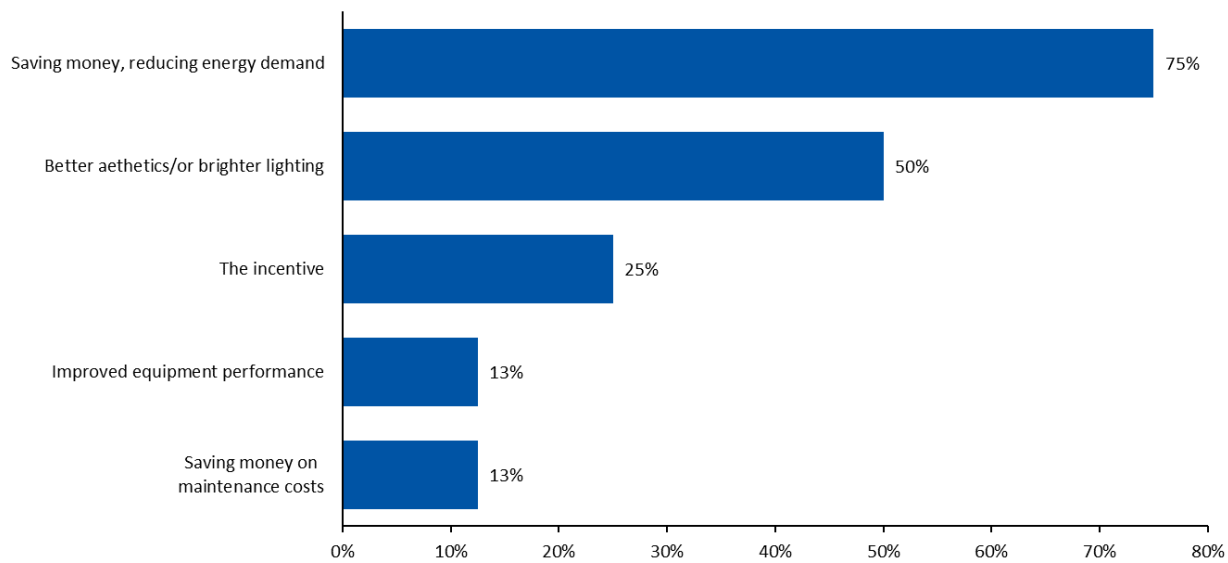


Source: Pacific Power 2020-2021 Wattsmart Business Program Participant Survey Questions B7, B9, and B21.

Project Benefits and Challenges

All eight participants reported one or more benefits that their companies experienced due to the equipment they installed. As shown in Figure 8, most respondents said the benefits included saving money and reducing energy demand.

Figure 8. Project Benefits



Source: Pacific Power 2020-2021 Wattsmart Business Program Participant Survey Question B17. (n=8)

Firmographics

Three of eight respondents reported that their companies were in the retail sector, while two are in the finance or insurance sector, one is in the repair and maintenance sector, and one is in the manufacturing sector (the last respondent did not describe their company sector). Six respondents said their companies own the facility where the improvements were made, while one respondent said they lease the facility and the final respondent did not provide an answer. Additionally, five respondents said their companies employ between 1 and 10 people, while one respondent each said that their company employs between 11 and 25, 26 and 50, and 201 and 500 people.

Respondents also identified the types of fuel sources their facilities use for space and water heating. For space heating, three respondents said their facility uses natural gas, one said they use electric sources, and another said they use propane. The last three respondents said their facilities use another source but did not further describe. For water heating, five respondents said they use electric sources, while the remaining three respondents did not know.

Partial Participant Experience

The Cadmus team obtained survey results from two partial participants regarding program awareness, motivations for and barriers to energy efficiency upgrades, satisfaction, and general firmographics.

Awareness

The two respondents learned about the program through contact with a Wattsmart Business program representative or Pacific Power representative. One respondent said their company had received a Wattsmart Business program incentive in the past, while the other respondent’s company had not. Additionally, one respondent said they were *very likely* to request an incentive for a project in the next six months while the other respondent said they were *not too likely*. Both respondents said the best way

for Pacific Power to keep them informed about incentives for energy efficiency improvements were through utility mailings, emails, newsletters with bills, or bill inserts.

Motivation and Barriers

One respondent reported that their company's most important motivating factor when making decisions about energy-efficient upgrades was saving money on energy bills, while the other respondent did not provide a motivating factor. While both respondents confirmed that their companies did not complete the project they initiated through the Wattsmart Business program, neither could provide an explanation as to why the project was not completed.

The Cadmus team also asked respondents about how the COVID-19 pandemic and related economic impacts had affected their companies' investments in building and equipment improvements. Both respondents indicated their Companies experienced no significant changes due to COVID-19.

Satisfaction

One respondent reported being *very satisfied* with the program overall and the other was *somewhat satisfied*. Neither respondent identified any areas for program improvement.

Firmographics

One respondent was from a construction business and one respondent was from a retail business. One respondent said their company does not own the facility while the other respondent did not provide any company details. One respondent said their company employs 1 to 10 people and the other respondent did not specify how many people are employed.

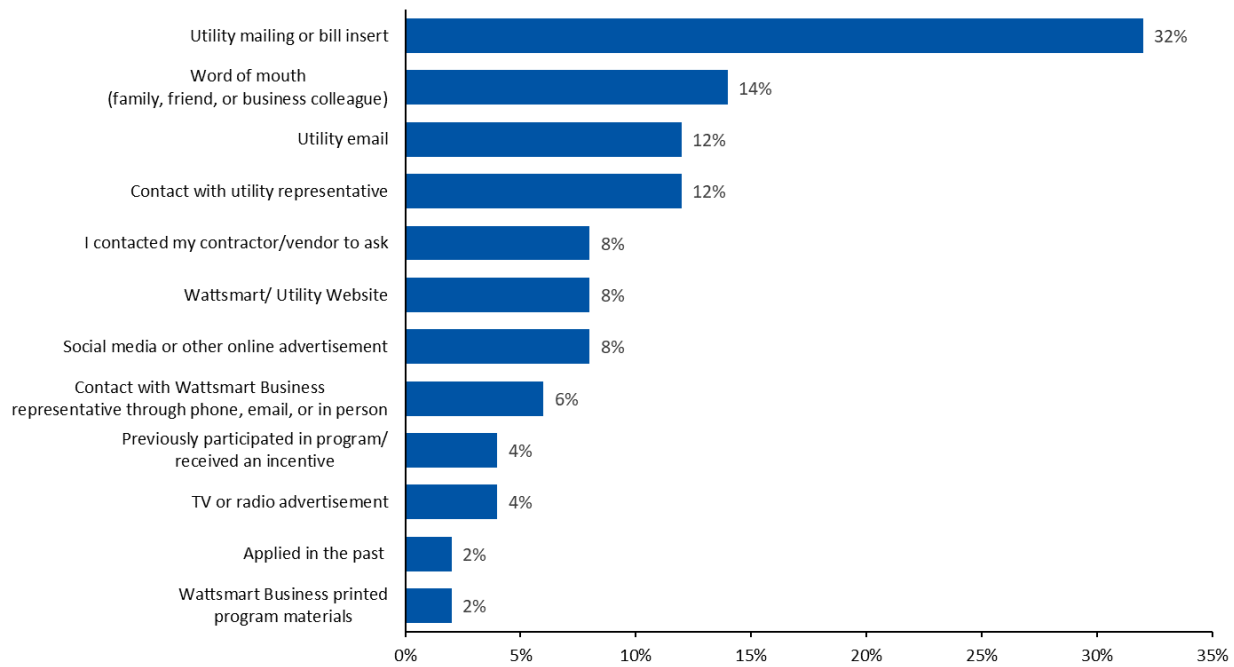
Nonparticipant Experience

The Cadmus team interviewed 198 nonparticipants to learn about program awareness, motivation for and barriers to energy efficiency upgrades, and general firmographics.

Awareness

Prior to the interview, 32% of respondents said they were aware of the Wattsmart Business program offerings (n=191), leaving 68% of the nonparticipants unaware of the program. Of those who were aware, 32% (n=50) said they learned about the program through utility mailing or bill inserts, as shown in Figure 9.

Figure 9. Awareness Source



Source: Pacific Power 2020-2021 Wattsmart Business Program Nonparticipant Survey Question C3. (n=50)

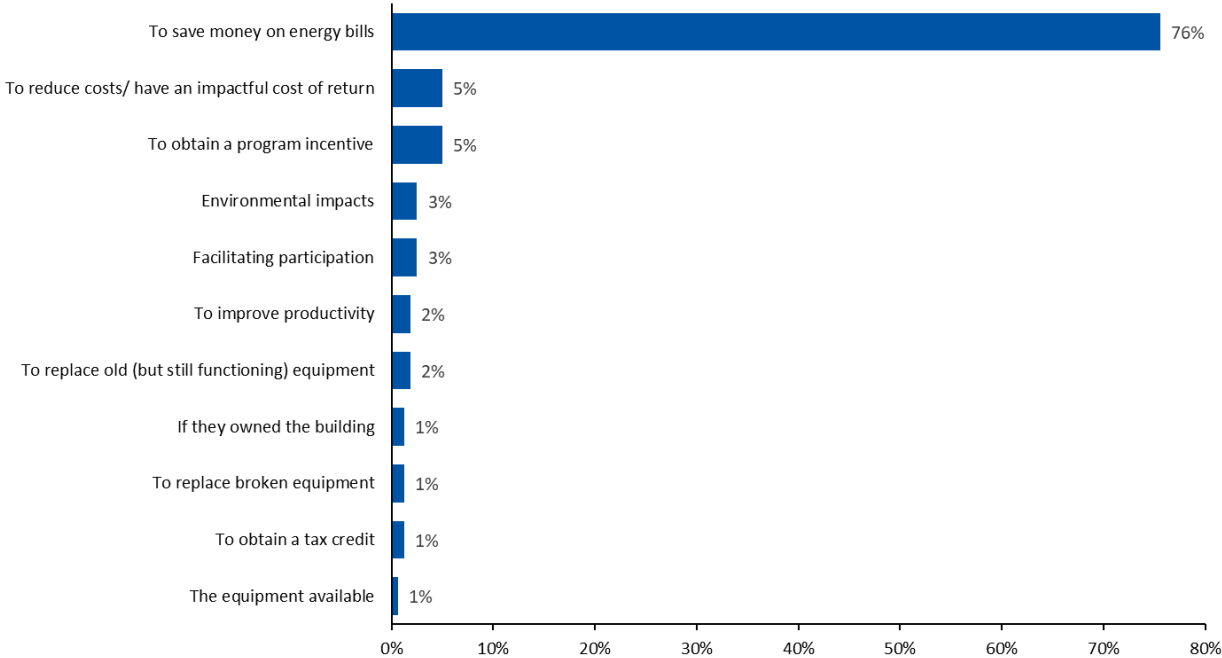
Furthermore, of the nonparticipants who were aware of the Wattsmart Business program offerings, 17% (n=59) said their companies had received a Wattsmart Business program incentive in the past. Additionally, 27% of the respondents said they were either *very likely* or *somewhat likely* to request a program incentive in the future (n=60).

Eighteen percent of the respondents said the best way for Pacific Power to keep them informed about incentives for energy-efficient improvements was through utility mailing, an email, a newsletter with the bill, or a bill insert (n=198). Other respondents said the best way to keep them informed is through contact with a Wattsmart Business representative; printed program materials; their electrician or contractor; the vendor, distributor, or supplier where they purchase lighting; or by calling or texting them about program information.

Motivation and Barriers

As shown in Figure 10, 76% of respondents said the most important factor to motivate their company to make energy-efficient upgrades was to save money on energy bills (n=160).

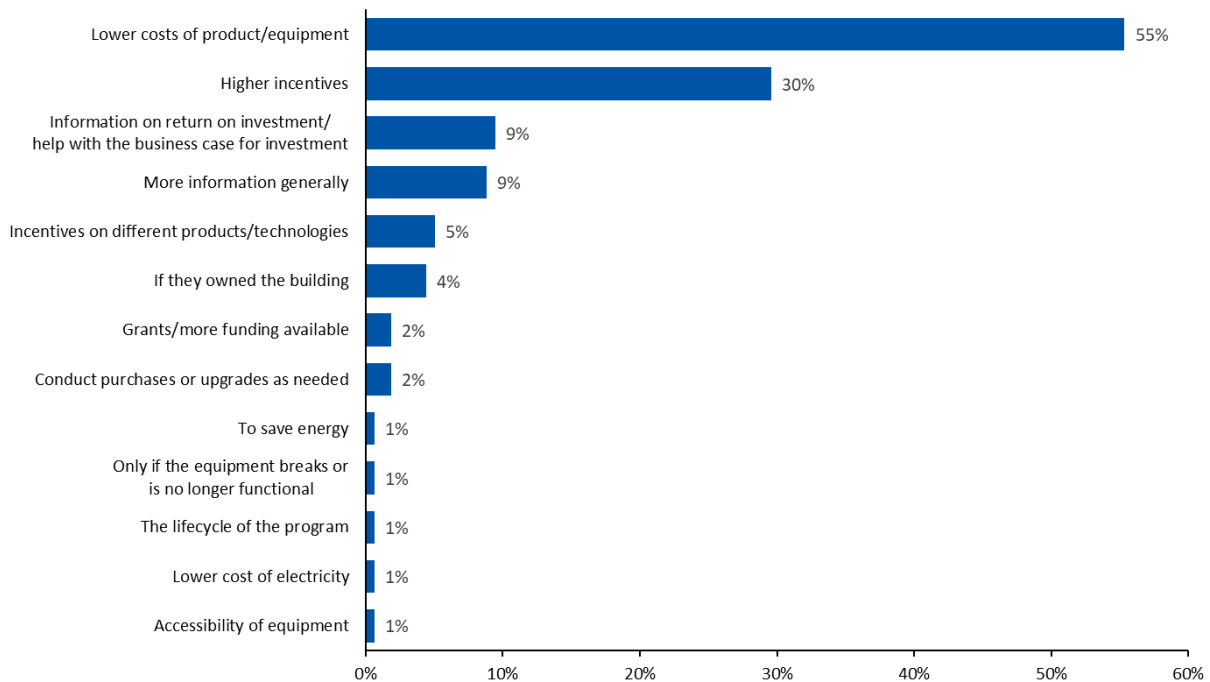
Figure 10. Most Motivating Reasons to Make Energy-Efficient Upgrades



Source: Pacific Power 2020-2021 Wattsmart Business Program Nonparticipant Survey Question D1. (n=160)

The respondents also shared what would motivate their business to make more energy-efficient purchases or upgrades to their current equipment: 55% said a lower cost for products or equipment and 29% said higher incentives (n=159; Figure 11). Those who said they would like to see incentives on different products or technologies mentioned lighting, HVAC electrical plumbing, new machinery that is cheaper to run, refrigeration, an energy-efficient stove, and solar (n=7).

Figure 11. Most Motivating Reasons to Make More Energy-Efficient Purchases or Upgrades



Source: Pacific Power 2020-2021 Wattsmart Business Program Nonparticipant Survey Question D9. (n=159). Multiple responses allowed.

Sixty-seven percent of the respondents said they did not participate in Wattsmart Business in the past two years because they do not know enough about the program (n=187). Other responses included not understanding what equipment or measures are available, not having the resources for initial investment, not having enough time to participate, not being sure how much the savings will be, not seeing the benefits, having already participated in the past, and not owning the building.

The Cadmus team also asked respondents about how the COVID-19 pandemic and related economic impacts had affected their companies’ investments in building and equipment improvements. Fifty-eight percent of the respondents said their company was investing about the same amount in building and equipment improvements as before the pandemic (n=177). Thirty-two percent of the respondents said their company is now investing less in building and equipment improvements, while 11% said their company is now investing more in buildings and equipment improvements.

Firmographics

Seventy-five percent of the respondents said their company employs 1 to 10 people, while 9% said their company employs 11 to 25 people, 9% said 26 to 50 people, and 7% have 51 or more people.

Trade Ally Experience

The Cadmus team interviewed four trade allies about their program experience including program awareness, the program’s impact on their business, their awareness of the small business efforts, their overall program satisfaction, and general company firmographics.

Trade Ally Experience

All four respondents said their company first learned about the Wattsmart Business program because they were looking for rebate opportunities for their customers. Two of the four trade allies said they chose to become an approved Wattsmart vendor because of the benefits provided, such as promotional materials and being able to provide more resources to their customers, while the other two said they became an approved vendor so they are able to offer either incentives or rebates.

Three of the four respondents said their participation in the Wattsmart Business program has had little effect on their business, while one respondent said their participation in the program has helped increase sales. Despite this, all four respondents said the program fits well with their business model.

When asked what products that are not currently eligible would be a good fit for the program, one respondent said exterior lighting products, while the remaining three respondents could not think of any products that should be added.⁷

One respondent reported having confusion when customers fill out the application, which complicates the process. The other three respondents did not indicate any barriers or challenges when participating in the program. However, three of the four respondents said they do not often interact with the materials provided by program staff, while one respondent said they use the marketing materials and the Wattsmart Business logo. Additionally, only one trade ally was aware of Pacific Power's 2021 effort to send 42 co-branded postcards to business customers to encourage lighting upgrades.

Satisfaction

When asked about their overall satisfaction with the Wattsmart Business program, all four respondents rated themselves as *satisfied*. Respondents also provided several recommendations to improve the participation process for customers and vendors:

- Have a Wattsmart representative interact with customers
- Provide more program materials for trade allies to present to customers
- Provide a list of contractors to the trade allies
- Provide resources for trade allies to build their network
- Keep the website up to date
- Send a list of potential upgrades for the upcoming year as the program continues to change

Overall, three of the four respondents said that Pacific Power is responsive to their needs and provides them with the information and support they need to be successful, while one respondent said Pacific Power is helpful and responsive at times. This respondent further indicated that they have not needed much help from Pacific Power.

⁷ Pacific Power does offer a range of lighting incentives that are suitable for many exterior applications.

Firmographics

Two trade allies were managers for their company, a distribution and wholesale company and a contracting company. The other two were their company's owners, a contracting company and a wholesale business. Three trade allies primarily serve commercial customers, two of which serve both industrial and commercial customers. All four trade allies serve the Northern California area and one trade ally also serves the south Oregon area. Two respondents said their companies staffed nine employees in 2021, while one had four employees and the other had three employees.

Cost-Effectiveness

As shown in Table 11, the Wattsmart Business program proved cost-effective for the 2020 and 2021 evaluation period from the perspectives of the PacifiCorp total resource cost (PTRC) test, with a benefit/cost ratio of 1.65, the total resource cost (TRC) test, with a benefit/cost ratio of 1.50, the utility cost test (UCT), with a benefit/cost ratio of 2.03, and the participant cost test (PCT), with a benefit/cost ratio of 3.71. The program was not cost-effective according to the ratepayer impact measure (RIM) test perspective. Table 12 and Table 13 show the cost-effectiveness test results individually for the 2020 and 2021 program years. Please see *Appendix B* for more information on cost-effectiveness.

Table 11. 2020 and 2021 Evaluated Net Wattsmart Business Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PacifiCorp Total Resource Cost Test (TRC + 10% conservation adder)	\$0.039	\$4,026,280	\$6,653,515	\$2,627,236	1.65
Total Resource Cost Test (TRC no adder)	\$0.039	\$4,026,280	\$6,048,650	\$2,022,371	1.50
Utility Cost Test (UCT)	\$0.022	\$2,976,764	\$6,048,650	\$3,071,886	2.03
Ratepayer Impact Measure Test (RIM)	-	\$12,070,462	\$6,048,650	(\$6,021,812)	0.50
Participant Cost Test (PCT)	-	\$3,049,317	\$11,300,690	\$8,251,372	3.71
Lifecycle Revenue Impacts (\$/kWh)					\$0.001657454
Discounted Participant Payback (years)					3.02

Table 12. 2020 Evaluated Net Wattsmart Business Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PacifiCorp Total Resource Cost Test (TRC + 10% conservation adder)	\$0.0712	\$2,380,071	\$4,078,928	\$1,698,857	1.71
Total Resource Cost Test (TRC no adder)	\$0.0712	\$2,380,071	\$3,708,116	\$1,328,046	1.56
Utility Cost Test (UCT)	\$0.0551	\$1,843,213	\$3,708,116	\$1,864,903	2.01
Ratepayer Impact Measure Test (RIM)	-	\$6,406,581	\$3,708,116	(\$2,698,465)	0.58
Participant Cost Test (PCT)	-	\$1,502,237	\$6,144,741	\$4,642,503	4.09
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000424988
Discounted Participant Payback (years)					1.79

Table 13. 2021 Evaluated Net Wattsmart Business Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PacifiCorp Total Resource Cost Test (TRC + 10% conservation adder)	\$0.0697	\$1,646,209	\$2,574,587	\$928,379	1.56
Total Resource Cost Test (TRC no adder)	\$0.0697	\$1,646,209	\$2,340,534	\$694,325	1.42
Utility Cost Test (UCT)	\$0.0480	\$1,133,551	\$2,340,534	\$1,206,983	2.06
Ratepayer Impact Measure Test (RIM)	-	\$5,663,881	\$2,340,534	(\$3,323,347)	0.41
Participant Cost Test (PCT)	-	\$1,547,080	\$5,155,949	\$3,608,869	3.33
Lifecycle Revenue Impacts (\$/kWh)					\$0.0007886
Discounted Participant Payback (years)					2.79

Conclusions and Recommendations

This section provides the Cadmus team’s conclusions, along with key findings and recommendations.

The Wattsmart Business program realized 98% of reported energy savings.

Of the 43 projects the Cadmus team evaluated, 28 projects realized energy savings within 10% of the reported savings. Lighting: Small Business projects realized the greatest energy savings relative to reported savings (with realization rates between 115% and 128%), while irrigation hardware measures realized the lowest savings relative to reported savings (with realization rates between 57% and 80%). While we found discrepancies among 65% of the sampled projects, the net impact of those deviations was small, resulting in a 98% gross realization rate for the 2020 and 2021 program years.

Although the Wattsmart Business program reach customers through a variety of sources, opportunities to expand customer awareness remains.

Thirty-five percent of the incentive list and custom analysis respondents learned about the program offerings through their electrician or contractor, through previous participation (29%), or through contact with a Wattsmart Business representative or utility representative (29%, n=17). This is similar to the 2018 and 2019 results, when 29% of the respondents identified learning about the incentives through contact with a Wattsmart Business representative or utility representative (n=14). Similarly, three of the eight Lighting: Small Business participants learned about the Wattsmart Business incentives through their electrician or contractor. However, of the nonparticipants who were aware of the program, 32% learned about the incentives through a utility mailing or bill insert (n=50), leaving 68% of the nonparticipants unaware of the program (n=191).

Recommendation: Explore multiple methods to reach currently unengaged and unaware customers e.g., expanded outreach through utility representatives and contractors, as well as continued use of bill inserts and utility mailings.

The Wattsmart Business program successfully meets customer expectations. ‘

Participants continue to be satisfied with the Wattsmart Business programs incentive amounts, paperwork, time to receive the rebate, and measures. Ninety-four percent of 2020 and 2021 incentive list and custom respondents reported being satisfied with their incentive amount (n=17),⁸ up from 82% of the 2018 and 2019 (n=11). Additionally, 93% of 2020 and 2021 participants were satisfied with the time it took to receive the rebate (n=17),⁹ which is slightly higher than the 88% of 2018 and 2019 survey respondents (n=8). All of the 2020 and 2021 respondents were also satisfied with the other aspect of the program and with the program overall. This overall program satisfaction rating in 2020 and 2021 is slightly higher than the rating in 2018 and 2019 (93%; n=14). In addition, all Lighting: Small Business

⁸ Note that the number of responses may vary because not all respondents were asked each question due to survey branching and not all survey respondents provided responses to all questions.

⁹ Those who rated themselves as *not too satisfied* with the number of weeks to receive the rebate also said they did not know how many weeks would be acceptable.

respondents were satisfied with their contractor's work and with the equipment they had installed. Correspondingly, all eight respondents were also satisfied with the program overall.

Customers continue to be motivated to make energy-efficient upgrades in order to save money, specifically on energy bills.

Among the incentive list and custom analysis respondents, 27% indicated that saving money on energy bills was the most important reason for program participating. In addition, four of the seven Lighting: Small Business respondents who provided a response said their utility bill and energy-savings information was the most influential element of their decision for project proposal. Furthermore, one of the two partial respondents reported that their company's most important motivating factor when making decisions about energy-efficient upgrades was saving money on energy bills (other respondent did not provide a motivating factor). Finally, of nonparticipating respondents, 76% said that saving money on energy bills was the most motivating reason to make energy-efficient upgrades.

The Wattsmart Business program positively supports trade allies; however, additional opportunity for program impact remains.

All four trade allies indicated that they were satisfied with the Wattsmart Business Program. Three of the four respondents said that Pacific Power is responsive to their needs and provides them with the information and support they need to be successful, while one respondent said Pacific Power is helpful and responsive at times. Additionally, all four respondents said that the Wattsmart Business program fit well with their business model; however, three of the four respondents said their participation in the Wattsmart Business program has had little effect on their business.

Recommendation: Explore if and how the program can provide greater positive benefits to trade allies e.g., additional customer engagement materials or utility support services, to increase program participation and related trade ally sales.

The Wattsmart Business program proved cost-effective according to all test perspectives except the RIM test for the 2020 and 2021 evaluation period.

All measure strata except farm and dairy were cost-effective from the PTRC and TRC test perspectives for the 2020 and 2021 evaluation period. The program generated more than \$2.6 million in net benefits during the evaluation period according to the PTRC test.

Appendix A. Gross Engineering Analysis Methodology

The Cadmus team conducted several activities for the Wattsmart Business program impact evaluation:

- Customer interviews
- Engineering analysis
- Site-level billing analysis

This appendix addresses gross evaluated savings. Pacific Power reported gross electricity savings (kilowatt-hours) in its *Rocky Mountain Power Energy Efficiency and Peak Reduction Annual Reports*.¹⁰ Gross evaluated savings are the savings achieved after applying installation and realization rates from an engineering analysis of a sample of projects. Net savings are program savings, net of what would have occurred in the program’s absence. These savings provide observed impacts attributable to the program.

To determine evaluated gross savings, the Cadmus team applied Steps 1 through 4, as shown in Table A-1. To determine evaluated net savings, the team applied Step 5 (discussed in *Appendix B*).

Table A-1. Impact Steps to Determine Evaluated Gross and Net Savings

Savings Estimate	Step	Action
Evaluated Gross Savings	1	Tracking Database Review: Validate the accuracy of data in the participant database and verify that savings match annual reports
	2	Verification: Adjust savings based on actual installation rates
	3	Unit Energy Savings: Validate savings calculations (through engineering review, analysis, and meter data)
	4	Realization Rates: Extrapolate realization rates to the population, if applicable
Evaluated Net Savings	5	Attribution: Apply NTG adjustments

Step 1: To verify the accuracy of data in the participant database, the Cadmus team reviewed the program tracking database to ensure that the number of participants and reported savings matched annual reports.

Step 2: The team selected a sample of sites from the Pacific Power program database and stratified the distribution of measures among sampled sites, primarily by end-use type. The team used phone interviews and customer-provided photos and site documentation to verify measure installations.

Step 3: For sampled projects, the team reviewed all project documentation; developed an evaluation, measurement, and verification plan; and, in a few instances, performed virtual site assessments to verify

¹⁰ These reports are available online: <https://www.pacificorp.com/environment/demand-side-management.html>

the installation, specifications, and operations of incented measures. The team also collected trend data for nine projects to document historical performance.

Step 4: The Cadmus team reviewed measure savings assumptions, equations, and inputs, which included conducting a billing analysis for selected measures. For complicated or custom measures, the team conducted an engineering analysis using the appropriate measurement and verification options from the *International Performance Measurement and Verification Protocol*.¹¹ The team used interviews and other operational data to determine hours of use and power consumption for metered equipment types. In some instances, customers provided trend data from their building management systems, which the team used to determine equipment load profiles, hours of use, and performance characteristics.

Step 5: The team used the participant survey to calculate freeridership using an industry-standard self-report methodology. In addition, the team surveyed nonparticipants to determine if nonparticipant spillover could be credited to the program (for projects that did not receive incentives).

Project Review

The Cadmus team reviewed all project documentation available from Pacific Power, which included project applications, equipment invoices, reports published by the pre-contracted group of energy engineering consultants, and savings calculation spreadsheets.

The team performed several tasks for each site within the sample:

- Reviewed the reported documentation to verify that the quantity and specifications of equipment receiving incentives matched the associated reported energy-savings calculations and confirmed that installed equipment met program eligibility requirements
- Performed a detailed review of site project files to collect additional data necessary for each site's savings analysis
- Where applicable, conducted a phone interview with facility personnel to gather information such as equipment types replaced and hours of operation

Engineering Analysis

In general, the Cadmus team referenced current measure workbooks and saving estimation methodologies from the California Electronic Technical Reference Manual,¹² the Regional Technical Forum (RTF), and the Idaho Power *Technical Reference Manual*,¹³ which was updated in 2018 and relies

¹¹ Efficiency Valuation Organization. January 2012. *International Performance Measurement and Verification Protocol, Concepts and Options for Determining Energy and Water Savings, Volume 1*. p. 25. EVO 10000 – 1:2012. <http://www.evo-world.org/>

¹² California Technical Forum. August 25, 2021. *California Electronic Technical Reference Manual*. <https://www.caetrm.com/login/?next=/>

¹³ ADM Associates. October 15, 2018. *Technical Reference Manual 2.2*. Prepared for Idaho Power Company. <https://docs.idahopower.com/pdfs/EnergyEfficiency/Reports/2018TRM.pdf>

on sources such as the Northwest Power and Conservation Council, Northwest Energy Efficiency Alliance, the *Database for Energy Efficiency Resources*, the Energy Trust of Oregon, the Bonneville Power Administration, third-party consultants, and other regional utilities.

Appendix B. Cost-Effectiveness Methodology and Measure Strata Results

In assessing the Wattsmart Business program’s cost-effectiveness, the Cadmus team analyzed program benefits and costs from five perspectives. The *California Standard Practice Manual* describes the benefit/cost ratios for these five tests, used to assess demand-side management program cost-effectiveness:

- The **PacifiCorp total resource cost (PTRC) test** examines program benefits and costs from Pacific Power and the customers’ perspectives (combined). The benefits include avoided energy costs, capacity costs, and line losses, plus a 10% adder to reflect non-quantified benefits. The costs include costs incurred by both the utility and participants.
- The **total resource cost (TRC) test** also examines program benefits and costs from Pacific Power and the customers’ perspectives (combined). The benefits include avoided energy costs, capacity costs, and line losses. The costs include costs incurred by both the utility and participants.
- The **utility cost test (UCT)** examines program benefits and costs solely from Pacific Power’s perspective. The benefits include avoided energy, capacity costs, and line losses. The costs include program administration, implementation, and incentive costs associated with program funding.
- The **ratepayer impact measure (RIM) test** incorporates rate increases that may be experienced by all ratepayers (participants and nonparticipants) due to decreased kilowatt-hour sales. The benefits include avoided energy costs, capacity costs, and line losses. The costs include all Pacific Power program costs and decreased revenues.

Because the RIM test measures program impacts on customers’ rates, most energy efficiency programs do not pass the RIM test. Although energy efficiency programs reduce energy delivery costs, they also reduce energy sales. As a result, average rates per energy unit may increase. A RIM benefit/cost ratio greater than 1.0 indicates that rates—as well as costs—will fall due to the program. Typically, this only happens for demand response programs or programs targeting the highest marginal cost hours (when marginal costs exceed rates).

- The **participant cost test (PCT)** examines program benefits and costs from the participants’ perspective. The benefits include bill reductions and incentives received. The costs include the measure incremental cost (compared to the baseline measures) plus installation costs incurred by the customer.

Table B-1 summarizes the five tests’ components.

**Table B-1. Wattsmart Business Program Benefits and Costs
Included in Various Cost-Effectiveness Tests**

Test	Benefits	Costs
PTRC	Present value of avoided energy and capacity costs ^a plus a 10% adder for non-quantified benefits	Program administrative and marketing costs and costs incurred by participants
TRC	Present value of avoided energy and capacity costs ^a	Program administrative and marketing costs and costs incurred by participants
UCT	Present value of avoided energy and capacity costs ^a	Program administrative, marketing, and incentive costs
RIM	Present value of avoided energy and capacity costs ^a	Program administrative, marketing, and incentive costs plus the present value of decreased revenues
PCT	Present value of bill savings and incentives received	Incremental measure and installation costs

^a These tests include avoided line losses.

Table B-2 shows needed cost-effectiveness inputs for each year, all of which Pacific Power provided to the Cadmus team for analysis.

Table B-2. California Wattsmart Selected Cost-Effectiveness Analysis Inputs

Input Description	2020 and 2021
Discount Rate	6.92%
Commercial Line Loss	8.63%
Industrial Line Loss	8.53%
Irrigation Line Loss	8.78%
Commercial Retail Rate (\$/kWh)	\$0.1357
Industrial Retail Rate (\$/kWh)	\$0.1029
Irrigation Retail Rate (\$/kWh)	\$0.1289
Inflation/Escalation Rate	2.28%

Table B-3 shows the cost-effectiveness inputs used for determining net results.

Table B-3. California Wattsmart Business End-Use Category Cost-Effectiveness Inputs

Input Description	2020	2021	Total
Average Measure Life			
Additional Measures	N/A	15.0	15.0
Building Shell	17.0	N/A	17.0
Farm and Dairy	10.0	N/A	10.0
Food Service Equipment	11.0	14.7	12.1
HVAC	N/A	15.0	15.0
Irrigation	10.0	7.6	8.9
Lighting	13.3	8.7	12.4
Motors	8.0	7.7	7.7
Refrigeration	15.0	N/A	15.0

Input Description	2020	2021	Total
Net Energy Savings (kWh) ^a			
Additional Measures	N/A	469,589	469,589
Building Shell	106	N/A	106
Farm and Dairy	7,742	N/A	7,742
Food Service Equipment	14,642	9,966	24,609
HVAC	N/A	156,360	156,350
Irrigation	443,631	486,181	929,812
Lighting	3,038,210	709,214	3,747,424
Motors	890	1,161,343	1,162,233
Refrigeration	14,425	N/A	14,425
Total Utility Costs (including Incentives)			
Additional Measures	N/A	\$178,529	\$178,529
Building Shell	\$318	N/A	\$318
Farm and Dairy	\$11,491	N/A	\$11,491
Food Service Equipment	\$7,696	\$7,021	\$14,717
HVAC	N/A	\$54,207	\$54,207
Irrigation	\$284,687	\$160,793	\$445,480
Lighting	\$1,437,037	\$291,478	\$1,728,515
Motors	\$95,782	\$441,522	\$537,304
Refrigeration	\$6,203	N/A	\$6,203
Incentives			
Additional Measures	N/A	\$100,626	\$100,626
Building Shell	\$270	N/A	\$270
Farm and Dairy	\$1,072	N/A	\$1,072
Food Service Equipment	\$1,590	\$5,250	\$6,840
HVAC	N/A	\$14,882	\$14,882
Irrigation	\$85,979	\$89,528	\$175,507
Lighting	\$546,065	\$166,473	\$712,538
Motors	\$61,368	\$248,859	\$310,227
Refrigeration	\$3,197	N/A	\$3,197

^a Evaluated savings reflect impacts at the customer meter.

Additional Measures

As shown in Table B-4, the additional measures stratum proved cost-effective according to all test perspectives except the RIM test in 2021.

Table B-4. 2021 California Additional Measures Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.063	\$312,564	\$580,027	\$267,462	1.86
TRC	\$0.063	\$312,564	\$527,297	\$214,732	1.69
UCT	\$0.036	\$178,529	\$527,297	\$348,768	2.95
RIM	-	\$1,219,006	\$527,297	(\$691,709)	0.43
PCT	-	\$335,230	\$1,141,103	\$805,872	3.40
Lifecycle Revenue Impacts (\$/kWh)					\$0.000169727
Discounted Participant Payback (years)					4.41

Building Shell

As shown in Table B-5, the building shell measure stratum proved cost-effective according to the PTRC, TRC, and PCT test perspectives in 2020.

Table B-5. 2020 California Building Shell Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0838	\$103	\$138	\$35	1.35
TRC	\$0.0838	\$103	\$126	\$23	1.22
UCT	\$0.2590	\$318	\$126	(\$192)	0.40
RIM	-	\$497	\$126	(\$371)	0.25
PCT	-	\$92	\$569	\$477	6.20
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000000289
Discounted Participant Payback (years)					N/A

Farm and Dairy

As shown in Table B-6, the farm and dairy measure stratum only proved cost-effective according to the PCT perspective in 2020.

Table B-6. 2020 California Farm and Dairy Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.1991	\$12,115	\$7,690	(\$4,425)	0.63
TRC	\$0.1991	\$12,115	\$6,991	(\$5,124)	0.58
UCT	\$0.1889	\$11,491	\$6,991	(\$4,500)	0.61
RIM	-	\$20,363	\$6,991	(\$13,372)	0.34
PCT	-	\$2,423	\$13,747	\$11,324	5.67
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000017696
Discounted Participant Payback (years)					1.27

Food Service Equipment

As shown in Table B-7, Table B-8, and Table B-9, the food service equipment measure stratum proved cost-effective in 2020, 2021, and the combined 2020 and 2021 period according to all test perspectives except the RIM test.

Table B-7. 2020 and 2021 California Food Service Equipment Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.038	\$17,098	\$28,064	\$10,966	1.64
TRC	\$0.038	\$17,098	\$25,513	\$8,415	1.49
UCT	\$0.029	\$14,717	\$25,513	\$10,796	1.73
RIM	-	\$50,988	\$25,513	(\$25,475)	0.50
PCT	-	\$11,561	\$52,904	\$41,342	4.58
Lifecycle Revenue Impacts (\$/kWh)					\$0.000006526
Discounted Participant Payback (years)					2.65

Table B-8. 2020 California Food Service Equipment Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0650	\$8,058	\$15,754	\$7,696	1.95
TRC	\$0.0650	\$8,058	\$14,322	\$6,264	1.78
UCT	\$0.0621	\$7,696	\$14,322	\$6,626	1.86
RIM	-	\$25,781	\$14,322	(\$11,459)	0.56
PCT	-	\$3,009	\$29,468	\$26,458	9.79
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000013784
Discounted Participant Payback (years)					0.70

Table B-9. 2021 California Food Service Equipment Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.085	\$9,040	\$12,310	\$3,270	1.36
TRC	\$0.085	\$9,040	\$11,191	\$2,151	1.24
UCT	\$0.066	\$7,021	\$11,191	\$4,170	1.59
RIM	-	\$25,207	\$11,191	(\$14,016)	0.44
PCT	-	\$8,552	\$23,436	\$14,884	2.74
Lifecycle Revenue Impacts (\$/kWh)					\$0.000003510
Discounted Participant Payback (years)					5.37

HVAC

As shown in Table B-10, the HVAC measure stratum proved cost-effective according to all test perspectives except the RIM test in 2021.

Table B-10. 2021 California HVAC Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.044	\$73,575	\$236,430	\$162,855	3.21
TRC	\$0.044	\$73,575	\$214,936	\$141,361	2.92
UCT	\$0.033	\$54,207	\$214,936	\$160,729	3.97
RIM	-	\$457,927	\$214,936	(\$242,991)	0.47
PCT	-	\$57,020	\$418,602	\$361,582	7.34
Lifecycle Revenue Impacts (\$/kWh)					\$0.000063759
Discounted Participant Payback (years)					2.04

Irrigation

As shown in Table B-11, Table B-12, and Table B-13, the irrigation measure stratum proved cost-effective in 2020, 2021, and the combined 2020 and 2021 period according to all test perspectives except the RIM test.

Table B-11. 2020 and 2021 California Irrigation Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.058	\$682,387	\$895,127	\$212,740	1.31
TRC	\$0.058	\$682,387	\$813,752	\$131,364	1.19
UCT	\$0.025	\$445,480	\$813,752	\$368,272	1.83
RIM	-	\$1,538,800	\$813,752	(\$725,049)	0.53
PCT	-	\$595,937	\$1,555,253	\$959,316	2.61
Lifecycle Revenue Impacts (\$/kWh)					\$0.000245153
Discounted Participant Payback (years)					3.40

Table B-12. 2020 California Irrigation Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.1119	\$390,169	\$441,240	\$51,071	1.13
TRC	\$0.1119	\$390,169	\$401,127	\$10,958	1.03
UCT	\$0.0817	\$284,687	\$401,127	\$116,440	1.41
RIM	-	\$767,611	\$401,127	(\$366,484)	0.52
PCT	-	\$305,017	\$855,328	\$550,311	2.80
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000484987
Discounted Participant Payback (years)					4.00

Table B-13. 2021 California Irrigation Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.086	\$292,218	\$453,887	\$161,669	1.55
TRC	\$0.086	\$292,218	\$412,625	\$120,406	1.41
UCT	\$0.048	\$160,793	\$412,625	\$251,832	2.57
RIM	-	\$771,189	\$412,625	(\$358,565)	0.54
PCT	-	\$290,920	\$699,925	\$409,005	2.41
Lifecycle Revenue Impacts (\$/kWh)					\$0.000162361
Discounted Participant Payback (years)					3.16

Lighting

As shown in Table B-14, Table B-15, and Table B-16, the lighting measure stratum proved cost-effective in 2020, 2021, and the combined 2020 and 2021 period according to all test perspectives except the RIM test.

Table B-14. 2020 and 2021 California Lighting Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.035	\$2,288,599	\$4,098,216	\$1,809,618	1.79
TRC	\$0.035	\$2,288,599	\$3,725,651	\$1,437,052	1.63
UCT	\$0.020	\$1,728,515	\$3,725,651	\$1,997,136	2.16
RIM	-	\$6,634,313	\$3,725,651	(\$2,908,662)	0.56
PCT	-	\$1,460,866	\$6,189,989	\$4,729,123	4.24
Lifecycle Revenue Impacts (\$/kWh)					\$0.000850478
Discounted Participant Payback (years)					2.93

Table B-15. 2020 California Lighting Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0650	\$1,924,753	\$3,595,859	\$1,671,107	1.87
TRC	\$0.0650	\$1,924,753	\$3,268,963	\$1,344,210	1.70
UCT	\$0.0485	\$1,437,037	\$3,268,963	\$1,831,926	2.27
RIM	-	\$5,467,278	\$3,268,963	(\$2,198,315)	0.60
PCT	-	\$1,180,225	\$5,147,959	\$3,967,734	4.36
Lifecycle Revenue Impacts (\$/kWh)					\$0.0002236826
Discounted Participant Payback (years)					1.64

Table B-16. 2021 California Lighting Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.068	\$363,846	\$502,357	\$138,511	1.38
TRC	\$0.068	\$363,846	\$456,688	\$92,842	1.26
UCT	\$0.054	\$291,478	\$456,688	\$165,210	1.57
RIM	-	\$1,167,035	\$456,688	(\$710,347)	0.39
PCT	-	\$280,641	\$1,042,030	\$761,389	3.71
Lifecycle Revenue Impacts (\$/kWh)					\$0.000225485
Discounted Participant Payback (years)					2.33

Motors

Table B-17, Table B-18, and Table B-19 show the motors measure stratum cost-effectiveness results for net evaluated savings. The motors measure stratum proved cost-effective in 2021 and for the 2020 and 2021 evaluation period from all test perspectives except the RIM test. However, in 2020 the motors measure stratum only proved cost-effective accordingly to the PCT perspective.

Table B-17. 2020 and 2021 California Motors Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.050	\$632,843	\$790,343	\$157,501	1.25
TRC	\$0.050	\$632,843	\$718,495	\$85,651	1.14
UCT	\$0.038	\$537,304	\$718,495	\$181,190	1.34
RIM	-	\$2,119,943	\$718,495	(\$1,401,449)	0.34
PCT	-	\$580,490	\$1,893,297	\$1,312,806	3.26
Lifecycle Revenue Impacts (\$/kWh)					\$0.000398510
Discounted Participant Payback (years)					2.37

Table B-18. 2020 California Motors Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$6.4887	\$37,878	\$767	(\$37,111)	0.02
TRC	\$6.4887	\$37,878	\$698	(\$37,181)	0.02
UCT	\$16.4079	\$95,782	\$698	(\$95,085)	0.01
RIM	-	\$96,427	\$698	(\$95,730)	0.01
PCT	-	\$5,773	\$62,443	\$56,670	10.82
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000158416
Discounted Participant Payback (years)					N/A

Table B-19. 2021 California Motors Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.074	\$594,965	\$789,576	\$194,612	1.33
TRC	\$0.074	\$594,965	\$717,797	\$122,832	1.21
UCT	\$0.055	\$441,522	\$717,797	\$276,275	1.63
RIM	-	\$2,023,516	\$717,797	(\$1,305,719)	0.35
PCT	-	\$574,717	\$1,830,854	\$1,256,136	3.19
Lifecycle Revenue Impacts (\$/kWh)					\$0.000426016
Discounted Participant Payback (years)					2.42

Refrigeration

As shown in Table B-20, the refrigeration measure stratum proved cost-effective according to all test perspectives except the RIM test in 2020.

Table B-20. 2020 California Refrigeration Cost-Effectiveness

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0456	\$6,994	\$17,479	\$10,484	2.50
TRC	\$0.0456	\$6,994	\$15,890	\$8,895	2.27
UCT	\$0.0404	\$6,203	\$15,890	\$9,687	2.56
RIM	-	\$28,624	\$15,890	(\$12,734)	0.56
PCT	-	\$5,698	\$35,227	\$29,529	6.18
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000011229
Discounted Participant Payback (years)					1.26