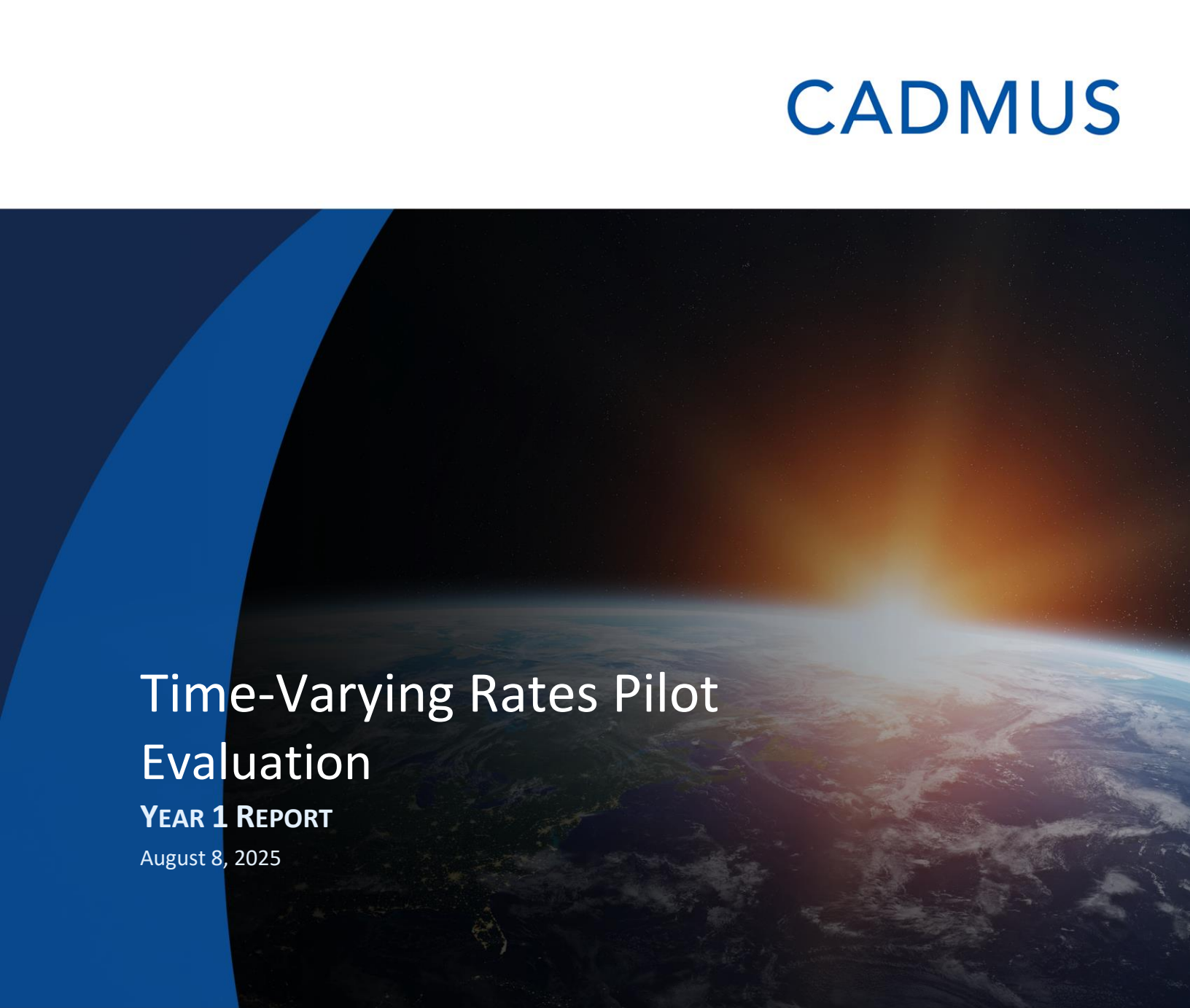




Time-Varying Rates Pilot Evaluation

YEAR 1 REPORT

August 8, 2025

Prepared for:

Puget Sound Energy

355 110th Ave NE

Bellevue, WA 98004



Prepared by:
David Ladd
Amalia Hicks
Zachary Horvath
Grant Jacobsen
Shantan Krovvidi
Liz Ross

Table of Contents

1. Executive Summary 1

 1.1. Residential TVR Pilot Evaluation 1

 1.2. Commercial TVR Pilot Evaluation..... 5

 1.3. Conclusions and Recommendations 8

2. Introduction 13

 2.1. Program Description 13

 2.2. Treatments Tested 13

 2.3. Research Objectives 16

 2.4. Time-of-Use Impact Evaluation Approach 16

 2.5. Billing Analysis Approach 18

 2.6. Process Evaluation Approach..... 19

3. Residential Evaluation 21

 3.1. Impact Evaluation 21

 3.2. Process Evaluation 33

4. Commercial Evaluation 72

 4.1. Impact Evaluation 72

 4.2. Process Evaluation 80

Appendix A. Data Collection Instruments and Response A-1

Appendix B. Evaluation Modeling B-1

Appendix C. Non-Participant Matching C-1

Tables

Table 1. TVR Treatment Groups.....	1
Table 2. Residential TVR Demand Reduction (Percentage) Summary Table - Winter.....	2
Table 3. Residential TVR Demand Reduction (Percentage) Summary Table - Summer	2
Table 4. Residential TVR Annual Billing Analysis, PTR Bill Credits, and Energy Savings Summary Table.....	4
Table 5. Commercial TVR Demand Reduction (Percentage) Summary Table - Winter	6
Table 6. Commercial TVR Demand Reduction (Percentage) Summary Table – Summer	6
Table 7. Commercial TOU Billing Analysis, PTR Bill Credits, and Energy Savings Summary Table.....	7
Table 8. TOU Schedule: Year 1 Summer and Winter Rates*	15
Table 9. Peak Energy Price Ratios by Rate	15
Table 10. Evaluation Objectives and Activities	16
Table 11. Residential TOU Demand and Energy Savings (kWh).....	24
Table 12. Residential <i>Ex Ante</i> Bill Impacts	29
Table 13. Residential <i>Ex Ante</i> Analysis Percentage of Structural Losers and Winners	30
Table 14. Residential <i>Ex Post</i> Billing Impacts	31
Table 15. Residential <i>Ex Post</i> Analysis TVR Comparison	31
Table 16. Residential Shadow Billing Impacts	32
Table 17. Residential Shadow Billing Analysis TVR Comparison	32
Table 18. TVR Pilot Treatment Groups	33
Table 19. Bill Protection Annual Credits Summary	63
Table 20. Usage and Energy Charges for Income Eligible BDR Participants with and without Bill Protection	64
Table 21. Commercial TOU Demand and Energy Savings (kWh)	74
Table 22. Commercial <i>Ex Ante</i> Bill Impacts	78
Table 23. Commercial <i>Ex Ante</i> Analysis Structural Losers and Winners	78
Table 24 Commercial <i>Ex Post</i> Billing Impacts.....	79
Table 25. Commercial <i>Ex Post</i> Analysis TVR Comparison	79
Table 26 Commercial Shadow Billing Impacts	79
Table 27. Commercial Shadow Billing Analysis TVR Comparison	79
Table 28. Response Rates for Surveys Distributed by Cadmus.....	A-1

Figures

Figure 1. Residential Winter Average Demand Reduction (kW) TOU Results	22
Figure 2. Residential Summer Average Demand Reduction (kW) TOU Results.....	23
Figure 3. Residential Winter Average Demand Reduction (%) TOU Results.....	23
Figure 4. Residential Summer Average Demand Reduction (%) TOU Results	24
Figure 5. Residential Average PTR Demand Savings by Rate and Season (kW).....	25
Figure 6. Residential Average PTR Demand Savings by Rate and Season (Percentage).....	26
Figure 7. Residential Average PTR Savings (kW) by Rate and Event – Winter Year 1.....	27
Figure 8. Residential Average Percentage PTR Savings by Rate and Event – Winter Year 1	27
Figure 9. Residential Average PTR Savings (kW) by Rate and Event – Summer Year 1	28
Figure 10. Residential Average Percentage PTR Savings by Rate and Event – Summer Year 1.....	28
Figure 11. TVR Pilot Participant Housing Type by Treatment.....	34
Figure 12. TVR Pilot Participant Home Ownership by Treatment	34
Figure 13. TVR Pilot Participant Household Cooling and Heating.....	35
Figure 14. TVR Pilot Participant Household Smart Thermostats and EV Charging	36
Figure 15. Enrollment Survey: Sources of Program Awareness.....	36
Figure 16. Non-Enrollment Survey: Sources of Program Awareness.....	37
Figure 17. Enrollment Survey: Reasons for Interest in Program	38
Figure 18. Exit Survey: Reasons for Interest in Program.....	38
Figure 19. Exit Survey: Top Five Reasons for Disenrolling	39
Figure 20. Non-Enrollment Survey: Top Five Reasons for Not Enrolling	40
Figure 21. Enrollment Survey: Ease of Understanding the Rate Advisor Tool.....	41
Figure 22. Enrollment Survey: Rate Advisor Tool Influence on Program Enrollment.....	41
Figure 23. Enrollment Survey: Rate Advisor Tool Overall Experience	42
Figure 24. Non-Enrollment Survey: Ease of Understanding the Rate Advisor Tool.....	43
Figure 25. Non-Enrollment Survey: Rate Advisor Tool Influence on Program Enrollment.....	43
Figure 26. Non-Enrollment Survey: Rate Advisor Tool Overall Experience	44
Figure 27. Participant Attitudes about Energy Use at Enrollment.....	45
Figure 28. Non-Enrollment Participant Attitudes About Energy Use	46
Figure 29. Motivations for Reducing or Shifting Electricity Use on TOU Rates	47
Figure 30. Awareness of Peak Periods	48

Figure 31. Viewing Usage History and Visiting pse.com/lower	49
Figure 32. Ratings for Information in Emails from PSE	50
Figure 33. Participant Suggestions for Improving Emails from PSE	51
Figure 34. Actions Taken to Reduce Electricity Use during Peak Periods, by Rate and Season	53
Figure 35. Actions Taken to Reduce Electricity Use during Peak Periods, by Income and Season.....	54
Figure 36. Smart Devices Used to Shift Usage from Peak Periods.....	55
Figure 37. Reasons for Difficulty Shifting Electricity Use on TOU Rates	56
Figure 38. Reasons for Not Shifting Electricity Use on TOU Rates.....	57
Figure 39. Average Ratings for PTR Event Notifications	58
Figure 40. Actions Taken to Shift Electricity Use During PTR Events	59
Figure 41. Reasons it was Difficult to Shift Electricity Use During PTR Events	60
Figure 42. Reasons for Not Shifting Electricity Use During PTR Events	61
Figure 43. Housing Types for BDR Smart Thermostat Offer	62
Figure 44. Participant Satisfaction for BDR Participants with Bill Protection and Without.....	65
Figure 45. Overall Satisfaction with the TVR Pilot	66
Figure 46. Satisfaction with Bill Savings since Enrolling in TOU Rates	70
Figure 47. Were PTR Rebates Worth the Effort.....	71
Figure 48. Commercial Winter Average Demand Reduction (kW) TOU Results.....	72
Figure 49. Commercial Winter Average Demand Reduction (%) TOU Results	73
Figure 50. Commercial Summer Average Demand Reduction (kW) TOU Results	73
Figure 51. Commercial Summer Average Demand Reduction (%) TOU Results.....	74
Figure 52. Commercial Average PTR Demand Savings by Season (kW).....	75
Figure 53. Commercial Average PTR Demand Savings by Season (Percentage).....	75
Figure 54. Commercial Average PTR Savings (kW) by Rate and Event – Winter Year 1	76
Figure 55. Commercial Average Percentage PTR Savings by Rate and Event – Winter Year 1.....	76
Figure 56. Commercial Average PTR Savings (kW) by Rate and Event – Summer Year 1.....	77
Figure 57. Commercial Average Percentage PTR Savings by Rate and Event – Summer Year 1	77
Figure 58. Pilot Participant Business Types.....	81
Figure 59. Non-Enrollment Business Types	82
Figure 60. Pilot Participant Organization Business Hours Overlapping with Peak Periods	83
Figure 61. Non-Enrollment Organization Business Hours Overlapping with Peak Periods	84
Figure 62. Participant Motivation to Enroll in the TVR Pilot.....	85

Figure 63. Exit Survey Motivations for Enrolling in the TVR Pilot	86
Figure 64. Exit Survey: Top Five Reasons for Leaving the Program	86
Figure 65. Non-Enrollment Survey: Top Five Reasons for Not Enrolling	87
Figure 66. Participant Attitudes about Energy Use at Enrollment.....	87
Figure 67. Respondent Attitudes about Energy Use among Customers who Did Not Enroll in the Pilot ..	88
Figure 68. Motivations for Reducing or Shifting Electricity Use on TOU Rates	89
Figure 69. Awareness of Peak Periods	90
Figure 70. Viewing Usage History and Visiting pse.com/lower	91
Figure 71. Participant Suggestions for Improving Emails from PSE	92
Figure 72. Actions Taken to Reduce Electricity Use during Peak Periods by Season.....	94
Figure 73. Smart Devices Used to Shift Usage from Peak Periods.....	95
Figure 74. Reasons for Difficulty Shifting Electricity Use on TOU Rates	96
Figure 75. Reasons for Not Shifting Electricity Use on TOU Rates.....	97
Figure 76. Average Ratings for PTR Event Notifications	98
Figure 77. Actions Taken to Shift Electricity Use During PTR Events	99
Figure 78. Reasons it was Difficult to Shift Electricity Use During PTR Events	100
Figure 79. Reasons for Not Shifting Electricity Use During PTR Events	101
Figure 80. Satisfaction Ratings for the TVR Pilot.....	102
Figure 81. Were PTR Rebates Worth the Effort.....	104
Figure 82. Matching for Schedule 307 Income Ineligible Customers	C-1
Figure 83. Matching for Schedule 307 Income Eligible Customers	C-2
Figure 84. Matching for Schedule 317 Income Ineligible Customers	C-2
Figure 85. Matching for Schedule 317 Income Eligible Customers	C-3
Figure 86. Matching for Schedule 327 EV Owning Customers	C-3
Figure 87. Matching for Schedule 327 non-EV Owning Customers.....	C-4
Figure 88. Matching for Schedule 324 Customers.....	C-4

Acronyms

Abbreviation	Definition
BDR	Bill Discount Rate
EV	Electric vehicle
HVAC	Heating Ventilation and Air Conditioning
HWA	Home Weatherization Assistance
kW	Kilowatt
kWh	Kilowatt-hour
OLS	Ordinary least squares
PSE	Puget Sound Energy
PTR	Peak time rebate
SMB	Small and medium businesses
TOU	Time-of-Use
TVR	Time varying rates

1. Executive Summary

Puget Sound Energy’s (PSE) Time Varying Rates (TVR) pilot program is designed to reduce demand (kW) during peak periods by offering participants electric rates that differ by time of day (Time-of-Use rates, or TOU), thereby providing incentives for them to use less energy during more expensive peak periods. Residential participants’ TOU rates took effect upon each participant’s first billing cycle on or after October 1, 2023, and the first year of their participation ended with their twelfth billing cycle on or after September 30, 2024. PSE also recruited small and medium business (SMB) customers for the TVR pilot. TOU rates for SMB customers also took effect upon the first bill cycle following enrollment; however, most SMB participants enrolled in December 2023 and January 2024, later than residential participants. Residential pilot participants were assigned to five treatment groups depending on their income status and chosen rate plan (Schedule 307, 317, or 327). The sixth treatment group (Schedule 324) comprised the SMB customers. The treatment groups are summarized in Table 1.

Table 1. TVR Treatment Groups

Treatment Group	Customer Type	TVR Treatments	Participant Count at End of Year 1
Schedule 307 income eligible	Residential (income eligible)	TOU	998
Schedule 307 income ineligible	Residential (income ineligible)	TOU	1,232
Schedule 317 income eligible	Residential (income eligible)	TOU with PTR events	1,645
Schedule 317 income ineligible	Residential (income ineligible)	TOU with PTR events	1,694
Schedule 327	Residential (no income criteria)	TOU with super off-peak rate	803
Schedule 324	Commercial (SMBs)	TOU with PTR events	1,035

Cadmus was contracted to conduct an impact and process evaluation of the TVR program. This evaluation included an impact evaluation using AMI and billing data, regular meetings with PSE program staff, and surveys with pilot participants and non-participants. Cadmus also conducted a billing analysis of the TVR program. This analysis included a billing data review and a comparison of bills for customers on TOU rates with hypothetical bills using standard PSE rates.

This report presents key findings from Cadmus’ impact, process, and billing evaluation.

1.1. Residential TVR Pilot Evaluation

1.1.1. Impact Evaluation Results: Energy Impacts

Participants on all TOU residential rates achieved significant demand reduction during rate-specific on-peak periods across both the summer and winter periods. Schedule 327 achieved the highest on-peak reduction in both seasons (21.6% in the winter and 21.4% in the summer), corresponding to large increases in super off-peak usage (44.8% in winter and 37.9% in summer). Customers on Schedules 307 and 317 had reductions of on-peak demand ranging from 5% to 11% depending on season, rate, and income category. Percentage reductions were comparable across seasons for all but Schedule 317

income ineligible participants, who reduced their on-peak usage by 5.0% in winter and 10.5% in summer.

For customers on schedule 317, Peak-Time-Rebates (PTR) did not statistically impact energy usage during summer events relative to the reduction they had already achieved through their TOU rates. However, during winter PTR events there was a statistically significant reduction in on-peak usage incremental to the TOU effect, with PTR impacts ranging from 4.0% to 6.5% by income group.

Table 2 and Table 3 provide a summary of residential TVR demand reduction results for participants on the Schedule 307, 317, and 327 rates in the summer and winter periods. Participants on Schedules 307 and 317 were assigned to income eligible and income ineligible groups, while Schedule 327 was evaluated as one treatment group.

Table 2. Residential TVR Demand Reduction (Percentage) Summary Table - Winter

Treatment	TOU Impact (kW)					PTR Impact During Events (kW)
	Weekday			Weekend		
	On-Peak	Off-Peak	Super Off-Peak	Off-Peak	Super Off-Peak	
RES 307 Income Ineligible	9.8% *	-1.8%	N/A	0.4%	N/A	N/A
RES 307 Income Eligible	9.4% *	0.5%	N/A	2.0% *	N/A	N/A
RES 317 Income Ineligible	8.8% *	0.7%	N/A	2.1% *	N/A	4.0% *
RES 317 Income Eligible	5.0% *	0.3%	N/A	1.0%	N/A	6.5% *
RES 327	21.6% *	13.3% *	-44.8% *	13.9% *	-31.8% *	N/A

* statistically significant at $p < .10$

Table 3. Residential TVR Demand Reduction (Percentage) Summary Table - Summer

Treatment	TOU Impact (kW)					PTR Impact During Events (kW)
	Weekday			Weekend		
	On-Peak	Off-Peak	Super Off-Peak	Off- Peak	Super Off-Peak	
RES 307 Income Ineligible	10.1% *	-1.3%	N/A	-0.3%	N/A	N/A
RES 307 Income Eligible	8.8% *	1.1%	N/A	1.3%	N/A	N/A
RES 317 Income Ineligible	11.0% *	3.2% *	N/A	3.9% *	N/A	1.1%
RES 317 Income Eligible	10.5% *	3.9% *	N/A	4.1% *	N/A	-1.0%
RES 327	21.4% *	15.9% *	-37.9% *	15.0% *	-32.1% *	N/A

* statistically significant at $p < .10$

1.1.2. Impact Evaluation Results: Billing Impacts

Cadmus performed a suite of billing analyses to examine the effect of TVR on residential customer bills. Based on the analyses, if participants did not change their behavior (i.e., based on their pre-period

usage) most customers on Schedule 307 and 317 would pay more on TOU rates than the standard residential rates (i.e., they were “structural losers” in the *ex ante* analysis). However, most Schedule 327 customers would be structural winners (pay less on TOU without changing behavior). In the *ex post* and shadow bill analyses which are based on actual behavior during Year 1 of the pilot, TOU rates created a nearly even mix of winners and losers under most scenarios, though on average TOU tends to save money for residential customers. The similarity between *ex post* and shadow bill results also indicates that the modeled estimation of participant behavior compared to control groups (*ex post*) predicted their actual usage in Year 1 (shadow bill) with reasonable accuracy.

Income eligible participants saved fewer dollars relative to ineligible participants with the same rate schedule, which corresponds to income eligible customers using less electricity and having lower bills compared to ineligible: in addition to income eligible having less usage to shift, ineligible customers used more energy so would pay higher per-kWh energy charges on standard rates, thus are able to save more per kWh by reducing on-peak under TOU. Participants on Schedule 327 saved substantially more money than other residential TOU participants because many of these customers shifted EV charging to the super off-peak rate, and they also had the highest usage and bills of any of the rate groups (e.g., had the most usage to reduce and would pay the highest average per-kWh energy charges on standard rates).

As shown in Table 4, participants on Schedule 317 received an average of about \$4 in total annual bill credits for additional usage reductions during PTR events. Participants on all residential TOU rates also reduced their total energy usage over the year, ranging from 93 kWh for Schedule 307 income ineligible customers to 388 kWh for Schedule 327 customers. This reduction in annual energy used also reduced pilot participants’ bills relative to those of the control group that remained on standard residential rates. Overall, the analyses indicate that every residential group saved money on average, but the impact on customer bills was not large except for Schedule 327 participants.

Table 4. Residential TVR Annual Billing Analysis, PTR Bill Credits, and Energy Savings Summary Table

Treatment	Ex Ante Billing Analysis: Structural Losers ^a	Ex Ante Billing Analysis: Average Difference ^b	Ex Post Billing Analysis: Average Difference ^c	Shadow Bill Analysis: Average Difference ^d	Year 1 Total PTR Bill Credits	Year 1 Annual Energy Savings (kWh) ^e
RES 307 Income Ineligible	68%	-\$5.08	\$89.34	\$61.24	N/A	93
RES 307 Income Eligible	64%	-\$17.02	\$27.88	\$32.14	N/A	264
RES 317 Income Ineligible	77%	-\$15.78	\$43.80	\$26.24	\$3.89	219
RES 317 Income Eligible	76%	-\$17.50	\$3.04	\$6.95	\$4.33	249
RES 327	41%	\$47.55	\$286.73	\$224.65	N/A	388

^a A structural loser would pay more on TOU rates if they do not change their behavior, based on their usage before the pilot period. All customers who are not losers are winners (i.e., they would pay less on TOU rates without changing behavior).

^b Negative values indicate how much more customers would pay on TOU rates if they did not change behavior, and positive rates show how much less they would pay.

^c Positive values indicate how much less participants paid on TOU rates, based on modeled behavior in Year 1 compared to a control group (accounts for behavior changes and seasonal weather differences).

^d Positive values indicate how much less participants paid on TOU rates, compared to what they would have paid for their actual Year 1 usage if they had been on standard rates (accounts for behavior changes).

^e Positive values indicate how much less total electricity participants used on TVR compared to the control group.

1.1.3. Process Evaluation

Customer uptake for residential TVR offerings was substantial enough that PSE was able to recruit more than the targeted minimum number of pilot participants for all residential rate offerings without difficulty, primarily through an email and printed mail marketing campaign. Enrollees said they found the Rate Advisor tool to be useful and that it influenced them to join the pilot, while two-thirds of non-enrollees did not recall Rate Advisor. Non-enrollees who recalled Rate Advisor agreed that it was easy to understand but also said that it influenced them to *not* join the pilot program. Almost all enrollees reported that saving money on their energy bill was a motivation for joining the pilot, and the most common reason given by customers who unenrolled from the pilot was that TVR was not saving them money on their bills.

Following enrollment, a large majority of pilot participants reported in surveys that they were aware of TOU peak periods and recalled communications from PSE about their energy usage, including PTR event notifications for the treatment groups that experienced events. Most pilot participants reported both taking action to reduce energy usage during, and/or shift usage away from, peak periods when their electricity rates were higher and if applicable making additional efforts on days when PTR events were called. For all rate and income groups, the most common actions reduced or shifted were doing laundry, dishwashing, bathing, lighting, and using appliances each mentioned by roughly half or more of respondents taking actions. Most participants on Schedule 327 charge EVs at home (83%), and most of

them reported shifting their EV charging away from peak hours (Schedule 307 and 317 participants also shifted EV charging, though at much lower rates because fewer Schedule 307 and 317 participants had home EV chargers.)

The most common difficulty participants reported in shifting or reducing energy usage during peak periods was making changes to household habits and routines. Concern about home temperature comfort was the second most common issue in winter, although only half as many participants mentioned home temperatures as an issue in the summer. Among participants who did not shift or reduce energy usage during peak periods, the most common reasons offered were that their household usage was already low and they did not know what else they could do to reduce energy usage during peaks, followed by concerns about comfort due to home temperature (in both seasons). These challenges were similar for TOU peak periods and PTR events, which coincide with TOU peak periods.

Participant satisfaction with the TVR pilot overall was moderate in the first year of the pilot but rose significantly from an average satisfaction rating of 6.4 following the winter season to 7.2 following the summer season (on a 10-point scale where 10 is *outstanding*). Participants' average ratings for satisfaction with the bill savings they achieved under the pilot also rose significantly from a modest 5.5 following the winter season to 6.4 following the summer season. Income eligible participants on Schedules 307 and 317 consistently gave average satisfaction ratings that were from 0.5 to 1.1 rating points higher than income ineligible participants, for both ratings in both seasonal surveys. The percentage of Schedule 317 participants who said that their efforts to earn PTR bill credits was worth the effort also rose from the first winter (20%) to summer (37%), though most Schedule 317 participants said they were not worth the effort, or they were not sure if they were worth the effort.

As part of the pilot, PSE offered smart thermostat and/or bill protection offerings to half the income eligible pilot participants: Following two rounds of delivering free smart thermostats to participants, only 10% of survey respondents reported installing these thermostats. Among more than 300 pilot participants who received bill protection, only 11% had annual charges that reached the threshold for a bill credit, and the average amount for participants who received a credit was \$19. Schedule 307 participants with bill protection saved less money on their bills compared to participants on the same rate without bill protection, though participants on Schedule 317 and 327 rates saved similar amounts with or without bill protection.

1.2. Commercial TVR Pilot Evaluation

1.2.1. Impact Evaluation: Energy Impacts

Non-residential TVR participants on Schedule 324 achieved significant demand reduction only during the summer on-peak period (3.7%). During the winter, on-peak reductions were not statistically significant, but off-peak increases in energy usage were statistically significant (3.8%). Peak-Time-Rebate (PTR) events did not produce demand reduction in either season. In fact, estimates indicate that participants increased demand by a statistically significant 4.7% kW during PTR event days in the winter.

Table 5 and Table 6 provide a summary of non-residential TVR demand reduction results for participants on the Schedule 324 rate in the summer and winter periods.

Table 5. Commercial TVR Demand Reduction (Percentage) Summary Table - Winter

Treatment	TOU Impact (kW)			PTR Impact During Events (kW)
	Weekday		Weekend	
	On-Peak	Off-Peak	Off-Peak	
COMM 324	-1.4%	-3.8% *	-3.2%	-4.7% *

* statistically significant at $p < .10$

Table 6. Commercial TVR Demand Reduction (Percentage) Summary Table – Summer

Treatment	TOU Impact (kW)			PTR Impact During Events (kW)
	Weekday		Weekend	
	On-Peak	Off-Peak	Off-Peak	
COMM 324	3.7% *	0.9%	2.3%	-2.9%

* statistically significant at $p < .10$

1.2.2. Impact Evaluation: Billing Impacts

Cadmus performed a suite of billing analyses to examine the effect of TVR on commercial customer bills. Based on the analyses, if participants did not change their behavior (i.e., based on their pre-period usage) most customers on Schedule 324 would pay less with TOU rates than with the standard commercial rates (i.e., they were “structural winners” in the *ex ante* analysis). The results of the *ex post* analysis, which compares actual bills to an estimate of what bills would have been under standard rates based on predicted Year 1 usage from a statistical model, indicate that participants saved \$43 over the first year of the pilot. The shadow bill analysis, which is based on actual Year 1 usage and compares how bills would have differed had participants remained on standard rates but changed their behavior, indicates that TOU rates led to a \$4 increase for Year 1. The discrepancy between *ex post* and shadow bill results indicates that these customers’ actual usage differed from the usage the *ex post* model predicted.

As shown in Table 7, participants on Schedule 324 received an average of about \$4 in total annual PTR bill credits for Year 1. Unlike residential customers who used fewer kilowatt-hours after joining the pilot, commercial participants increased their consumption by an average of 69 kWh during Year 1. Collectively, the analyses indicate that the average impact of TVR on these customers’ bills was small.

Table 7. Commercial TOU Billing Analysis, PTR Bill Credits, and Energy Savings Summary Table

Treatment	Ex Ante Billing Analysis: Structural Losers ^a	Ex Ante Billing Analysis: Average Difference ^b	Ex Post Billing Analysis: Average Difference ^c	Shadow Bill Analysis: Average Difference ^d	Y1 Total PTR Bill Credits	Y1 Annual Energy Savings (kWh) ^e
COMM 324	25%	\$153.94	\$42.91	-\$3.88	\$4.25	-69

^a A structural loser would pay more on TOU rates if they do not change their behavior, based on their usage before the pilot period. All customers who are not losers are winners (i.e., they would pay less on TOU rates without changing behavior).

^b Negative values indicate how much more customers would pay on TOU rates if they did not change behavior, and positive rates show how much less they would pay.

^c Positive values indicate how much less participants paid on TOU rates, based on modeled behavior in Year 1 compared to a control group (accounts for behavior changes and seasonal weather differences).

^d Positive values indicate how much less participants paid on TOU rates, compared to what they would have paid for their actual Year 1 usage if they had been on standard rates (accounts for behavior changes).

^e Positive values indicate how much less total electricity participants used on TVR compared to the control group.

1.2.3. Process Evaluation

Compared to residential pilot participants, SMBs were less engaged with TVR. Despite multiple rounds of email and print mail recruiting, the number of businesses that joined the pilot was about half of the minimum targeted. The response rate for the experience surveys Cadmus fielded fell by almost half between the winter and summer surveys, which was another sign of low engagement from this group of customers.

Only 75% of businesses that enrolled reported being open during part of the morning peak period (winter TOU and PTR only) and 47% said they were open during part of the evening peak period (TOU in both seasons and PTR only in summer). Participating businesses were open during an average of 34% of the total peak hours during the year (43% of morning peak hours and 25% of evening peak hours). When participants who gave low ratings for their satisfaction with the pilot were asked to explain the ratings, many respondents mentioned that they were unable to reduce usage during peaks because they were not open at those times.

Among participating businesses, only about half could correctly identify when TOU peak periods were occurring, and only about 60% said they took action to reduce or shift usage during peak periods after the correct period was identified to them. Only about half of participants responded to winter and summer PTR events, though most recalled receiving event notifications (68% in the winter survey, and 81% in the summer survey). The most common actions respondents reported taking during TOU peaks and PTR events were reducing equipment use and lighting. Participants reported reducing heating in the winter (63%) but were less likely to adjust cooling in the summer (42%). Participants who said reducing usage during peak periods was difficult mostly explained that they had equipment that needed to stay on all the time, which was also the top reason given by businesses that did not try to reduce their usage during peak periods.

Business participants in the TVR pilot were evenly divided between those who were satisfied and not satisfied with their experience with the pilot: overall satisfaction was 5.5 on a 10-point scale (where 10 is *outstanding*) in a survey following their first winter with TVR rates, and 5.4 in another survey after the

subsequent summer. Satisfaction with bill savings were even lower, at 4.7 in the winter survey and 4.6 in the summer survey. When asked if their bill savings was worth their effort in response to PTR events, only 19% agreed it was in the winter survey and 33% agreed in the summer survey, with the rest of respondents saying it was not worth it, or they could not tell.

1.3. Conclusions and Recommendations

CONCLUSION 1 : Participants on all residential TOU rates reduced their demand during on-peak periods in both seasons.

All residential treatment groups produced statistically significant demand reduction during peak periods in both seasons. During the Year 1 winter season, on-peak demand reduction attributed to TOU ranged from 0.06 kW to 0.42 kW (5% to 21.6%) per participant. During the Year 1 summer season, on-peak demand reduction ranged from 0.11 kW to 0.33 kW (8.8% to 21.4%). Percentage on-peak reductions were higher for Schedule 327 participants (three-tiered TOU rates) than for Schedules 307 and 317 (two-tiered). Schedules 307 and 317 percentage reductions attributed to TOU were similar across seasons, rates, and income groups, except for a 5% reduction for the Schedule 317 income eligible group in winter.

RECOMMENDATION 1

Cadmus recommends that PSE offer TOU rate options to residential customers and continue to gather data to evaluate and refine program processes and lay the groundwork for expanding the reach of residential TOU offerings in the post-pilot phase.

CONCLUSION 2 : Participants on the Schedule 327 three-period TOU rate, which targeted electric vehicle (EV) owners, achieved the highest per-participant demand reduction among all residential TOU rates during weekday on-peak (and evening off-peak) periods, successfully shifting participants' demand to the lowest priced, overnight off-peak periods.

Schedule 327 participants reduced on-peak energy usage by 21.6% in winter and 21.4% in summer. These participants also significantly reduced their demand during weekday and weekend off-peak periods in both seasons, though this was an unintended consequence rather than a goal of the rate design. As expected, these participants shifted demand from those periods to the lowest priced, overnight super off-peak period, during which they increased demand substantially across both seasons (44.8% in winter and 37.9% in summer.)

Schedule 327 is the only TVR rate that includes a third, overnight, super off-peak period. Upon enrollment in the pilot, 83% of participants on the Schedule 327 rate charged EVs at home, which facilitated substantial load shifting through overnight charging as confirmed in the winter and summer experience surveys. These substantial shifts in demand indicate that EV owners have a greater ability than the average household to shift their demand patterns.

RECOMMENDATION 2

Cadmus recommends that PSE offer a three-period TOU rate and market this rate to households that own EVs. PSE should also explore opportunities to stack incentives for these customers (e.g., combine a three-period TOU with smart charger rebates).

CONCLUSION 3: Non-residential participants on TOU rates were not effective at reducing demand. Business participants were less engaged than residential participants, appeared to have little peak usage that could be shifted, and many were not satisfied with their pilot experience.

Non-residential participants on the Schedule 324 rate did not achieve statistically significant demand reduction on average in any TOU period for either season but did increase their consumption by a statistically significant 3.8% during the winter weekday off-peak period. Likewise, PTR events for these participants yielded no significant demand reduction in the summer; in fact, they produced a statistically significant *increase* in demand during winter events. The winter and summer experience surveys indicated that only half of participating businesses took action to reduce usage during peak periods, and only about half could correctly identify when peak periods occurred. Most participating businesses were not open at 7 a.m. or 8 p.m., the earliest and latest peak hours. Across the entire year, participant businesses were open during only about a third of all peak period hours (43% of morning peak hours and 25% of evening peak hours). Cadmus conducted a billing analysis that assessed the extent to which non-residential TVR participants structurally benefit from TOU rates and found that most non-residential customers are “structural winners” who would save money with TOU rates even without reducing their usage during peak periods. These structural benefits could partly explain Schedule 324 participants’ lack of significant on-peak demand reduction, especially in the winter months, when weekdays from 10 a.m. to 5 p.m. are off-peak periods. Before enrolling in TVR, the average non-residential participant’s daily load shape peaked in the middle of the day.

Non-residential participants indicated a lack of engagement with TVR in other ways: uptake of PSE’s enrollment offers fell short of expectations, and the pilot was able to recruit only half of the targeted number of participants; the response rate to survey invitations fell by nearly half from winter to summer; and satisfaction ratings for these participants were lower than those for residential participants and did not improve from winter (5.5) to summer (5.4), with even lower ratings for satisfaction with bill savings.

RECOMMENDATION 3

Further refinement is needed to create commercial rate plans that have a positive impact on behavior, savings, and experience for non-residential customers. Cadmus recommends suspending non-residential TVR and transitioning these customers to other commercial rate plans. Unless and until a revised TVR program is designed, PSE should incentivize these customers to reduce their demand during peak periods through existing commercial demand response programs.

To maximize effectiveness of TVR for non-residential customers, PSE should identify the types of businesses that are most suited for TVR and target these businesses for future offerings. A key consideration should be focusing on businesses that operate during peak periods and have the capacity to reduce usage during those periods.

CONCLUSION 4: PTR events produced significant on-peak demand reduction during the winter for participants on Schedule 317. Summer PTR events for participants on Schedule 317 did not result in significant demand reduction.

Cadmus found that during the winter season, residential income eligible participants on Schedule 317 consumed about 6.5% less energy relative to their baseline consumption (that is, relative to what their consumption would have been while on a TOU rate, had an event not been called), while income ineligible customers reduced consumption by 4.0%. However, none of the summer PTR events produced statistically significant demand reductions. A potential explanation for modest and inconsistently significant PTR effects is that participants had already changed their energy consumption behavior substantially in response to the TOU rates, thereby making it more challenging to achieve additional demand reduction during events. Though more than 90% of Schedule 317 participants earned PTR bill credits in each season, the total average annual PTR credit received was only about \$4 per household for 10 events during the year (an average credit of \$0.43 per PTR event).

RECOMMENDATION 4

PSE may be able to achieve equivalent or better behavioral demand response impacts through offerings other than PTR events. Additional evaluation research is underway to determine if demand response offerings under PSE's Flex program deliver equivalent or superior impacts compared to PTR events. If Flex offerings for TOU customers deliver similar benefits as PTR events, then PSE should consider sunsetting their PTR offering in favor of streamlining its demand response options, concentrating on those that are the most efficient to deliver and administer. Sunsetting PTR offerings would also avoid interoperability conflicts between demand response offerings and reduce customer confusion, as customers participating in Schedule 317 with PTR are currently unable to concurrently participate in Flex programs.

CONCLUSION 5 : Smart thermostats are beneficial for reducing usage during peak periods, and their market penetration is lower among income eligible households. However, few income eligible participants who received free smart thermostats by mail were able to install and use them.

Smart thermostats were the most leveraged smart technology that participants on 307 and 317 rates used to reduce usage during peak periods, but only a third of income eligible households had a smart thermostat at the time of enrollment compared to just over half of income ineligible households. After PSE mailed free smart thermostats to selected participants with compatible electric HVAC systems, only 10% of surveyed recipients confirmed the installation of the smart thermostat they received. Most of these customers reported that they did not know how to install the smart thermostat (despite indicating on the enrollment survey they would be comfortable self-installing), had tried but failed to complete their installation, or had not installed the thermostat because they believed it was not compatible with existing HVAC systems (despite self-reporting eligible HVAC system types). For participants who rent their homes, getting permission from property owners to install thermostats may have been a barrier, in that very few thermostat recipients who lived in multifamily housing (75% of whom were renters) responded to the winter or summer surveys.

RECOMMENDATION 5

PSE already has effective programs for delivering smart technology to income eligible customers, such as point-of-sale smart thermostat rebates, Efficiency Boost rebates, Multifamily Retrofit (direct install delivered through property managers), and the Weatherization Assistance Program (or WAP, also known as Low Income Weatherization). Cadmus recommends that instead of mailing smart thermostats to customers, PSE explore ways to combine existing offerings with TVR such as stacking incentives. For example, a customer who purchases a smart thermostat could receive rebates along with invitations to join demand response and TVR programs for additional savings.

CONCLUSION 6 : The bill protection offering for Bill Discount Rate (BDR) customers did not have a significant effect on their bills.

Half of residential BDR customers were offered bill protection, which gave them a bill credit if they paid 10% more on TOU rates than what they would have paid on standard Schedule 7 rates. Only 11% of participants with bill protection earned a credit (averaging \$18 for the year), with 89% not having high enough bills under TOU to qualify for a credit. The shadow bill analysis showed that the difference in bill savings between participants with and without bill protection was less than \$4 per year for Schedules 317 and 327. For Schedule 307 participants, those without bill protection saved about \$25 more over the year than those with bill protection; however, this can partly be explained by Schedule 307 participants with bill protection using 6% less electricity over the year than those without bill protection. This difference was only 1% for Schedules 317 and 327; customers that use more energy pay a higher average rate per kilowatt-hour under standard residential rates, so reducing on-peak usage saves them more per kilowatt-hour. Participants with bill protection also provided lower satisfaction ratings than those without following their first winter with TVR; however, after the subsequent summer, satisfaction ratings were equivalent for participants with and without bill protection. At the end of Year 1, the

impact of bill protection on customer bills is inconclusive. According to the rate tariff, the bill protection offering will continue for both years of the TVR pilot program.

RECOMMENDATION 6

After analyzing and reviewing the results of bill protection in the second year of the pilot, PSE and the evaluation team should determine whether this offering is a beneficial component of TVR offerings based on the cost to administer relative to leveraging existing BDR program infrastructure to address any potential customer need.

2. Introduction

2.1. Program Description

This pilot program was designed to reduce demand (kW) during peak periods by offering participants electric rates that differ by time of day (Time-of-Use rates, or TOU), thereby providing incentives for them to use less electricity during more expensive peak periods. All six treatments included a higher rate during TOU peak periods, and participants in two treatments (Schedule 317 and Schedule 324) were also enrolled in a Peak Time Rebate offering (PTR), which provided additional incentives for reducing energy usage during peak periods on days when PSE calls a PTR event. One treatment group (Schedule 327) included a third super off-peak rate at night when electricity is even less expensive to encourage EV charging when system electric demand is at its lowest. Within the 307 (TOU only) and 317 (TOU with PTR) rate groups, participants were enrolled into income eligible and income ineligible treatment groups to analyze how these rates affect customers at different income levels. Although reducing participants' overall electric energy usage (kWh) was not a primary goal of this pilot program, the evaluation also examines overall electric savings for the six treatment groups.

A program year comprises two seasons with different rates and peak periods: for all rates except Schedule 327, the summer season has only one peak period in the late afternoon on weekdays (5 p.m. to 8 p.m.), and the winter season has the same late afternoon peak plus a weekday morning peak period (7 a.m. to 10 a.m.). The Schedule 327 rate differs in that it includes late afternoon and morning peak periods during both seasons. PTR events happen during the peak periods defined for TOU rates.

Residential participants' TOU rates took effect upon each participant's first billing cycle on or after October 1, 2023, and the first year of their participation ended with their twelfth billing cycle on or after September 30, 2024. The five residential treatment groups are summarized below in Table 8. The TOU-only (Schedule 307) and TOU-with-PTR (Schedule 317) treatments were further divided into income eligible and income ineligible treatment groups to estimate the effects for different income groups. PSE also recruited small and medium business (SMB) customers for the TVR pilot; their TOU rates also took effect upon their first bill cycle following enrollment; however, most SMB participants enrolled later than the residential participants in December 2023 and January 2024. Participants in the SMB group were also enrolled in the PTR offering.

2.2. Treatments Tested

The TVR Pilot Program tested four treatments, consisting of TOU and TOU-PTR hybrids. This section summarizes these four program designs and the four different treatments. There are six treatment groups in total because Schedule 307 and 317 participants were split into income eligible and income ineligible groups; however, the treatment (i.e., rate structure) was the same across the two income groups.

2.2.1. Time-of-Use Rates

The price of electricity for customers enrolled in a TOU treatment depended on when the electricity was consumed. TOU rates encourage customers to shift electricity consumption from periods when the utility's cost of supplying electricity is high to periods when the cost is low.

PSE tested four TOU rate schedules: Residential Schedule 307 (RES 307), Residential Schedule 317 (RES 317), Residential Schedule 327 (RES 327), and Commercial Schedule 324 (COMM 324). Table 8 shows TOU rate schedules for summer and winter seasons under the TVR Pilot.¹ RES 307, RES 317 and COMM 324 have the same off-peak and on-peak periods, with a higher price differential between the two periods for RES 307 than for RES 317. RES 307 has the lowest off-peak rate but also the highest on-peak rate (in both summer and winter). RES 327 includes an overnight super off-peak period, which offers the lowest energy rate among all the TOU rates, and also has morning and late afternoon peak periods during both seasons (the other rates do not include summer morning peaks). Otherwise, RES 327 has the same off-peak and on-peak periods with a similar ratio to RES 307. For comparison, during Year 1 of the TVR Pilot, the energy charge for PSE's standard, time-invariant residential rate (Schedule 7) was 8.9437¢/kWh for the first 600 kWh, and 10.8854¢/kWh for all kilowatt-hours over 600 within a billing period. The energy charge for PSE's standard, general service non-residential rate (Schedule 24) was 9.2537¢/kWh in winter and 8.9337¢/kWh in summer.²

All TOU rate schedules vary by season. During winter, each TOU rate includes morning and evening peak periods. During summer, the Schedule 307 and 317 rates include only an evening peak period while Schedule 327 still includes both peak periods.

¹ Summer TOU rates are in effect from April 1 to September 30. Winter TOU rates are in effect from October 1 to March 31. This evaluation estimated TOU pricing impacts by season, following these definitions.

² The quoted rates apply to the per-kilowatt-hour "Energy Charge" component of customer bills and do not include other fees, taxes, and credits, some of which are also applied on a per-kilowatt-hour basis.

Table 8. TOU Schedule: Year 1 Summer and Winter Rates*

Summer	RES 307	RES 317	RES 327	COMM 324
Super Off-peak			4.43¢/kWh	
			• 12 a.m.–7 a.m. • 11 p.m.–12 a.m.	
Off-peak	6.36¢/kWh	8.3¢/kWh	7.16¢/kWh	7.7¢/kWh
	• 12 a.m.–5 p.m. • 8 p.m.–12 a.m. • All day on weekends and holidays	• 12 a.m.–5 p.m. • 8 p.m.–12 a.m. • All day on weekends and holidays	• 10 a.m.–5 p.m. • 8 p.m.–11 p.m. • 7 a.m.–11 p.m. on weekends and holidays	• 12 a.m.–5 p.m. • 8 p.m.–12 a.m. • All day on weekends and holidays
On-peak ^a	19.69¢/kWh	15.91¢/kWh	15.95¢/kWh	15.57¢/kWh
	• 5 p.m.–8 p.m.	• 5 p.m.–8 p.m.	• 7 a.m.–10 a.m. • 5 p.m.–8 p.m.	• 5 p.m.–8 p.m.
Winter	RES 307	RES 317	RES 327	COMM 324
Super Off-peak			4.43¢/kWh	
			• 12 a.m.–7 a.m. • 11 p.m.–12 a.m.	
Off-peak	6.36¢/kWh	8.3¢/kWh	7.46¢/kWh	7.7¢/kWh
	• 12 a.m.–7 a.m. • 10 a.m.–5 p.m. • 8 p.m.–12 a.m. • All day on weekends and holidays	• 12 a.m.–7 a.m. • 10 a.m.–5 p.m. • 8 p.m.–12 a.m. • All day on weekends and holidays	• 10 a.m.–5 p.m. • 8 p.m.–11 p.m. • 7 a.m.–11 p.m. on weekends and holidays	• 12 a.m.–7 a.m. • 10 a.m.–5 p.m. • 8 p.m.–12 a.m. • All day on weekends and holidays
On-peak ^a	31.28¢/kWh	18.41¢/kWh	29.55¢/kWh	18.08¢/kWh
	• 7 a.m.–10 a.m. • 5 p.m.–8 p.m.	• 7 a.m.–10 a.m. • 5 p.m.–8 p.m.	• 7 a.m.–10 a.m. • 5 p.m.–8 p.m.	• 7 a.m.–10 a.m. • 5 p.m.–8 p.m.

* TOU rates in effect as of October 14, 2023. Note that these rates do not reflect the variable discounts available to income eligible customers who enroll in PSE's BDR.

^a On-peak rates do not apply on weekends and holidays.

In summer, the ratio of the peak energy price to the off-peak price was 3.1 for RES 307, 1.9 for RES 317, 2.2 for RES 327, and 2.0 for COMM 324, and the ratio of the peak energy price to the super off-peak price for RES 327 equaled 3.6. In winter, these ratios increased, as shown in Table 9, to 4.9 for RES 307, 2.2 for RES 317, 4.0 for RES 327, and 2.3 for COMM 324. The peak-to-super-off-peak ratio for RES 327 also increased to 6.7. A higher peak-to-off-peak price ratio should incentivize greater load shifting, all else equal.

Table 9. Peak Energy Price Ratios by Rate

Ratio	RES 307	RES 317	RES 327	COMM 324
Summer peak to off-peak	3.1	1.9	2.2	2.0
Summer peak to super off-peak	N/A	N/A	3.6	N/A
Winter peak to off-peak	4.9	2.2	4.0	2.3
Winter peak to super off-peak	N/A	N/A	6.7	N/A

2.2.2. Hybrid Time-of-Use with Peak Time Rebates

Customers in the Residential Schedule 317 and the Commercial Schedule 324 treatment groups received a combination of TOU and PTR treatments: Customers in these groups paid different prices for electricity, depending on the day of week and time of day, *and* became eligible to receive a rebate for reducing consumption below baseline levels during PTR events.

2.3. Research Objectives

Cadmus evaluated the TVR pilot to measure load shifting and energy savings, assess the impact of rate changes on customer bills, and identify areas for improving program delivery and customer involvement and satisfaction. Table 10 lists evaluation goals, along with the corresponding evaluation activities Cadmus employed to achieve those goals.

Table 10. Evaluation Objectives and Activities

Evaluation Objectives	Program Staff Meetings	Participant and Non-participant Surveys	Impact Analysis	Tracking Database Review
Track and analyze pilot enrollments	X			X
Evaluate customer motivations, engagement, satisfaction, and behavior changes.	X	X		
Estimate electricity demand, energy, and bill impacts of TVR treatments			X	X
Document pilot design, implementation, and lessons learned	X	X		X

2.4. Time-of-Use Impact Evaluation Approach

TOU analysis compared the treatment group's energy consumption with that of a matched comparison group during the period from October 1, 2023, through September 30, 2024.

2.4.1. Data Collection and Preparation

Cadmus collected and prepared the following data for analysis:

- Individual-customer AMI meter electricity consumption data for all treatment and comparison group customers
- Weather data for each customer from the NOAA weather station closest to each customer's residence.
- Pilot enrollment, program participation, and account closure data for customers who participated in TVR.
- Dates and times of all PTR events and rate schedules for all TOU pricing treatments

The AMI meter data recorded each customer's electricity consumption at 15-minute intervals and covered 12 months before the customer first received treatment (i.e., the customer's TOU rate became active) and all post-treatment months that the customer's account remained active. Some timestamp

adjustments were made to ensure all data was in the correct time zone. Cadmus aggregated all 15-minute interval consumption data to the hour level. We performed standard data-cleaning steps to address duplicate observations, extreme outliers, and missing values.

The weather data Cadmus used comprised high-frequency, asynchronous temperature and humidity readings from NOAA weather stations across PSE's service area. Cadmus aggregated the weather data to the hour level and merged them with the hourly interval consumption data.

The pilot enrollment and program participation data included the following fields for each customer:

- The date the customer joined the pilot and the rate schedule to which they enrolled
- The account closure date if the customer's account closed during the pilot.
- The date the customer unenrolled from the pilot if the customer opted out of treatment.

Cadmus used the pilot enrollment and program participation data to identify customers in the treatment and comparison groups for each treatment, to define different variables for the load impact analysis such as treatment and test-group indicator variables.

2.4.2. Impact Evaluation Activities

Cadmus collected AMI data for all PSE customers in the program from October 1, 2022, through the end of the first program year (PY1). To evaluate the impact of TOU rates, Cadmus established a matched comparison group of customers that did not participate in the TOU program to compare against the treatment customers (i.e., customers enrolled in a TVR plan). Using the pre-treatment period data, Cadmus ran a matching algorithm to select comparison customers with consumption patterns that were similar to those of the treatment group prior to the start of the pilot.

Cadmus estimated treatment effects for TOU rate and TOU-PTR rate treatments by comparing the demand of customers on each rate schedule to their matched comparison group. Using interval data on customer demand for each winter or summer season, Cadmus estimated a multivariate panel regression of customer hourly energy demand on control variables for pretreatment demand, peak and off-peak hours, day of the week, weather, and treatment variable indicating enrollment in a given TVR plan. We estimated treatment effects for summer 2024 using data from April 1, 2024, to September 30, 2024 and for winter 2023/2024 using data from October 1, 2023, to March 31, 2024. We estimated a separate model for each treatment—both at the hourly and aggregate level to obtain treatment averages.

Cadmus estimated the TOU and Hybrid models by using an ordinary least squares (OLS) method and clustered the standard errors on customers. Cadmus also estimated alternative model specifications to test the robustness of estimates to specification changes. To estimate the treatment effect for the Schedule 327, which included a super off-peak period, Cadmus added an indicator variable for the super off-peak period to the specification.

To estimate treatment effects for the hybrid treatments that included peak time rebates (Schedule 317 and 324), Cadmus developed a model that allowed the effect of peak period hours to depend on whether the hour was a Flex event hour.

We provide a more detailed description of the econometric methods in *Appendix B*.

2.5. Billing Analysis Approach

Cadmus conducted a variety of billing analyses. In brief, the *ex ante* analysis calculates how customer bills prior to the pilot would have changed had the customer been on TVR instead of a standard rate. This is helpful for identifying structural “losers” (customers who would pay more with TVR if they did not alter their consumption patterns) versus “winners” (customers who would pay less on TVR if they did not alter their consumption patterns). The *ex post* analysis models what customers’ consumption would have been during the pilot period had they not enrolled in a time-varying price schedule, and then applies standard rates to that estimated consumption to generate a counterfactual bill. We then compare the counterfactual bill to the customer’s actual bill during the pilot period to derive the *ex post* analysis. Finally, the shadow bill analysis computes how bills during the pilot period would have differed had customers’ bills been based on standard rates instead of TVR. Shadow bill and *ex post* analyses focus on the PY1 period from October 1, 2023, through September 30, 2024. The *ex ante* analysis utilized the AMI data in the pre-treatment period.

2.5.1. Data Collection and Preparation

The billing analysis makes use of the monthly billing data, which records a customer’s electricity consumption and associated billing totals. For the *ex ante* and *ex post* analyses, Cadmus used the full monthly aggregated billing data. For the shadow billing analysis Cadmus used billing data that was distributed to a customer’s respective on-peak, off-peak (and super off-peak for Schedule 327 customers) periods.

Cadmus used the same weather and program participation data as we used for the TOU impact analysis. Cadmus used the pilot enrollment and program participation data to identify customers in the treatment and comparison groups for each treatment, to define different variables for the load impact analysis such as treatment and test-group indicator variables.

2.5.2. Impact Evaluation Activities

Ex Ante and Ex Post Billing Analysis

For the *ex ante* analysis Cadmus collected hourly AMI data for all TOU treatment customers and matched comparison customers in the program pre-treatment period (October 1, 2022, through September 30, 2023). Using each customer’s associated weather data, Cadmus ran multivariate panel regression of customer hourly demand on weather data. Cadmus used these saved hourly-level coefficients to apply normalized hourly weather data to generate kilowatt-hours for each hour of the “normal weather” calendar year. We then aggregated these totals to the monthly level and used them as pre-treatment period hypothetical consumption totals under normal weather conditions. Cadmus then calculated the customer’s hypothetical/*ex ante* annual bills under the standard rate and their selected TOU rate. Cadmus finally subtracted the hypothetical TOU bill from the hypothetical Schedule 7 bill to get the *ex ante* annual bill impact and classified participants with *ex ante* savings as structural winners and participants with negative *ex ante* savings as structural losers.

For the *ex post* analysis, Cadmus applied the saved individual customer regression coefficients from the *ex ante* analysis against the post-treatment period weather data to calculate each customer's total counterfactual kilowatt-hours in PY1. Cadmus used customers' monthly billing cycles to verify total counterfactual kilowatt-hours against actual usage and billing amounts. Cadmus calculated the customer's hypothetical annual billing amount under the standard Schedule 7/24 rates and the hypothetical annual TOU bill under the customer's respective TOU rate schedule. Cadmus then repeated this process for each treatment customer's matched comparison non-participant.

We provide an overview of the estimation approach, but a more detailed description for both the *ex ante* and *ex post* analyses can be found in *Appendix B*.

Shadow Billing Analysis

Cadmus analyzed PY1 customer billing data by treatment customers' on-peak and off-peak periods (along with super off-peak for customers on the Schedule 327 rate). Using these peak totals, Cadmus applied the various energy charges as defined on the tariff sheets to calculate bill totals for customers on TOU rates. As a comparison, Cadmus aggregated energy consumption to the full monthly total and to calculate hypothetical bill totals under standard Schedule 7 (residential) or Schedule 24 (SMB) rates.

Half of the customers with BDRs on the Schedule 307 Income Eligible, Schedule 317 Income Eligible, and Schedule 327 Super Off-Peak rates were randomly chosen to receive Bill Protection. Under the Bill Protection offering, if their billed annual energy charges under TOU rates exceeded their hypothetical standard Schedule 7 energy charge billing amount by more than 10%, they received a credit for the amount over 110% of the hypothetical energy charge on standard rates. For this subset of customers, Cadmus conducted additional calculations to determine which customers qualified for a rebate based on their calculated billing totals.

2.6. Process Evaluation Approach

Cadmus developed a set of customized research activities relevant to the given target audience for each research objective. These activities are described in detail below.

2.6.1. Participant Surveys

PSE required participants to complete a short enrollment survey as part of the process of enrolling in the TVR pilot. The enrollment survey was developed by Cadmus with input from PSE. The survey presented questions about customers' motivations for joining the pilot and collected information about their households. PSE also provided participants voluntarily leaving the pilot with the opportunity to take an exit survey (also developed by Cadmus), which asked about why they left the pilot and what, if anything, could be done to make it better. Cadmus analyzed the data from the enrollment and exit surveys for the pilot evaluation.

Cadmus also fielded three additional waves of surveys during the first year of the pilot:

- A **non-enrollment survey** with PSE customers who were invited but decided not to enroll in the TVR pilot, asking them why they chose not to enroll and collecting information about their households for comparison to enrollee households

- A **winter experience survey** with participants following their first winter on TVR, asking about their awareness of and response to TOU peak periods and PTR events. Cadmus conducted this survey again following the second winter of the pilot in 2025.
- A **summer experience survey** with participants following the first summer of the pilot, covering the same topics as the winter experience survey but adjusted for the season (heating in winter with two peak periods, cooling in summer with one peak period). Cadmus will conduct this survey again following the second summer of the pilot in 2025.

2.6.2. Program Staff Meetings

Cadmus evaluation staff met biweekly with the PSE program manager and staff from prior to launch throughout the entire first year of the pilot, to keep abreast of developments with program processes, marketing, administration, and performance. Cadmus also plans to conduct a structured stakeholder interview toward the end of the second year of the pilot.

3. Residential Evaluation

3.1. Impact Evaluation

3.1.1. Demand and Energy Evaluations

The evaluation team executed regression models using data broken out by season (summer vs. winter) and period (weekdays vs. weekends/holidays) due to TOU energy charges varying by season and/or period for all residential rate schedules. Varying price points have the potential to impact consumption patterns, thus necessitating a split to determine if there is a difference in savings between these season-period combinations. TOU demand impacts were evaluated at both the hourly level and aggregated season-period level.

Figure 1 shows average winter TOU demand reduction (kW) across all rate schedules and consumption peaks as defined in each rate's tariff sheet. All residential rates experienced statistically significant savings during the respective on-peak periods. This demonstrates the effectiveness of the residential rates at incentivizing customers to shift their consumption to a different peak period since on-peak pricing is substantially higher than the pricing for off-peak periods, thus inducing these significant demand reductions during the on-peak period. During the on-peak period, customers on Schedule 327 had the most demand reduction (0.42 kW in winter) followed by customers on the Schedule 307 rate (0.16 kW for income ineligible customers and 0.14 kW for income eligible customers). During the weekend off-peak period, participants in the Schedule 307 income eligible groups and Schedule 317 income ineligible group were able to reduce demand by 0.03 kW each.

Only customers on the Schedule 327 rates experienced statistically significant savings during both the weekday off-peak and weekend off-peak periods. This was the only rate that had a super off-peak period, which charges customers the lowest price per kilowatt-hour. The large, negative bars under Schedule 327 indicate that these participants shifted their demand from the on- and off-peak periods to the lowest priced, overnight super off-peak period. The results demonstrate that the rate was effective at inducing customers to shift consumption to cheaper off-peak periods away from more expensive, higher-demand peaks.

PSE surveyed pilot participants upon enrollment at the start of Year 1 and found that 83% of enrollees on the Schedule 327 rates (n=989) had electric vehicles (EVs), which they charged at home, which helps to facilitate substantial load shifting through overnight charging. The large shifts in demand suggest that EV owners have a greater ability to shift their demand patterns compared to the average household.

Figure 1. Residential Winter Average Demand Reduction (kW) TOU Results

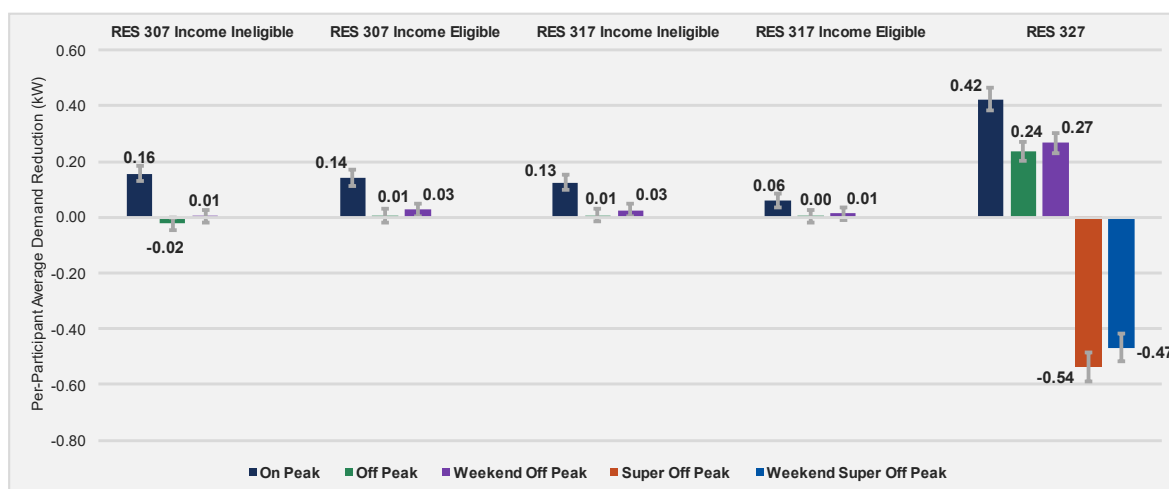


Figure 2 shows the average summer TOU demand reduction (kW) across all rates. Results are similar to the winter period with all residential rates experiencing statistically significant savings during the on-peak period. Customers on the Schedule 327 rate showed the same savings behavior, although in aggregate they reduced more kilowatts during peaks in the winter than in the summer.

Unlike the winter period, customers on the Schedule 317 rate experienced statistically significant demand reductions during both the weekday and weekend off-peak periods. Even though the basic off-peak TOU energy charges did not change between seasons for the Schedule 317 rate, these customers had a lower consumption baseline in the summer to reduce against thus leading to statistically significant savings.

Compared to the winter season, absolute on-peak demand reduction was lower in the summer for all customers on the Schedule 307 rate, though the reductions were similar in relative percentage terms. Customers on the Schedule 317 Income Ineligible rate had on-peak demand reductions at similar or higher levels in the summer compared to the winter season.

Figure 2. Residential Summer Average Demand Reduction (kW) TOU Results

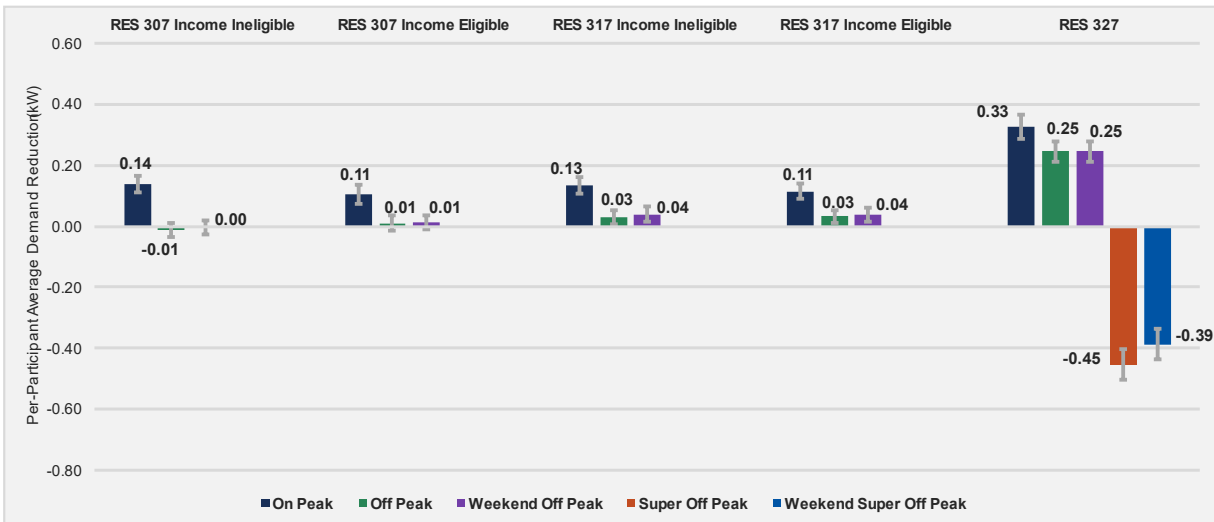


Figure 3 and Figure 4 display demand reduction as a percentage of the matched comparison group's baseline demand across the winter and summer seasons. The percentage reductions follow the absolute demand reductions closely. For on-peak percentage demand reductions, there is little difference between the seasons for customers on either the Schedule 307 or Schedule 327 rates.

While per-participant kilowatt demand reductions were similar between the seasons for customers on the Schedule 317 Income Ineligible rate, on-peak percentage demand reduction was higher in the summer season. On-peak percentage demand reduction increased from 8.8% (Figure 3) to 11.0% (Figure 4).

Since average demand reduction (kW) jumped substantially between the winter and summer period for the Schedule 317 Income Eligible group, percentage savings also increased from 5.0% (Figure 3) to 10.5% (Figure 4).

Figure 3. Residential Winter Average Demand Reduction (%) TOU Results

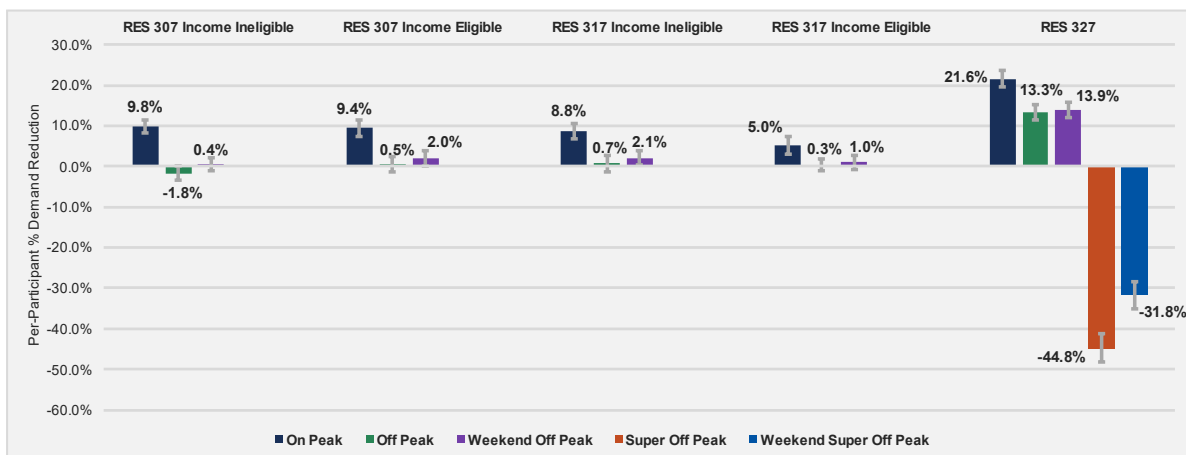


Figure 4. Residential Summer Average Demand Reduction (%) TOU Results

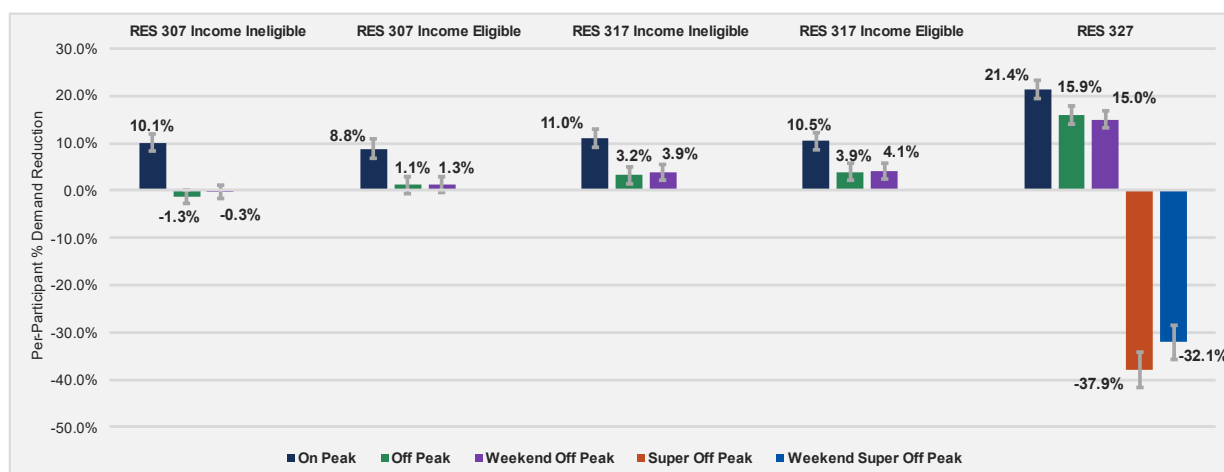


Table 11 shows daily average energy savings by season (summer and winter) and period of the week (weekday and weekend), along with Y1 annual energy savings (kWh). Participants on all residential TVR rates achieved statistically significant daily kWh energy savings on weekdays or weekends during at least one season. Participants in the Schedule 307 Income Eligible, Schedule 317 Income Ineligible, and Schedule 327 groups achieved statistically significant daily energy savings for at least three out of the four time periods.

Schedule 327 had the highest weekday and weekend percentage demand reduction, thus leading to the highest daily energy savings. For Schedule 327, daily energy savings were highest during weekday periods (1.28 kWh in the summer and 1.22 kWh in the winter).

After Schedule 327 (388 kWh), the Schedule 307 Income Eligible group had the most annual energy savings (264 kWh), followed by the Schedule 317 Income Eligible group (249 kWh).

Table 11. Residential TOU Demand and Energy Savings (kWh)

Treatment	Daily Energy Savings, Summer				Daily Energy Savings, Winter				Y1 Annual Energy Savings (kWh)
	Weekday		Weekend		Weekday		Weekend		
	kWh	90% CI	kWh	90% CI	kWh	90% CI	kWh	90% CI	
RES 307 Income Ineligible	0.13	±0.35	-0.09	±0.38	0.58	±0.55	0.22	±0.54	93
RES 307 Income Eligible	0.57	±0.39	0.34	±0.39	1.10	±0.58	0.80	±0.59	264
RES 317 Income Ineligible	0.91	±0.38	-0.86	±0.39	0.94	±0.56	0.66	±0.56	219
RES 317 Income Eligible	1.04	±0.36	0.90	±0.37	0.46	±0.52	0.29	±0.53	249
RES 327	1.28	±0.56	0.88	±0.61	1.22	±0.75	0.62	±0.76	388

Notes: The table reports the average daily energy savings per participant. Positive values indicate energy savings. Items in bold are statistically significant at 90% confidence. The precision was estimated at the 90% confidence level based on standard errors clustered on customers.

3.1.2. Peak Time Rebate Analysis

As discussed in this report's *Introduction* participants on the Schedule 317 rate are eligible to receive a rebate for reducing consumption below baseline levels during Peak Time Rebate (PTR) events, in addition to paying different prices for electricity depending on the day of week and time of day. The evaluation team executed similar regression models as in the TOU demand reduction analysis and included PTR event day indicators to isolate PTR effects from TOU impacts.

Figure 5 shows the average savings estimate (kW) from PTR for each applicable rate, income eligibility group, and season, and Figure 6 displays the percentage estimates. These are the incremental demand reductions from PTR events relative to participants' demand (with TOU) on PTR non-event days during Year 1. Cadmus calculated percentage savings relative to the treatment group's predicted consumption in the absence of a PTR event. In the figures, positive values represent demand reduction and negative values represent increases in demand. Gray error bars show the 90% confidence interval for each estimate. Estimates are statistically significant when the error bars do not cross zero, and differences between estimates are statistically significant when their error bars do not overlap.

Figure 5 shows that PTR events produced significant demand reduction during the winter for participants on Schedule 317, regardless of income eligibility. During the winter season, residential income eligible participants on Schedule 317 saved about 6.5% (0.106 kW) relative to their baseline energy consumption (that is, in addition to their average TOU on-peak reduction), while income ineligible customers saved 4.0% (0.058 kW) (Figure 5 and Figure 6).

Summer PTR events for Schedule 317 participants did not produce significant demand reduction on average. A potential theory for the modest and inconsistently significant PTR effects is that participants had already changed their energy consumption behavior substantially in response to the TOU rates, thereby increasing the challenge or inconvenience of achieving additional demand reduction during events.

Figure 5. Residential Average PTR Demand Savings by Rate and Season (kW)

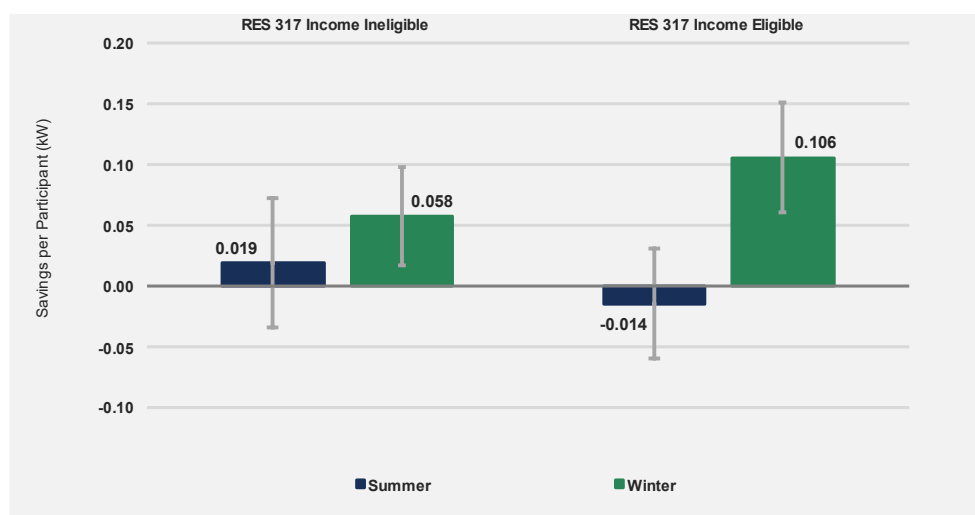


Figure 6. Residential Average PTR Demand Savings by Rate and Season (Percentage)

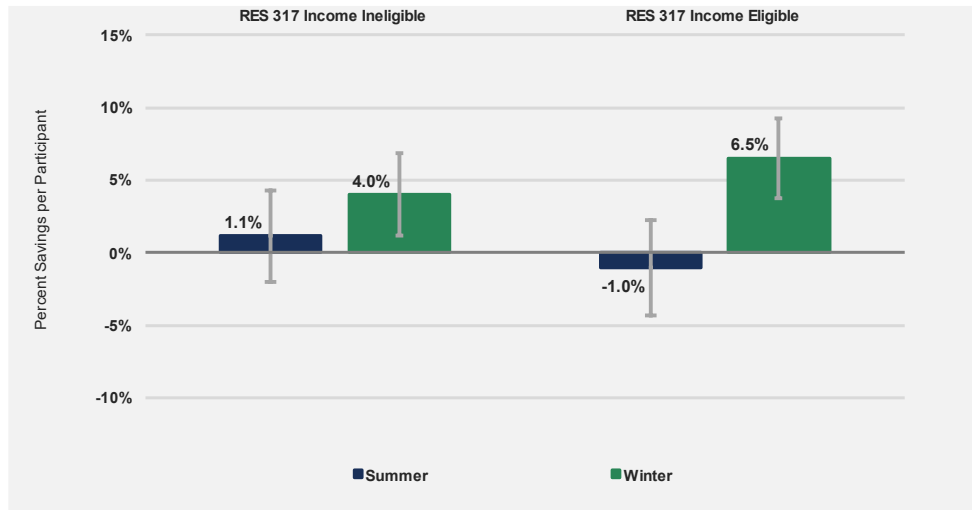


Figure 7 and Figure 8 show the average savings estimate (kW) from residential PTR for each event by income eligibility group and season, and Figure 9 and Figure 10 display the percentage estimates. All winter PTR events occurred in the morning, and summer PTR events took place in the evening. During the winter season, income eligible customers had higher PTR savings compared to the income ineligible group (excluding the first event; Figure 7). This finding suggests that income eligible participants were more engaged with or motivated by PTR than the income ineligible group. Percentage savings closely track the absolute savings estimate, with income eligible customers saving as much as 6% relative to the baseline comparison during PTR Event 4.

Participants on Schedule 317 appeared to reduce demand more during colder PTR events. The highest savings for both income eligibility groups occurred during Event 4 (the coldest event of Year 1 winter at 28°F on average; Figure 7). Across the winter season, the evaluation team observed a negative correlation for income eligible participants between PTR event savings and temperature—colder temperatures yielded significantly higher event savings. This correlation was not as strong for income ineligible participants.

Figure 7. Residential Average PTR Savings (kW) by Rate and Event – Winter Year 1

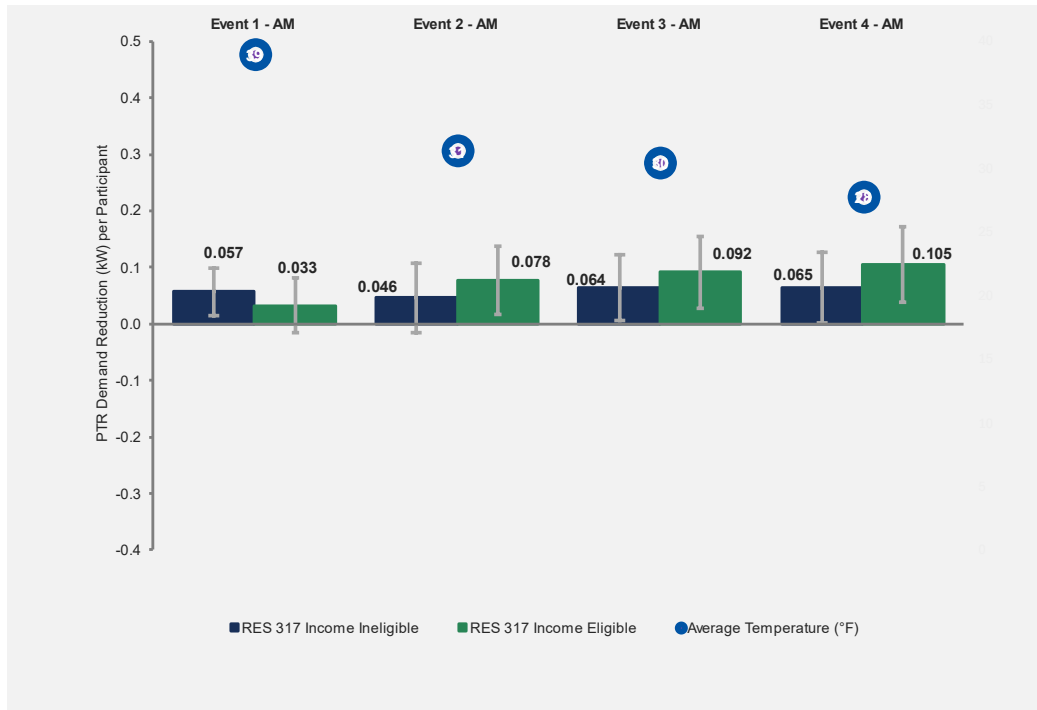
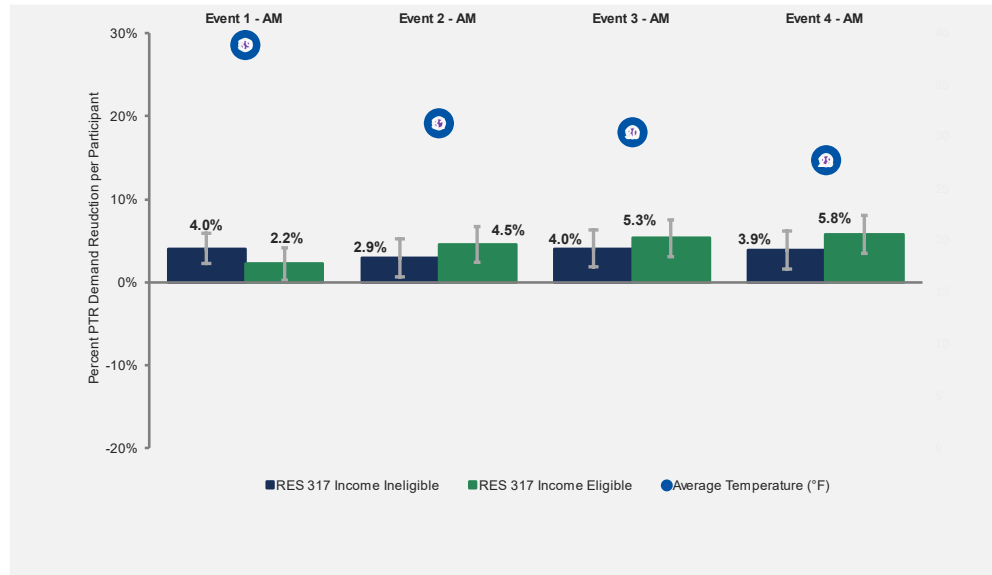


Figure 8. Residential Average Percentage PTR Savings by Rate and Event – Winter Year 1



As seen in the aggregated PTR impacts, residential PTR impacts for individual summer events are not statistically significant. Perhaps since all customers on the Schedule 317 rate experience statistically significant TOU demand reduction during the summer months, the TOU effect reduced the efficacy of PTR events in inducing energy savings.

Figure 9. Residential Average PTR Savings (kW) by Rate and Event – Summer Year 1

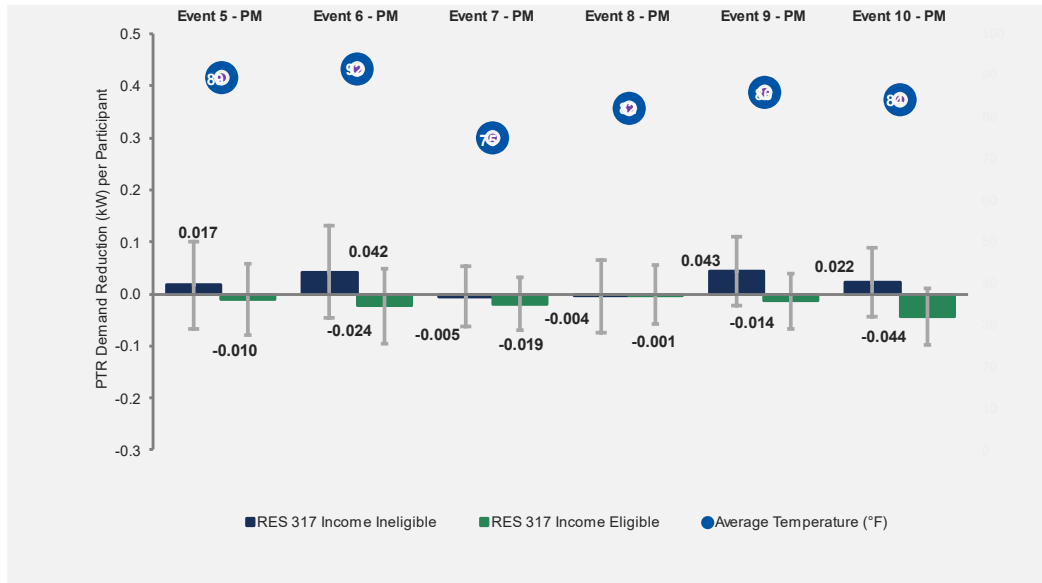
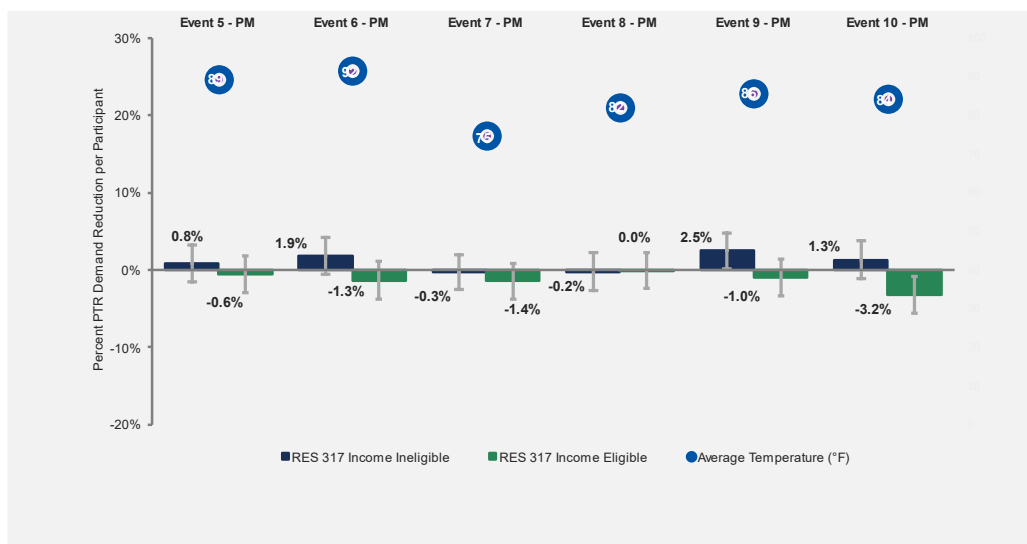


Figure 10. Residential Average Percentage PTR Savings by Rate and Event – Summer Year 1



3.1.3. Billing Analysis

Following the TOU impact analysis, the evaluation team further investigated the impact of TOU rates on customers' bills. Discussion of the analysis can be found in detail in the *Impact Evaluation Results* section.

Ex Ante Billing Analysis

Table 12 shows the distribution of results by rate from the residential *ex ante* billing analysis along with mean savings. Negative values represent higher bills, and positive values represent lower bills, relative to what customers' bills would have been had they remained on the standard Schedule 7 residential

rate. Table 13 provides the breakdown by rate of structural winners (those who would save money under TVR absent any change in their consumption pattern) and structural losers (those who would lose money under TVR absent any change in their consumption pattern).

Since this analysis uses pre-treatment period data, customers are assumed to not be engaging in load reducing or shifting behaviors associated with being on a TOU rate. Hence, we can directly calculate their hypothetical consumption against two rate schedules: the standard Schedule 7 rate and the associated TOU rate in effect once the program year begins. Without engaging in TOU shifting behavior, most customers on Schedule 307 and 317 would be structural losers and would not accrue any savings being on a TOU rate in the program pre-period. Median losses would amount to less than \$2.60/month. The TOU impact analysis showed that TOU rates were effective at reducing demand during on-peak hours in the program period. However, without customers changing their consumption behaviors to reflect their new rates, these schedules would not generate savings.

Only Schedule 327 shows most customers classified as structural winners during the pre-period. On average, customers on this rate would save \$47.55 annually on their bills during the pre-period if they were on this TOU rate instead on Schedule 7. The evaluation team determined from surveys that most of the customers on Schedule 327 are EV owners, and by analyzing actual consumption from billing data, that these customers tend to consume more than customers on the other rates. Schedule 327 customers likely benefited from having significant consumption during off-peak and super off-peak periods even prior to the pilot's launch. Shifting more energy usage to these low-rate periods provided further benefits during the pilot period.

Table 12. Residential Ex Ante Bill Impacts

SCHEDULE	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Mean
307 Income Eligible (n=1,390)	\$(365.75)	\$(96.55)	\$(65.47)	\$(49.03)	\$(37.57)	\$(26.47)	\$(13.51)	\$2.78	\$27.45	\$64.02	\$951.39	\$(17.02)
307 Income Ineligible (n=1,683)	\$(482.77)	\$(83.40)	\$(57.23)	\$(44.78)	\$(33.33)	\$(21.00)	\$(8.15)	\$11.46	\$44.41	\$97.04	\$763.06	\$(5.08)
317 Income Eligible (n=2,202)	\$(190.08)	\$(66.14)	\$(53.07)	\$(45.41)	\$(37.39)	\$(30.71)	\$(21.88)	\$(12.08)	\$5.08	\$42.96	\$625.05	\$(17.50)
317 Income Ineligible (n=2,394)	\$(270.44)	\$(65.01)	\$(53.95)	\$(45.86)	\$(38.15)	\$(30.43)	\$(21.80)	\$(9.46)	\$9.27	\$47.91	\$1,976.77	\$(15.78)
327 (n=869)	\$(571.24)	\$(84.50)	\$(47.57)	\$(22.72)	\$(1.52)	\$19.00	\$48.42	\$80.55	\$139.36	\$215.90	\$857.60	\$47.55

0% represents the minimum, 50% the median, and 100% the maximum difference between TOU and standard rates.

Table 13. Residential *Ex Ante* Analysis Percentage of Structural Losers and Winners

SCHEDULE	Structural Losers	Structural Winners
307 Income Eligible (n=1,390)	63.6%	36.4%
307 Income Ineligible (n=1,683)	68.1%	31.9%
317 Income Eligible (n=2,202)	75.6%	24.4%
317 Income Ineligible (n=2,394)	77.4%	22.6%
327 (n=869)	40.9%	59.1%

Ex Post Billing Analysis

The *ex post* analysis compares actual bills to modeled bills and calculates how many participants are expected to pay more, or less, than if they remained on Schedule 7. Table 14 shows the distribution of results by rate from the residential *ex post* billing analysis along with mean savings. The values are the differences between participant and matched non-participant impacts. Negative values represent higher bills, and positive values represent lower bills, relative to hypothetical bills generated by the matched non-participant. Table 15 provides the breakdown of TVR participants that paid more or less on their TOU rate than their matched non-participant.

Table 14 shows that on average, after changing their behavior in response to TOU rates, participants' bills were lower than estimates of what the bills would have been on Schedule 7, which were based on their matched non-participants' consumption. The *ex ante* analysis showed that without changing their usage patterns, customers on Schedule 307 and Schedule 317 would not accrue annual savings. Under modeled consumption derived from the weather conditions during the program period, the analysis predicts that customers on these two rates will shift consumption to cheaper peak periods and benefit from TOU rates.

Under both schedules, customers in the income eligible groups had lower means and median values than the income ineligible groups, indicating that they saved less than their income ineligible counterparts on the same rate. In Table 15 there is a nearly even split between TVR participants paying more compared to their matched non-participants for both income eligible groups. Since hypothetical consumption is based on weather and pre-existing behavioral patterns, it does not control for individual, non-pilot consumption changes (i.e. occupancy or added loads). Results from the TOU impact analysis show that when analyzing actual consumption, these rates are effective at reducing usage during on-peak periods.

Schedule 327 was the best performing rate, with customers saving on average \$286.73 more than their matched non-participants (Table 14) and 73% of participants paying less on TVR as well. Since hypothetical consumption uses pre-existing behavioral patterns, the predominantly higher number of EV owners on this rate could be charging their vehicles during the more favorable off-peak and super off-peak periods, which could account for the high median and mean difference in savings between participants and matched non-participants.

Table 14. Residential Ex Post Billing Impacts

SCHEDULE	10%	20%	30%	40%	50% (Median)	60%	70%	80%	90%	Mean
307 Income Eligible (n=1,390)	\$(435.72)	\$(244.72)	\$(130.54)	\$(63.24)	\$(1.03)	\$71.62	\$159.78	\$302.76	\$535.95	\$27.88
307 Income Ineligible (n=1,683)	\$(359.75)	\$(177.55)	\$(94.61)	\$(22.24)	\$39.51	\$105.57	\$191.67	\$341.55	\$628.63	\$89.34
317 Income Eligible (n=2,202)	\$(471.04)	\$(236.49)	\$(126.65)	\$(54.90)	\$(2.56)	\$60.73	\$127.69	\$224.77	\$426.67	\$3.04
317 Income Ineligible (n=2,394)	\$(400.67)	\$(213.57)	\$(116.87)	\$(45.29)	\$12.33	\$76.49	\$170.88	\$295.48	\$549.41	\$43.80
327 (n=869)	\$(313.92)	\$(80.22)	\$31.26	\$133.93	\$233.83	\$347.49	\$486.16	\$663.74	\$933.33	\$286.73

Table 15. Residential Ex Post Analysis TVR Comparison

SCHEDULE	Paid More with TVR	Paid Less with TVR
307 Income Eligible (n=1,390)	43%	57%
307 Income Ineligible (n=1,683)	50%	50%
317 Income Eligible (n=2,202)	47%	53%
317 Income Ineligible (n=2,394)	51%	49%
327 (n=869)	27%	73%

Shadow Bill Billing Analysis

The shadow billing analysis determines how much more or less participants paid under TVR compared to what they would have paid under Schedule 7 based on actual Year 1 usage. Table 16 shows the distribution of results by rate from the residential shadow billing analysis along with mean savings. Negative values represent higher bills, and positive values represent lower bills, relative to what customers' bills would have been if they had remained on Schedule 7. Results are from TOU impacts only, and PTR credits are not applied. The only charges used are the constant energy charges as defined on the PSE rate tariff sheets. Table 17 provides the breakdown of TVR participants that actually paid more or less on their TOU rate compared to what their yearly total would have been on Schedule 7.

On average, residential participants tended to save money on their annual bills while under the TVR program (all rates have positive mean billing impacts as per Table 16). Schedule 327 customers saved the most on average with \$224.65 in annual bill savings, which is consistent with results from the *ex ante* and *ex post* billing analyses. Schedule 317 customers in both income eligibility groups saved the least with the distribution skewed for these customers (slightly negative medians and positive means, indicating bill savings for the group in aggregate, but with more customers' bills increasing than decreasing). Table 17 shows that only Schedule 327 and Schedule 307 Income Ineligible groups had more than 50% of participants paying less under the TVR rates than with Schedule 7 (87% and 56% respectively). Since Schedule 317 customers saved the least compared to customers on the other residential rates, it could be that the average amount of demand reduction calculated in the TOU impact

section from the on-peak period is not enough to offset the peak pricing for this rate for most participants.

The income ineligible groups also appeared to achieve the greatest bill reductions for Schedules 307 and 317, with average bill savings of about double their income eligible counterparts. According to customer billing data, income ineligible households on average used 12% more kilowatt-hours than income eligible customers used during Year 1, which probably explains most of this difference: higher usage households are charged at a higher rate per kilowatt-hour on Schedule 7 standard rates when they use more than 600 kWh in a month, therefore they can save more money for each on-peak kilowatt-hour reduced compared to customers who use less energy and would pay a lower average per-kilowatt-hour rate on Schedule 7. The same logic applies to the larger bill savings for Schedule 327 participants: on average, their Year 1 usage was about 1,200 kWh per month, which was 29% higher than the average usage of households on the 307 and 317 rates.

Table 16. Residential Shadow Billing Impacts

SCHEDULE	10%	20%	30%	40%	50% (Median)	60%	70%	80%	90%	Mean
307 Income Eligible (n=1,237)	\$(60.88)	\$(40.24)	\$(27.22)	\$(16.57)	\$(5.23)	\$9.12	\$38.45	\$81.00	\$167.61	\$32.14
307 Income Ineligible (n=1,665)	\$(46.64)	\$(29.82)	\$(19.38)	\$(7.31)	\$13.69	\$43.74	\$78.80	\$138.56	\$233.47	\$61.24
317 Income Eligible (n=1,947)	\$(48.13)	\$(39.36)	\$(32.26)	\$(25.58)	\$(17.86)	\$(7.67)	\$9.10	\$37.22	\$90.72	\$6.95
317 Income Ineligible (n=2,252)	\$(46.22)	\$(36.66)	\$(28.48)	\$(19.34)	\$(8.31)	\$8.68	\$34.50	\$72.75	\$132.70	\$26.24
327 (n=999)	\$(11.29)	\$21.01	\$71.53	\$115.55	\$169.39	\$229.01	\$298.34	\$378.94	\$511.02	\$224.65

Table 17. Residential Shadow Billing Analysis TVR Comparison

SCHEDULE	TVR Paid Less	TVR Paid More
307 Income Eligible (n=1,237)	47%	53%
307 Income Ineligible (n=1,665)	56%	44%
317 Income Eligible (n=1,947)	34%	66%
317 Income Ineligible (n=2,252)	44%	56%
327 (n=999)	87%	13%

Peak Time Rebate Bill Credits

Participants on Schedule 317 can earn bill credits (Peak Time Rebates) for additional reductions in energy usage during peak periods on days when PSE calls a PTR event. During the winter season, 92% of participants earned PTR bill credits, and 94% earned bill credits in the summer. The average amount of bill credits per winter event for participants who received a credit was \$2, and the corresponding average per event for all summer events was \$3. Across all Schedule 317 participants, the average

amount of annual PTR bill credits was \$4 per household, with a maximum total of about \$40. These results were similar by income group.

3.2. Process Evaluation

This section of the report presents the findings of the process evaluation based on surveys conducted with customers who enrolled in the TVR pilot, customers who were invited to enroll but did not, and customers who enrolled but then voluntarily left the pilot. The objective of the process evaluation was to assess the effectiveness of the pilot program, document the customer experience (including with a sentiment analysis), and answer how impacts were achieved by tying customer-reported behavior and other characteristics to impact results.

3.2.1. Enrollment and Participation

PSE preselected 184,000 residential customers and invited them to participate in the TVR pilot. Marketing to residential customers ran from July to September 2023, and the number of customers in all five residential treatment groups who chose to enroll exceeded the minimum targeted sample sizes for evaluation. TVR rates for residential pilot enrollees took effect on October 1, 2023. Cadmus performed statistical power calculations to determine the minimum sample size required for each of the pilot treatments and their matching control groups. Table 18 shows the number of enrolled pilot participants by treatment group at the end of Year 1 of the pilot. At the beginning of the pilot period, PSE enrolled more than the minimum targeted sample size for all residential treatment groups, but by the end of the year disenrolling customers brought the count for Schedule 307 Income Ineligible down to 998, just below the minimum target of 1,000.

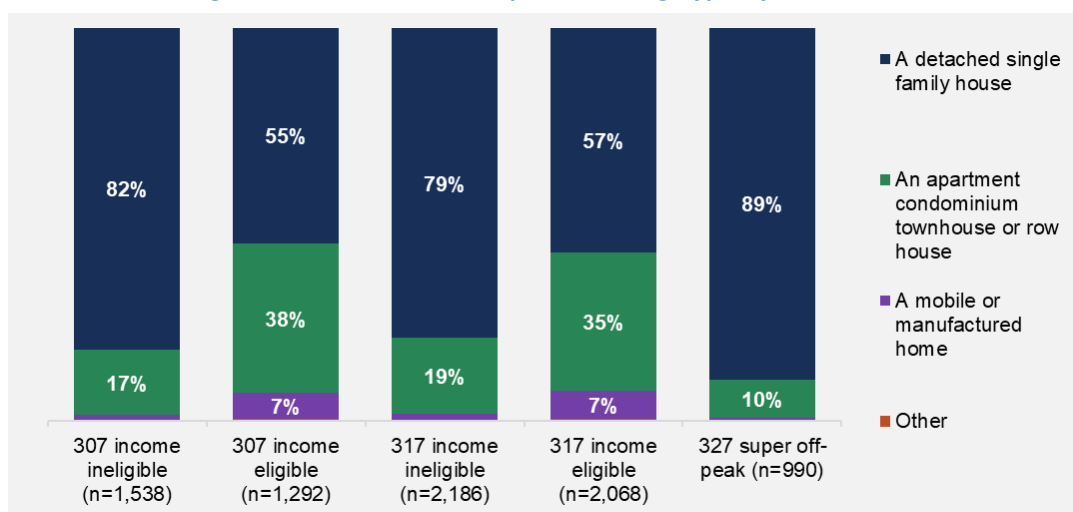
Table 18. TVR Pilot Treatment Groups

Treatment Group	Rates	Minimum Sample Size	Maximum Sample Size	Participation Count at End of Year 1
Schedule 307 Income Ineligible	Residential TOU	1,000	2,000	1,232
Schedule 307 Income Eligible	Residential TOU	1,000	2,000	998
Schedule 317 Income Ineligible	Residential TOU+PTR	1,500	3,000	1,694
Schedule 317 Income Eligible	Residential TOU+PTR	1,500	3,000	1,645
Schedule 327	Residential three-period TOU with super off-peak	500	1,000	803

Household Characteristics

Most pilot participants lived in detached single family homes, ranging from 55% to 57% of income eligible treatment groups up to 89% of participants on Schedule 327 (Figure 11). Cadmus observed notable trends in pilot participant housing, with a greater percentage of income eligible customers on Schedules 307 and 317 living in multifamily or mobile/manufactured housing than ineligible customers with the same rates. However, the distribution of housing types was very similar between Schedule 307 and 317 customers at the same income level.

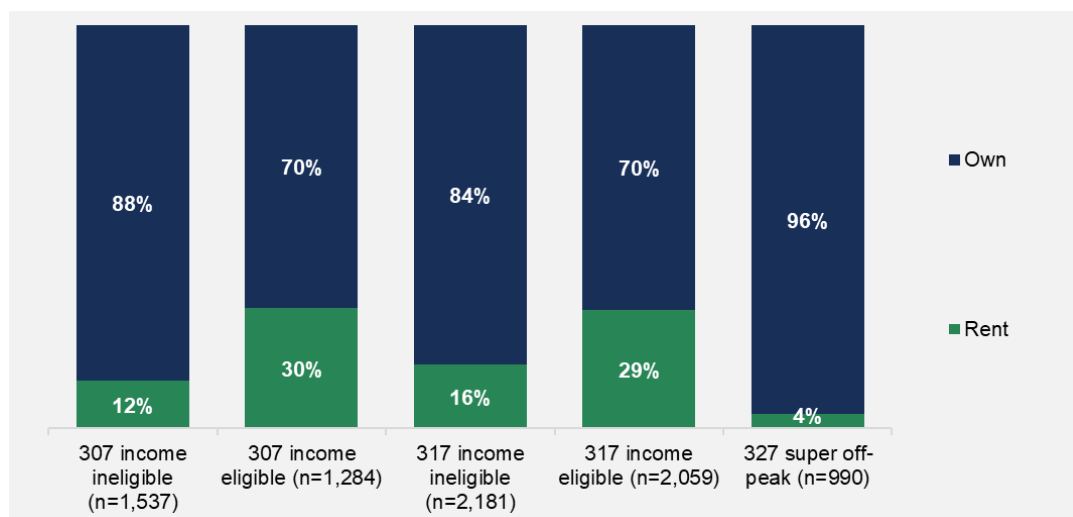
Figure 11. TVR Pilot Participant Housing Type by Treatment



Source: Enrollment survey. "What type of housing do you currently live in?"
(Percentages of 2% or less are not labeled in the chart)

Figure 12 shows a similar pattern for home ownership, with income eligible participants most likely to rent their homes (29% to 30% versus 12% to 16%, respectively) and customers on Schedule 327 rate least likely (4%).

Figure 12. TVR Pilot Participant Home Ownership by Treatment



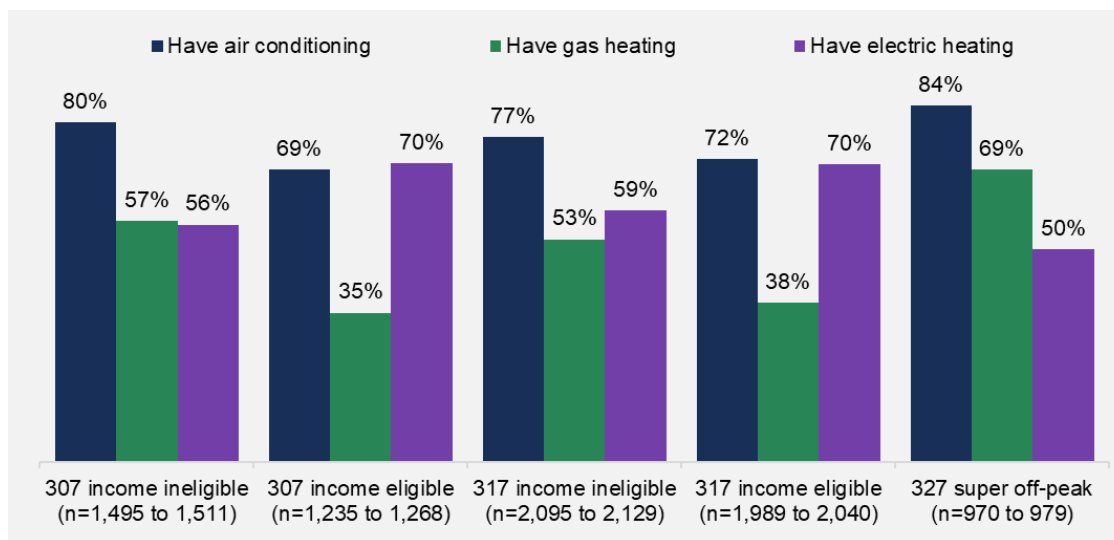
Source: Enrollment survey. "Do you own or rent your home?"

Household Systems and Technology

Figure 13 shows that most pilot participants have air conditioning in their homes, with income eligible groups slightly less likely to have air conditioning (69% to 72%) than ineligible groups (77% to 80%) and customers on Schedule 327 (84%). Income eligible participants are also the most likely group to have

electric heating (70% for both rates), compared to a little over half of ineligible groups (56% to 59%) and half of customers on rate 327 (50%). Correspondingly, income ineligible participants and those on Schedule 327 were the most likely to have gas heating (53% to 69%) and income eligible were the least likely (35% to 38%). Because the TVR pilot rates apply only to electricity charges, they do not incentivize customers to shift gas heating away from peak periods or PTR events.

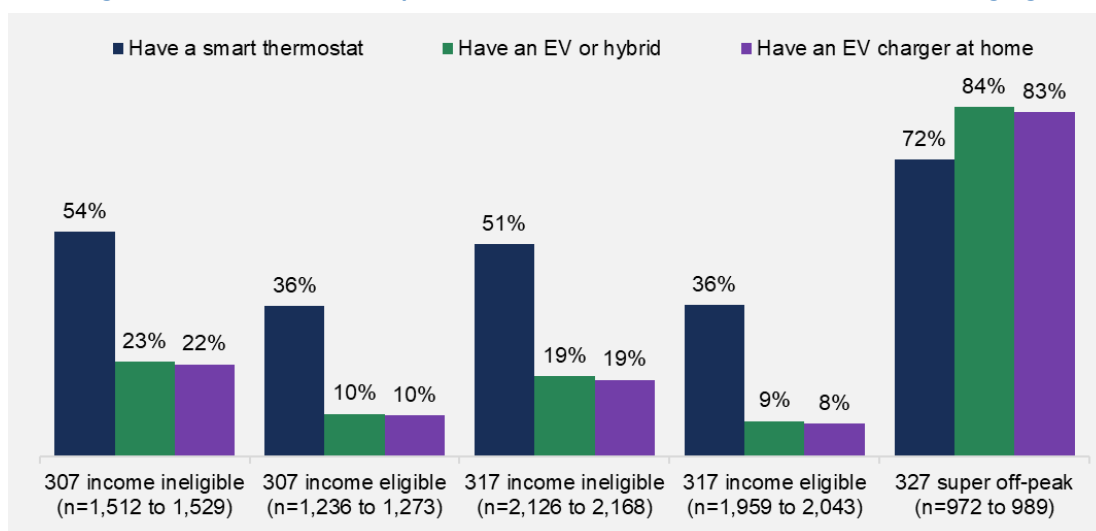
Figure 13. TVR Pilot Participant Household Cooling and Heating



Source: Enrollment survey. “What air conditioning system do you have in your home?”, “What heating system do you have in your home?” (Respondents could select multiple heating and cooling systems, so the sum of gas and electric heating is greater than 100%).

The enrollment survey collected data about the prevalence of smart thermostats, EVs, and EV home chargers in participant households at the beginning of the pilot. Smart thermostats are an increasingly common technology that enable participants to shift heating and cooling usage away from peak time periods, while charging EVs at home adds a significant load to household electricity demand. Figure 14 shows differences between treatment groups in adoption of these technologies: a large majority of participants on Schedule 327 own EVs (84%) and charge at home (83%), compared to 8% to 10% of income eligible participants and 19% to 22% of ineligible participants. The concentration of EV owners in Schedule 327 was by design, as the super off-peak rate was marketed as an opportunity to save money by charging overnight. There were similar though less pronounced differences in smart thermostat adoption, with 36% of income eligible participants having smart thermostats at the start of the pilot compared to 51% to 54% of income ineligible and 72% of customers on Schedule 327. Additionally, 98% of income eligible customers (n=3,539) and 99% of income ineligible customers (n=4,535) had Wi-Fi internet in their homes, indicating that a lack of high-speed internet access is not a significant barrier to adopting smart technology.

Figure 14. TVR Pilot Participant Household Smart Thermostats and EV Charging

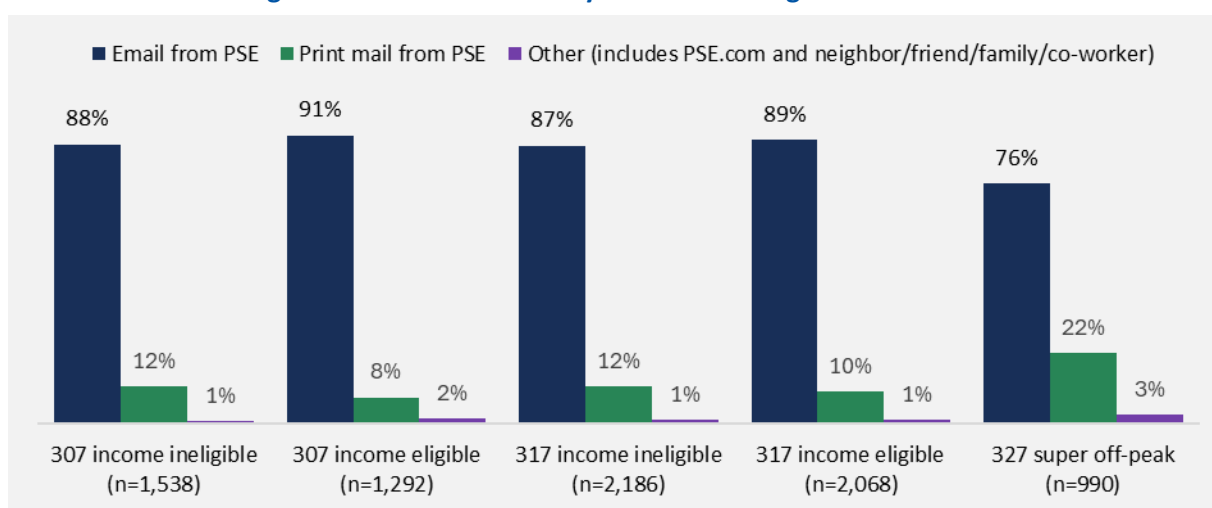


Source: Enrollment survey. “Do you have a smart thermostat in your home?”, “Does your household have an electric vehicle?”, “What kind of EV charger do you have at home?”

Pilot Enrollment

Most enrollment survey respondents (87%; n=8,074) heard about the TOU pilot program through emails from PSE, but nearly 1,000 participants (12%) heard about the program through print mail from PSE. Very few respondents heard about the program through other sources. These proportions remained consistent across treatment groups, with the exception of Schedule 327 participants, who less commonly heard about the program through email from PSE (76%) and more commonly heard about the program through print mail from PSE (22%) than the other treatment groups (see Figure 15).

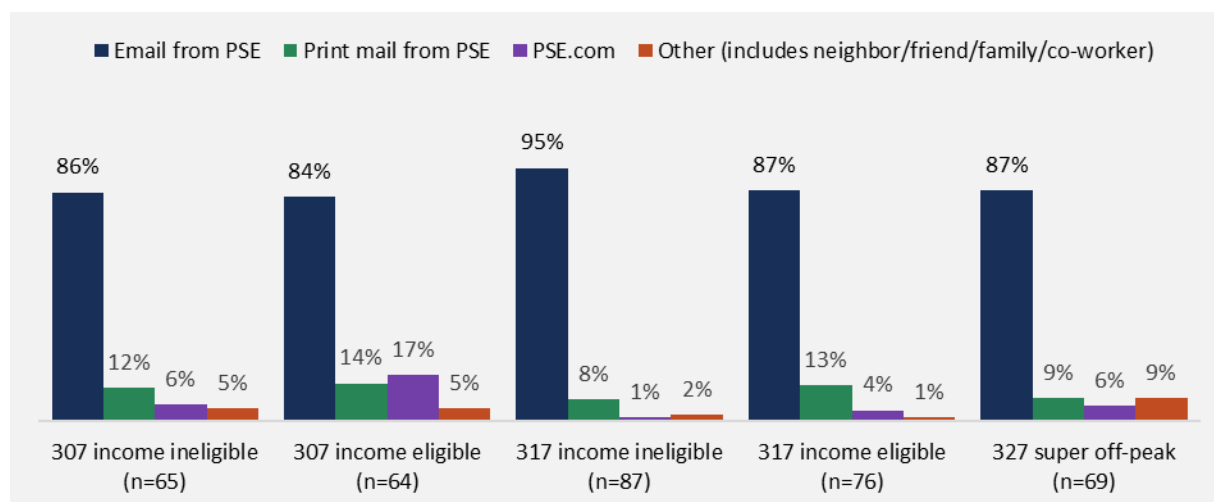
Figure 15. Enrollment Survey: Sources of Program Awareness



Source: Enrollment survey. “How did you hear about the Time-of-Use (TOU) pilot program?”

Similar proportions of non-enrollment survey respondents heard about the TOU pilot program through emails from PSE (88%) and print mail from PSE (11%). However, more non-enrollment respondents heard about the program through PSE.com (6%) than respondents to the enrollment survey. This was especially true among Schedule 307 income eligible respondents, 17% of whom heard about the program through PSE.com (Figure 16).

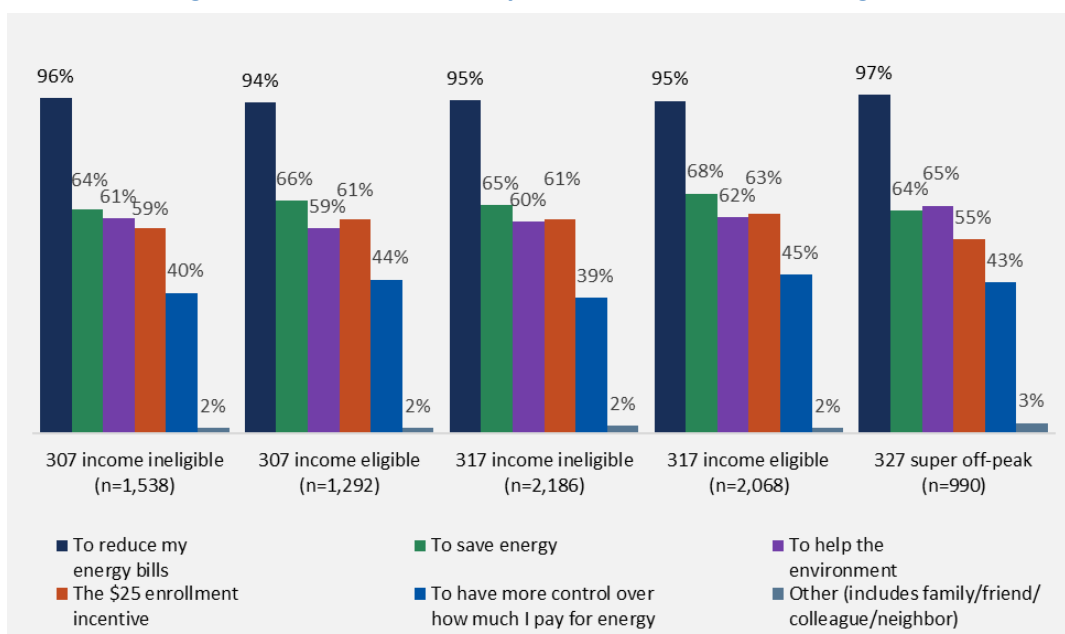
Figure 16. Non-Enrollment Survey: Sources of Program Awareness



Source: Non-enrollment survey. "How did you hear about the Time-of-Use (TOU) pilot program?"
(Respondents could select multiple responses, so the sums total more than 100%).

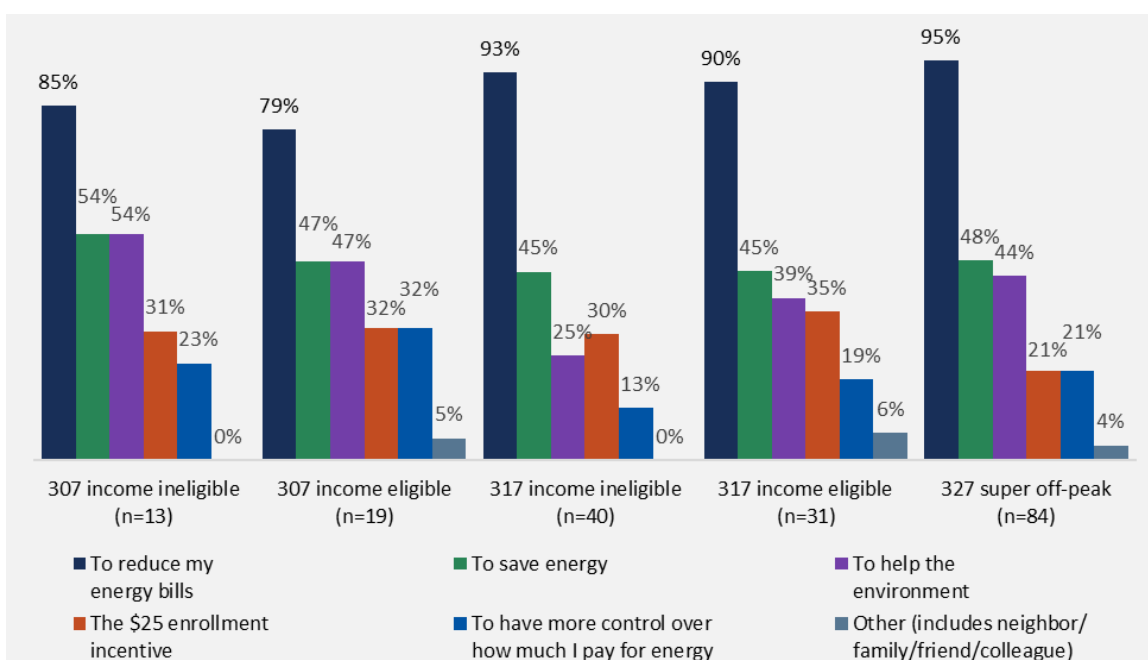
Enrollment survey respondents most frequently joined the program to reduce their energy bills (95%; n=8,074), but many of them also joined the program to save energy (66%), help the environment (61%), and receive the \$25 enrollment incentive (60%). These proportions were generally consistent across treatment groups (see Figure 17). Among those who initially enrolled but later withdrew (exit survey respondents), 92% also said they enrolled to reduce their energy bills (n=187). Customers who took the exit survey were less likely than enrollment survey respondents to mention secondary motivations for enrollment such as saving energy (42%), helping the environment (35%), and receiving the \$25 enrollment incentive (22%). This pattern was similar across rate and income groups (Figure 18).

Figure 17. Enrollment Survey: Reasons for Interest in Program



Source: Enrollment survey. “Why are you interested in the Time-of-Use (TOU) pilot program?”
(Respondents could select multiple responses, so the sums total more than 100%).

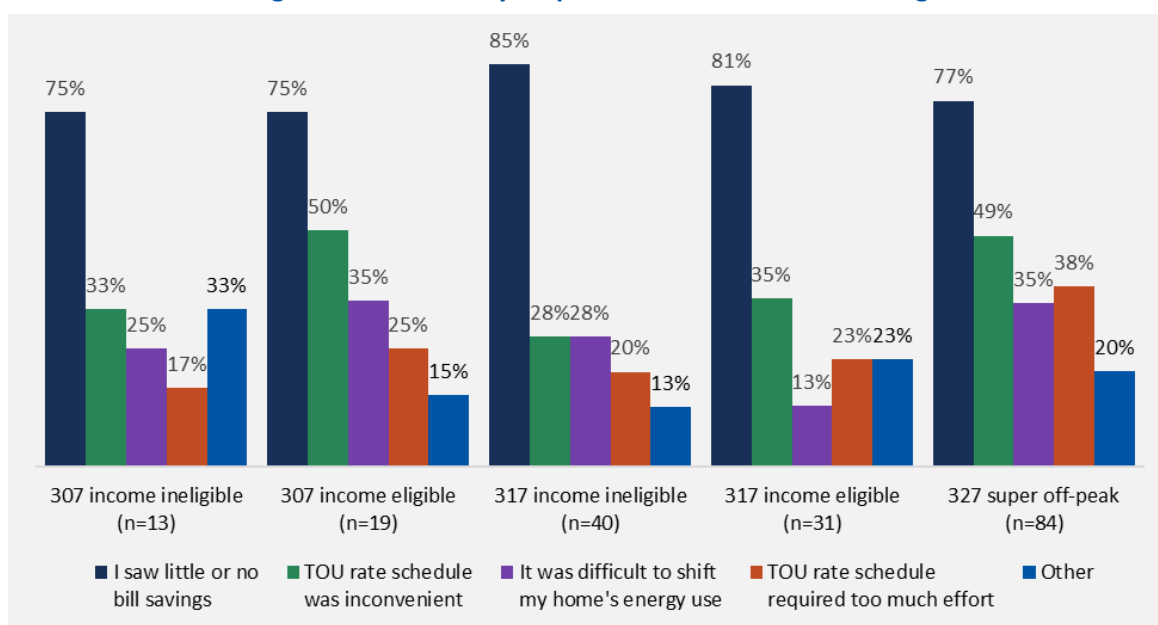
Figure 18. Exit Survey: Reasons for Interest in Program



Source: Exit survey. “What motivated you to enroll in the Time-of-Use pilot program?”
(Respondents could select multiple responses, so the sums total more than 100%).

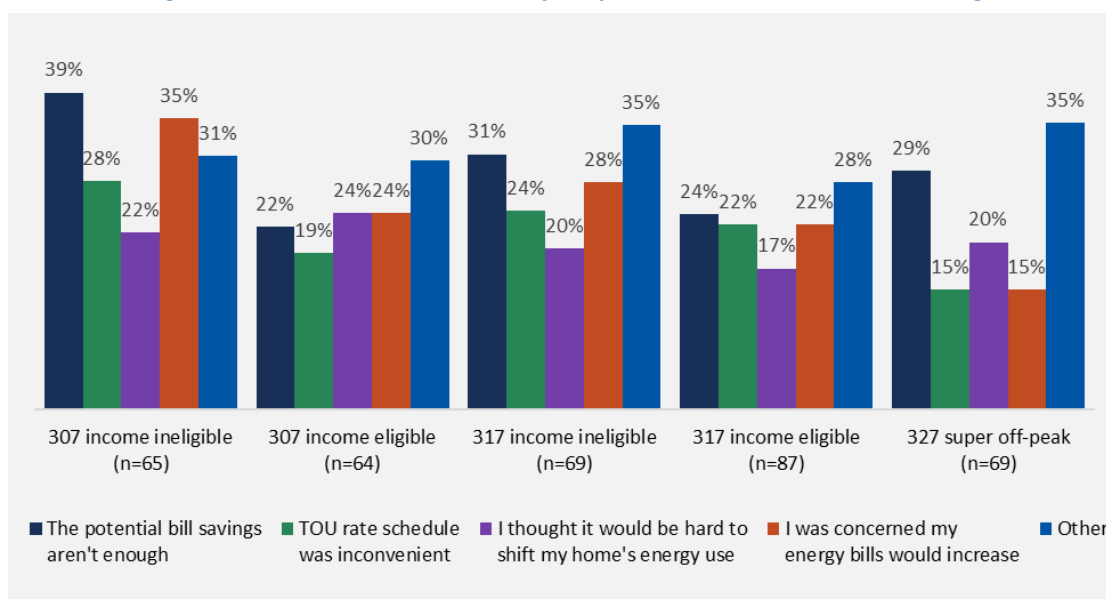
Exit survey respondents unenrolled largely because they saw little to no bill savings (79%; n=187), which all treatment groups reported at similar rates (see Figure 19). Similarly, non-enrollment survey respondents most frequently reported not enrolling because the potential bill savings were not enough to make enrollment worthwhile (29%). Respondents also unenrolled or chose not to enroll because the TOU rate schedule was inconvenient and because they expected to have difficulty with shifting their home's energy use. Respondents from the exit survey who offered "other" reasons for unenrolling said that the rates were higher than advertised, that their energy bill became more expensive, and that they did not have enough knowledge to participate; respondents from the non-enrollment survey who offered "other" reasons for not enrolling reported that they already use most of their electricity during off-peak hours, that they did not have time to read the sign-up information, and that they wanted to enroll but the pilot was already full. Some of the responses varied between the treatment groups (see Figure 19 and Figure 20).

Figure 19. Exit Survey: Top Five Reasons for Disenrolling



Source: Exit survey. "Which of the following describe your reason(s) for leaving the program?"
(Respondents could select multiple responses, so the sums total more than 100%).

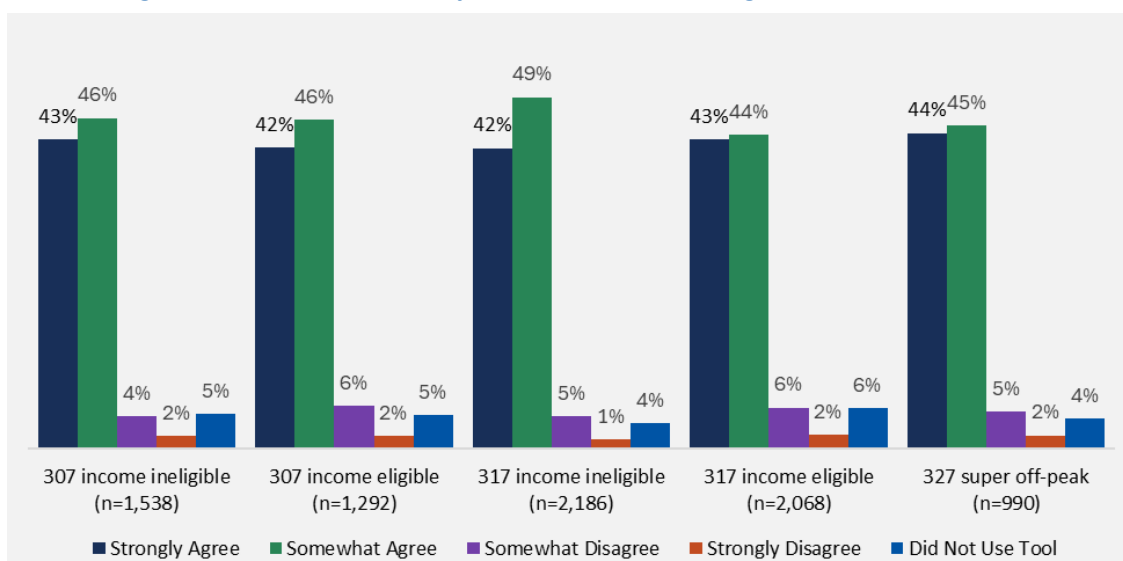
Figure 20. Non-Enrollment Survey: Top Five Reasons for Not Enrolling



Source: Non-enrollment survey. "Which of the following describe your reason(s) for not enrolling in the Time-of-Use pilot program?" (Respondents could select multiple responses, so the sums total more than 100%).

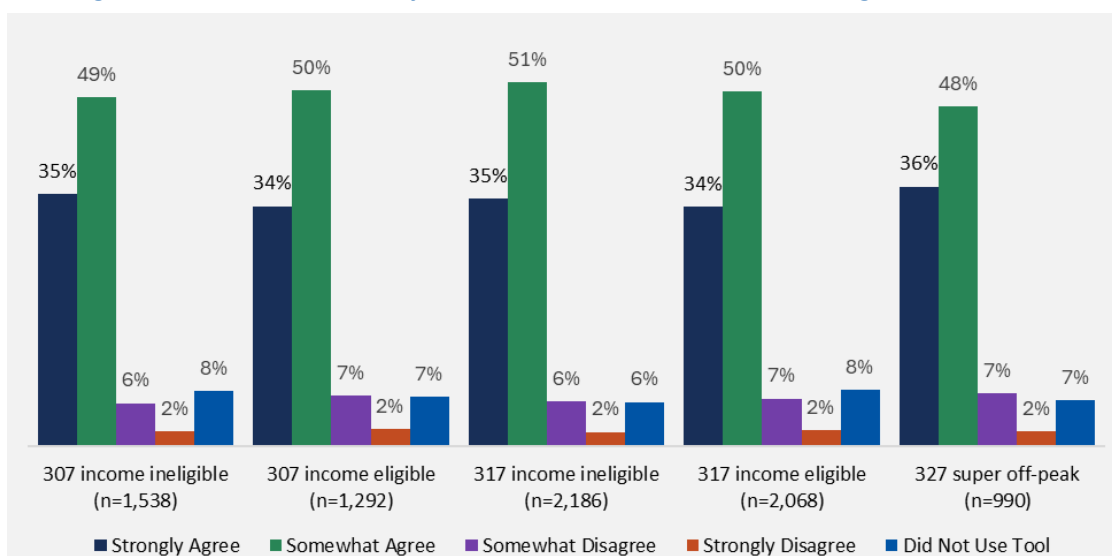
Respondents also answered questions about their experience with the Rate Advisor Tool, which largely received positive feedback across all treatment groups. Eighty-nine percent of enrollment survey respondents *strongly agreed* or *somewhat agreed* that the Rate Advisor Tool was easy to understand (n=7,526; see Figure 21), and 85% of respondents said that the Rate Advisor Tool influenced their decision to enroll in the program (n=7,320; see Figure 22). Overall, respondents rated the tool a 7.3 on a scale from 1 (*unacceptable*) to 10 (*acceptable*; n=7,177), with little variation across treatment groups (see Figure 23).

Figure 21. Enrollment Survey: Ease of Understanding the Rate Advisor Tool



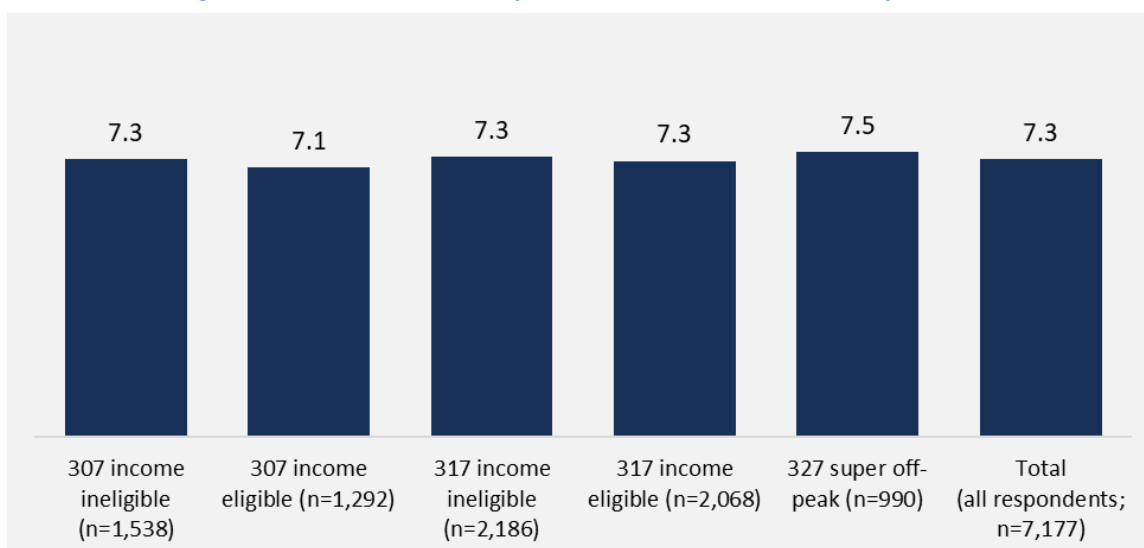
Source: Enrollment survey. "The information presented by the Rate Advisor Tool was easy to understand."

Figure 22. Enrollment Survey: Rate Advisor Tool Influence on Program Enrollment



Source: Enrollment survey. "The Rate Advisor tool influenced my decision to enroll in the program."

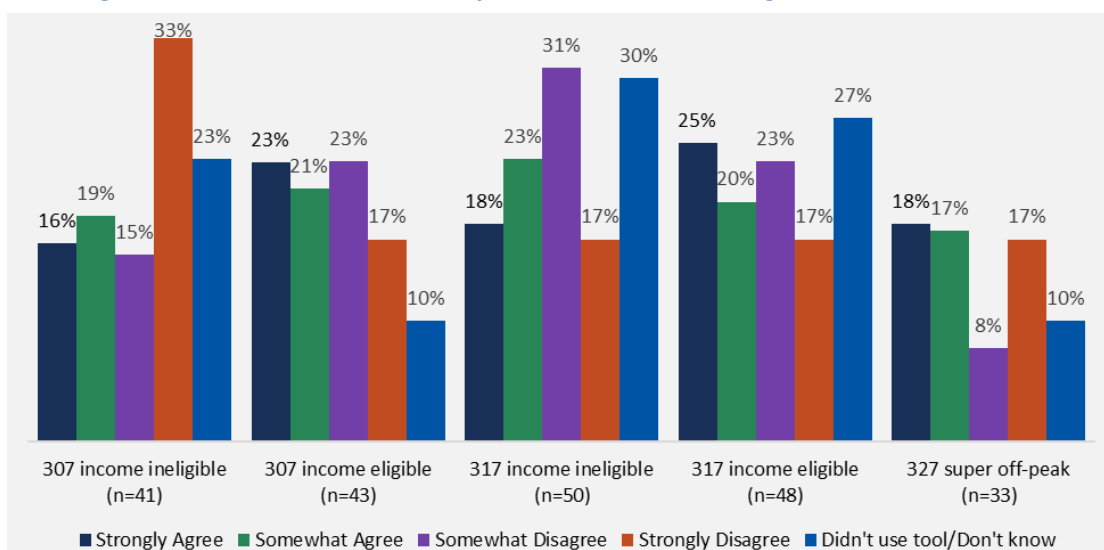
Figure 23. Enrollment Survey: Rate Advisor Tool Overall Experience



Source: Enrollment survey. "Please rate your overall experience with the Rate Advisor tool."

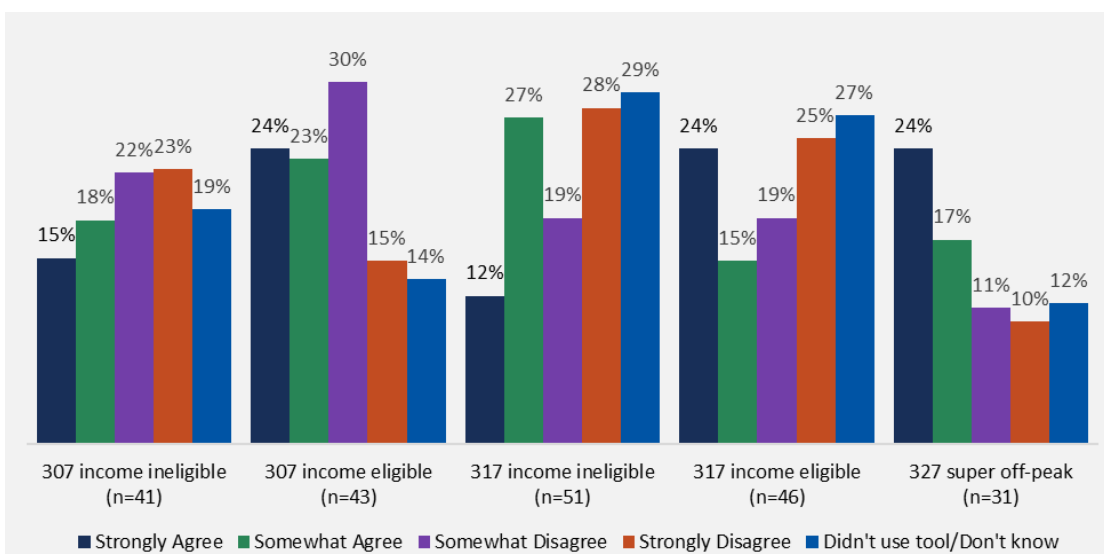
Customers who chose not to enroll in the program also reported on their experience with the Rate Advisor Tool. Most respondents (66%, n=215) did not remember seeing the Rate Advisor Tool. Those who did remember generally provided less positive ratings for the tool than those of the enrollment survey respondents, and the scores often varied across treatment groups. A majority of respondents (87%; n=215) either *strongly agreed* or *somewhat agreed* that the Rate Advisor Tool was easy to understand (see Figure 24), and 85% of respondents *strongly agreed* or *somewhat agreed* that the Rate Advisor Tool influenced their decision to enroll in the program (n=212; see Figure 25). Additionally, more non-enrollment survey than enrollment survey respondents reported not using the tool. Overall, non-enrollment respondents rated the tool a 5.9 on a scale from 1 (*unacceptable*) to 10 (*acceptable*; n=208), with little variation across treatment groups (see Figure 26).

Figure 24. Non-Enrollment Survey: Ease of Understanding the Rate Advisor Tool



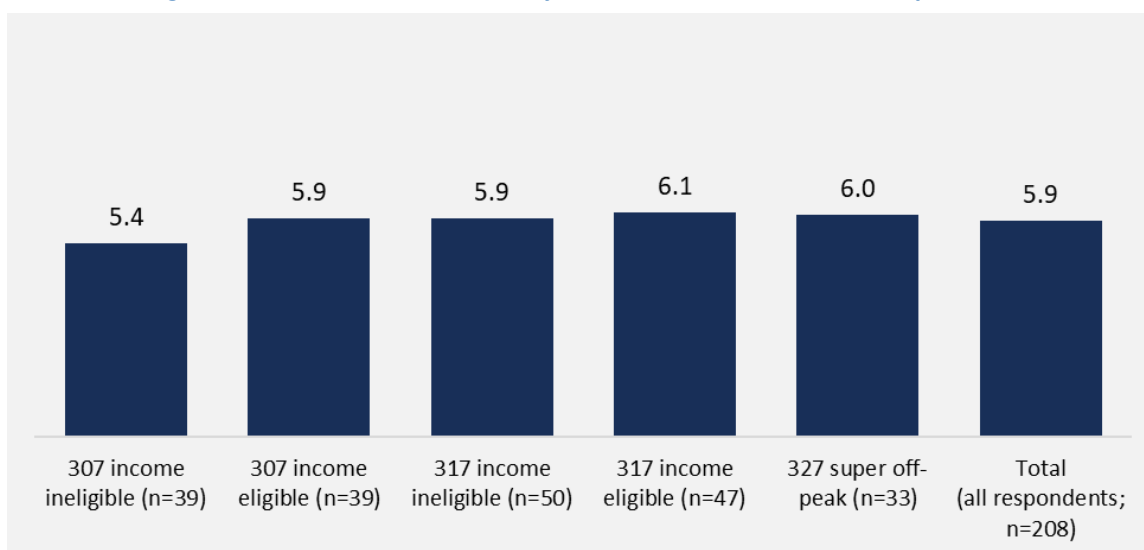
Source: Non-enrollment survey. "The information presented by the Rate Advisor Tool was easy to understand."

Figure 25. Non-Enrollment Survey: Rate Advisor Tool Influence on Program Enrollment



Source: Non-enrollment survey. "The Rate Advisor tool influenced my decision to not enroll in the program."

Figure 26. Non-Enrollment Survey: Rate Advisor Tool Overall Experience

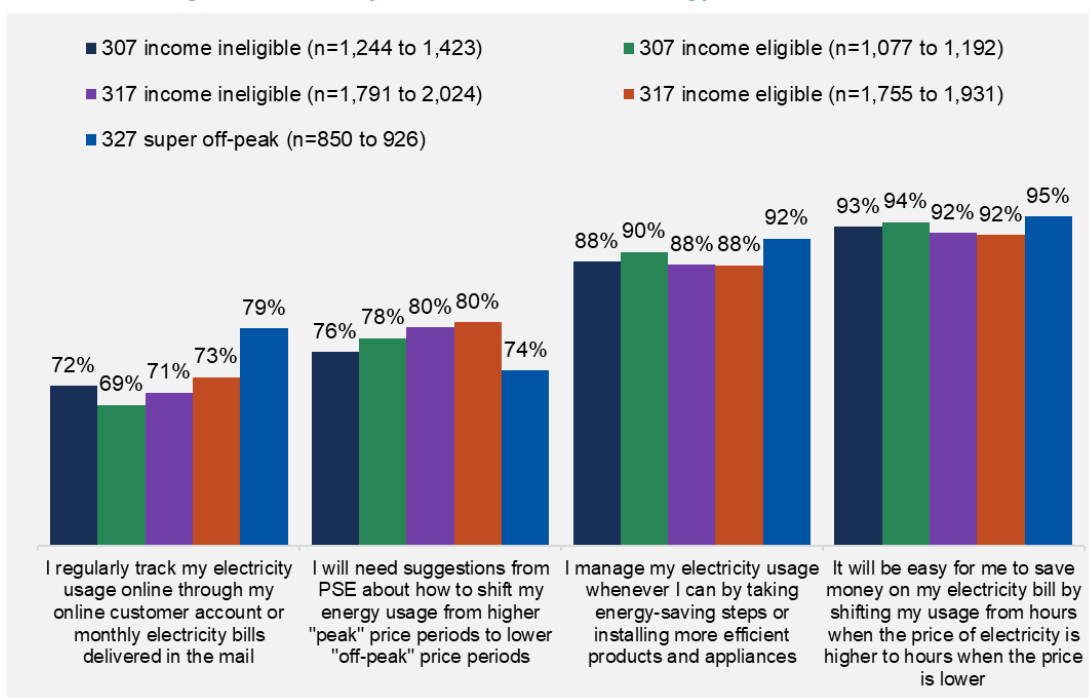


Source: Non-enrollment survey. "Please rate your overall experience with the Rate Advisor tool."

3.2.2. Motivations and Attitudes

Figure 27 shows that most customers who enrolled in the TVR pilot agreed that they track their energy usage (69% to 79% by treatment), that they take steps to save energy when they can (88% to 92%), and that it would be easy for them to save money with TVR (92% to 95%), but also that they need suggestions from PSE about how to shift usage to off-peak periods (74% to 80%). Agreement with these statements was very consistent across income groups and between the 307 and 317 rates, though customers on Schedule 327 were more likely to agree that they track their usage and less likely to agree that they need suggestions from PSE.

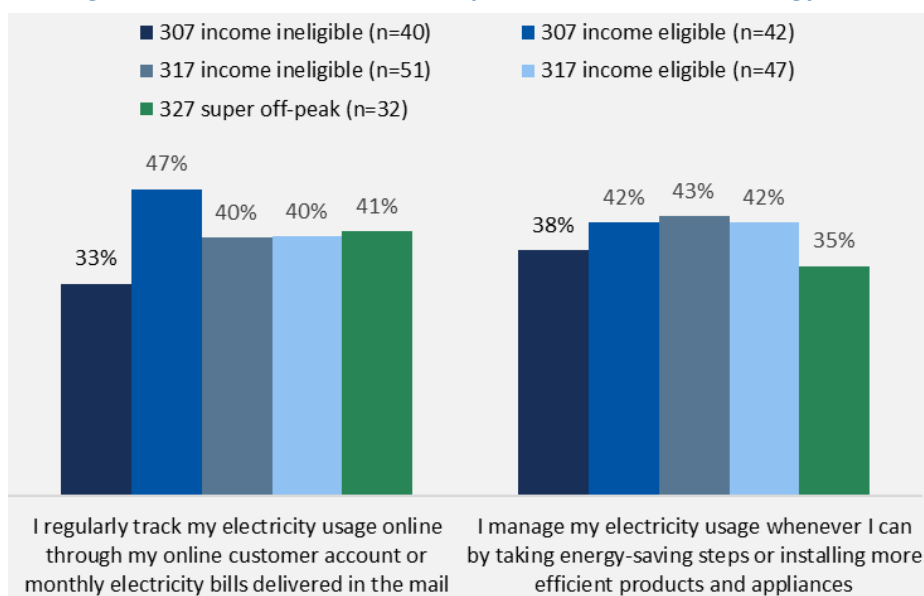
Figure 27. Participant Attitudes about Energy Use at Enrollment



Source: Enrollment survey. Percentage agreeing with the statement listed:
strongly agree or somewhat agree on a 4-point rating scale.

Non-enrollment survey respondents rated their agreement with similar statements (Figure 28) and gave lower agreement ratings than enrollment survey respondents. While 69% to 79% of participants agreed that they regularly track their energy usage, only 33% to 47% of non-enrolled respondents agreed with this statement. The gap was even larger for managing their energy usage when they can, with 88% to 92% expressing agreement among participants and 35% to 43% among non-enrolled customers. This indicates that customers who track their usage and make efforts to manage their usage were more likely to self-select into the pilot by accepting the enrollment offer from PSE.

Figure 28. Non-Enrollment Participant Attitudes About Energy Use

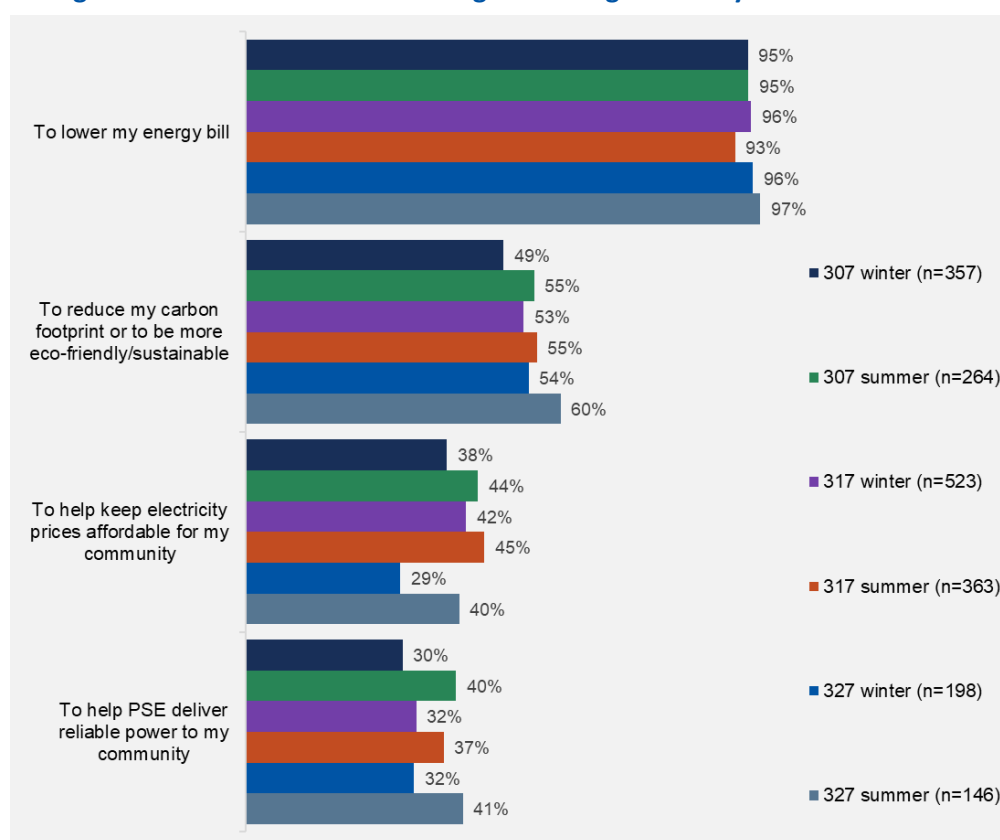


Source: Enrollment survey. Percentage agreeing with the statement listed: *strongly agree or somewhat agree* on a 4-point rating scale.

Enrollment survey respondents also rated their level of concern about climate change on a 10-point scale where 10 is *extremely concerned*. The average rating was 7.8 for all treatment groups except customers on Schedule 327 who gave a higher average rating of 8.1. Across all treatment groups, 49% rated their concern about climate change at 9 or 10 out of 10 (n=8,074).

The seasonal experience surveys asked participants who had shifted or reduced energy during peak periods what motivated them to do so (Figure 29). Almost all respondents were motivated to lower their energy bills, with a range of 93% to 97% by treatment group and season. Sustainability and reducing carbon footprints was mentioned by about half of respondents in all treatment groups in both seasons. Keeping electricity prices affordable and reliable power delivery were also motivations for a substantial minority of participants. Cadmus noted no major differences by income or rate groups, though mentions of the secondary motivations (sustainability, affordability, reliability) all increased to some degree from the winter to the summer survey, with Schedule 307 and Schedule 327 customers seeing the largest increases in these motivations.

Figure 29. Motivations for Reducing or Shifting Electricity Use on TOU Rates



Source: Enrollment survey. "What motivates you to reduce or shift electricity on the TOU rate plan?" (Respondents could select multiple actions)

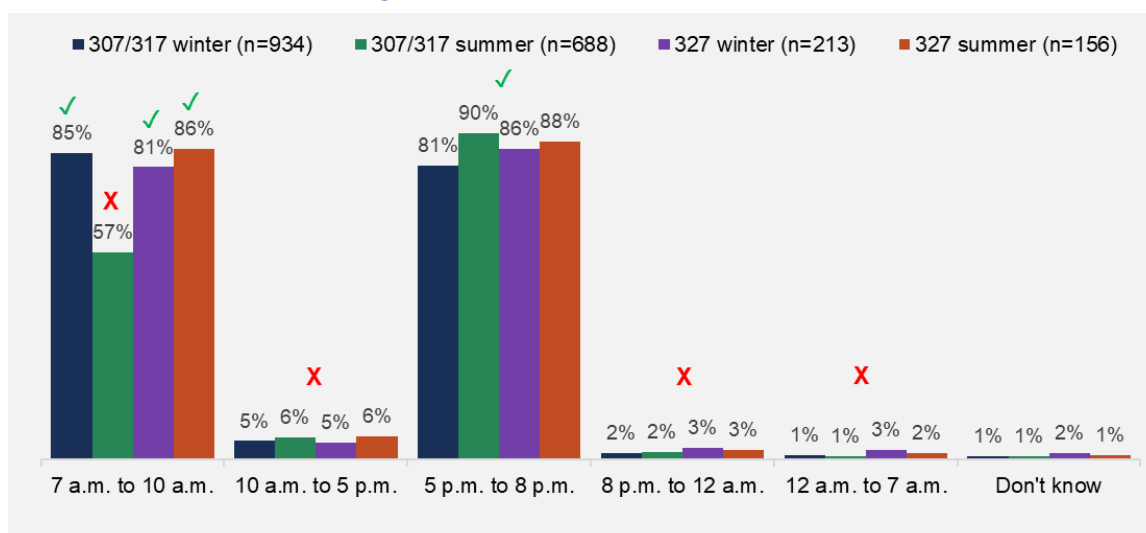
3.2.3. Participation and Experience

Cadmus surveyed a sample of pilot participants following their first winter on TVR (winter experience survey) and following their first summer (summer experience survey).

Awareness of Peak Periods and Energy Use

In the winter experience survey, most participants accurately recalled when peak periods had occurred on weekdays (81% to 85% for the morning peak and 81% to 86% for the evening peak; Figure 30). In the summer survey, most participants identified the same two periods as peaks; however, there is only an evening peak in summer for Schedules 307 and 317 (90% correctly identified) and no morning peak (57% incorrectly identified). Most respondents on Schedule 327 correctly identified the summer morning peak for their rate (86%). Very few participants incorrectly identified other time periods as being peaks (5% to 6% for midday, 2% or less for nighttime periods). Income eligible participants were a little less likely to correctly identify peaks (5% to 11% points lower than income ineligible for both rates in both seasons), and a little more likely to incorrectly identify summer mornings as a peak period (4% to 9% points higher than income ineligible by rate).

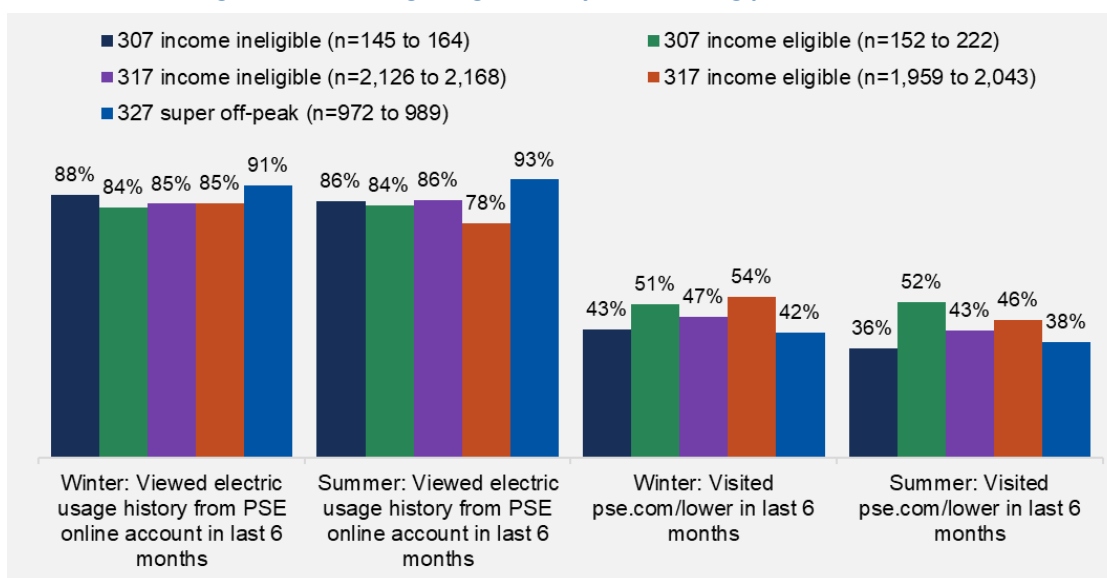
Figure 30. Awareness of Peak Periods



Source: Winter and Summer experience surveys. “To the best of your knowledge, when do peak periods occur during weekdays in [winter/summer]?” (Green check marks indicate correct answers, red X’s indicate incorrect answers)

Most pilot participants had viewed their usage history online in the six months before taking the survey for both the winter and summer seasons (ranging from 78% to 93% by rate and season; Figure 31). Customers on Schedule 327 rate were the most likely to have done so (91% winter, 93% summer), while responses from other rate and income groups were similar to each other. Overall, participants were equally likely to say they had viewed their usage history in both seasonal surveys (winter 86%, n=1,146 and summer 85%, n=844). About half of participants said they had visited pse.com/lower for insights into energy use and ways to save energy (38% to 54% by rate and season), with income eligible customers most likely report visiting the PSE website (3% to 16% higher than income ineligible in both seasons for both rates). Overall, visits to pse.com/lower declined somewhat from winter (48% of all 1,146 respondents) to summer (43%, n=841).

Figure 31. Viewing Usage History and Visiting pse.com/lower



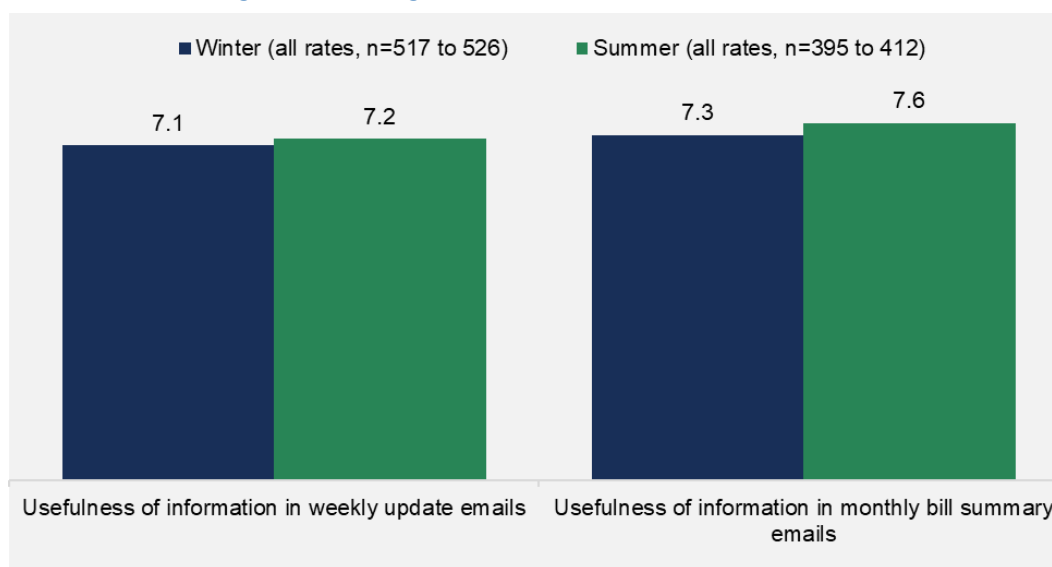
Source: Winter and Summer experience surveys. "In the past 6 months, have you viewed your home's electric usage history from your PSE online account?", "In the past 6 months, have you visited the pse.com/lower webpage for more insights into energy use and ways to save?"

Communications from PSE

PSE sent weekly update emails and monthly bill summary emails to pilot participants. Recall of receiving the weekly update emails was consistently high at 90% in winter (n=575) and 94% in summer (n=422), as was recall of monthly bill summaries (92% winter, n=570 and 94% summer, n=422). Across both seasons, at least 89% of respondents in every rate and income group recalled getting the updates and bill summaries.

Pilot participants generally found the information in the emails they received "useful," with average usefulness ratings on a 10-point scale (where 10 means *extremely useful*) of 7.1 (winter) and 7.2 (summer) for the weekly updates and slightly higher 7.3 (winter) and 7.6 (summer) for the monthly bill summaries (Figure 32). Cadmus also asked respondents if they were getting too many, too few, or just the right amount of emails from PSE. Most said it was the right amount (83% winter, n=536 and 89% summer, n=818), though 10% said they were getting too few emails in winter, and 5% reported too few in summer. The percentage of respondents that said they receive too many emails about the pilot was consistently low (7% winter, 6% summer).

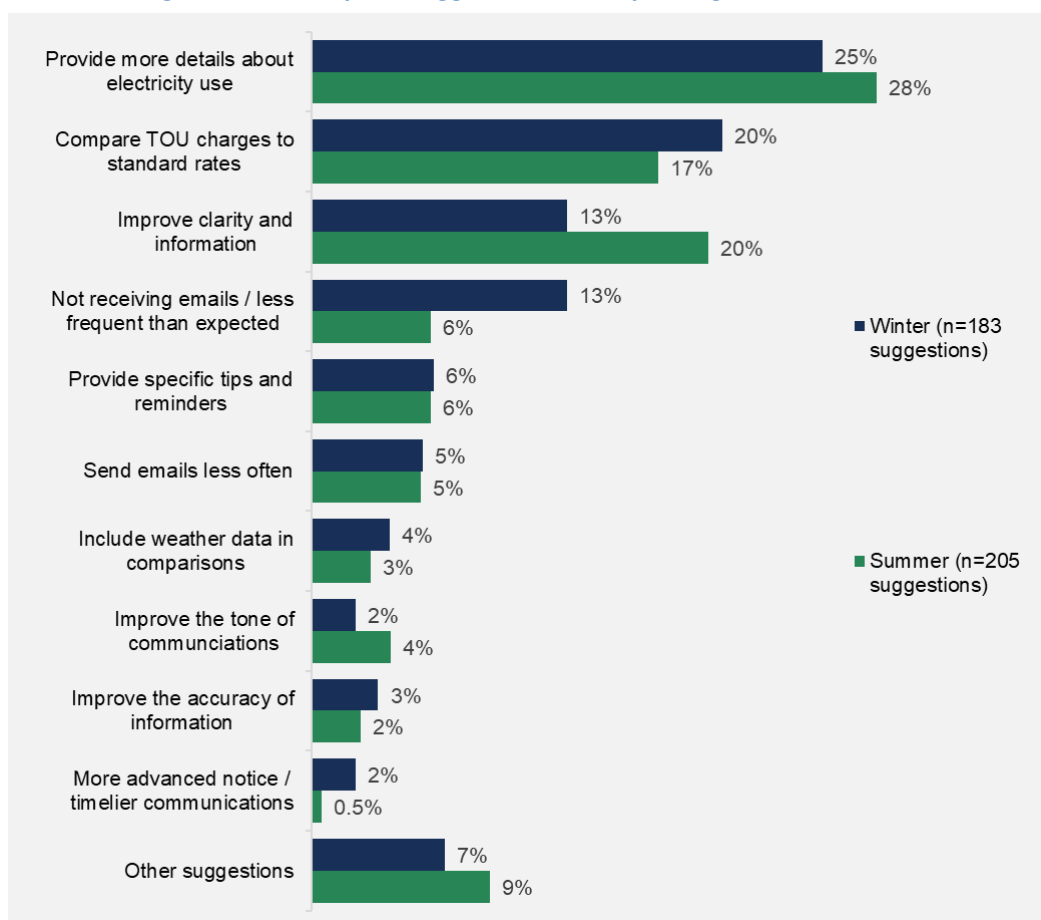
Figure 32. Ratings for Information in Emails from PSE



Source: Winter and Summer experience surveys. “How would you rate the usefulness of the information provided in the weekly update emails?”, “How would you rate the usefulness of the information provided in the monthly bill summary emails?” (Mean ratings on a 10-point scale where 10 is *extremely useful*)

The seasonal experience surveys asked pilot participants if they had any suggestions for improving TOU rate emails from PSE. From the winter survey, 18% of 1,044 respondents who recalled receiving emails from PSE offered suggestions, and 25% of 808 offered suggestions from the summer survey. Cadmus categorized these suggestions, which are summarized in Figure 33. In both seasons, the top suggestion was to provide more details about household electricity use (25% winter, 28% summer). Other common suggestions were to provide a comparison of actual charges under TOU rates to standard residential rates (20% winter, 17% summer), and to improve the clarity of information provided in the emails (13% winter, 20% summer). In the winter survey, 13% of suggestions related to participants not receiving emails, or not receiving them as often as expected; however, only 6% of suggestions in the summer survey related to not receiving emails. PSE confirmed that summary emails were not sent to all participants during the first winter of the pilot due to data issues between backend systems, which explains the frequency of comments in the winter survey about not receiving emails.

Figure 33. Participant Suggestions for Improving Emails from PSE



Source: Winter and Summer experience surveys. “What advice would you give PSE on how they can make the TOU rate emails better?” (Percentage of suggestions for improvement)

Many participant suggestions about including more details in rate emails included requests for specific data: comparisons to the previous year or to peer households; daily, hourly, or even 15-minute interval

“At a minimum, I need daily by-hour data on total electricity usage. Aggregating a week, then sending it a week later, doesn’t give me the details or the recency to know what is going on.” - Rate 307 income ineligible

data; energy usage by kilowatt-hour and kilowatt in addition to or instead of dollar comparisons; and information on which equipment and systems are using energy at a given time. Other suggestions were to clearly label peak periods and associated rates, and to make data available in real time.

Suggestions about providing a comparison to standard residential rates usually related to participants wanting to know if they are actually saving money, which indicates that the rate emails did not convey this information clearly to everyone.

“It would be nice if we were told how much money we're saving compared to someone who's not using the TOU program. I'm doing my best to conserve energy during those times, and I'm not convinced I'm really saving money.” - Rate 317 income eligible

Suggestions about improving clarity and information mostly concentrated on two themes: customers were not clear about why PSE was sending emails, and customers were requesting specific information such as contact info for PSE program staff, links to online resources, and reminders of peak periods and rates. A few respondents also mentioned accessibility issues, such as charts being hard to read on a cellphone screen.

“The only things you can really delay are: laundry, dishwashing, and EV charging. Everything else has to happen when it happens. Guilt tripping people about not doing enough is off-putting.” - Rate 327

Customers who commented about not receiving emails from PSE included customers who had updated their email address or were receiving messages at an old account, and a few who suspected that emails from PSE were not reaching them due to spam filters. Other customers were confused about the cadence of communication, reporting that they received rate emails from PSE irregularly and unpredictably.

A few participants took issue with the tone of rate emails from PSE, describing them as “scolding” or “guilt-tripping” customers for “trivial” week-to-week increases in electricity usage.

Behavior during TOU Peak Periods

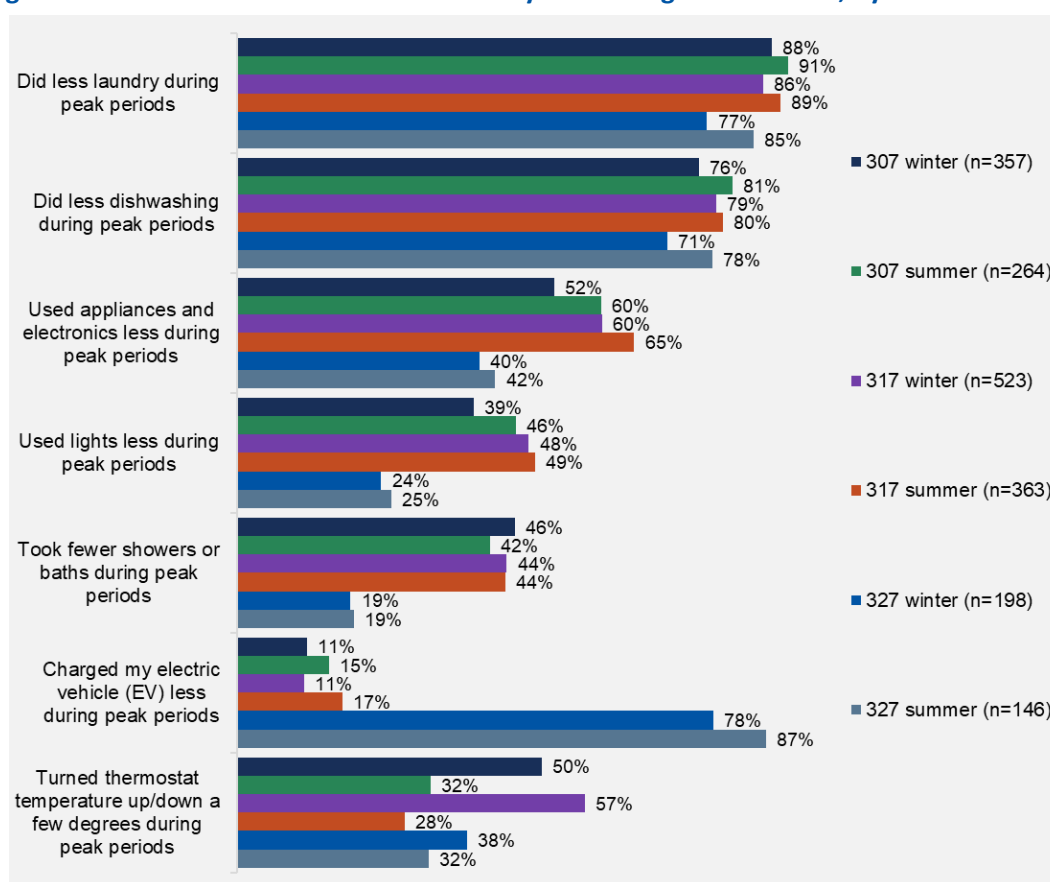
A large majority of pilot participants reported that their households were taking action to reduce electricity use during peak periods. During the winter season, 94% (n=1,144) of participants reported taking action to reduce usage during peaks, and 92% (n=838) reported doing so during the summer season, with every treatment group across both seasons reporting at least 87% taking action. During the winter, 56% of those who took action to reduce usage did so “every” weekday and 35% “several days per week” (n=1,062). Summer results were almost identical (55% every weekday, 36% several days per week, n=759). These results were consistent across rate and income groups.

The most common actions taken to reduce usage during peak periods were shifting laundry and dishwashing to off-peak periods, with 71% to 91% of respondents on all rates taking these actions in both seasons (Figure 34). A majority of Schedule 307 and Schedule 317 respondents also used appliances and electronics less during peak periods (52% to 65% by rate and season), though Schedule 327 customers were less likely to take these actions (40% to 42% by season). Customers on Schedule 327 were also half as likely as Schedule 307 and Schedule 317 customers to use lights less and take fewer showers during peaks. The most common action for Schedule 327 customers was to charge their

EVs during off-peak periods (78% winter and 87% summer); customers on this rate have a lower super off-peak rate for charging late at night. The percentage of Schedule 307 and Schedule 317 customers shifting EV charging off-peak (11% to 17%) was in line with the much lower penetration of EV ownership in those groups (only 15% of participants on rates 307 and 317 were charging EVs at home when they enrolled in 2023, n=7,013).

Schedule 307 and Schedule 317 respondents also displayed a notable seasonal difference in thermostat adjustments during peaks: these customers were much more likely to reduce heating in winter (50% to 57% by rate) than to reduce cooling in summer (28% to 32% by rate). Customers with the 327 rate were just as likely as 307 and 317 to make temperature adjustments in summer (32%), but were less likely to do so in winter (38%). This is explained in part by Schedule 327 customers being less likely to have electric heating systems (50% at time of enrollment, n=970) than customers on the other rates (64% of Schedule 307 and 317 customers, n=6,814).

Figure 34. Actions Taken to Reduce Electricity Use during Peak Periods, by Rate and Season



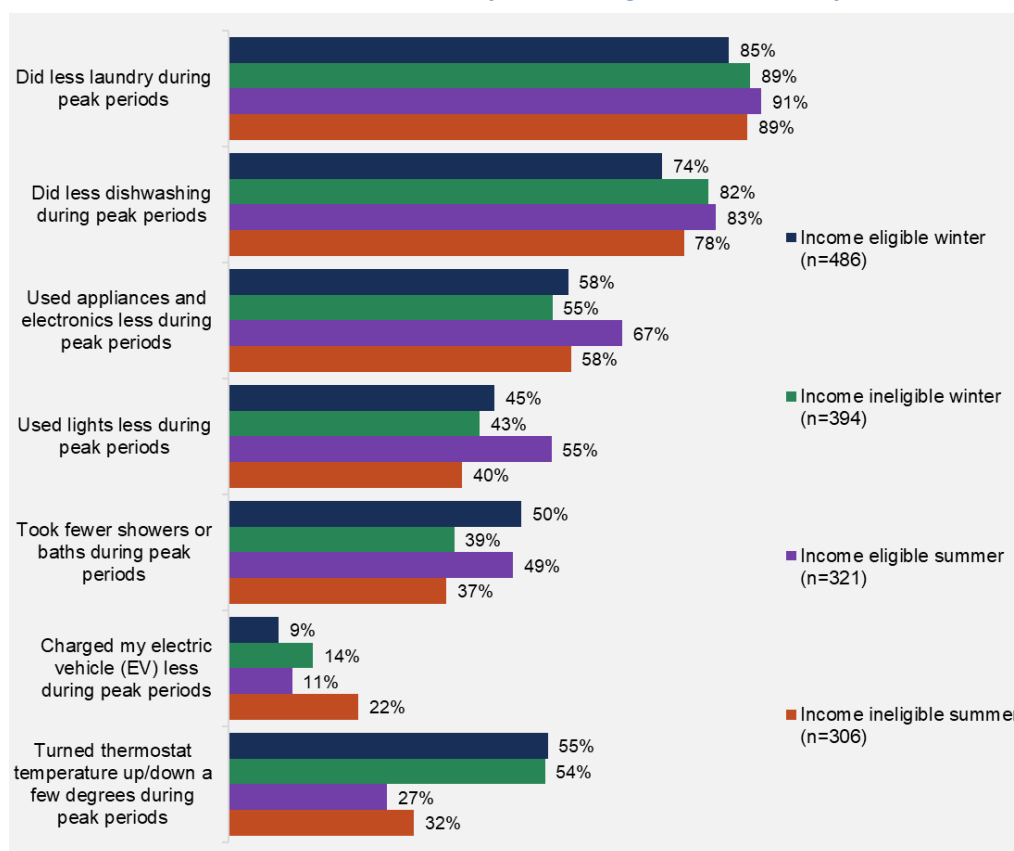
Source: Winter and Summer experience surveys. "Here is a list of high-impact actions your household could have done. Please select all the actions your household did." (Respondents could select multiple actions)

Figure 35 shows that income eligible and income ineligible customers took actions at similar rates for the most part, although income eligible customers were more likely to shift showers and bathing to off-

peak periods (49% to 50% by season) than income ineligible customers (37% to 39%). Income eligible customers were also more likely than income ineligible customers to shift appliance and electronics use (67% compared to 58%) and lighting use (55% compared to 40%) to off-peak periods during the summer, though the income groups took these actions at similar rates during the winter.

Notably, the pattern of reducing heating in winter more often than reducing cooling in winter was very similar for both income groups (income eligible: 55% winter and 27% summer; income ineligible: 54% winter and 32% summer). Income eligible customers were also the least likely to shift EV charging (9% to 11% by season), in line with having the lowest EV penetration (9% of income eligible charged EVs at home at the time of enrollment, n=3,316, compared to 20% of income ineligible, n=3,697).

Figure 35. Actions Taken to Reduce Electricity Use during Peak Periods, by Income and Season

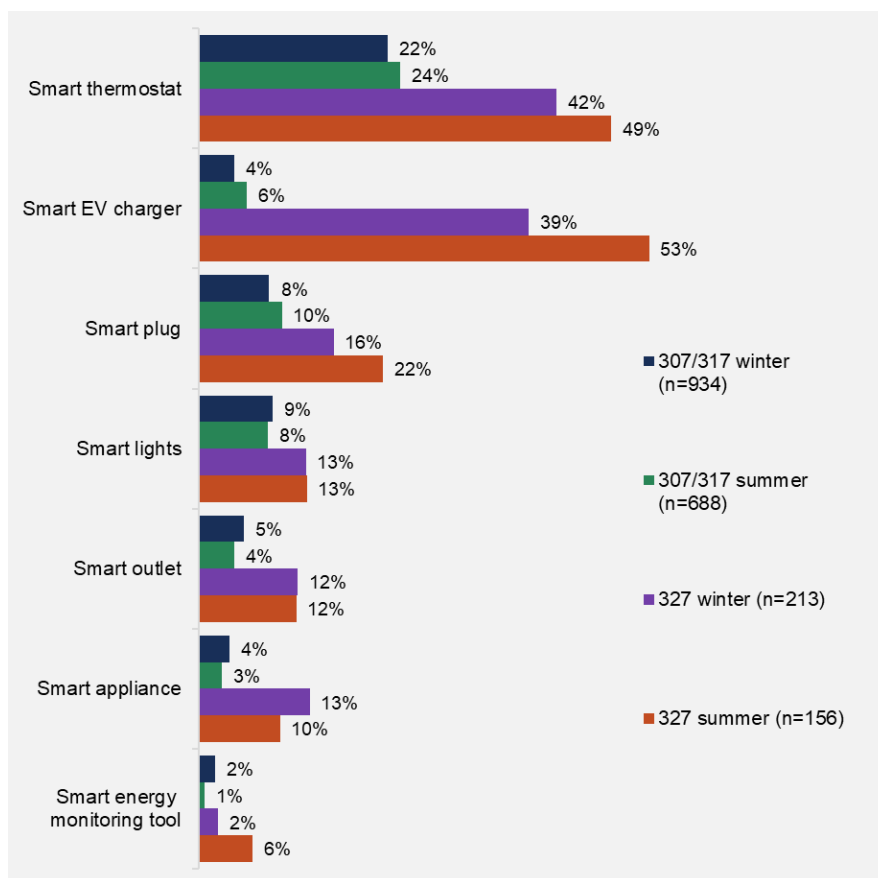


Source: Winter and Summer experience surveys. “Here is a list of high-impact actions your household could have done. Please select all the actions your household did.” (Respondents could select multiple actions; Schedule 307 and 317 treatment groups combined in this chart, 327 treatment group not shown)

Many pilot participants used smart devices to shift electricity usage to off-peak periods, with customers on rate 327 being the most likely to do this in both winter (62%, n=198) and summer (68%, n=146). Among the other TVR participants, smart device use was comparable across rate groups 307 and 317, though income eligible participants were less likely to use smart devices (26% winter, n=484 and 24% summer, n=321) than income ineligible customers (34% winter, n=394 and 39% summer, n=306).

Figure 36 shows that the most common smart devices respondents used were smart thermostats (for all groups) and smart EV chargers (for Schedule 327 only). Customers who used smart appliances most often mentioned dishwashers, clothes washers, and water heaters.

Figure 36. Smart Devices Used to Shift Usage from Peak Periods



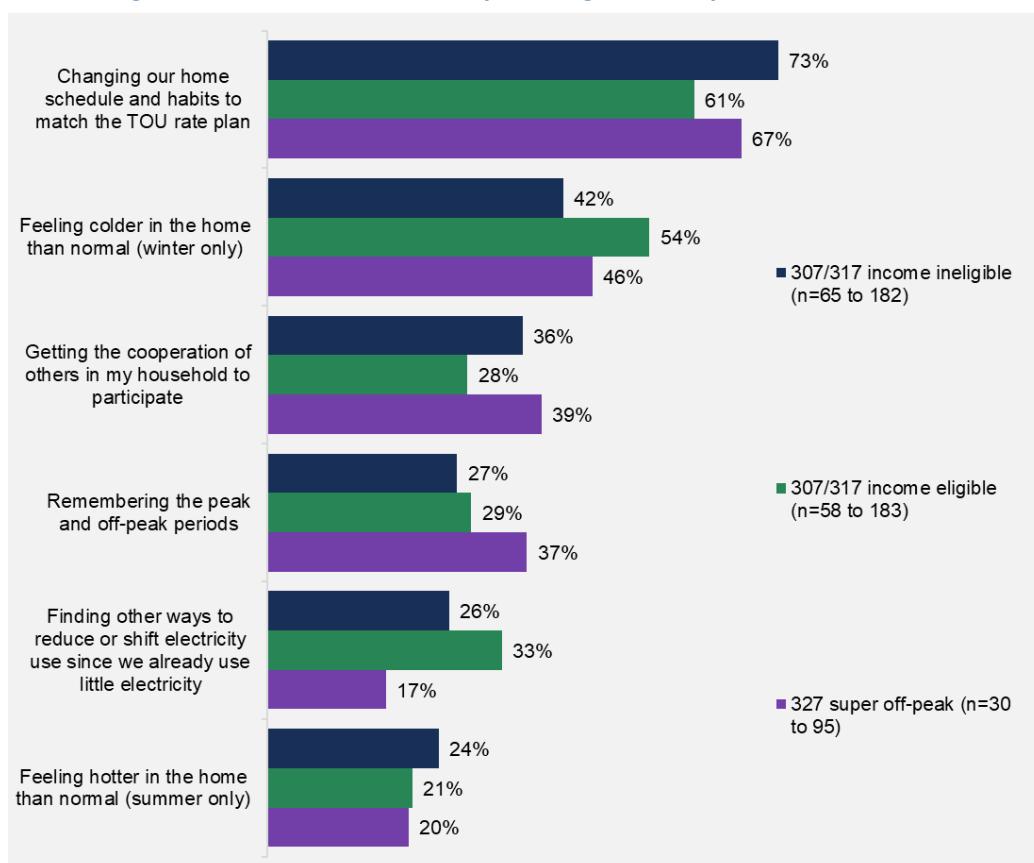
Source: Winter and Summer experience surveys. "What smart devices did you use to help you schedule or automate your electricity use to off-peak periods?"
(Respondents could select multiple devices)

Following their first winter season with TOU rates, 71% (n=1,060) of respondents reported that it was *very easy* or *somewhat easy* to shift their electricity usage. The percentage saying it was easy rose significantly to 80% (n=765) following the subsequent summer season. These ratings were similar across rate and income groups.

Figure 37 shows the reasons given by participants who found shifting use on TOU rates to be *somewhat difficult* or *very difficult*. The most common reason, changing household schedules and habits, was mentioned most often by income ineligible respondents on the 307 and 317 rates (73%). A majority of income eligible respondents mentioned concerns about home temperature in the winter (54%), which was also the second most-mentioned reason for income ineligible (42%) and Schedule 327 (46%) participants in the winter. However, concern about home temperature during the summer cooling season was much lower (20% to 24% by group). Income eligible customers were also the most likely to

report that they have difficulty finding ways to use less energy because they are already using very little (33% compared to 26% of income ineligible and 17% of customers with 327 rates). Conversely, income eligible customers were the least likely to mention the cooperation of others in the household being a difficulty (28% compared to 36% of income ineligible and 39% of rate 327 customers). Customers with the 327 rate are the only ones with three rate periods, and respondents in this group were the most likely to mention difficulty with remembering the peak and off-peak periods (37%).

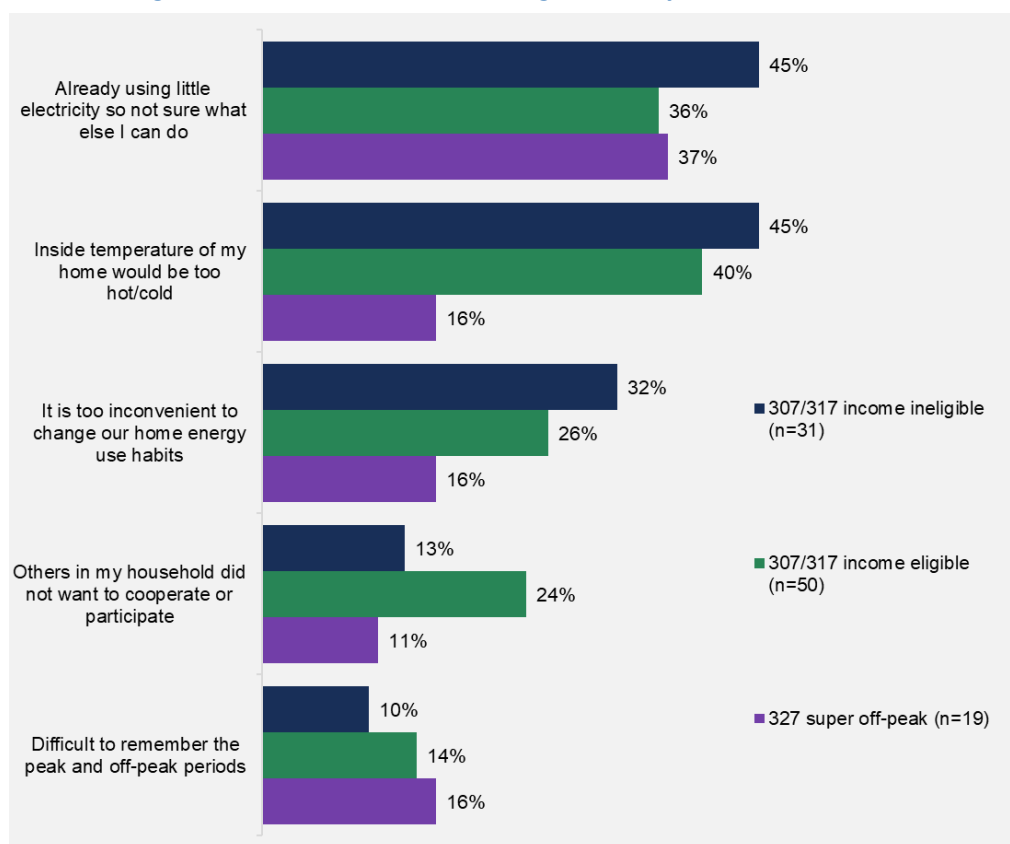
Figure 37. Reasons for Difficulty Shifting Electricity Use on TOU Rates



Source: Winter and Summer experience surveys. "What difficulties did your household have in reducing or shifting electricity use on the TOU rate plan?" (Respondents could select multiple devices; results are combined winter and summer responses unless labeled otherwise)

The experience surveys asked respondents who did not shift their usage from peak periods why they did not shift. Figure 38 shows that many of these customers felt they were already using little electricity so were not sure what else they could do (36% to 45% by group). Customers on the 307 and 317 rates were also concerned about the temperature in their homes (40% to 45%) though fewer customers on the 327 rate were concerned about temperature (16%). Income eligible participants were the most likely to mention a lack of cooperation from other household members (24%).

Figure 38. Reasons for Not Shifting Electricity Use on TOU Rates

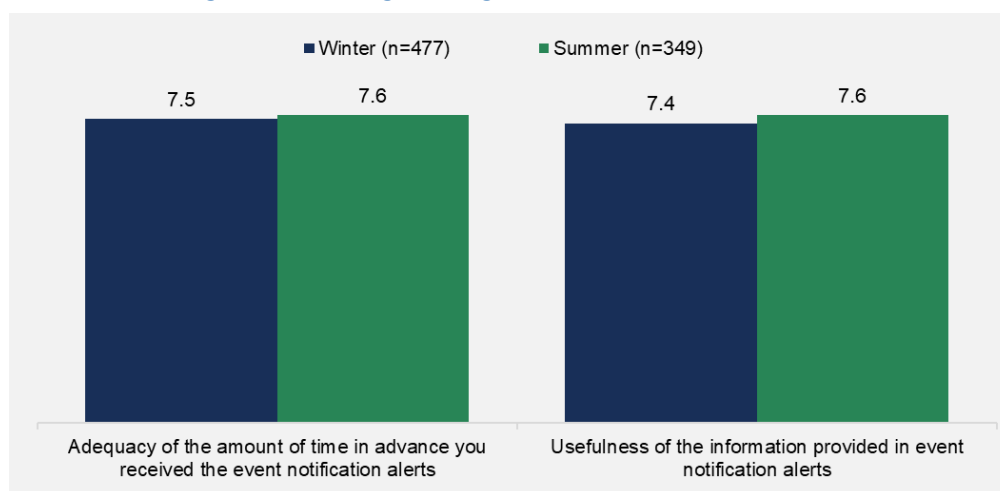


Source: Winter and Summer experience surveys. “Why did your household not reduce or shift electricity use on the TOU rate plan?” (Respondents could select multiple reasons; results are combined winter and summer responses)

Response to PTR Events

Residential customers on rate 317 can receive PTRs for reducing electricity use during peak periods on days when PSE calls a PTR event. In the first year of the TVR pilot, PSE called four PTR events in the winter season and six in the summer. In the winter experience survey after the first winter of the pilot, 88% (n=542) of Schedule 317 respondents recalled receiving notification of PTR events, and in the summer experience survey after the first summer, 90% (n=388) recalled notifications. Figure 39 shows that Schedule 317 participants gave generally positive ratings for the amount of advance notice provided by notification alerts (7.5 to 7.6 by season) and usefulness of the information provided in the notifications (7.4 to 7.6 by season).

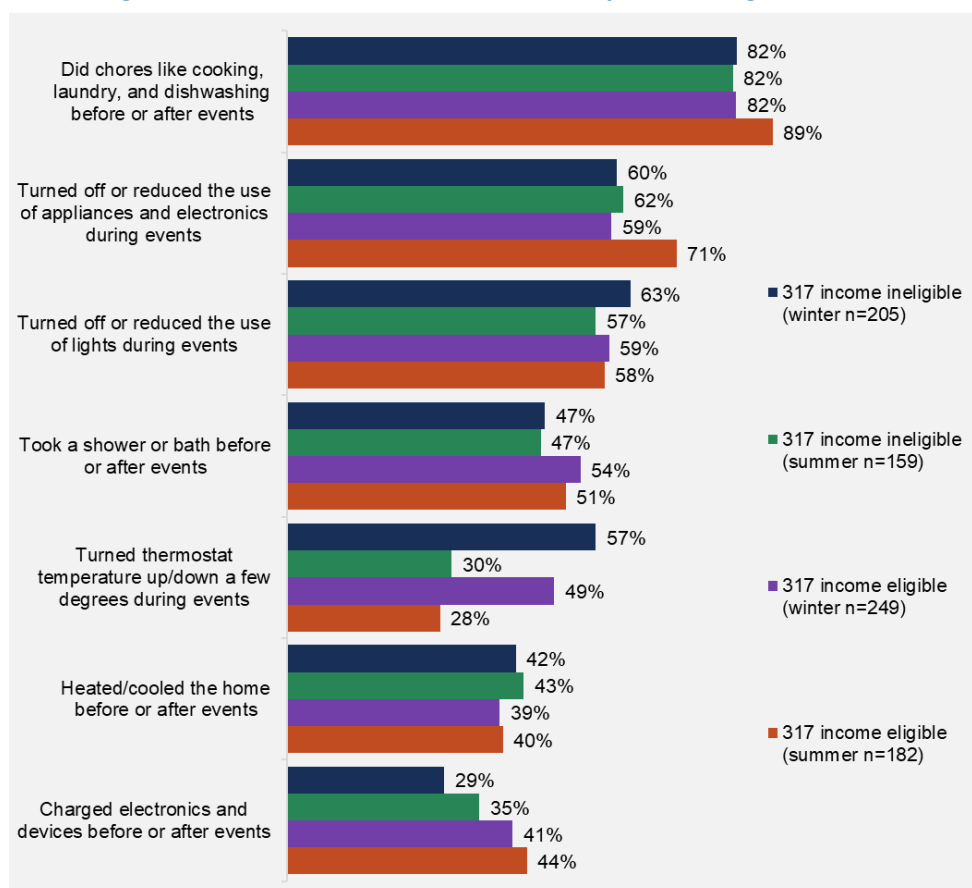
Figure 39. Average Ratings for PTR Event Notifications



Source: Winter and Summer experience surveys. “How would you rate the adequacy of the amount of time in advance you received the Peak Time Rebate event notification alerts?”, “How would you rate the usefulness of the information provided in the Peak Time Rebate event notification alerts?”
(Average ratings on a 10-point scale where 10 is extremely adequate or useful)

Most Schedule 317 participants reported taking action to shift electricity use during PTR events: 83% (n=545) during winter and 87% (n=390) during summer. About half of these participants took action to shift use for every PTR event of the season (44% winter, 36% summer) and the rest for only some PTR events (39% winter, 51% summer). Figure 40 shows the actions taken by season and income group: most respondents shifted cooking; laundry; dishwashing; and use of appliances, electronics, and lighting during PTR events. Cadmus observed only two consistent differences by season or income group: customers on 317 rates were more likely to make thermostat adjustments in winter (49% to 57%) than summer (28% to 30%), and income eligible customers were more likely to shift the charging of electronics in both seasons (41% to 44%, compared to 29% to 35% of income ineligible customers).

Figure 40. Actions Taken to Shift Electricity Use During PTR Events



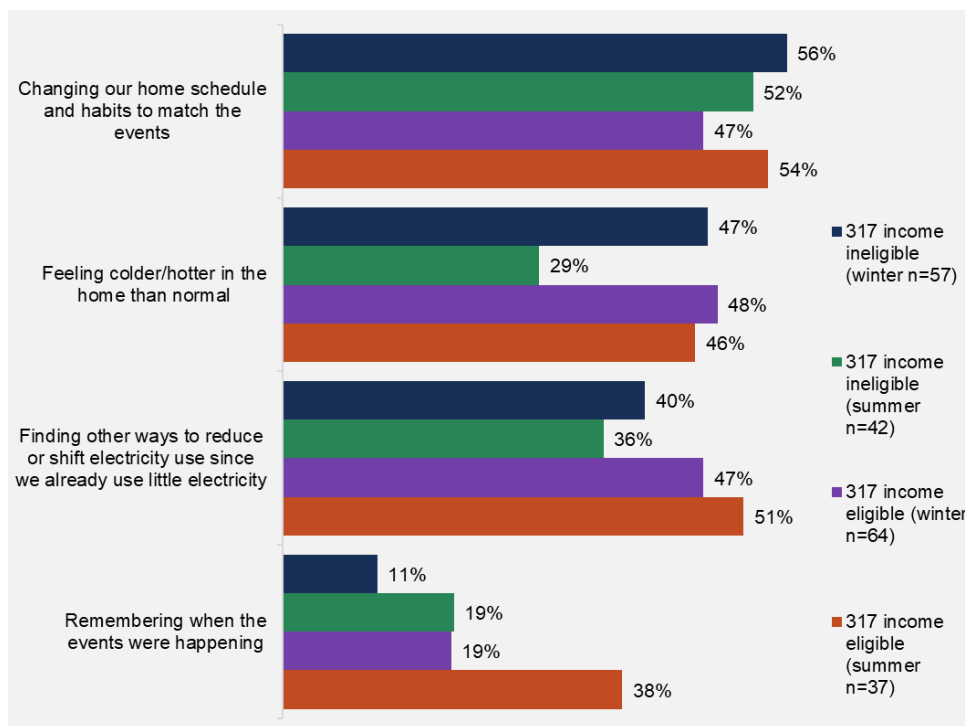
Source: Winter and Summer experience surveys. “How did your household reduce or shift electricity use during the [winter/summer] Peak Time Rebate events?” (Actions taken by respondents who took action; respondents could select multiple actions)

Following their first winter season of PTR events, 73% (n=450) of Schedule 317 participants reported that it was *very easy* or *somewhat easy* to shift their electricity usage during events. The percentage saying it was easy was similar (77%, n=339) following the subsequent summer PTR event season and across rate and income groups.

Figure 41 shows the reasons given by participants who found shifting use during PTR events to be *somewhat difficult* or *very difficult*. Changing household schedules and habits was mentioned most frequently, as it also was for customers who reported difficulty with shifting use away from TOU peaks (Figure 37). About half of income eligible customers reported home temperature concerns as a reason for not shifting usage in both seasons (48% winter and 46% summer), as did income ineligible customers in winter (47%) though fewer of this group expressed concern about temperature in the summer (29%). Income eligible customers were more likely to report that they found shifting during PTR events difficult because they were already using little electricity (47% to 51% by season) compared to income ineligible customers (36% to 40%). Income eligible customers were also about twice as likely to have difficulty

remembering when events were happening (19% and 38% by season) compared to income ineligible customers (11% and 19%).

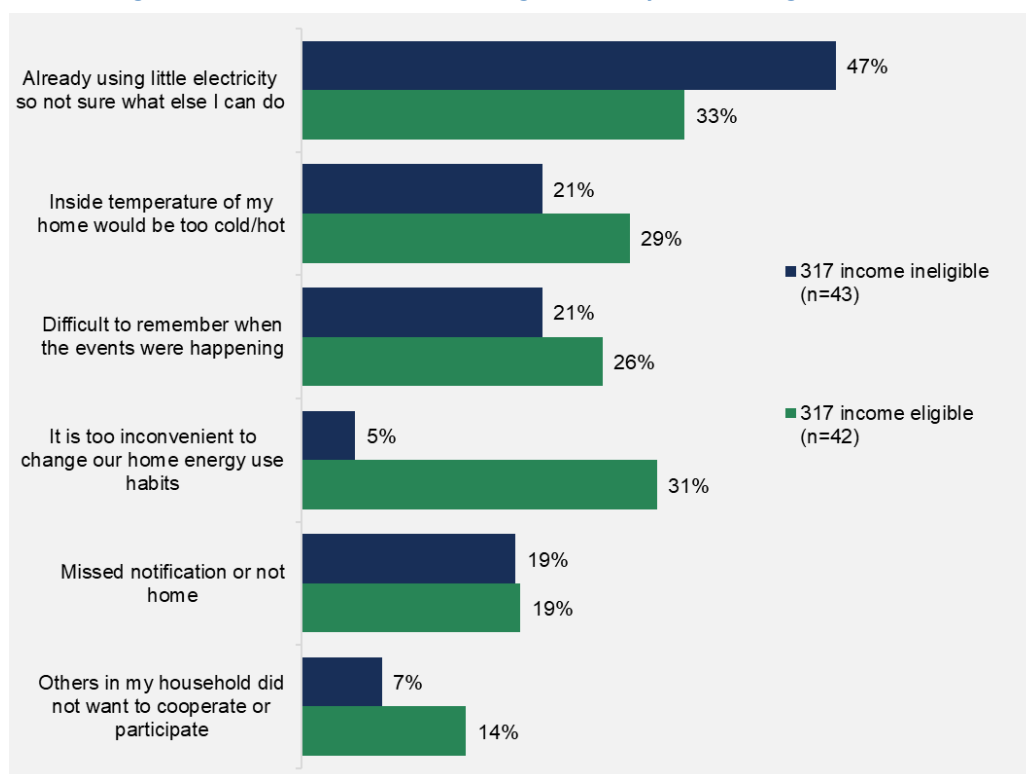
Figure 41. Reasons it was Difficult to Shift Electricity Use During PTR Events



Source: Winter and Summer experience surveys. “What difficulties did your household have in reducing or shifting electricity use during the [winter/summer] Peak Time Rebate events?” (Respondents could select multiple actions)

The experience surveys asked respondents who did not respond to PTR events why they did not respond. Figure 42 shows that many of these customers said they were already using little electricity and were not sure what else they could do (33% income eligible and 47% income ineligible). Other reasons mentioned by 20% or more of these respondents centered around concerns about home temperature becoming uncomfortable, not recalling when events are happening, missing notifications, and not being home during events to respond to them. Income eligible customers often mentioned the inconvenience of changing habits and schedules (31%) but few income ineligible customers mentioned this reason (5%).

Figure 42. Reasons for Not Shifting Electricity Use During PTR Events



Source: Winter and Summer experience surveys. “What were your reasons for not participating in the [winter/summer] Peak Time Rebate events?” (Respondents could select multiple reasons; results are combined winter and summer responses)

3.2.4. Income Eligible Initiatives

PSE reached out to a subset of income eligible pilot participants to offer them free smart thermostats and enrolled a random 50% of BDR participants into a bill protection plan, in keeping with modifications to the pilot stemming from a General Rate Case settlement order.³

Free Smart Thermostat Offers

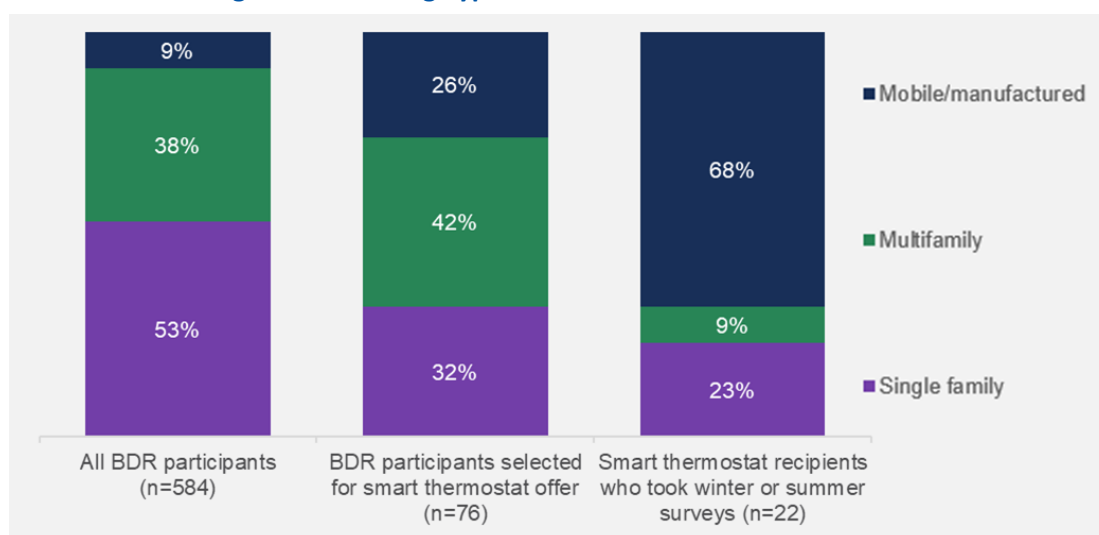
PSE sent free smart thermostats to selected pilot participant households with BDR using self-reported data from the enrollment survey to select households that could take advantage of the thermostats. Participants selected for the smart thermostat offer had expressed confidence in their ability to install a smart thermostat and confirmed that they had Wi-Fi internet in their homes, which is necessary to fully utilize the thermostat’s smart features. Only participants with central electric forced air furnaces or ducted heat pumps were included in the offers to ensure compatibility with the Google Nest thermostats. Participants with gas heat are not affected by TVR (which apply only to electricity), and

³ Washington Utilities and Transportation Commission v. Puget Sound Energy, Dockets UE-220066 and UG-220067 (consolidated), Final Order 24, (December 22, 2022) <https://apiproxy.utc.wa.gov/cases/GetDocument?docID=3215&year=2022&docketNumber=220066>

other line voltage electric systems such as baseboard heating require professional installation for smart thermostats to work properly. Although the settlement order required PSE to provide smart thermostats to half of the participants with BDR, fewer than half of these participants passed the selection screens, so PSE offered smart thermostats to all BDR customers who passed the screens.

The requirement of non-baseboard electric heat systems meant that BDR participants in single family homes were less likely to be selected for the thermostat offer (32% of recipients lived in single-family homes compared to 53% of all BDR participants, Figure 43), and participants in mobile and manufactured homes were more likely to be selected (26% of thermostat recipients vs. 9% of all BDR participants lived in mobile and manufactured homes). The 22 smart thermostat recipients who responded to the winter and summer experience surveys mostly lived in mobile and manufactured homes (68%), and only 9% of survey respondents lived in multifamily housing (compared to 42% of participants who received thermostats). Of the smart thermostat recipients who lived in multifamily housing (n=32), 75% were renters, and not having permission from the property owner may have been a barrier for these customers.

Figure 43. Housing Types for BDR Smart Thermostat Offer



Source: Enrollment survey. "What type of housing do you currently live in?"

The first offering took place during the first winter of the pilot, and was an opt-out offer, meaning that PSE sent a smart thermostat unless the customer had responded to PSE saying they did not want one sent. PSE initially shipped free smart thermostats to 40 pilot participants. Based on feedback from survey respondents who had received opt-out smart thermostats, PSE's second offer was changed to opt-in. PSE notified customers that they could receive a free smart thermostat if they responded to the notification and requested one. PSE shipped free smart thermostats to 37 more pilot participants during this round of outreach.

Cadmus surveyed 11 opt-out thermostat recipients during the winter experience survey, and 10 opt-in thermostat recipients during the summer experience survey. Only one opt-in respondent did not recall receiving the smart thermostat shipped by PSE, thus 95% (n=21) confirmed receipt of their smart

thermostat. For both offerings, only one respondent had installed their free smart thermostat at the time of the survey, for an installation rate of just 10% (n=21). Of the 18 respondents who had not installed their smart thermostat, four said they planned to install it in the next three months. The remaining 14 respondents did not plan to install their thermostat: six did not know how to install it, three had tried and failed to install it, three said it was not compatible with their existing HVAC system, and two said they already had a programmable thermostat and did not need a new one.

Bill Protection Credit

PSE enrolled a random 50% of income eligible customers with BDRs into a bill protection offering that provided participants with a refund credit for energy charges⁴ if their TOU charges exceeded 110% of what they would have paid under the standard Schedule 7 rate. The credit of the difference between the TOU charges and the charges under Schedule 7 was calculated based on annual usage at the end of the first year of the pilot. Customers were eligible for bill protection credits even if they had not been participating in the pilot for the full 12 months.

Cadmus analyzed customer billing data to compare these customers' actual energy charges under TOU to what their energy charges would have been on Schedule 7 and calculated the credit amounts owed. As Table 19 shows, only 11% of customers who were enrolled in bill protection paid more than 110% of what they would have with Schedule 7 rates and were thus eligible for the credit. Customers with 307 and 317 rates were equally likely to be eligible for credit, but none of the Schedule 327 participants were eligible for a bill protection credit.⁵ However, the amount of credit per customer was substantially higher for Schedule 307 participants (\$34 on average) than Schedule 317 participants (\$10 on average). The larger credits for Schedule 307 participants were due to Schedule 307 having higher on-peak rates than Schedule 317, particularly in winter (see rates in Table 8). In total, PSE paid \$656.06 in bill credits to the 35 customers who were eligible for this credit.

Table 19. Bill Protection Annual Credits Summary

Rate group	Enrolled in Bill Protection	Eligible for Credit (TOU > 110% of Schedule 7)	Percentage Eligible for Credit	Minimum Credit	Maximum Credit	Average Credit
307	105	13	12%	\$3.97	\$104.37	\$33.67
317	195	22	11%	\$0.04	\$51.91	\$9.93
327	17	0	0%	N/A	N/A	N/A
Total (all rates)	317	35	11%	\$0.04	\$104.37	\$18.74

⁴ Energy charges refer to the per-kilowatt-hour charges in the published rate schedules (7, 307, 317, and 327) and do not include any taxes, fees, or other credits that apply to customer bills.

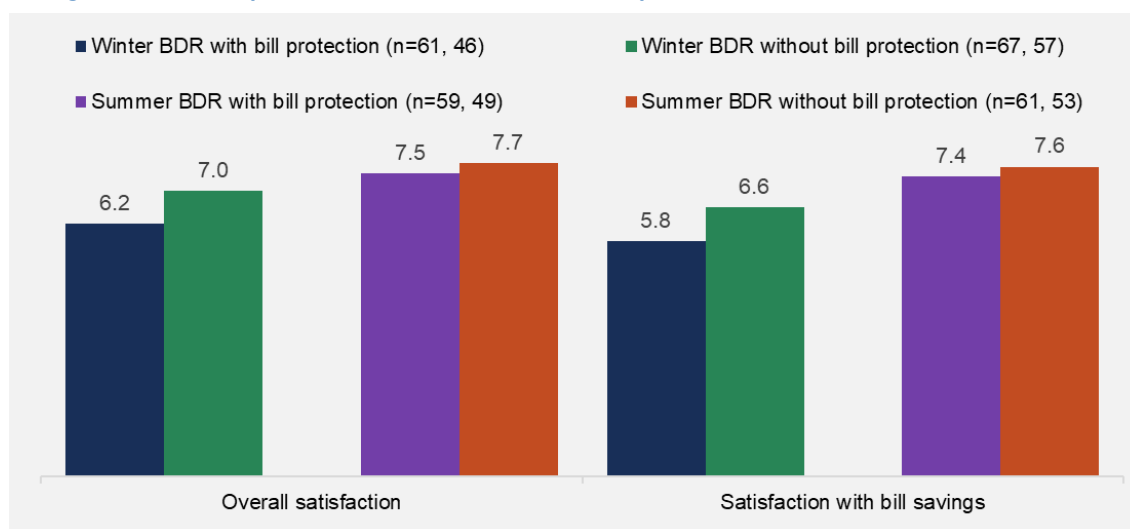
⁵ Although the rate 327 group was not split into two treatment groups by income level (as the 307 and 317 rate groups were), there were income eligible customers on rate 327 who were enrolled in BDRs and therefore 50% of them received bill protection.

Cadmus compared income eligible BDR participants who received bill protection with those who did not. Table 20 shows that all income eligible BDR participants spent less with TOU rates than they would have spent on standard Schedule 7 rates. Participants on rate 307 who did not have bill protection saved more on average (\$33) than those with bill protection (\$7), but Schedule 307 customers with bill protection also used 6% fewer kilowatt-hours during the year than those without bill protection. For BDR participants on rate 317, the differences in average annual savings were small (\$5 compared to \$2), and the average kilowatt-hours used during the year differed by only about 1% between customers with bill protection and those without. Among the small number of BDR participants on rate 327, results were very similar for those with and without bill protection, with both groups saving more than \$130 per year on average with TOU rates compared to standard rates (none of the Schedule 327 customers received any credit from the bill protection offer).

Table 20. Usage and Energy Charges for Income Eligible BDR Participants with and without Bill Protection

Rate group	Count of Participants	Average Annual kWh used	Average Annual TOU energy charges	Average Annual energy charges on Schedule 7 rate	Average Difference (Schedule 7 minus TOU)
307 with bill protection	105	9,580.4	\$921.60	\$929.07	\$7.46
307 without bill protection	166	10,201.9	\$966.41	\$998.99	\$32.57
317 with bill protection	195	10,366.1	\$1,008.85	\$1,010.66	\$1.82
317 without bill protection	234	10,497.7	\$1,019.06	\$1,024.48	\$5.43
327 with bill protection	17	11,822.3	\$1,026.73	\$1,157.86	\$131.12
327 without bill protection	20	12,170.6	\$1,071.91	\$1,205.48	\$133.57

Figure 44 shows that following their first winter on TOU rates, participants with bill protection were less satisfied with their bill savings (5.8) and the pilot overall (6.2) than those without bill protection (6.6 and 7.0, respectively). However, following their subsequent summer on TOU rates, satisfaction increased for both groups and the gap between those with and without bill protection narrowed from 0.8 points to 0.2 points for both ratings. Since bill protection credits were paid at the end of the year based on annual results, both seasonal experience surveys were fielded before customers learned if they were going to get a credit and how much they would get.

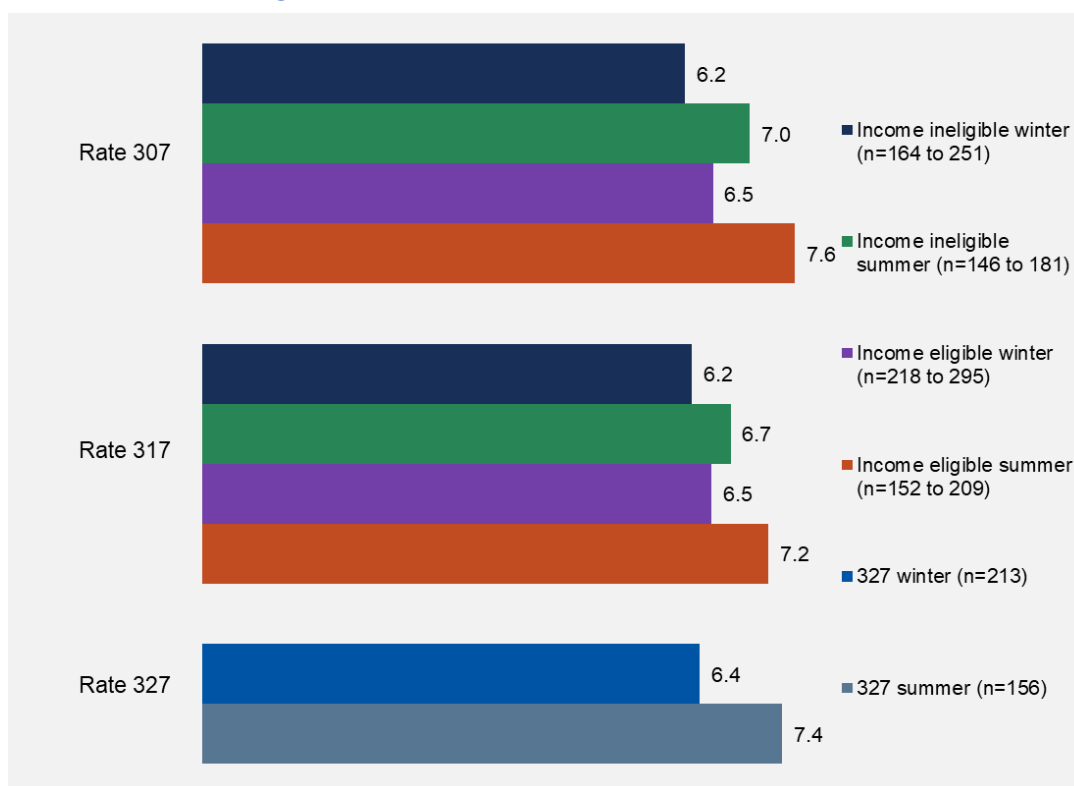
Figure 44. Participant Satisfaction for BDR Participants with Bill Protection and Without

Source: Winter and Summer experience surveys. “Taking everything into consideration, please rate your overall experience with PSE’s TOU pilot program?”, “How satisfied are you with your bill savings since enrolling in PSE’s TOU pilot program?” (Average rating on a 10-point scale where 10 is *Outstanding or Extremely satisfied*). Income eligible BDR participants on 307 and 317 rates are combined for this analysis.

3.2.5. Customer Satisfaction and Suggestions for Improvement

Pilot participants rated their overall satisfaction with their experience on TOU rates on a 10-point scale where 10 means *extremely satisfied*. Ratings by season and treatment group are presented in Figure 45. Across all treatment groups, survey respondents gave average satisfaction ratings of 6.4 (n=1,144) following the winter season and 7.2 (n=844) following the subsequent summer season, indicating a significant increase in satisfaction. The largest increases from winter to summer ratings were among Schedule 307 income eligible and Schedule 327 respondents (from 6.5 to 7.6 and from 6.4 to 7.4, respectively). Ratings were also consistently higher from income eligible respondents with 307 and 317 rates, and the gap between their ratings and those of income ineligible respondents grew from 0.3 rating points in winter to 0.5 to 0.6 rating points in summer.

Figure 45. Overall Satisfaction with the TVR Pilot



Source: Winter and Summer experience surveys. "Taking everything into consideration, please rate your overall experience with PSE's TOU pilot program?" (Average rating on a 10-point scale where 10 is *Outstanding* and 1 is *Unacceptable*)

Participants were given the opportunity to explain why they gave the satisfaction rating they did. Satisfied customers generally mentioned bill savings and ease of participation and praised the goals of the pilot program. Many unsatisfied customers reported that they were not saving money on bills, that they could not tell if they were saving on their bills, or that their bills had gone up under TVR.

The following comments from seasonal experience survey respondents whose satisfaction rating for the TVR pilot was 6 or lower (on a 10-point scale) illustrate some of the specific barriers customers faced in the pilot program:

Schedule 307 income ineligible comments

- *Doing the math beforehand I definitely thought I was going to save money, but it doesn't appear I did. The program was advertised with one price, but then I paid another (the advertised price didn't include taxes/fees that my normal rate did). So I was comparing a very cheap TOU rate vs. my real (including taxes/fees) rate, so it sounded even better than it ended up being. Would have been nice to compare apples to apples.*
- *Given the time periods and rates you have to make fairly drastic cuts during the times most people are at home, and for many households the only times they are active in their home, just to break even on your electricity costs. For households with gas heating, LED lighting, etc., there*

aren't a lot of ways to significantly reduce electricity usage without a disproportionate reduction in quality of life. Any presentation of this program as "cost savings" for consumers is disingenuous because the rates have clearly been calculated to make sure PSE continues to make about the same revenue while still reducing their peak output demand.

- *Honestly I don't have a good way to compare before and after usage of electricity for TOU. I also think the PSE phone app and usage page needs some improvement to make it easier to visualize peak vs. nonpeak. I don't think emails are sufficient here, to me it needs to also have a good way to look through the data quickly.*
- *I saw recently that the rates are going to be increasing substantially over the next couple of years. So I don't expect to see lower bills coming my way, in spite of my efforts to reduce my use of electricity. That is discouraging, but I want to do what I can for the environment, so I'll keep doing what I'm doing.*
- *I'm not sure that we have saved all that much, as our biggest use is for heating and in our 70s, we need the heat at 71 degrees to feel comfortable and able to function. We do have it set lower at night. So, I'm not sure that we are the best demographic to succeed at this.*

Schedule 307 income eligible comments

- *Three times the rate during peak periods coupled with half the rate at other times is too punitive.*
- *Given my schedule, trying to do things outside of peak hours such as laundry, etc. was a massive pain but the savings on my bill were negligible at best. I really didn't notice any change in my monthly bill. Especially when most of my electricity is used for my horribly inefficient baseboard heating and I have pets at home so can't just turn the heat off when I'm not there. I'd rather have real options to reduce my power such as getting the HOA to install solar panels or upgrade our circuit breakers to be able to support on demand water heating, etc.*
- *I can't tell if I'm saving money versus a regular plan so I can't tell how satisfied I am. Also, I didn't know until [taking this survey] that weekends didn't have peak hours. That makes things a bit easier.*
- *I can't be pressured to use less electricity during peak hours when I work from home during peak hours.*
- *My bill hasn't been any lower. If anything, my electricity bill this winter has been the most expensive since we moved into this unit, and that's with my household trying their DARNED-EST to lower electricity use, which often means very cold evenings after coming home from work, waiting until 8:00 PM to turn on the heat. I appreciate knowing when peak and off-peak hours are, but it doesn't seem to actually help. It could be that knowing when off-peak hours are gives us a false sense of how relatively inexpensive it will be to use electricity during those times, encouraging us to use the heat more, cook more, etc., which adds up to being even more expensive than if we had simply used the heat when we actually needed it.*

Schedule 317 income ineligible comments

- *Compared to Schedule 7, the TOU rate schedule doesn't offer much upside (save ~10% off bill if we drop electrical usage to 0% during peak times), but there's a lot of downside if we need to use electricity during peak times (over ~65% increase to bill during peak times). If we had continued our normal behavior, we'd be spending more using TOU. After making the adjustments we could (ensuring dishwasher/dryer/oven are used during off hours) we're essentially breaking even. In other words, TOU has turned out to be more a stick pretending to be a carrot.*
- *I don't mind trying to conserve during periods, just not the periods PSE has chosen. We are retired, and this completely negatively affects our daily routines and schedules (eating and chores). I don't understand why EV owners don't bear more responsibilities to charge during off peak hours. PSE doubles my power cost during "peak time."*
- *[The program is] a pain with all the emails plus we're using less heat on cold days, and having to remember not to use high electric appliances such as the washer and dryer is again a pain.*
- *I wish the nighttime off peak hours were cheaper than daytime off peak hours to make it lucrative for EV owners and generally trying to save more.*
- *The peak rebate times don't do anything to help, since we already reduce our use during that time as it is. \$0.29 cents in rebate is useless when your bill has gone up by a third.*

Schedule 317 income eligible comments

- *I already have the heat off or low in most of the rooms so without changing my heating source, there isn't much more I can do. For this reason and I don't like the restrictions of the 7–10 am hot water usage, I'm leaning towards stopping the pilot.*
- *Didn't want to say it's not useful, just doesn't feel useful to me. I already don't do laundry or run the dishwasher or charge my electric car during those periods, but I'm older and I get cold so I'm not willing to turn down the thermostat during those periods. I'm also not willing to shift meal preparation or showering. I have a heat pump and gas stove and fireplace insert, but now you're not recommending using gas, so don't know what else I can do.*
- *I'm not sure yet about the [PTR] savings events that you're calling for on specific dates and any benefit I might have gotten from them. My new bill doesn't have any line for that yet...The only indication I have is my paper statement showed \$164.20 was due, but when I paid, only \$163.39 was actually due. So less than \$1 credit. If it was for multiple events, then definitely not worth the extra effort, as I already make efforts during peak time every weekday and that's what you're comparing it to during an event.*
- *I really want a plan 7 vs. plan 317 comparison. I'm instead having to dig up your rates and from what I have determined, plan 7 is cheaper all around vs. 317. Essentially the peak cost is punitive if you are below 600 kWh a billing period. I plan to call and get removed as we have "lost" money every month being on plan 317 vs. plan 7.*
- *It seems weird that others who haven't signed up for the program essentially get to use energy during the peak times at a better value. It seems like the people that care to make the program*

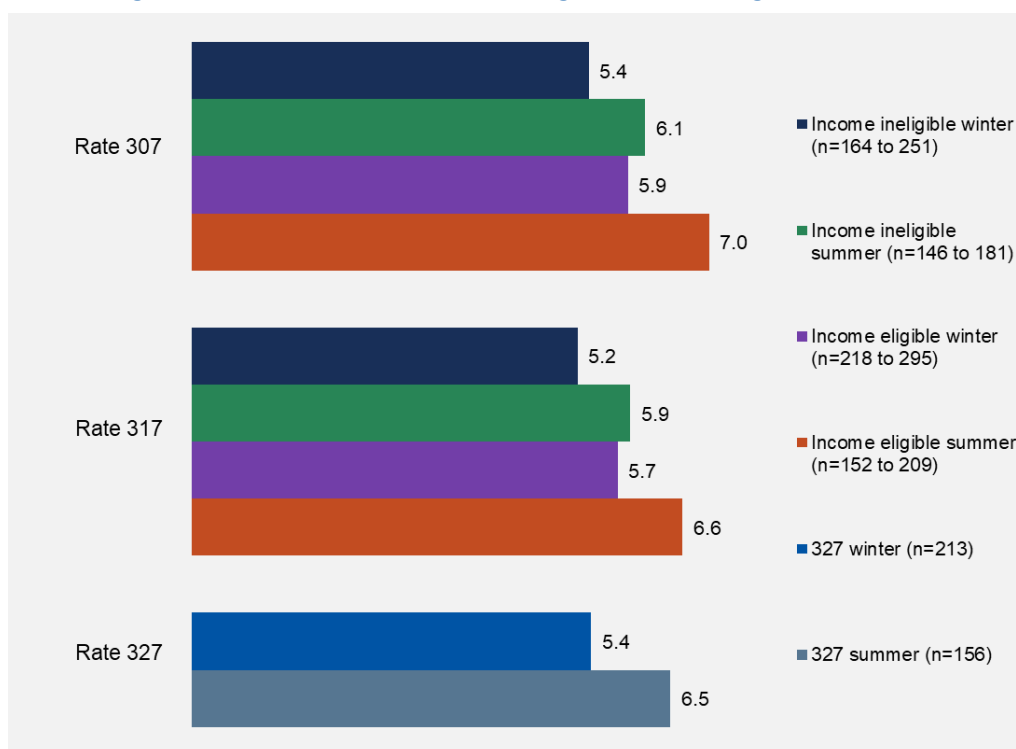
successful are actually the ones being punished for it while those that aren't interested get to continue unimpaired. Just an observation; pretty typical when looking at society.

Schedule 327 (super off-peak) comments

- *The rates on the bill are not the same as the rates I signed up for. About \$.02/kWh higher in all time periods. The rates we were offered should have included all surcharges and taxes, so we would know how much it really costs to use electricity.*
- *It caused us to focus on something that ultimately didn't matter at all. Our power consumption is mostly driven by heating costs, and we already use our heat the least that we're willing to. We stopped paying attention to the emails when we realized that our behaviors had no impact. Also, the peak hours are the only time our home has humans in it that are awake, so not helpful.*
- *Even if I shifted EV charging, dishwasher and dryer use out of peak hours, the increased rate in peak hours offsets all savings. So I think the peak rate is pretty high and that demotivates the shift use.*
- *Haven't noticed a change in bill. Historical usage data on website only shows 13 months, so it's hard to compare a full year-on-year.*
- *I am not happy with the savings. According to my calculations, I actually paid more on the TOU plan compared to the flat rate plan, even though I was using less energy during peak periods. I think the economic incentive is not large enough. Given that I have air conditioning needs for the summer and my poor experience with saving money, I plan to leave the TOU pilot in the next month or two. I did a lot of work for no economic benefit, and it will hurt me in the summer. I can try to avoid energy use as a good citizen during peak periods while on the flat rate plan without experiencing the economic penalty for being on the TOU plan.*
- *I feel like I jumped through a bunch of hoops and ended up with the same bill.*

Pilot participants also rated their satisfaction with their bill savings since enrolling in TOU rates on a 10-point scale where 10 means *extremely satisfied*. Ratings by season and treatment group are summarized in Figure 46. Across all treatment groups, survey respondents gave average satisfaction ratings of 5.5 (n=1,138) following the winter season and 6.4 (n=843) following the subsequent summer season, indicating a significant increase in satisfaction like the increase in overall satisfaction (Figure 45). The pattern of income eligible Schedule 307 and Schedule 317 respondents giving higher average ratings than those of income ineligible respondents also matches the pattern seen with overall satisfaction: income eligible participants gave higher ratings for both rates in both seasons, and the gap grew from 0.5 rating points in winter to 0.7 to 0.9 points in summer. Respondents on rate 327 had a comparable increase in satisfaction with bill savings from winter (5.4) to summer (6.5).

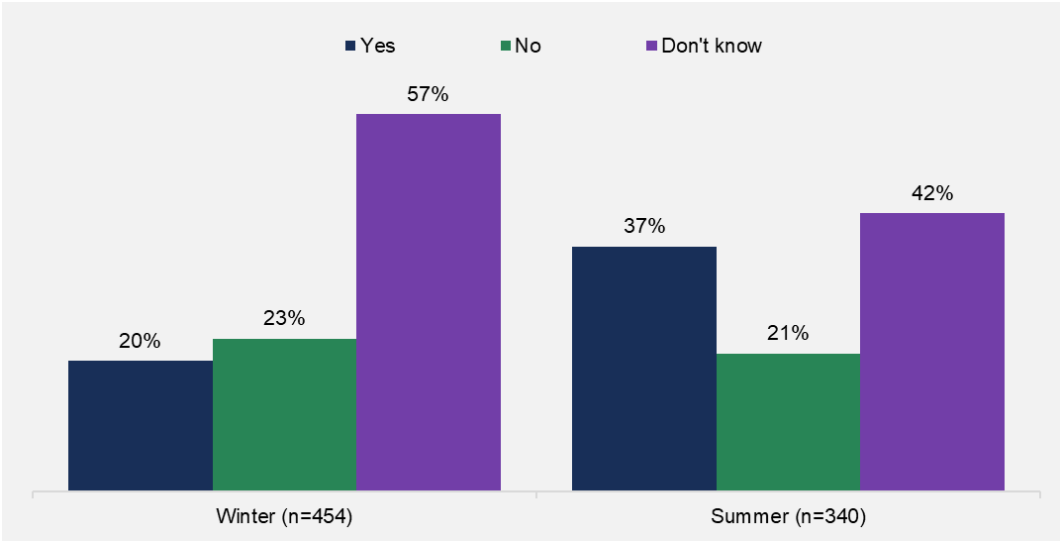
Figure 46. Satisfaction with Bill Savings since Enrolling in TOU Rates



Source: Winter and Summer experience surveys. "How satisfied are you with your bill savings since enrolling in PSE's TOU pilot program?" (Average rating on a 10-point scale where 10 is *extremely satisfied* and 1 is *Not at all satisfied*)

The experience surveys also asked participants on Schedule 317 if the amount of rebate they received for limiting electricity use during PTR events was consistent with the level of effort that they made (Figure 47). In the winter survey, only 20% said it was worth the effort while 23% said it was not and 57% did not know. This improved in the summer survey, with 37% saying the PTR rebates were worth the effort and 21% saying they were not, though the most common response was still *don't know* (42%). This pattern was similar for both income groups on Schedule 317.

Figure 47. Were PTR Rebates Worth the Effort



Source: Winter and Summer experience surveys. “Was the bill credit amount for the [winter/summer] Peak Time Rebate events consistent with your level of effort?”

4. Commercial Evaluation

4.1. Impact Evaluation

4.1.1. Energy and Demand Evaluations

The evaluation team executed similar regression models as the residential evaluation using data broken out by season (summer vs. winter) and period (weekdays versus weekends and holidays). Cadmus evaluated TOU demand impacts at both the hourly level and aggregated by season.

Figure 48 shows average winter TOU demand reduction (kW) as defined in the tariff sheet. Non-residential participants on the Schedule 324 rate did not produce statistically significant demand reduction on average in any TOU period during the winter; however, they did increase their consumption by 3.8% during the winter off-peak period (Figure 49). Since winter morning on-peak hours (7 a.m. to 10 a.m.) occur when most SMBs are ramping up operations for the day, participants probably found it difficult to shift their energy usage significantly outside of these crucial operating hours.

Figure 48. Commercial Winter Average Demand Reduction (kW) TOU Results

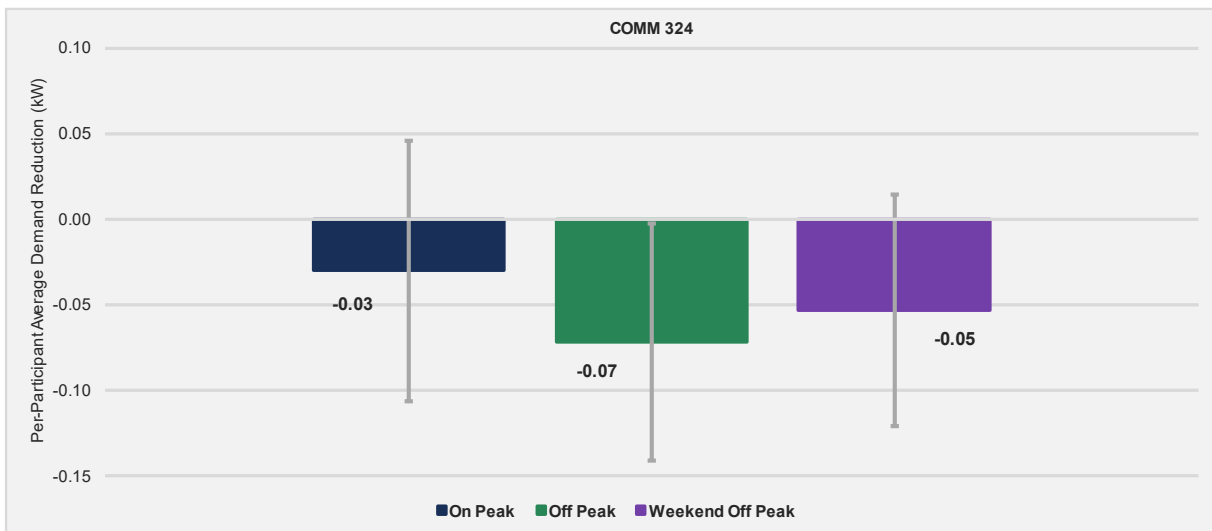
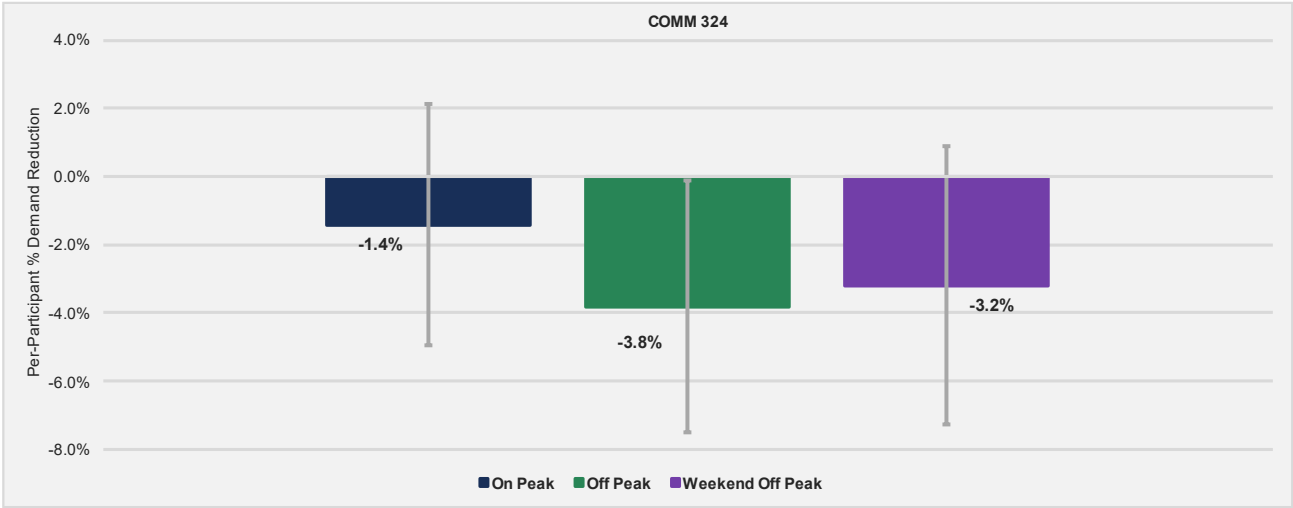


Figure 49. Commercial Winter Average Demand Reduction (%) TOU Results



In contrast, business participants on the Schedule 324 rates were able to achieve statistically significant demand reduction during the summer on-peak period in both absolute terms (Figure 50) and as a percentage of demand reduction (Figure 51). Unlike the winter season, which had both morning and evening on-peak periods, the summer on-peak period was from 5 p.m. to 8 p.m. Participants were most likely able to achieve significant demand reduction in the summer due to on-peak hours falling outside of typical business operating hours. Similar to customer behavior in the winter period, non-residential participants did not see statistically significant savings during both the weekday off-peak and weekend off-peak periods.

Figure 50. Commercial Summer Average Demand Reduction (kW) TOU Results

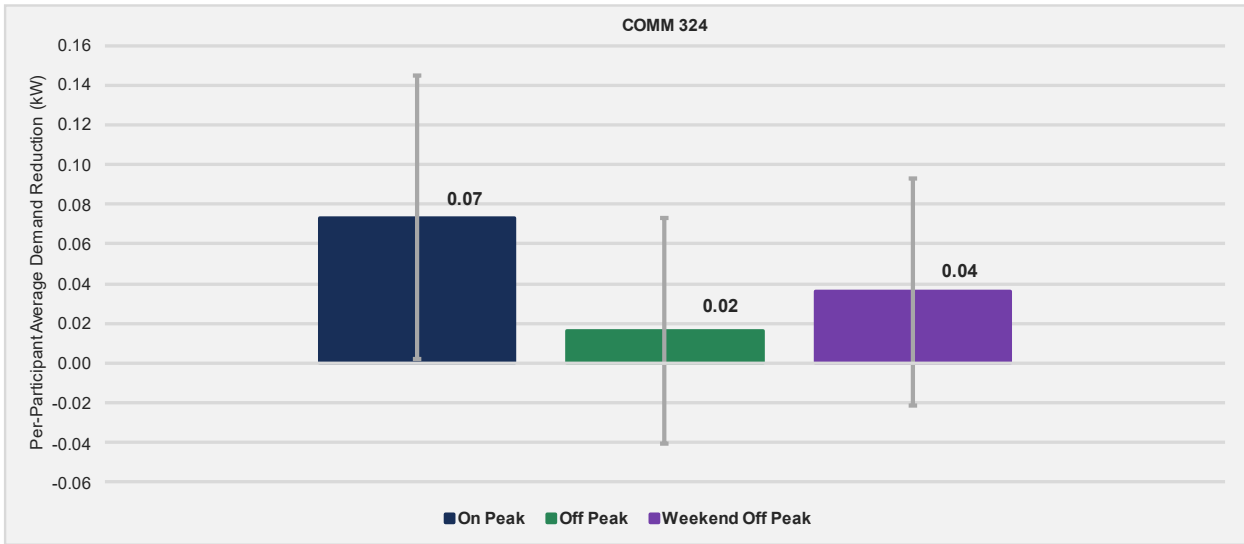


Figure 51. Commercial Summer Average Demand Reduction (%) TOU Results

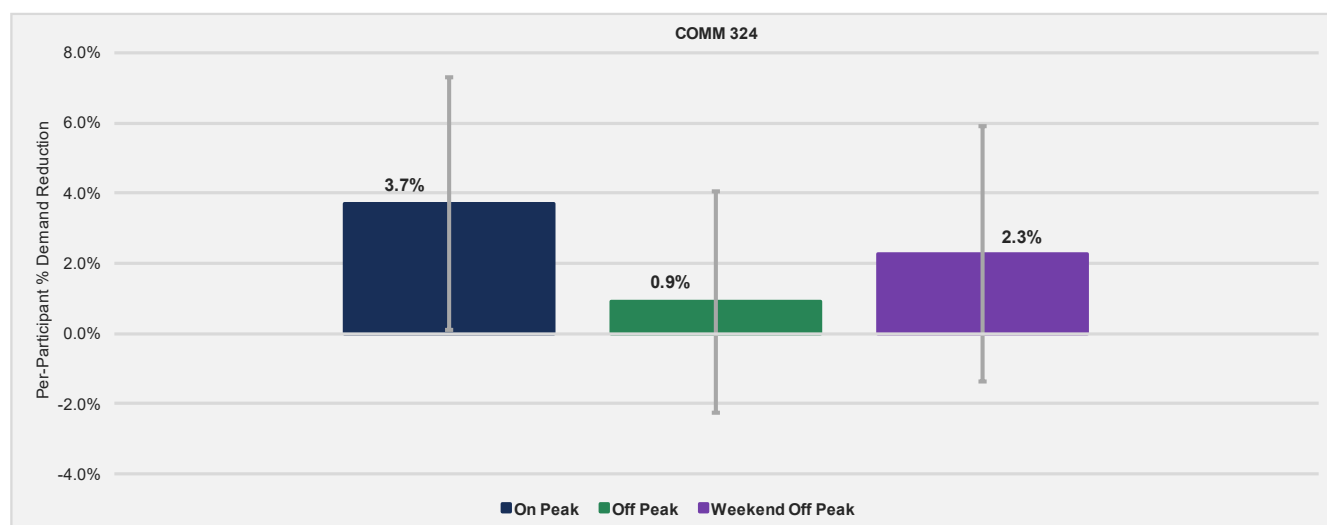


Table 21 shows daily average energy savings by season (summer versus winter) and period of the week (weekday versus weekend), along with Y1 annual energy savings (kWh) for non-residential participants. Participants on Schedule 324 did not have any statistically significant daily average energy savings. Demand reductions during summer on-peak periods were not enough to offset consumption and lack of demand reduction during off-peak periods. The negative value for Y1 annual energy savings implies that over the course of Y1 non-residential customers consumed more energy than they did at baseline.

Table 21. Commercial TOU Demand and Energy Savings (kWh)

Treatment	Daily Energy Savings, Summer				Daily Energy Savings, Winter				Y1 Annual Energy Savings (kWh)
	Weekday		Weekend		Weekday		Weekend		
	kWh	90% CI	kWh	90% CI	kWh	90% CI	kWh	90% CI	
COMM 324	0.30	±1.23	0.58	±1.23	-0.81	±1.48	-0.76	±1.41	-69

Notes: The table reports the average daily energy savings per participant. Positive values indicate energy savings. Items in bold are statistically significant at 90% confidence. The precision was estimated at the 90% confidence level based on standard errors clustered on customers.

4.1.2. Peak Time Rebates Evaluation

Participants that are on the Schedule 324 rate are eligible to receive a rebate for reducing energy consumption below baseline levels during PTR events, in addition to paying different prices for electricity depending on the day of week and time of day. The evaluation team ran similar regression models as the for the Residential PTR rate.

Figure 52 shows the average savings estimate (kW) from PTR for each season, and Figure 53 displays the percentage estimate. Non-residential participants did not achieve statistically significant demand reduction during summer PTR events (Figure 52) and even increased (rather than decreased) their energy usage during winter events by 0.128 kW per participant on average.

Figure 52. Commercial Average PTR Demand Savings by Season (kW)

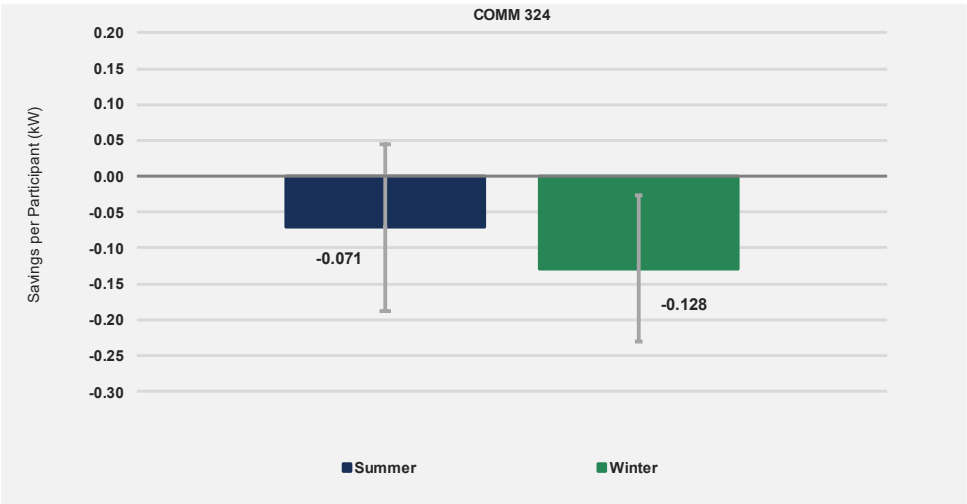


Figure 53. Commercial Average PTR Demand Savings by Season (Percentage)

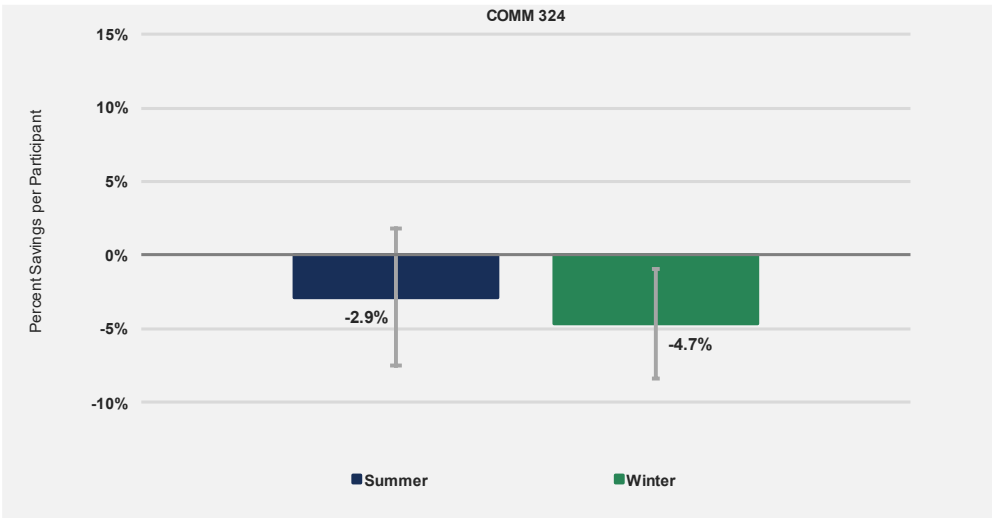


Figure 54 and Figure 56 show the average savings estimate (kW) from non-residential PTR for each event by season while Figure 55 and Figure 57 display the percentage estimate. All winter PTR events occurred in the morning, and all summer PTR events took place in the evening. During the winter season, non-residential participants did not experience any PTR event savings. Participants increased their energy usage during Events 2 and Event 3.

Figure 54. Commercial Average PTR Savings (kW) by Rate and Event – Winter Year 1

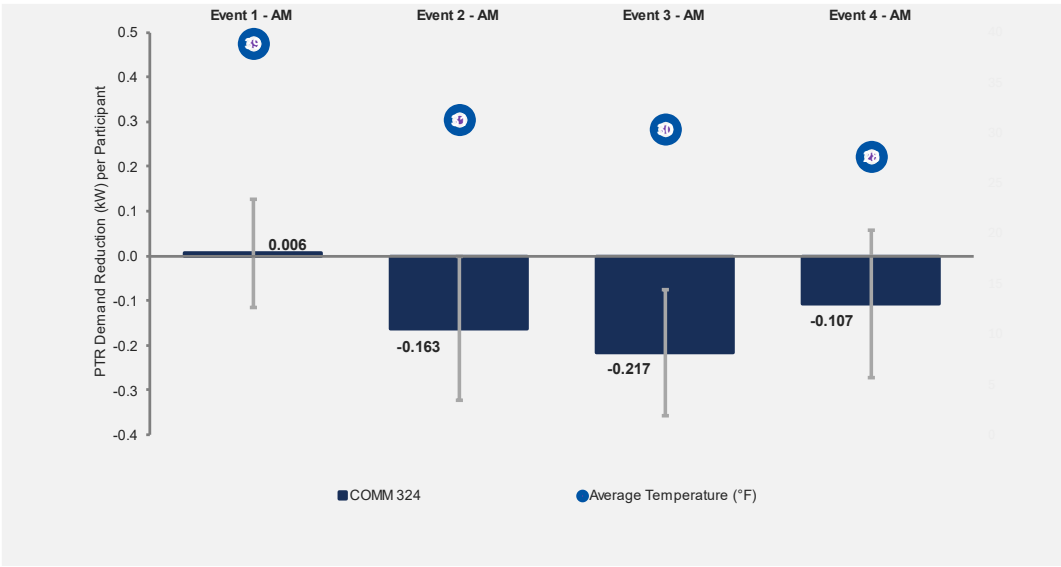
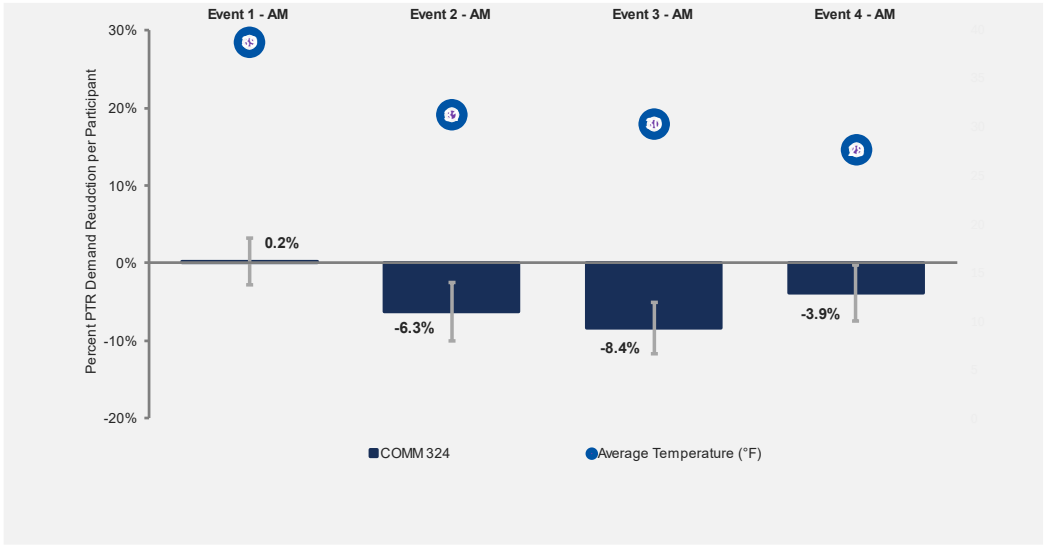


Figure 55. Commercial Average Percentage PTR Savings by Rate and Event – Winter Year 1



Similarly, the evaluation team found no statistically significant residential PTR impacts for summer events when broken out to the individual event. Just like for customers on the residential rates, the PTR effect was most likely negated in the summer period due to significant on-peak demand reduction for non-residential participants. These participants most likely could not shift any more of their energy usage to other parts of the day given that the on-peak period covers some business operating hours.

Figure 56. Commercial Average PTR Savings (kW) by Rate and Event – Summer Year 1

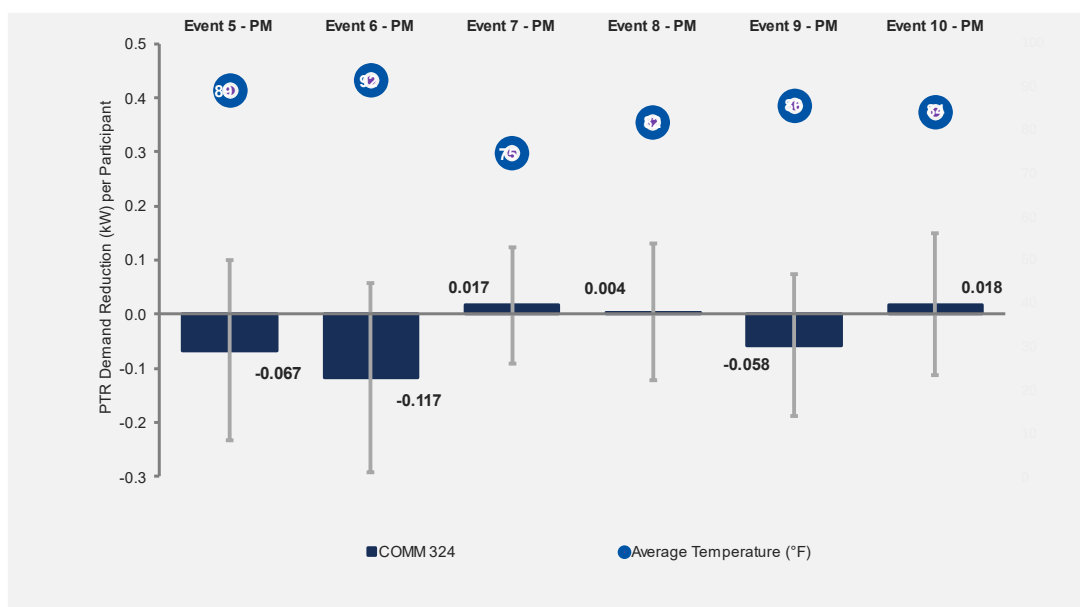
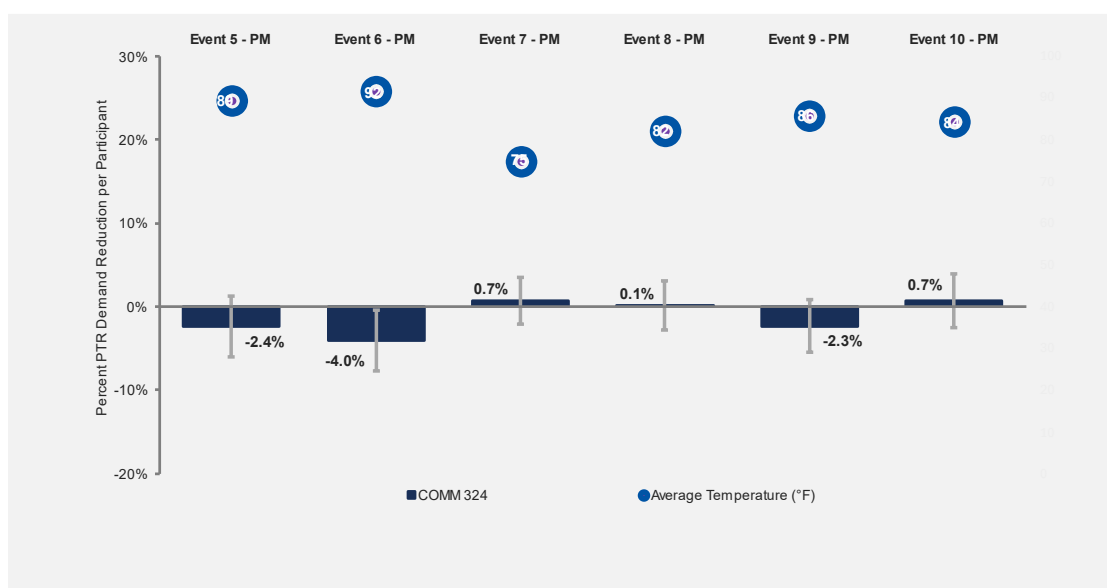


Figure 57. Commercial Average Percentage PTR Savings by Rate and Event – Summer Year 1



4.1.3. Billing Analysis

The evaluation team ran similar billing analyses for non-residential TVR participants. Discussion of the analysis can be found in detail in the *Impact Evaluation Activities* section for the billing analysis.

Ex Ante Billing Analysis

Table 22 shows the distribution of results by rate from the non-residential *ex ante* billing analysis along with mean savings. Negative values represent higher bills, and positive values represent lower bills,

relative to what customers' bills would have been had they remained on the standard Schedule 24 non-residential rate.

Table 23 provides the breakdown by rate of structural winners (those who would save money under TVR absent any change in their consumption pattern) and structural losers (those who would lose money under TVR absent any change in their consumption pattern).

Without engaging in any behavior to reduce usage during peak periods, most customers on Schedule 324 would be structural winners and would accrue savings being on a TOU rate in the program pre-period. Table 22 shows that customers could save on average \$153.94 annually, with median savings around \$48 annually. The average and median potential bill savings were higher than the residential rates, as were the proportion of structural winners. This demonstrates that this TOU rate for non-residential customers is designed to save customers money if they maintain their current consumption patterns.

Table 22. Commercial *Ex Ante* Bill Impacts

SCHEDULE	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Mean
324 (n=722)	\$(129.41)	\$(11.36)	\$(2.11)	\$4.17	\$15.29	\$48.19	\$91.03	\$153.58	\$245.40	\$482.34	\$2,289.20	\$153.94

0% represents the minimum, 50% the median, and 100% the maximum difference between TOU and standard rates.

Table 23. Commercial *Ex Ante* Analysis Structural Losers and Winners

SCHEDULE	Structural Losers	Structural Winners
324 (n=722)	25%	75%

Ex Post Billing Analysis

Table 24 shows the distribution of results by rate from the non-residential *ex post* billing analysis along with mean savings. Negative values represent higher bills, and positive values represent lower bills, relative to hypothetical bills generated by the matched non-participant. Table 25 provides the breakdown of TVR participants that paid more or less on their TOU rate compared to their matched non-participant.

Table 24 shows that on average, after changing their behavior in response to TOU rates, participants saved money relative to an estimate of what their bills would have been under Schedule 24 based on their modeled consumption when compared to matched non-participants. The *ex ante* analysis showed that without changing their behavior, Schedule 324 customers had a high potential for bill savings. Under modeled consumption derived from the weather conditions during the program period, customers on this rate would still reduce usage during peak periods but would accrue smaller annual bill savings (\$42.91 on average).

In Table 25, there is a nearly even split of TVR participants paying less compared to their matched non-participant.

Table 24 Commercial Ex Post Billing Impacts

SCHEDULE	10%	20%	30%	40%	50% (Median)	60%	70%	80%	90%	Mean
324 (n=722)	\$(582.33)	\$(281.47)	\$(135.44)	\$(36.46)	\$18.59	\$70.08	\$172.58	\$381.98	\$696.45	\$42.91

Table 25. Commercial Ex Post Analysis TVR Comparison

SCHEDULE	TVR Paid More	TVR Paid Less
324 (n=722)	47%	53%

Shadow Bill Billing Analysis

Table 26 shows the distribution of results from the non-residential shadow billing analysis along with mean savings. The values are the difference between a participant's hypothetical bill on Schedule 24 compared to their actual bill on the TOU rate. Negative values represent bill increases, and positive values represent bill decreases, relative to remaining on Schedule 24. Table 27 provides the breakdown of TVR participants that actually paid more or less on their TOU rate compared to calculated Schedule 24 total.

On average, non-residential participants tended to not save money on their annual bills while under the TVR program. Schedule 324 customers spent \$3.88 more on average compared to their hypothetical Schedule 24 bill. The distribution was skewed slightly positive for these participants, with an annual median savings of \$2.40. These values split over 12 months come out to median monthly savings of \$0.20 and average monthly losses of \$0.32, implying some degree of rate neutrality between winners and losers. Table 27 shows that 56% of Schedule 324 customers paid less under TVR than they would have paid on Schedule 24.

Year 1 of the program has the same peak period definitions for both winter and summer, but these definitions change in Year 2. While potential exists for bill savings for customers under this rate, analyzing another year of program performance could help determine if this rate structure is effective in the long run.

Table 26 Commercial Shadow Billing Impacts

SCHEDULE	10%	20%	30%	40%	50% (Median)	60%	70%	80%	90%	Mean
324 (n=1,069)	\$(54.67)	\$(26.67)	\$(10.81)	\$(2.37)	\$2.40	\$6.13	\$13.40	\$22.86	\$41.21	\$(3.88)

Table 27. Commercial Shadow Billing Analysis TVR Comparison

SCHEDULE	TVR Paid Less	TVR Paid More
324 (n=1,069)	56%	44%

Peak Time Rebate Bill Credits

Participants on Schedule 324 can earn bill credits (Peak Time Rebates) for additional reductions in energy usage during peak periods on days when PSE calls a PTR event. During the winter season, 87% of participants earned PTR bill credits, and in summer, 93% earned bill credits. The average total for winter bill credits for participants who earned a credit was \$2, and the corresponding average total credit for all summer events was \$3. Across all Schedule 324 participants, the average amount of annual PTR bill credits was \$4, with a maximum total of \$97.

4.2. Process Evaluation

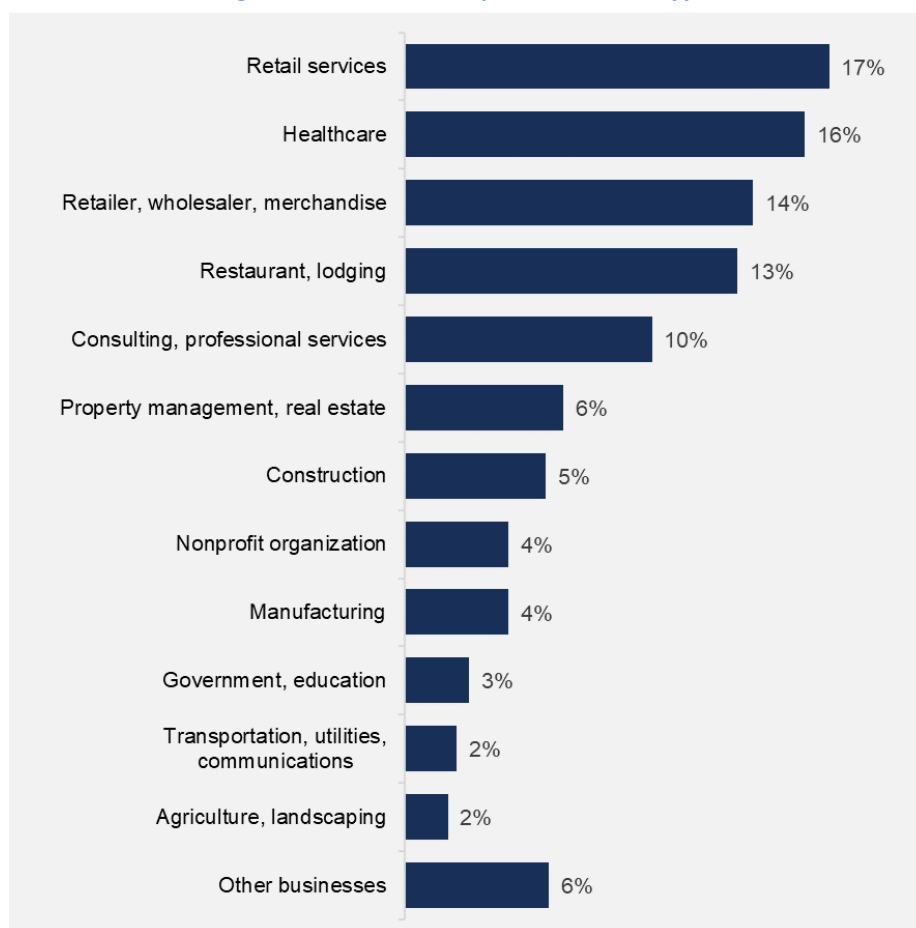
4.2.1. Enrollment and Participation

PSE preselected 50,000 SMB customers and invited them to participate in the TVR pilot. Marketing to SMB customers began in December 2023, and uptake was lower than for residential customers. Despite several waves of invitations, the sample size of 1,035 participants at the end of Year 1 for this rate group fell short of the target of at least 2,000 enrollees.

Company Characteristics

Pilot participants represented a wide array of small businesses, including offices, clinics, salons, retailers, services, and schools. Figure 58 shows the distribution of participating organizations by business type. Retail services, retail goods, healthcare, and restaurants and lodging were the most common participant types, and these four categories together accounted for about 60% of pilot participants. The median number of on-site employees at participating businesses was four, though 25% (n=839) had 10 or more employees on site and 13% had only one employee on site. Most businesses participating in the pilot rented their place of business (59%, n=839), while 41% owned their facilities.

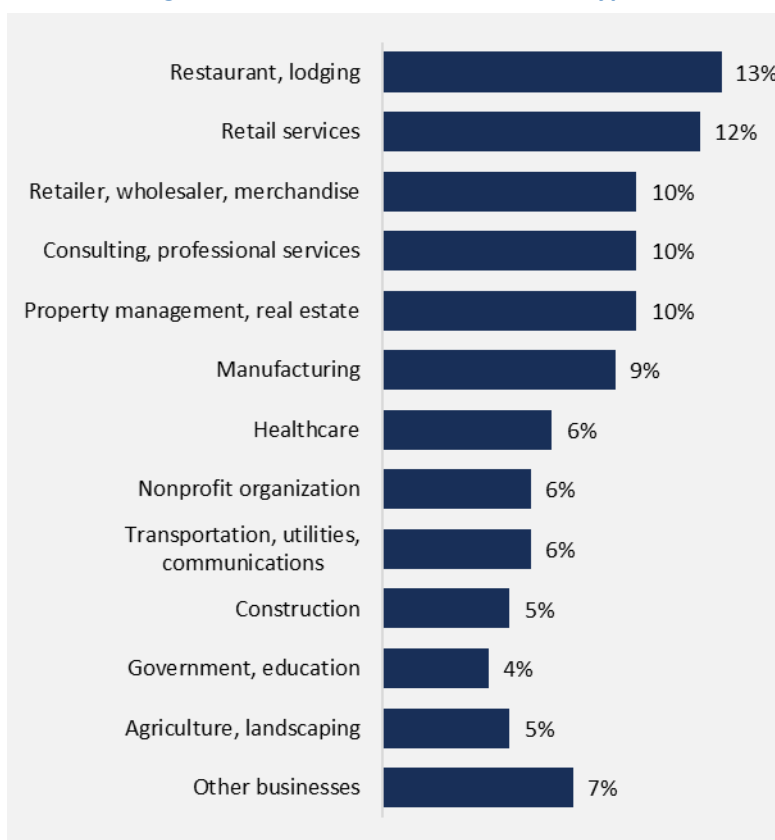
Figure 58. Pilot Participant Business Types



Source: Enrollment survey. "Which of the following best describes your business type?" (n=839)

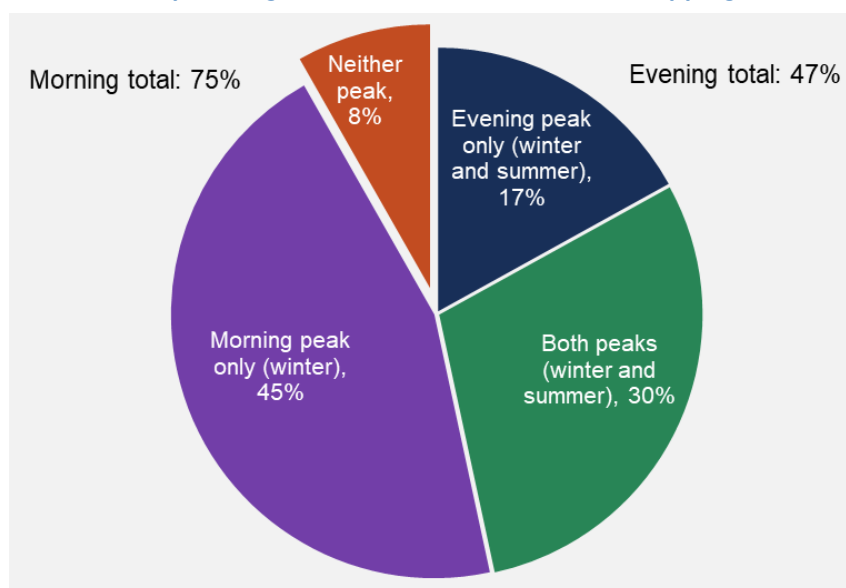
For organizations that chose not to enroll in the pilot, retail services and healthcare organizations accounted for a smaller percentage than of pilot participants, while manufacturing; transportation, utilities, and communications; and agriculture, landscaping, and water systems accounted for a greater percentage than of pilot participants. (see Figure 59). Similar to the enrolled respondents, the median number of on-site employees at non-enrolled businesses was four, though 26% had 10 or more employees on site and 12% had only one employee on site (n=112). Additionally, most non-enrolled businesses rented their place of business (62%, n=121), while 38% owned their facilities.

Figure 59. Non-Enrollment Business Types



Source: Non-enrollment survey. "Which of the following best describes your business type?" (n=126)

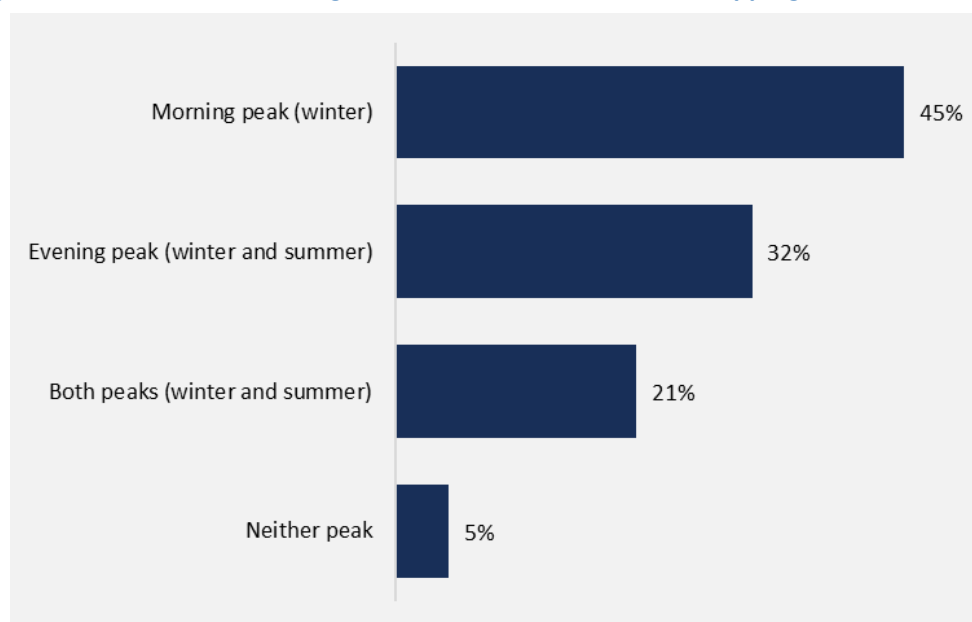
The enrollment survey asked participants which hours of the day and week their business was open. Figure 60 shows that most pilot participant businesses were open for at least part of the morning 7 a.m. to 10 a.m. peak period (75%), but fewer than half were open hours that overlapped with the evening 5 p.m. to 8 p.m. peak period (47%). Only 30% of participating businesses were open during at least a portion of both peak periods, and 8% were not regularly open during either peak period. For all businesses that provided their operating hours, the average percentage of the peak period that these businesses were open over the course of a year was 34%. Participating businesses were open for an average of 43% of the total morning peak hours (which occur in winter only) and an average of 25% of the total evening peak hours in winter and summer.

Figure 60. Pilot Participant Organization Business Hours Overlapping with Peak Periods

Source: Enrollment survey. "What are your current business hours?" (n=813)

The non-enrollment survey also asked respondents which hours of the day and week their business was open. Forty-five percent of non-enrolled businesses were open for at least part of the morning 7 a.m. to 10 a.m. peak period, substantially less than the 75% of enrollment respondents who said they were open during that period. Non-enrolled customers were also less likely than enrollees to have hours that include evening peaks: 32% were open hours that overlapped with the evening 5 p.m. to 8 p.m. peak period, and 21% were open during at least a portion of both peak periods. Only 5% were not regularly open during either peak period (n=126; see Figure 61).

Figure 61. Non-Enrollment Organization Business Hours Overlapping with Peak Periods



Source: Enrollment survey. “What are your current business hours?” (n=126; percentage of businesses whose hours overlap any part of a peak period)

Company Systems and Technology

The enrollment survey asked business respondents what heating and cooling systems they used. About two-thirds (68%; n=703) used electric heating, while 37% used other fuels for heating (response percentages sum to more than 100% because some businesses reported using both electricity and other fuels). Additionally, 4% of respondents said the facility enrolled in the pilot was unheated.

About three-quarters of pilot participants (73%, n=698) used some type of electric cooling at their facility, including 55% reporting central air conditioning, 10% heat pumps, and 10% smaller cooling devices (portable, window, wall, evaporative). As with heating systems, some businesses use multiple cooling systems.

Additionally, 31% (n=757) of pilot participants reported using a smart thermostat, and 8% (n=826) of businesses owned an EV, though only 5% had on-site EV charging facilities.

The non-enrollment survey also asked non-enrolled business respondents about their heating and cooling systems. Similar to enrolled respondents, about two-thirds (63%; n=111) of non-enrolled respondents used electric heating and 48% used other fuels for heating. Ten percent of respondents said their spaces were unheated.

About two-thirds of non-enrolled respondents (65%; n=112) used some type of electric cooling at their facility, including 37% reporting central air conditioning, 22% heat pumps, and 12% smaller cooling devices (portable, window, wall, evaporative).

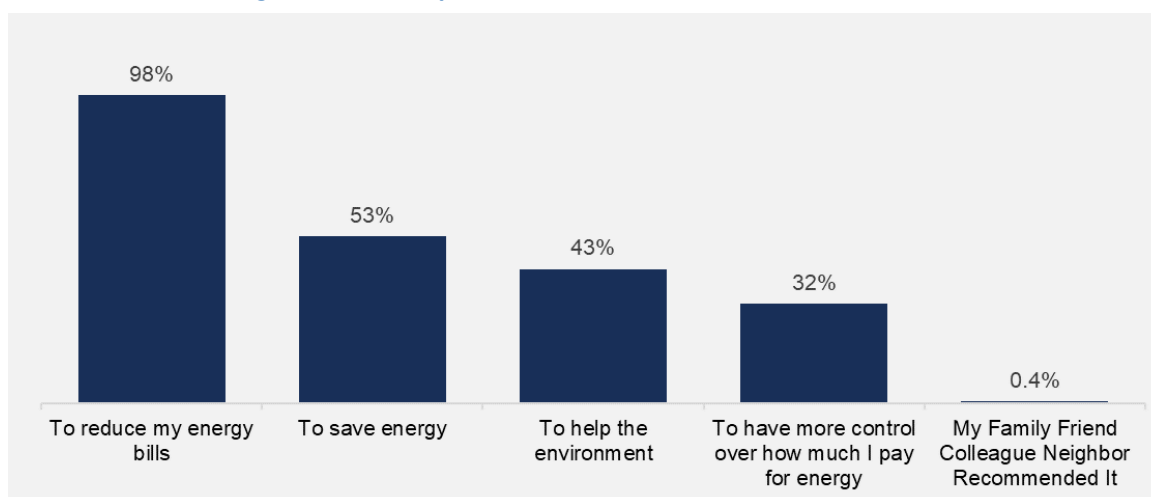
Additionally, 26% (n=105) of non-enrolled respondents' facilities used a smart thermostat, 6% had EVs (n=119), and 5% had on-site EV charging facilities.

Pilot Enrollment

Most business respondents that enrolled in the TVR pilot recalled receiving printed material from PSE (77%, n=832), and a substantial number recalled emails from PSE (37%). Only 0.5% of enrollees recalled reading about the pilot at PSE.com. In contrast, business respondents who chose not to enroll mostly learned about the program through an email from PSE (76%; n=103) rather than print mail (30%), while 7% learned about the program through PSE.com.

Overwhelmingly, business participants who enrolled in the pilot were interested in reducing their energy bills (98%, Figure 62). Many respondents also mentioned saving energy (53%), helping the environment (43%), and having control over what they pay for energy (32%). Very few business participants who took the survey said they joined because a friend, colleagues, or neighbor recommended the pilot (0.4%).

Figure 62. Participant Motivation to Enroll in the TVR Pilot



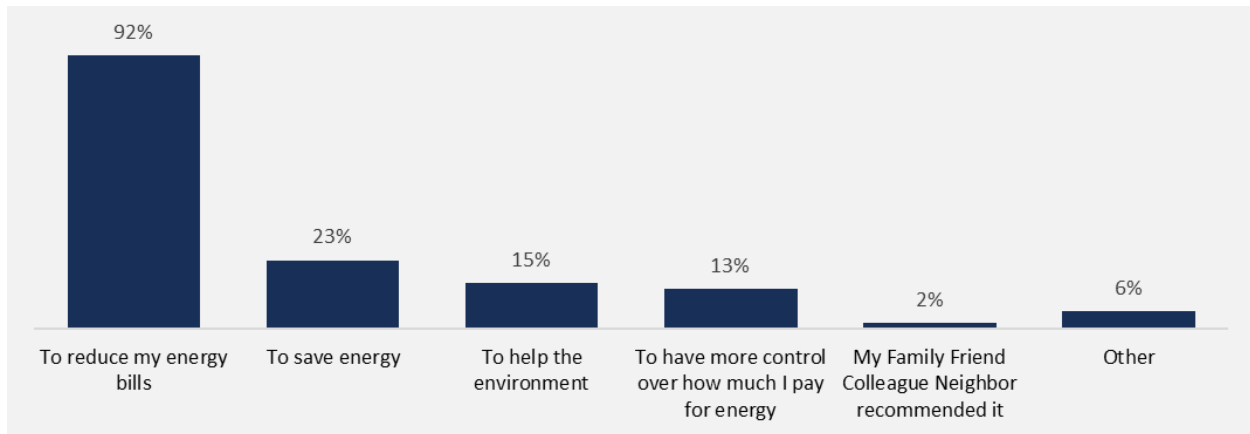
Source: Enrollment survey. "Why are you interested in the Time-of-Use (TOU) pilot program?" (Respondents could select multiple reasons; n=833)

Pilot participants' motivations to enroll among exit survey respondents were similar to those reported by participants who remained in the pilot. Ninety-two percent of respondents initially enrolled to reduce their energy bills, whereas 23% enrolled to save energy and 15% enrolled to help the environment (Figure 63). These respondents said that they ultimately left the program largely because they saw little to no bill savings (79%), but also because the TOU rate schedule was inconvenient (21%), and because it was difficult to shift their business energy use (17%; Figure 64).

Businesses that chose not to enroll said they thought it would be difficult to shift their business' energy use (22%), the time-of-use rate schedule was inconvenient (21%), and the potential bill savings were not enough (18%; Figure 65). Forty-four percent of respondents described other reasons for not enrolling,

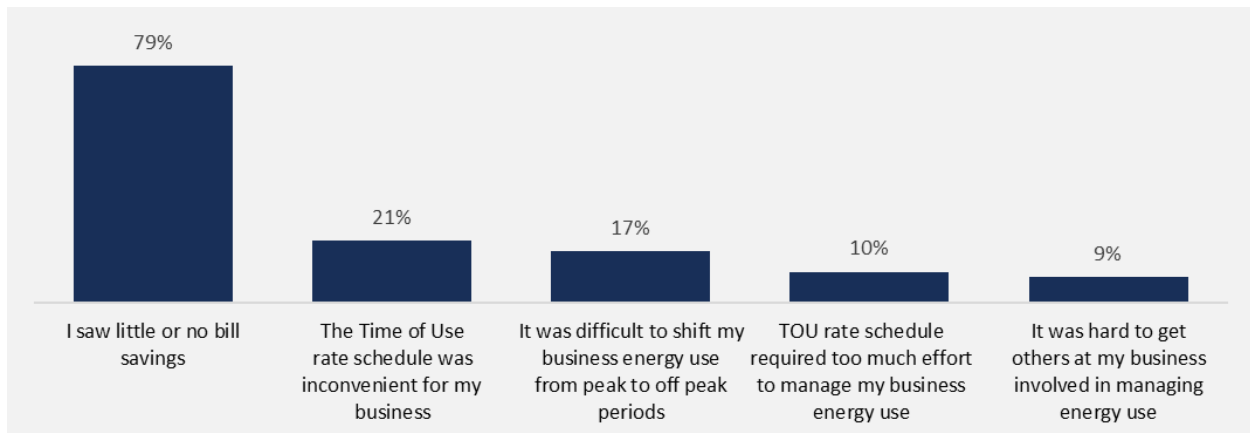
which included the beginning of the year being a busy time for small businesses, their attempts at enrolling were unsuccessful, and adjustments to energy use would be impossible.

Figure 63. Exit Survey Motivations for Enrolling in the TVR Pilot



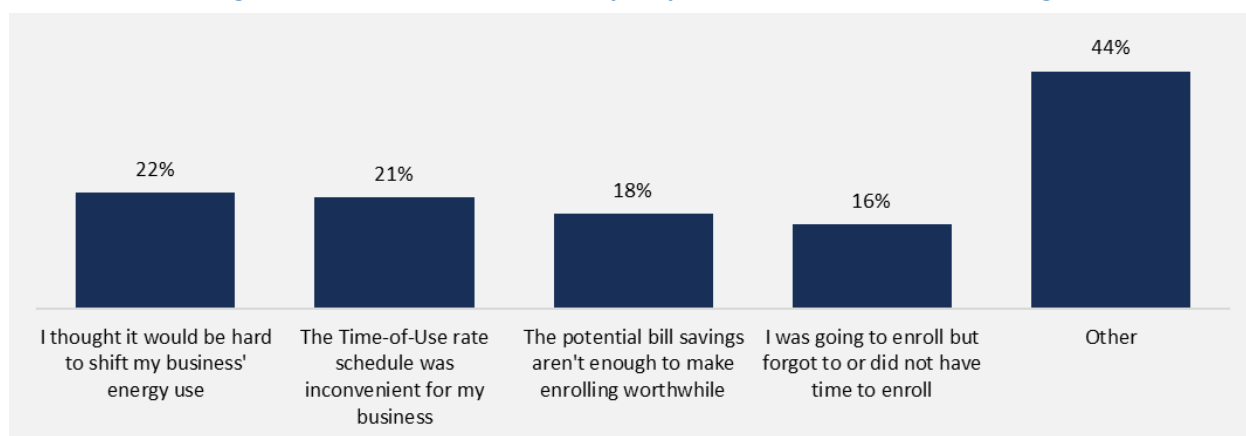
Source: Exit survey. "What motivated you to enroll in the Time-of-Use (TOU) pilot program?" (Respondents could select multiple reasons; n=52)

Figure 64. Exit Survey: Top Five Reasons for Leaving the Program



Source: Exit survey. "Which of the following describe your reason(s) for leaving the program?" (Respondents could select multiple reasons; n=58)

Figure 65. Non-Enrollment Survey: Top Five Reasons for Not Enrolling

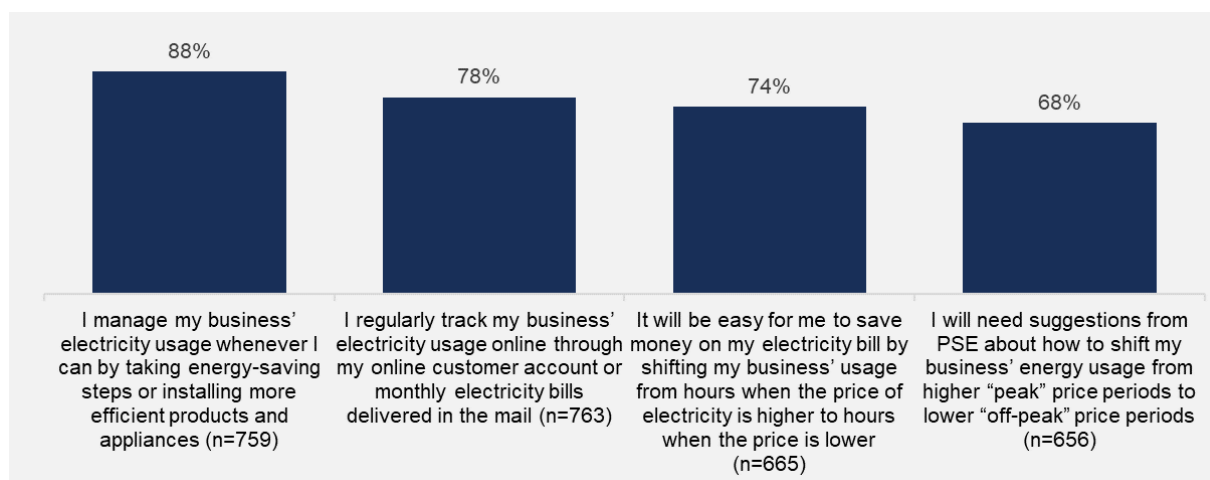


Source: Non-enrollment survey. "Which of the following describe your reason(s) for not enrolling in the Time-of-Use pilot program?" (Respondents could select multiple reasons; n=102)

4.2.2. Motivations and Attitudes

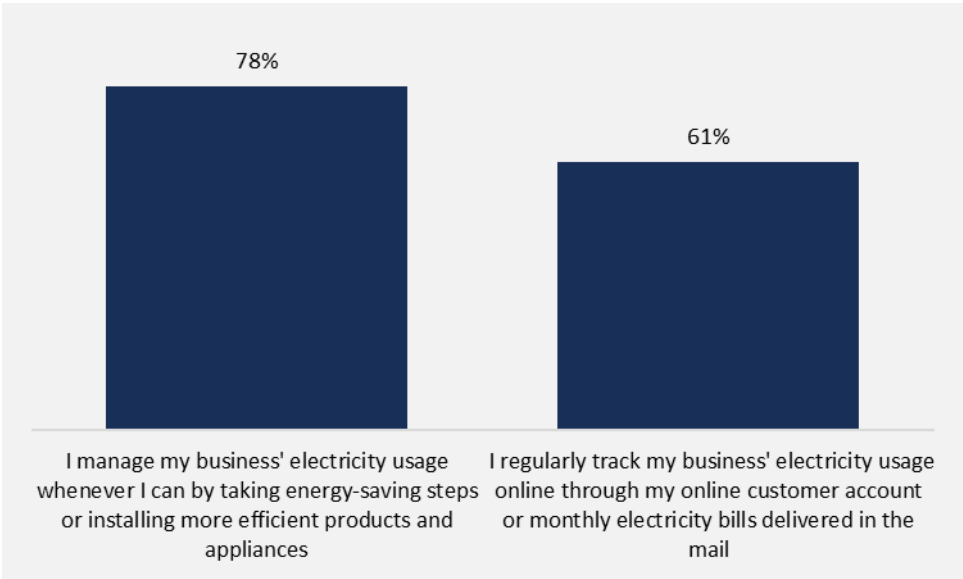
Figure 66 shows that at the time of their enrollment in the TVR pilot, most businesses agreed that they manage their electricity usage whenever they can (88%), that they regularly track their electricity usage online (78%), and that it would be easy for them to save money on their bills by shifting energy usage (74%). However, 68% also agreed that they would need suggestions from PSE on how to shift their energy usage to off-peak periods. Non-enrollment survey respondents generally agreed less with the statements—78% agreed that they manage their electricity usage when they can (n=122), and 61% agreed that they regularly track their electricity usage online (Figure 67).

Figure 66. Participant Attitudes about Energy Use at Enrollment



Source: Enrollment survey. Percentage agreeing with the statement listed: *strongly agree or somewhat agree* on a 4-point rating scale.

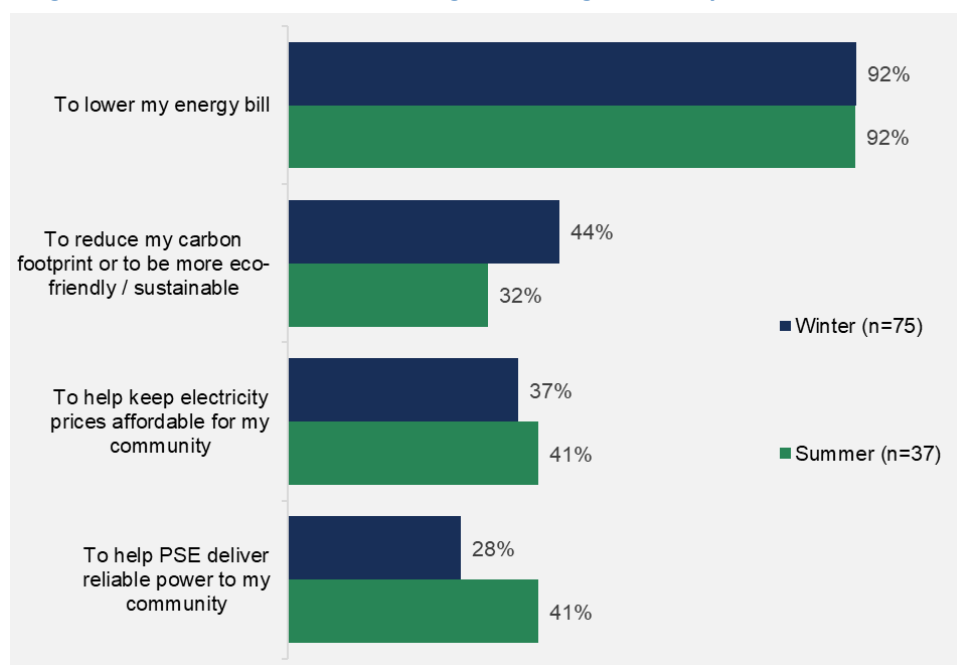
Figure 67. Respondent Attitudes about Energy Use among Customers who Did Not Enroll in the Pilot



Source: Non-enrollment survey. Percentage agreeing with the statement listed: *strongly agree or somewhat agree* on a 4-point rating scale. (n=122)

The seasonal experience surveys asked participants who had shifted energy from or reduced energy during peak periods what motivated them to do so (Figure 68). Almost all respondents said they were motivated to lower their energy bills, mentioned by 92% for both seasons. None of the other reasons were mentioned by more than 44% of respondents for either season.

Figure 68. Motivations for Reducing or Shifting Electricity Use on TOU Rates



Source: Enrollment survey. "What motivates you to reduce or shift electricity on the TOU rate plan?" (Respondents could select multiple reasons)

Business respondents also rated their level of concern about climate change on a 10-point scale where 10 is *extremely concerned*. Their mean rating was 6.7 (n=839), with 32% of respondents giving ratings of 9 or 10. Businesses that chose not to enroll rated their level of concern similarly, with a mean rating of 6.3 and 30% of respondents giving ratings of 9 or 10 (n=95).

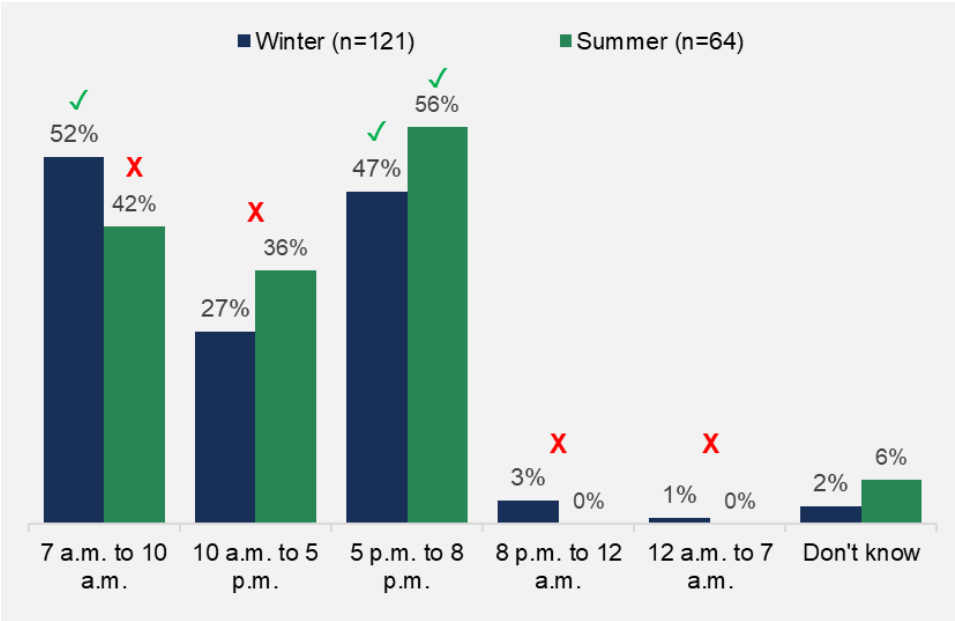
4.2.3. Participation and Experience

Cadmus surveyed a sample of businesses participating in the pilot following their first winter on TVR (winter experience survey) and following their first summer on TVR (summer experience survey).

Awareness of Peak Periods and Energy Use

In the winter experience survey, a little over half of respondents accurately recalled the times of peak periods on weekdays (52% for morning peak and 56% for evening peak; Figure 69). In the summer survey, most participants identified the same two periods as peaks; however, there is only an evening peak in summer (47% correctly identified) and no morning peak (42% incorrectly identified). A substantial number also said that 10 a.m. to 5 p.m. was a peak period in both seasons (27% winter, 36% summer), which is not correct, though only 0% to 3% by season said that there were peak periods between 8 p.m. and 7 a.m.

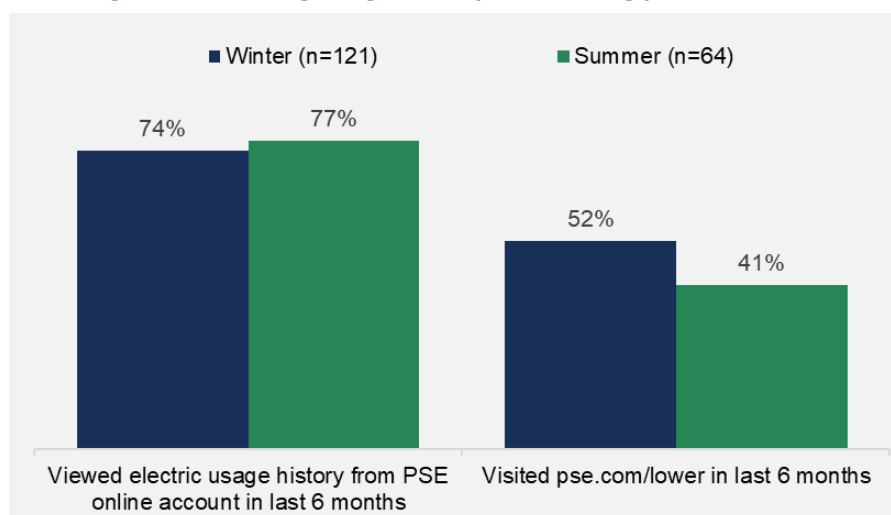
Figure 69. Awareness of Peak Periods



Source: Winter and Summer experience surveys. “To the best of your knowledge, when do peak periods occur during weekdays in [winter/summer]?” (Green check marks indicate correct answers, red Xs indicate incorrect answers)

Most business respondents had viewed their usage history online in the six months before taking the survey for both the winter (74%) and summer seasons (77%; Figure 70). About half of participants said they had visited pse.com/lower for insights into energy use and ways to save energy after the winter season (52%), though this declined to 41% following the summer season.

Figure 70. Viewing Usage History and Visiting pse.com/lower



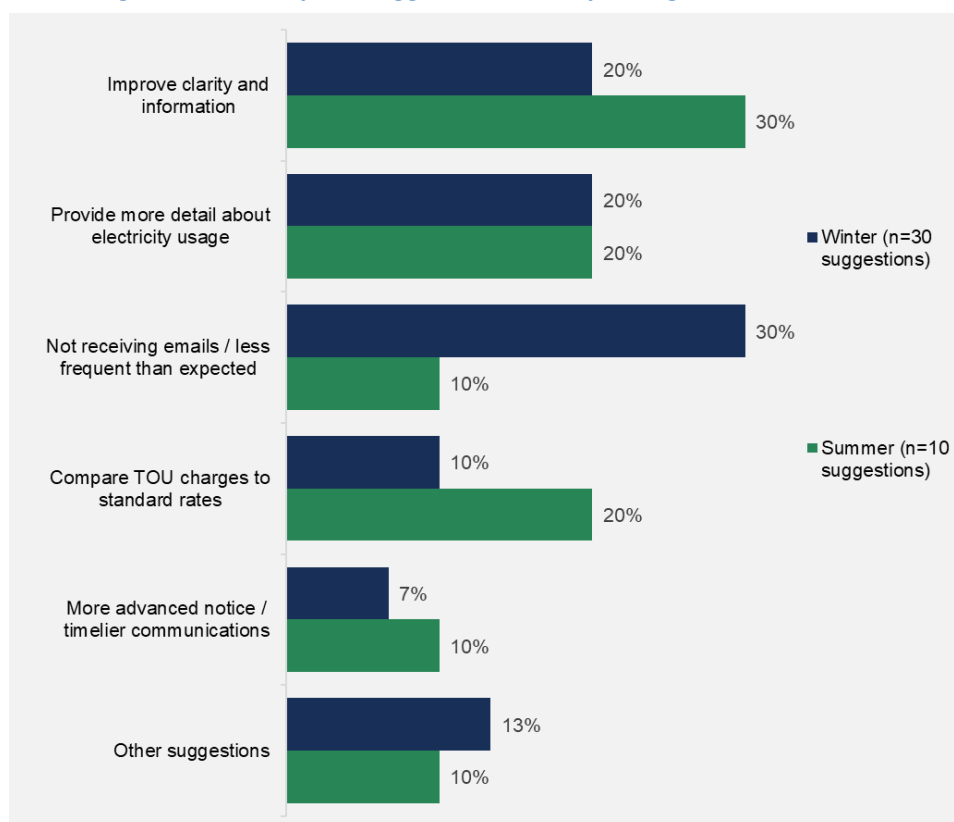
Source: Winter and Summer experience surveys. “In the past 6 months, have you viewed your business’ electric usage history from your PSE online account?”, “In the past 6 months, have you visited the pse.com/lower webpage for more insights into energy use and ways to save?”

Communications from PSE

PSE sent monthly bill summary emails to pilot participants. Recall of receiving the monthly bill summary emails was 68% in the winter experience survey (n=121), which rose to 88% in the summer experience survey (n=64). Respondents said they generally found the information in the emails they received useful, with average usefulness ratings on a 10-point scale (where 10 is *extremely useful*) of 7.4 (winter) and 6.4 (summer), indicating that while awareness increased from winter to summer, usefulness ratings declined over the same period. Cadmus also asked respondents if they were getting too many, too few, or just the right amount of emails from PSE. Most said it was the right amount (80% winter, n=108 and 83% summer, n=54), though 14% said they were getting too few emails in the winter survey, and 4% reported too few in the summer survey. The percentage of respondents that said they receive too many emails about the pilot rose from 6% in the winter survey to 13% in the summer survey.

The seasonal experience surveys asked respondents if they had any suggestions for improving TOU rate emails from PSE. In the winter survey, 33% of 82 respondents who recalled receiving emails from PSE offered suggestions, and 16% of 56 respondents offered suggestions in the summer survey. Cadmus categorized these suggestions, which are presented in Figure 71. Suggestions were divided evenly between several themes: in the winter survey, the most common suggestions related to participants not receiving rate emails, or not receiving them as often as expected or desired (30% of 30 suggestions). PSE confirmed that summary emails were not sent to all participants during the first winter of the pilot due to data issues between backend systems, which explains the frequency of comments in the winter survey about not receiving emails. In the summer survey, the most common suggestions were to improve the clarity of information provided about the pilot (3 of 10 suggestions). Twenty percent of suggestions in both season surveys were requests to provide more detail about electricity usage.

Figure 71. Participant Suggestions for Improving Emails from PSE



Source: Winter and Summer experience surveys. “What advice would you give PSE on how they can make the TOU rate emails better?” (Percentage of suggestions for improvement, some respondents made more than one suggestion)

Several suggestions about improving the clarity of information mentioned confusion about the TOU rate for “energy charges” shown in pilot marketing, which did not include all of the per-kilowatt-hour fees, charges, and taxes shown on customer bills.

“The rate advertised in the emails needs to reflect the actual rate that appears on my bill. As it is, the emails advertise a rate that's 2 cents per kWh lower, which caused me to sign up for TOU and pay a higher bill even after adjusting my thermostats for off-peak hours. It felt like a bait-and-switch.”

- Rate 324

Participant suggestions about including more details in rate emails often included requests for kilowatt and kilowatt-hour results in addition to dollars, or requests for specific comparison periods.

Suggestions about providing a comparison to standard residential rates usually related to participants wanting to know if they are actually saving money, which indicates that the rate emails are not conveying this information clearly.

Other suggestions included providing tips on ways to shift energy usage to off-peak periods, sending updates by text message instead of email, sending fewer rate emails, and improving the tone of communications. According to one participant, “positive prompts work better for people and businesses to conserve energy.”

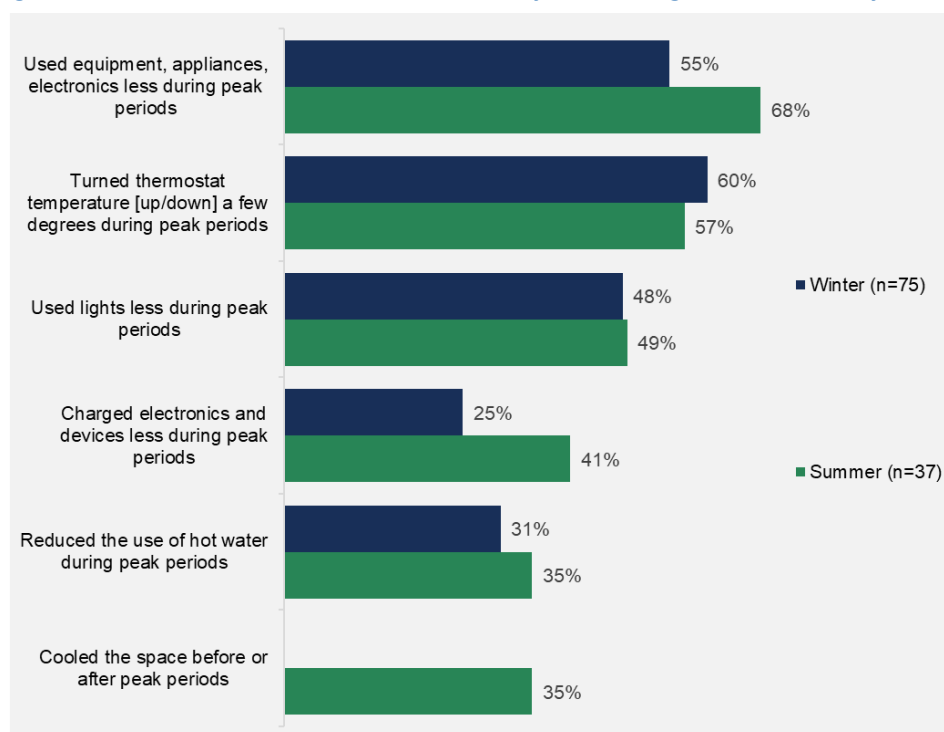
“You provide zero info on actual kW use in each period, or any change from prior times. Pretty much worthless info to take any action.” - Rate 324

Behavior during TOU Peak Periods

Most survey respondents in the commercial TVR pilot reported that their business took action to reduce electricity use during peak periods, though a substantial portion of participants said they did not take action during peaks. In the winter survey, 62% (n=121) of participants reported taking action to reduce energy usage during winter peaks, and in the summer survey, 58% (n=64) reported doing so during the summer peak. Of participants who said they had reduced energy usage during the winter, 48% said they did so “every” weekday and 33% said “several days per week” (n=75). Summer survey results were similar (51% every weekday, 19% several days per week, n=37).

The most common actions business participants reported taking to reduce energy usage during peak periods were using equipment and appliances less (55% to 68% by season) and adjusting thermostat settings (57% to 60% by season; Figure 72). About half also reported using less lighting during peaks (48% to 49% by season), and about one-third mentioned shifting charging electronic devices (25% to 41%) and reducing hot water usage (31% to 35%).

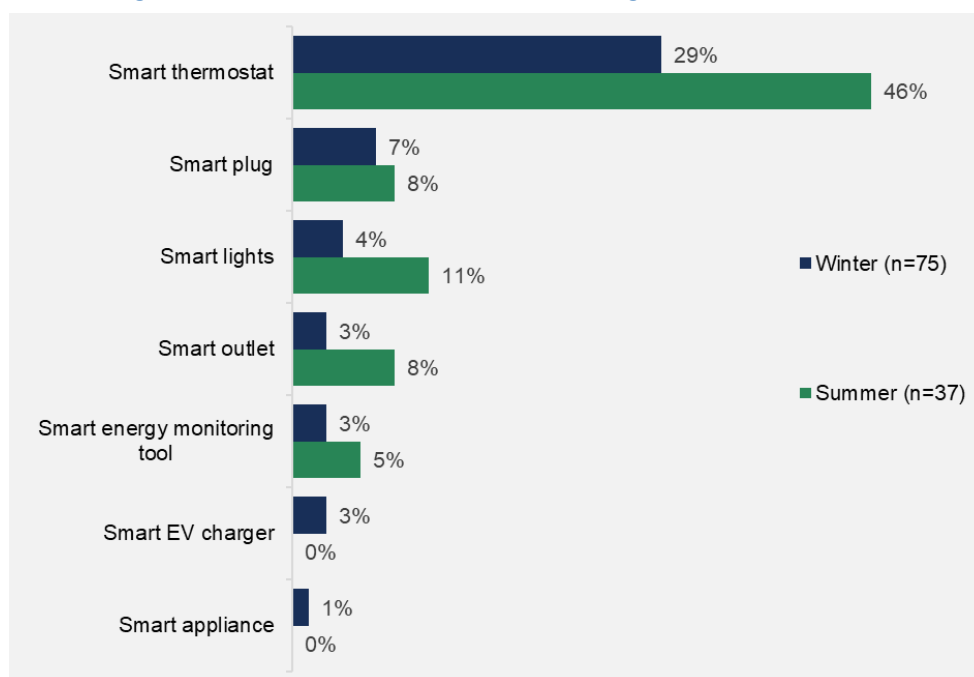
Figure 72. Actions Taken to Reduce Electricity Use during Peak Periods by Season



Source: Winter and summer experience surveys. “Here is a list of high-impact actions your business could have done during peak periods. Please select all the actions your business did.” (Respondents could select multiple actions)

Many pilot participants reported using smart devices to shift electricity usage to off-peak periods, and the percentage of participants who reported this increased from the winter survey (36%, n=75) to the summer survey (51%, n=37). Figure 73 shows that the most common smart devices respondents cited were smart thermostats, and use of smart thermostats also saw the largest increase from winter (29%) to summer (46%). Participants also reported an increase in use of smart lights and smart outlets from the winter survey to the summer survey, though use of this equipment was not common (11% and 8% in summer, respectively). Very few respondents mentioned smart EV chargers and smart appliances in the winter survey, and none mentioned these in the summer survey.

Figure 73. Smart Devices Used to Shift Usage from Peak Periods

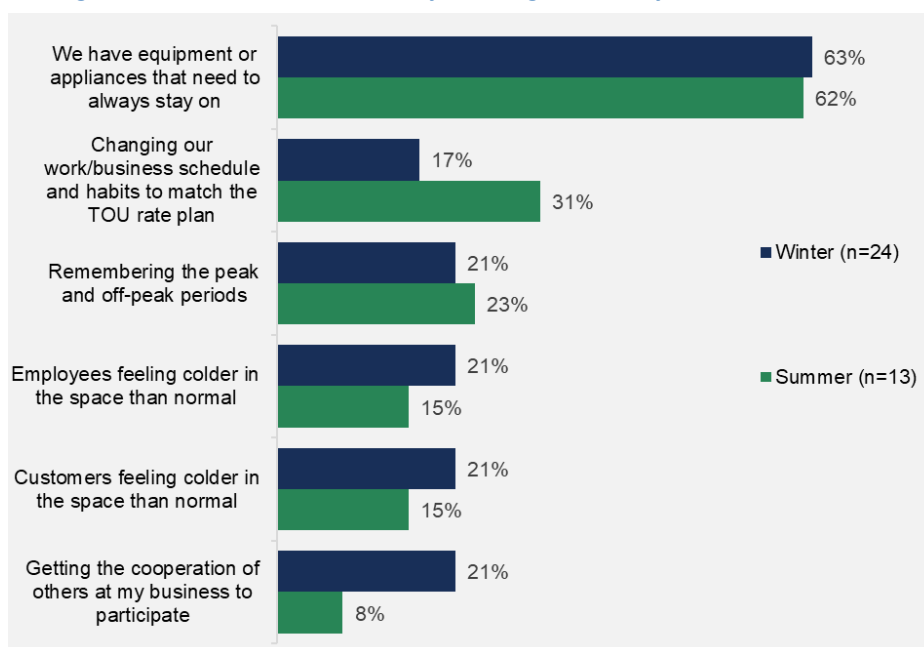


Source: Winter and Summer experience surveys. "What smart devices did you use to help you schedule or automate your electricity use to off-peak periods?"
(Respondents could select multiple devices)

Following their first winter season with TOU rates, 67% (n=72) of respondents reported that it was *very easy* or *somewhat easy* to shift their electricity usage. The percentage saying it was easy following the first summer season was similar (64%, n=36).

Figure 74 shows the reasons given by participants who found shifting use on TOU rates to be *somewhat difficult* or *very difficult*. The most common reason, mentioned by most respondents for both seasons, was that the business has equipment that needs to always stay on (63% winter, 62% summer). Other issues like changing schedules, remembering when peak periods occur, and maintaining comfortable temperatures were mentioned at similar rates by less than a third of respondents who cited difficulties shifting usage.

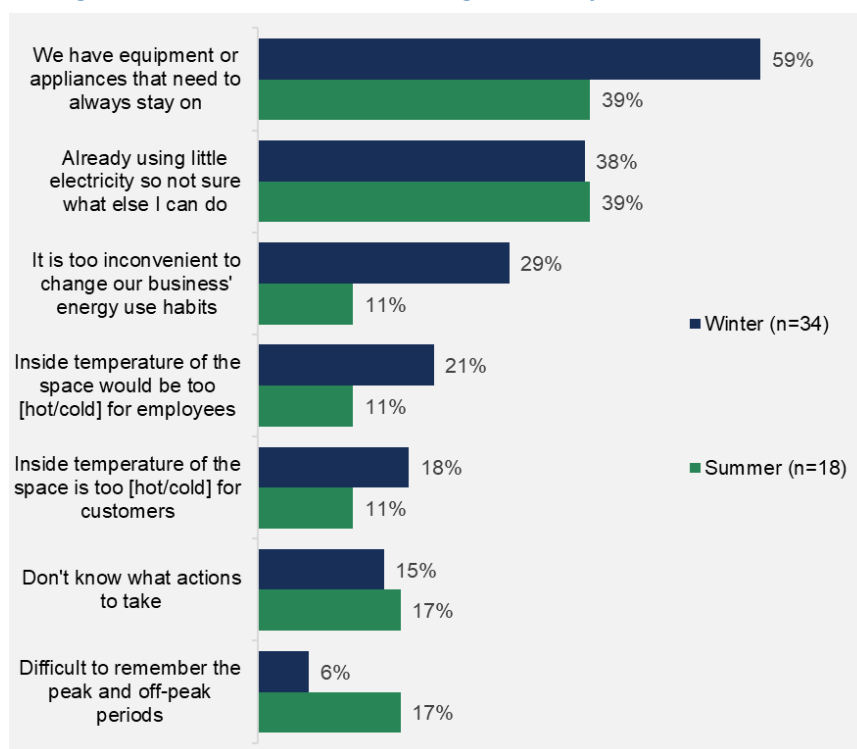
Figure 74. Reasons for Difficulty Shifting Electricity Use on TOU Rates



Source: Winter and Summer experience surveys. "What difficulties did your business have in reducing or shifting electricity use on the TOU rate plan?"
(Respondents could select multiple reasons)

The experience surveys asked respondents who did not shift their usage from peak periods why they did not shift. Figure 75 shows that many of these customers had equipment that needed to always stay on (59% winter, 39% summer), or said they were already using little electricity so were not sure what else they could do (38% winter, 39% summer).

Figure 75. Reasons for Not Shifting Electricity Use on TOU Rates

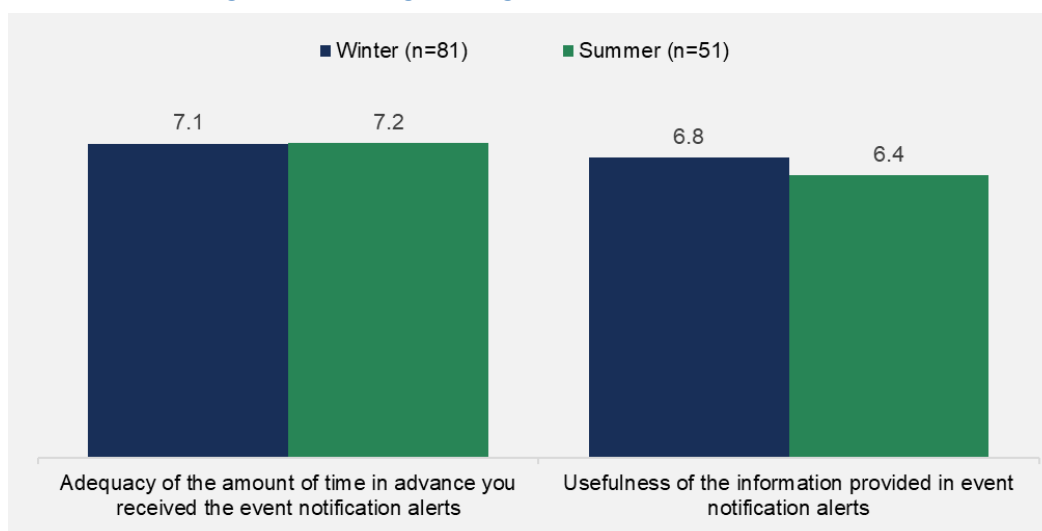


Source: Winter and Summer experience surveys. "Why did your business not reduce or shift electricity use on the TOU rate plan?" (Respondents could select multiple reasons)

Response to PTR Events

Commercial customers on Schedule 324 can receive PTRs for reducing electricity use during peak periods on days when PSE calls a PTR event. In the first year of the TVR pilot, PSE called four PTR events in the winter season and six in the summer. In the winter experience survey after the first winter of the pilot, 68% (n=120) recalled receiving notification of PTR events, and in the summer experience survey after the first summer, 81% (n=63) recalled PTR event notifications. Figure 76 shows that respondents gave generally positive ratings for the amount of advance notice provided by notification alerts (7.1 to 7.2 by season) and somewhat lower ratings for the information provided in the notifications (6.4 to 6.8 by season).

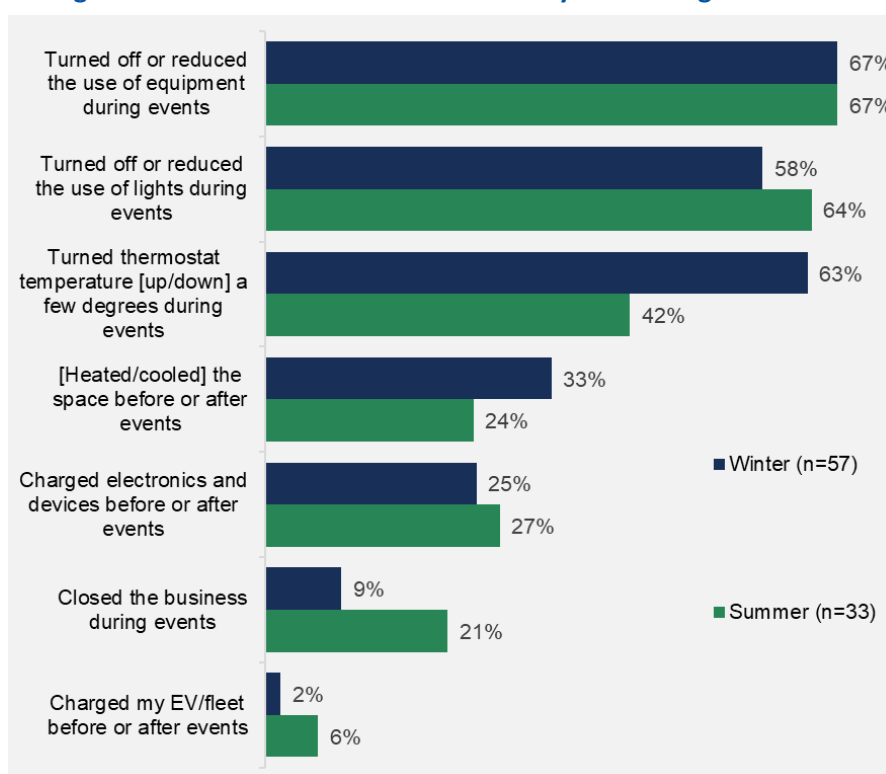
Figure 76. Average Ratings for PTR Event Notifications



Source: Winter and Summer experience surveys. "How would you rate the adequacy of the amount of time in advance you received the Peak Time Rebate event notification alerts?", "How would you rate the usefulness of the information provided in the Peak Time Rebate event notification alerts?"
 (Average ratings on a 10-point scale where 10 is *extremely adequate or useful*)

About half of Schedule 324 businesses reported taking action to shift electricity use during at least some of the PTR events: 49% (n=119) during winter and 52% (n=63) during summer. For winter, only 19% reported taking action during every PTR event, while 32% reported taking action during every summer PTR event. Figure 77 shows the actions taken by season; most respondents said they had reduced equipment use (67% in both seasons) and lighting use (58% to 64% by season) during PTR events. Thermostat adjustments were a more common action in winter (63%) than summer (42%), while respondents were more likely to close their business during summer PTR event hours (21%) compared to winter (9%).

Figure 77. Actions Taken to Shift Electricity Use During PTR Events

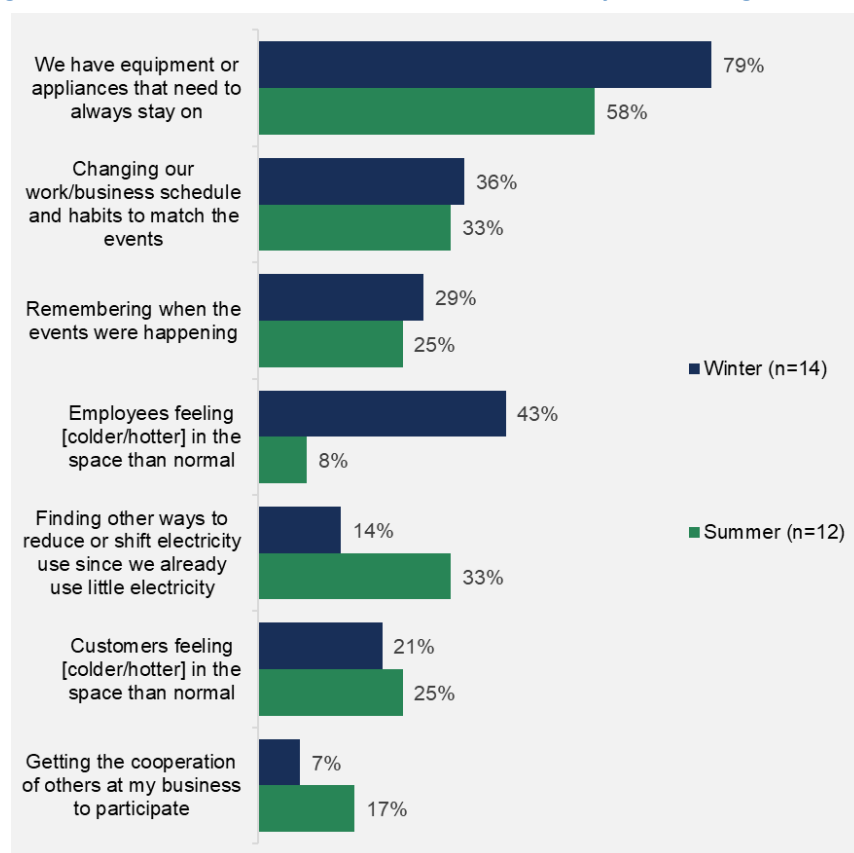


Source: Winter and Summer experience surveys. “How did your business reduce or shift electricity use during the [winter/summer] Peak Time Rebate events?” (Actions taken by respondents who took action; respondents could select multiple actions)

Following their first winter season of PTR events, 75% (n=55) of respondents reported that it was *very easy* or *somewhat easy* to shift their electricity usage during events. The percentage saying it was easy decreased (64%, n=33) following the subsequent summer PTR event season.

Figure 78 shows the reasons given by participants who found shifting energy use during PTR events to be *somewhat difficult* or *very difficult*. Equipment that needs to always stay on was mentioned most frequently in both seasons (79% winter, 58% summer), as it also was for participants who reported difficulty with shifting use away from TOU peaks (Figure 74). None of the other reasons for having difficulty was mentioned by a majority of respondents in either season. Respondents were more likely to mention temperature comfort issues for employees in winter (43% compared to 8% in summer), though concern about the comfort of customers was similar in both seasons (21% and 25%).

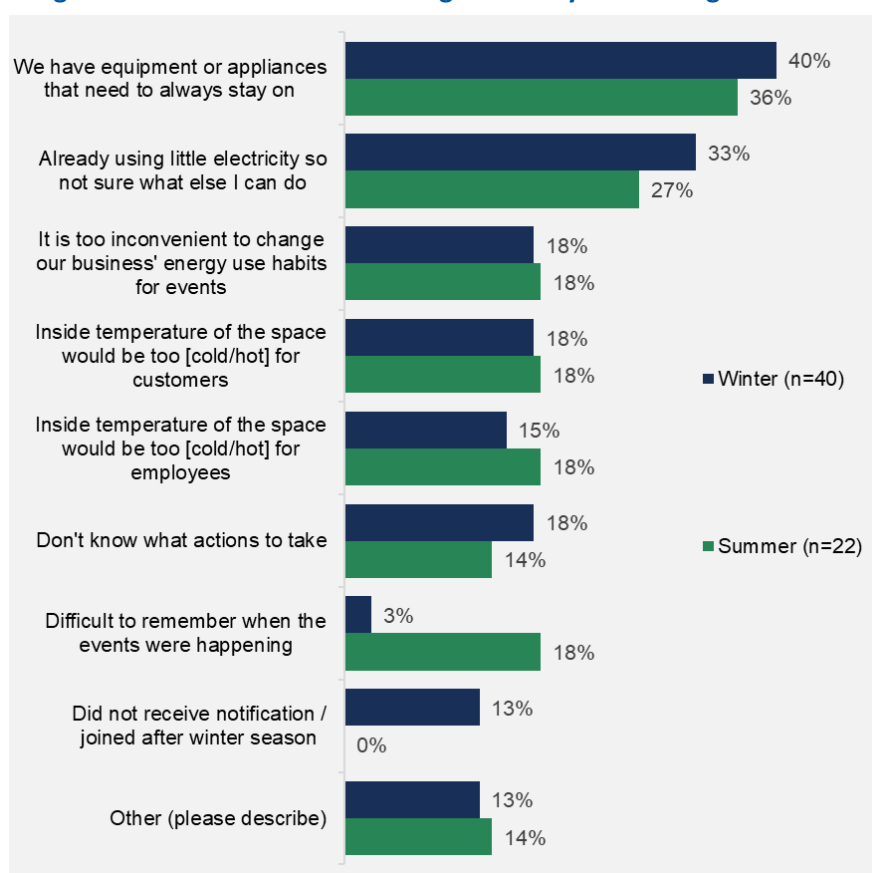
Figure 78. Reasons it was Difficult to Shift Electricity Use During PTR Events



Source: Winter and Summer experience surveys. “What difficulties did your business have in reducing or shifting electricity use during the [summer/winter] Peak Time Rebate events?” (Respondents could select multiple actions)

The experience surveys asked respondents who did not respond to PTR events why they did not respond. Figure 79 shows that many of these participants said they had equipment that needed to always stay on (40% winter and 36% summer), which was the same reason participants most frequently cited to explain why they found it difficult to shift during TOU peak periods (Figure 74) and PTR events (Figure 78). About one-third said they were already using little electricity and were not sure what else they could do (33% winter, 27% summer), which was also a common reason for participants’ difficulty with shifting energy usage during peak periods and PTR events. Responses were generally similar in the winter and summer surveys, although respondents were more likely to say it was difficult to remember when events happened in summer (18% compared to 3% in winter). Some respondents to the winter survey (13%, or 5 of 40 who did not respond to PTR events) reported that they did not receive notice about events, or that they joined the pilot after the winter events were completed.

Figure 79. Reasons for Not Shifting Electricity Use During PTR Events

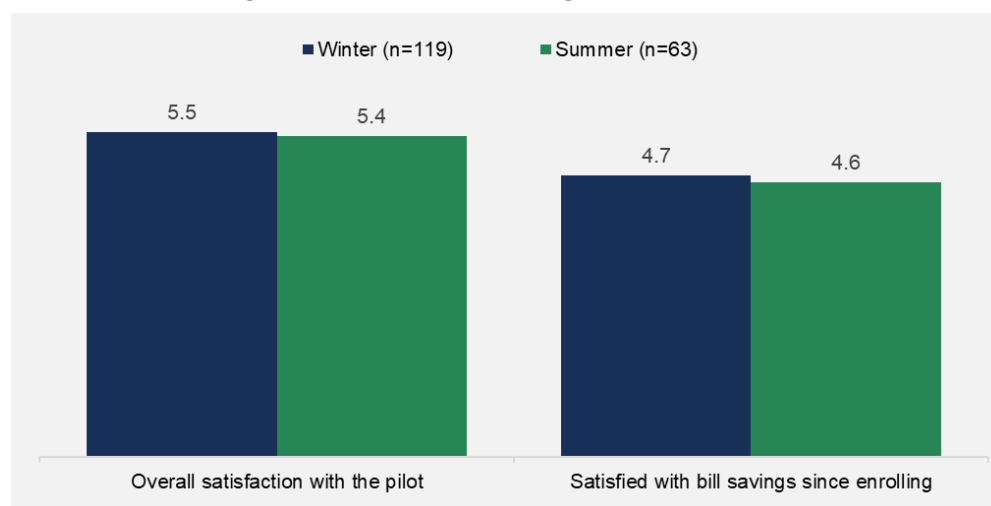


Source: Winter and Summer experience surveys. "What were your reasons for not participating in the [winter/summer] Peak Time Rebate events?"
(Respondents could select multiple reasons)

4.2.4. Customer Satisfaction and Suggestions for Improvement

Pilot participants rated their satisfaction with their experience and bill savings on TOU rates on a 10-point scale where 10 means *outstanding or extremely satisfied*. Ratings by season are summarized in Figure 80. The average overall satisfaction rating was 5.5 in winter and 5.4 in summer, and satisfaction with bill savings was even lower at 4.7 in winter and 4.6 in summer. These ratings indicate a polarized response, with both very satisfied and very dissatisfied participants. More respondents rated their satisfaction with the pilot overall as a 1 out of 10 (*unacceptable*) in both winter (24%) and summer (27%) than gave ratings of 8 or higher (23% and 24%, respectively).

Figure 80. Satisfaction Ratings for the TVR Pilot



Source: Winter and Summer experience surveys. "Taking everything into consideration, please rate your overall experience with PSE's TOU pilot program?", "How satisfied are you with your bill savings since enrolling in PSE's TOU pilot program?" (Average rating on a 10-point scale where 10 is *Outstanding or Extremely Satisfied*)

Participants were given the opportunity to explain why they gave the satisfaction rating they did. Satisfied customers generally mentioned bill savings and ease of participation and praised the goals of the pilot program. Many unsatisfied customers reported that they were not saving money on bills, that they could not tell if they were saving on their bills, or that their bills had gone up under Schedule 324. Several winter respondents also mentioned that they joined the pilot late in the season, so had not experienced many PTR events or opportunities for bill savings at the time of the survey.

The following comments from Schedule 324 winter survey respondents illustrate some of the specific barriers customers faced in the pilot program:

- *I can't change how my business runs. It's an auto repair shop. How do you propose I save energy during business hours? I can't change when the air compressor is going to turn on or when I should turn off the heater in the office for our customers. This program may be better fitted for households where people can do their laundry, do dishes or vacuum at different times.*
- *Based upon what we do in our business, it is very difficult and, in some cases, not possible, to adjust power usage outside of the peak hours without it costing us more in expenses of labor, equipment, and causing significant challenges in our operations.*
- *The peak hours are when my business is busiest, and despite my efforts to lower usage during peak hours, my electricity bill has actually become a lot more expensive. I would like to leave the TOU pilot program.*
- *We don't believe we use a lot of power relatively speaking, and are generally not operating during peak hours, [therefore] did not see much of a reduction in our bills.*

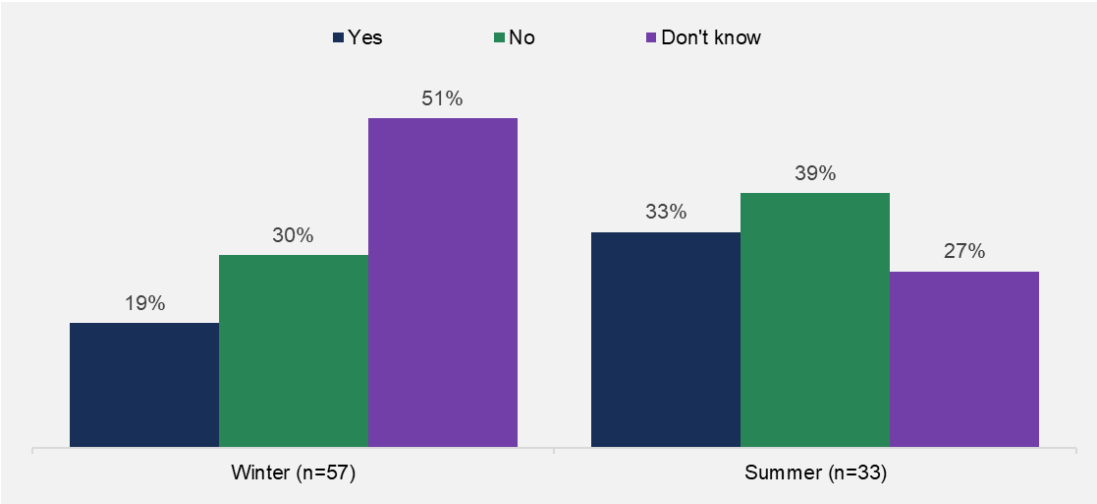
- *I was unable to fully take advantage of [TVR] since the pub building is unable to reduce electricity use during those periods due to customer discomfort and cooking appliances that need to be used.*
- *This program is not helpful for a business. There are no real tools offered to help reduce usage. A real person coming in and looking at each individual business would better serve me.*
- *I don't check my email enough for one-day warnings, sometimes [the PTR event] was over [by the time I saw the email].*
- *The TOU rate plan charges 180% more than my pre-TOU rate during winter peak times but only offers a 12.85% rate reduction for off peak power usage. I haven't been in the program long enough to assess impacts yet. I will stay in the program to learn more. It took me a little while to configure my HVAC equipment to set back or turn off during peak rate hours or during events but now that is complete, so it will be a little easier to assess financial impacts going forward. From a financial perspective, I'm not convinced the TOU rate structure is saving any money versus staying on my previous rate plan. It's possible that staying on the [standard Schedule 24] rate and still participating in demand response events when they are called would be my best option. I'm looking forward to leaning more after a year in the program.*

Summer survey respondents made similar comments and suggestions, with even more focus on hours of operation not aligning with peak periods:

- *Unless our business is closed, it is difficult to change the electricity [usage] since equipment needs to be on.*
- *Our business is closed at 5:30, so for 2.5 hours of your events, we are using very little energy. The thermostat is set at 75 from 5:00 to 8:00. It seems to me that we can't do much else to cut energy use, but we are not saving anything even though we are closed.*
- *We are a service business: customer focused. We were not usually able to reduce power use at the times needed. When we were successful, there was not much to be gained by doing so, i.e. the discounts were not sufficient.*
- *We have office hours and are done most days by 5:00 pm so everything is shut down for peak [periods] already.*
- *I misunderstood. I thought I was a good candidate for this [pilot] because my business is not open during peak hours. However, every time I got a report it said my bill went up because I did not use less electricity.*

The experience surveys also asked participants if the amount of rebate they received for limiting electricity use during PTR events was consistent with the level of effort that they made (Figure 81). In the winter survey, only 19% said it was worth the effort, while 30% said it was not and 51% did not know. This improved somewhat in the summer survey, with 33% saying the PTR rebates were worth the effort, 39% saying they were not, and only 27% saying they were not sure. However, in both seasons more respondents said the rebate was not worth the effort than those who said it was.

Figure 81. Were PTR Rebates Worth the Effort



Source: Winter and Summer experience surveys. “Was the bill credit amount for the [winter/summer] Peak Time Rebate events consistent with your level of effort?”

Appendix A. Data Collection Instruments and Response

This appendix provides response rates by treatment group for the six Year 1 online surveys distributed by Cadmus (Table 28). PSE distributed the enrollment and exit surveys to participants upon their enrollment or exit from the pilot program. Following the response rate table are the survey instruments used to collect data from participants and non-participants.

Response rates for the residential surveys were consistently about twice the response rate for commercial surveys. Both experience surveys were sent to a census of current SMB participants due to this group's smaller population and lower response rates; however, the number of summer experience survey responses fell short of the target of 75. Residential surveys were sent to a randomly selected sample of participants each season due to larger populations and higher response rates, and every group exceeded the targeted number of responses for all Year 1 surveys.

Table 28. Response Rates for Surveys Distributed by Cadmus

Survey	Contacts Invited	Responses Received	Response Rate	Targeted Responses
Non-Enrollment: SMB (Schedule 324)	4,499	145	3%	75
Non-Enrollment: Residential	10,150	705	7%	325
TOU (Schedule 307)	1,550	101	7%	50
TOU Low-Income (Schedule 307)	1,550	106	7%	50
TOU+PTR (Schedule 317)	2,350	151	6%	75
TOU+PTR Low-Income (Schedule 317)	2,350	138	6%	75
TOU Super Off Peak (Schedule 327)	2,350	209	9%	75
Winter Experience Year 1: SMB (Schedule 324)	941	127	13%	75
Winter Experience Year 1: Residential	5,000	1,163	23%	575
TOU (Schedule 307)	850	165	19%	100
TOU Low-Income (Schedule 307)	850	226	27%	100
TOU+PTR (Schedule 317)	1300	258	20%	150
TOU+PTR Low-Income (Schedule 317)	1300	299	23%	150
TOU Super Off Peak (Schedule 327)	700	215	31%	75
Summer Experience Year 1: SMB (Schedule 324)	799	66	8%	75
Summer Experience Year 1: Residential	4,498	859	19%	575
TOU (Schedule 307)	753	146	19%	100
TOU Low-Income (Schedule 307)	751	156	21%	100
TOU+PTR (Schedule 317)	1,150	185	16%	150
TOU+PTR Low-Income (Schedule 317)	1,145	215	19%	150
TOU Super Off Peak (Schedule 327)	699	157	22%	75

PSE Time-of-Use Rates Pilot Enrollment Survey for Residential Schedule 7 Audience

Survey Sections Overview

Section Name and Question Topics	Survey Item
Enrollment-Specific - How customer heard about the offering - Reasons for enrolling - Feedback on Rate Advisor Tool (comprehensibility, decision-making influence, and satisfaction)	Items under Section B
Baseline - Awareness of time-of-use rates - Energy usage behaviors, expectations, and concerns	Items under Section C
Home and Household Characteristics - Residence dwelling type - Renter or owner - HVAC equipment - Smart thermostat ownership and eligibility for receiving smart thermostat - EV ownership and charger type - Concern for climate change	Items under Section D

Variables/Data to Carry Over into Survey

- Contract Account
- First Name
- Last Name
- Premise ID
- Premise Address
- Email
- Completed On Date
- TOU Rate

Note: Only questions marked with an asterisk * will be mandatory to answer.

A. Survey Introduction Message

As part of this enrollment process, we'd like to ask you a few questions about you and your home. Your answers will help confirm your eligibility for the Time-of-Use (TOU) pilot program and help us to provide the best program experience for you. Please answer each question to the best of your knowledge.

[Start button]

[Page break]

B. Enrollment-Specific

B1. How did you hear about the Time-of-Use (TOU) pilot program? Select all that apply. [Multiple answers allowed.]

1. Email from PSE
2. Print mail from PSE
3. PSE.com
4. A neighbor/family/friend/co-worker
5. Other (please describe) [Text entry]

B2. Why are you interested in the Time-of-Use (TOU) pilot program? Select all the reasons that apply. [Multiple answers allowed.]

1. To reduce my energy bills
2. To save energy
3. To help the environment
4. To have more control over how much I pay for energy
5. The \$25 enrollment incentive
6. My family/friend/colleague/neighbor recommended it
7. Other (please describe) [Text entry]

[Page break]

B3. You may have seen the Rate Advisor tool (image shown below). This tool shows you the estimated impact of the Time-of-Use (TOU) pilot program on your energy bills.

[Insert image of Rate Advisor Tool]

Please tell us if you agree or disagree with the following statements about the Rate Advisor tool.

[Response choices: 1=Strongly Agree, 2=Somewhat Agree, 3=Somewhat Disagree, 4=Strongly Disagree, 5=Did not use the tool/Don't know]

- A. The information presented by the Rate Advisor tool was easy to understand
- B. The Rate Advisor tool influenced my decision to enroll in the program

[Page break]

B4. Please rate your overall experience with the Rate Advisor tool.

0. 1 Unacceptable
1. 2
2. 3
3. 4

4. 5 Average
5. 6
6. 7
7. 8
8. 9
9. 10 Outstanding
10. Did not use the tool/Don't know

B5. Do you have any suggestions to improve the Rate Advisor tool or ways to better inform customers about the Time-of-Use (TOU) pilot program?

[Text entry]

[Page break]

C. Baseline

C1. Before you learned about the Time-of-Use (TOU) pilot program, did you know that PSE's cost to supply electricity to the grid varies by hour of the day? For example, the cost to supply electricity on a typical winter weekday is higher at 6 p.m. when more people are using energy in their homes than at 12 p.m. when more people may be away from their homes.

1. Yes
2. No

[Page break]

C2. Please indicate whether you agree or disagree with the following statements. [Response choices: 1=Strongly Agree, 2=Somewhat Agree, 3=Somewhat Disagree, 4=Strongly Disagree, 5=Don't know] [Randomize statement order A-D]

- A. I regularly track my electricity usage online through my online customer account or monthly electricity bills delivered in the mail
- B. I manage my electricity usage whenever I can by taking energy-saving steps or installing more efficient products and appliances
- C. It will be easy for me to save money on my electricity bill by shifting my usage from hours when the price of electricity is higher to hours when the price is lower
- D. I will need suggestions from PSE about how to shift my energy usage from higher "peak" price periods to lower "off-peak" price periods

[Page break]

[Make section D forced response. All other sections do not use forced response.]

D. Home and Household Characteristics

D1. What type of housing do you currently live in?*

1. A detached single-family house
2. An apartment, condominium, townhouse, or row house
3. A mobile or manufactured home
4. Other (please describe) [Text entry]

D2. Do you own or rent your home?*

1. Own
2. Rent/lease
3. Other (please describe) [Text entry]

[Page break]

D3. What heating system do you have in your home?* Select all that apply. [Multiple answers allowed]

1. Electric central forced-air furnace
2. Natural gas central forced-air furnace
3. Central forced-air heat pump
4. Ductless heat pump or mini-split
5. Radiant floor heating
6. Baseboard
7. Wall heater
8. Portable space heater
9. Other (please describe) [Text entry]
10. Don't know [Exclusive answer]

D4. What air conditioning system do you have in your home?* Select all that apply. [Multiple answers allowed]

1. Ductless heat pump or mini-split system
2. Central forced-air heat pump
3. Central forced-air conditioning
4. Window/wall air conditioner
5. Evaporative cooler or swamp cooler
6. Portable air conditioner
7. Other (please describe) [Text entry]
8. None/I do not have air conditioning [Exclusive answer]
9. Don't know [Exclusive answer]

[Page break]

D5. Do you have a smart thermostat in your home?* A smart thermostat automatically learns your preferences and adjusts the temperature for you when you are not home. Popular smart thermostat brands include Nest, Ecobee, Honeywell Lyric, and Emerson Sensi.

1. Yes, I have a Nest smart thermostat
2. Yes, I have another brand of smart thermostat
3. No, I do not have a smart thermostat
4. Don't know

D6. [Ask if D5=3 or 4] Do you have Wi-Fi internet in your home?*

1. Yes
2. No

D7. [Ask if D6=1] If you were to receive a smart thermostat with installation instructions, how confident are you in your ability to install a smart thermostat in your home?*

1. Very confident
2. Somewhat confident
3. Not too confident
4. Not at all confident
5. Don't know

D8. Does your household have an electric vehicle (EV)?*

1. Yes, a plug-in hybrid EV
2. Yes, an all-electric vehicle
3. No, I do not have any EV
4. Don't know

[Page break]

D9. [Ask if D8=1 or 2] What kind of EV charger do you have at home?*

1. Level 1 charger: a home outlet
2. Level 2 charger: a dedicated home charging station
3. I don't charge at home
4. Don't know

D10. On a scale of 1-10, where 1 is not at all concerned and 10 is extremely concerned, how concerned or not concerned are you about climate change?*

1. 1 Not at all concerned
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely concerned

[Page break]

E. End-of-Survey Message

Those were all the questions we had for you. Thank you for completing the survey. You may continue with the enrollment process.

Time of Use (TOU)

Those were all the questions we had for you. Thank you for completing the enrollment process. You will receive follow-up communication from PSE about the status of your enrollment to the Time of Use program.

☐ By checking this box, I accept the [terms and conditions](#).

[< BACK](#)

[ENROLL](#)

Time of Use (TOU) Enrollment confirmation

Thank you for enrolling in PSE's Time of Use (TOU) pilot program! You should receive an email to the address on file with your PSE account confirming the details of your enrollment.

[Back to My Account >](#)

PSE Time-of-Use Rates Pilot Participant Exit Survey

For Residential Audience

Survey Sections Overview

Section Name and Question Topics	Survey Item
Original Motivation and Reason for Leaving - Motivation(s) for enrolling - Reason(s) for unenrolling from the program	Items under Section B
Program Expectations and Awareness - Money-saving expectation - Ease/difficulty expectation - Awareness of changing energy-use habits - Awareness of online tools/reports/alerts - Inconvenience for environmental benefit expectation	Items under Section C
Program Engagement - Self-reported level of participation and effort - Ease/difficulty of participation	Items under Section D
Areas for Improvement and Opinion of Utility - Customer-suggested improvements - Likelihood to re-enroll in the future if improvements are made - Program experience's impact on customer opinion of utility	Items under Section E

Variables/Data to Include in the Survey

- First Name
- Last Name
- Contract Account
- Premise ID
- Premise Address
- Email
- Enrollment Date
- TOU Rate
- BDR Status
- Smart Tstat Status

Note: Only questions marked with an asterisk * will be mandatory to answer.

A. *Survey Introduction*

Thank you for participating in the Time-of-Use (TOU) pilot program. We are sorry to see you go. As part of the unenrollment process, we'd like to ask you a few questions about your experience. This survey will take 3 minutes. Please answer each question to the best of your knowledge.

[Start button]

[Page break]

B. *Original Motivation and Reason for Leaving*

B1. What motivated you to enroll in the Time-of-Use pilot program? Select all the reasons that apply.

[Multiple answers allowed]

1. To reduce my energy bills
2. To save energy
3. To help the environment
4. To have more control over how much I pay for energy
5. The \$25 enrollment incentive
6. My family/friend/colleague/neighbor recommended it
7. Other (please describe) [Text entry]

B2. *Which of the following describe your reason(s) for leaving the program? Select all that apply.

[Multiple answers allowed]

1. I saw little or no bill savings
2. The Time-of-Use rate schedule was inconvenient for my household
3. The Time-of-Use rate schedule required too much effort to manage my household's energy use
4. It was difficult to shift my home's energy use from "peak" to "off-peak" periods
5. It was hard to get others in my household involved in managing energy use
6. The online tools/report/alerts from the program were not helpful
7. There was a change in my household's lifestyle or home occupancy that made it hard to participate
8. I didn't want to participate in Peak Time Rebate events [Display if TOURate=317]
9. I didn't like receiving Peak Time Rebate event notifications and reminders [Display if TOURate=317]
10. Something else (please describe) [Text entry]

[Page break]

C. *Program Expectations and Awareness*

C1. Please indicate whether you agree or disagree with the following statements about your expectations when you enrolled in the Time-of-Use pilot program. [Response choices: 1=Strongly Agree, 2=Somewhat Agree, 3=Somewhat Disagree, 4=Strongly Disagree, 5=Don't know]

- A. I expected my household would need to change its energy use habits to save money in this program

- B. I expected it would be easy to shift energy use from “peak” periods to “off-peak” periods
- C. I expected to save a lot on my energy bills under this program
- D. I expected PSE would provide helpful online tools and reports to help me save money under this program
- E. I expected to be slightly inconvenienced or my bills might increase by participating but the benefits to the environment will be worth it

[Page break]

D. Program Engagement

- D1. Did your household do anything to shift energy use from “peak” periods to “off-peak” periods?
- 1. Yes
 - 2. No
 - 3. Don’t know
- D2. [Ask if D1=1] How often did your household attempt to shift energy use from “peak” periods to “off-peak” periods?
- 1. Daily
 - 2. A few times a week
 - 3. A few times a month
 - 4. A few times a year
 - 5. Never
 - 6. Don’t know
- D3. [Ask if D1=1] How difficult or easy was it to shift your energy use from “peak” periods to “off-peak” periods?
- 1. Very difficult
 - 2. Somewhat difficult
 - 3. Somewhat easy
 - 4. Very easy
 - 5. Don’t know

[Page break]

E. Areas for Improvement and Opinion of Utility

- E1. What could PSE do to make the Time-of-Use pilot program better in the future? [Text entry]

- E2. In the future, if PSE were to make changes to the program that addressed your reason(s) for leaving, how likely would you be to re-enroll in the program?
1. Very likely
 2. Somewhat likely
 3. Not too likely
 4. Not at all likely
 5. Don't know
- E3. How has the Time-of-Use pilot program affected your opinion of PSE, if at all?
1. Much less favorable toward PSE
 2. Somewhat less favorable
 3. Does not affect my opinion either way
 4. Somewhat more favorable
 5. Much more favorable toward PSE
 6. Don't know

[Page break]

F. End-of-Survey Message (Not Terminated)

Those were all the questions we had for you. Thank you for completing the un-enrollment process. You will receive a follow-up email right away from PSE confirming the status of your removal from the Time-of-Use pilot program.

PSE Time-of-Use Rates Pilot Non-Enrollment Survey for Residential Customers

Survey Design Overview

Research Objective	Topic Area in the Survey or Analysis Plan
Understand why these customers did not enroll in the pilot program	- Section B. Awareness of Pilot Program Offering and Marketing - Section C. Reasons for Not Enrolling
Characterize the customers who did not enroll in the pilot program	- Section D. TOU Concept Awareness and Energy Management Behaviors - Section E. Home and Household Characteristics
Identify any differences between enrollees and non-enrollees, and any differences across treatment groups	- Statistical comparison of enrollment survey responses to non-enrollment survey responses on shared questions (If enough respondents across treatment groups) Statistical comparison of non-enrollee responses across treatment groups
Find ways to improve the recruitment marketing and increase conversion	Synthesis of findings from items listed above

Target Audience

Those residential customers who were marketed to but did not enroll in the Time-of-Use pilot program.

Fielding Timeline

Mid-October through mid-November 2023. At least one week prior to launch, Cadmus will notify Eric Haechrel and provide a notice of customer contact document.

Sampling Plan

The table below shows the tentative sampling plan for the residential non-enrollment survey. Based on the final enrollment counts across treatment groups, the target number of completes and the treatment groups to contact for the survey may be subject to change. Cadmus will consult with PSE on the final sampling plan in early October 2023.

Treatment Group	Population Count	Target Number of Completes	Sample Frame Needed to Reach Target
TOU Residential (Sch. 307)	21,686	50	1,550
TOU Low-Income Residential (Sch. 307)	27,456	50	1,550
TOU+PTR Residential (Sch. 317)	32,799	75	2,350
TOU+PTR Low-Income Residential (Sch. 317)	40,903	75	2,350
Three-Period TOU EV Residential (Sch. 327)	11,550	75	2,350
Total	134,394	325	10,150

Variables/Data to Carry Over into Survey

- Name
- Email
- MarketedTOURate = 307, 317, or 327

- FirstMarketingDate
- IncomeEligible = Y or N
- PremiseID
- PremiseAddress
- TreatmentGroup

Note: Questions marked with an asterisk * indicate that this was asked in the enrollment survey.

Email Invitation

To: [Email]

From: PSE Time-of-Use Research

Subject: Tell PSE why you did not enroll in TOU and get a chance at \$100

Hi [Name],

You were invited to enroll in the Time-of-Use (TOU) pilot program from Puget Sound Energy. We noticed that you did not enroll and would like to understand why. Will you participate in a 5-minute survey? After you complete the survey, you can enter a drawing for a chance to win a \$100 e-gift card from a retailer of your choice. Two winners will be randomly selected.

Click the link below to take the survey:

[auto-generated link]

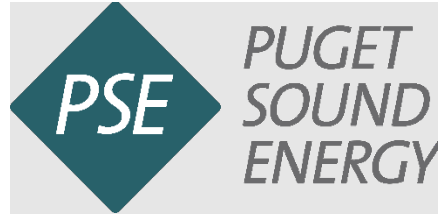
Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have any difficulties taking the survey, please contact Masumi Izawa at Cadmus, the research firm conducting this survey on our behalf. You can reach her at masumi.izawa@cadmusgroup.com. If you have any questions about this pilot program, contact Richie Fader at TOU@pse.com.

Thank you in advance for your time.

Richie Fader
Program Coordinator
Puget Sound Energy

A. Start Screen



Welcome! This survey will take 5 minutes to complete. Your responses will remain confidential and will only be used for research purposes. When you complete the survey, you may enter into a drawing for a chance to win a \$100 e-gift card.

[\[Start button\]](#)

B. Awareness of Pilot Program Offering and Marketing

B1. The Time-of-Use pilot program is an optional rate plan from PSE designed to help customers save money on their monthly bill by shifting energy use to “off-peak” periods. Before this survey, do you remember hearing about the Time-of-Use pilot program?

1. Yes
2. No

B2. [\[Ask if B1=1\]](#) *How did you hear about the Time-of-Use pilot program? Select all that apply.

[\[Multiple answers allowed\]](#) [\[Randomize order 1-4\]](#)

1. Email from PSE
2. Print mail from PSE
3. PSE.com
4. A neighbor/family/friend/co-worker
5. Other (please describe) [\[Text entry\]](#)

B3. Are you receiving too many, just the right amount, or not enough emails from PSE?

1. Too many emails
2. Just the right amount
3. Not enough emails
4. Don't know

C. Reasons for Not Enrolling

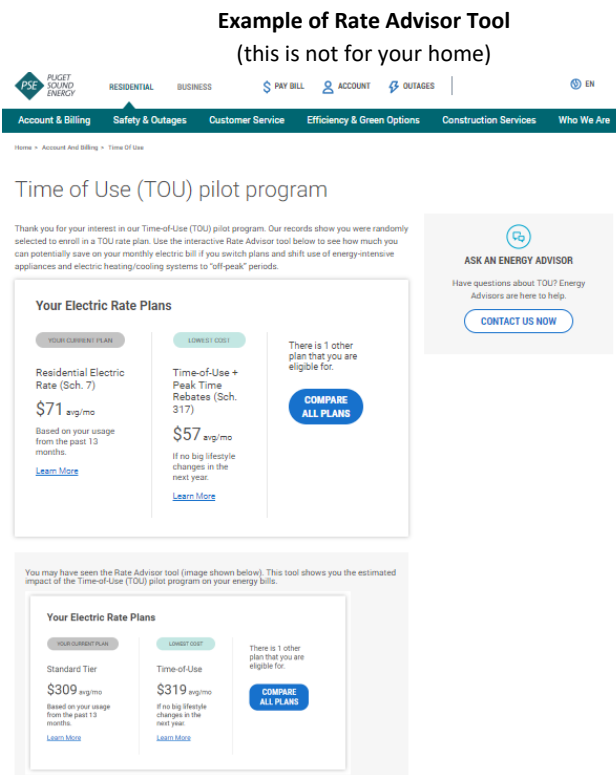
C1. [\[Ask if B1=1\]](#) Which of the following describe your reason(s) for not enrolling in the Time-of-Use pilot program? Select all that apply. [\[Forced response\]](#) [\[Multiple answers allowed\]](#) [\[Randomize order 1-9\]](#)

1. I was concerned my energy bills would increase if I enrolled
2. The potential bill savings aren't enough to make enrolling worthwhile
3. The Time-of-Use rate schedule was inconvenient for my household

4. The Time-of-Use rate schedule required too much effort to manage my household's energy use
5. I thought it would be hard to shift my home's energy use from "peak" to "off-peak" periods
6. Others in my household did not want to be involved in managing energy use
7. I was going to enroll but forgot to or did not have time to enroll
8. I received other program offerings from PSE that interested me more
9. I didn't want to participate in Peak Time Rebate events [Display if MarketedTOURate=317]
10. Something else (please describe) [Text entry]

C2. *Do you remember seeing the Rate Advisor tool (example image shown below)?

This tool showed you the estimated impact of the Time-of-Use (TOU) pilot program on your energy bills.



1. Yes
2. No

C3. [Ask if C2=1] *Please tell us if you agree or disagree with the following statements about the Rate Advisor tool. [Response choices: 1=Strongly Agree, 2=Somewhat Agree, 3=Somewhat Disagree, 4=Strongly Disagree, 5=Did not use the tool/Don't know] [Randomize order A-B]

- A. The information presented by the Rate Advisor tool was easy to understand
- B. The Rate Advisor tool influenced my decision to not enroll in the program

C4. [Ask if C2=1] *Please rate your overall experience with the Rate Advisor tool.

1. 1 Unacceptable
2. 2
3. 3
4. 4
5. 5 Average
6. 6
7. 7
8. 8
9. 9
10. 10 Outstanding

C5. [Ask if C4≤8] Please tell us why you gave that rating for the Rate Advisor tool. [Text entry]

D. TOU Concept Awareness and Energy Management Behaviors

- D1. *Did you know that PSE's cost to supply electricity to the grid varies by hour of the day?
For example, the cost to supply electricity on a typical winter weekday is higher at 6 p.m. when more people are using energy in their homes than at 12 p.m. when more people may be away from their homes.
1. Yes
 2. No
- D2. *Please indicate whether you agree or disagree with the following statements. [Response choices: 1=Strongly Agree, 2=Somewhat Agree, 3=Somewhat Disagree, 4=Strongly Disagree, 5=Don't know] [Randomize order A-B]
- A. I regularly track my electricity usage online through my online customer account or monthly electricity bills delivered in the mail
 - B. I manage my electricity usage whenever I can by taking energy-saving steps or installing more efficient products and appliances

E. Home and Household Characteristics

- E1. *What type of housing do you currently live in?
1. A detached single-family house
 2. An apartment, condominium, townhouse, or row house
 3. A mobile or manufactured home
 4. Other (please describe) [Text entry]
- E2. *Do you own or rent your home?
1. Own
 2. Rent/lease
 3. Other (please describe) [Text entry]

E3. *What heating system do you have in your home? Select all that apply. [Multiple answers allowed]

1. Electric central forced-air furnace
2. Natural gas central forced-air furnace
3. Central forced-air heat pump
4. Ductless heat pump or mini-split
5. Radiant floor heating
6. Baseboard
7. Wall heater
8. Portable space heater
9. Other (please describe) [Text entry]
10. Don't know [Exclusive answer]

E4. *What air conditioning system do you have in your home? Select all that apply. [Multiple answers allowed]

1. Ductless heat pump or mini-split system
2. Central forced-air heat pump
3. Central forced-air conditioning
4. Window/wall air conditioner
5. Evaporative cooler or swamp cooler
6. Portable air conditioner
7. Other (please describe) [Text entry]
8. None/I do not have air conditioning [Exclusive answer]
9. Don't know [Exclusive answer]

E5. *Do you have a smart thermostat in your home?

A smart thermostat automatically learns your preferences and adjusts the temperature for you when you are not home. Popular smart thermostat brands include Nest, Ecobee, Honeywell Lyric, and Emerson Sensi.

1. Yes, I have a Nest smart thermostat
2. Yes, I have another brand of smart thermostat
3. No, I do not have a smart thermostat
4. Don't know

E6. *Does your household have an electric vehicle (EV)?

1. Yes, a plug-in hybrid EV
2. Yes, an all-electric vehicle
3. No, I do not have any EV
4. Don't know

E7. [Ask if E6=1 or 2] *What kind of EV charger do you have at home?

1. Level 1 charger: a home outlet
2. Level 2 charger: a dedicated home charging station
3. I don't charge at home

4. Don't know

E8. *On a scale of 1-10, where 1 is not at all concerned and 10 is extremely concerned, how concerned or not concerned are you about climate change?

1. 1 Not at all concerned
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely concerned

F. Gift Card Drawing

F1. You've made it through the survey! Would you like to enter in the drawing for a chance to win a \$100 e-gift card?

Two winners will be randomly selected. Winners will get to select a \$100 e-gift card from a retailer of their choice.

1. Yes
2. No

F2. [Ask if F1=1] To be entered in the e-gift card drawing, please provide your name, email, and phone number. PSE will not use this information for marketing. This information will only be used to contact you and send you the e-gift card if you are the winner.

You must fill in all three fields below to be entered into the drawing. Any blank fields will forfeit your entry.

1. Name:
2. Email:
3. Phone number:

G. End-of-Survey Message

Your responses have been submitted. [IF F1=1: You will be notified in a few weeks if you are the lucky gift card winner.] Thank you for your time today.

PSE Time-of-Use Rates Pilot Winter Mid-Progress Survey for Residential Customers

Survey Design Overview

Research Objective	Relevant Survey Items
Measure the level of customer engagement (i.e., rate/event awareness and frequency of participation)	B1, B2, B3, C1, C2, D1, E1, G2, G3
Determine the effectiveness of communication and educational materials on customer awareness and participation	B4, B5, B6, B7, B8, B9, B10, B11, D2, D3
Identify the behaviors that customers are taking/not taking and any barriers to behavior change	C3, C4, C5, C6, C7, C8, E2, E3, E4, E5
Assess customer satisfaction with the pilot program and identify areas of success and areas for improvement	F1, F2, F3, F4

Target Audience

Residential customers who are enrolled in the Time-of-Use pilot program.

Fielding Timeline

Late February 2024. Two weeks prior to launch, Cadmus will notify Eric Haechrel and provide a notice of customer contact document.

Sampling Plan

The table below shows the proposed sampling plan for the residential winter mid-progress survey. Based on the enrollment counts across treatment groups, the target number of completes and the number of customers to contact for the survey may be subject to change.

Treatment Group	Estimated Population Count	Target Number of Completes	Sample Frame Needed to Reach Target
TOU Residential (Sch. 307)	1,600	100	850
TOU Low-Income Residential (Sch. 307)	1,300	100	850
TOU+PTR Residential (Sch. 317)	2,200	150	1,300
TOU+PTR Low-Income Residential (Sch. 317)	2,100	150	1,300
Three-Period TOU EV Residential (Sch. 327)	1,000	75	700
Total	8,200	575	5,000

Variables/Data to Carry Over into Survey

- CA_ID
- Name
- Email
- TOURate = 307, 317, or 327
- IncomeEligible = Y or N

- BDREnrolled = Y or N
- SmartTstatRecipient = Y or N
- PremiseID
- PremiseAddress
- TreatmentGroup

Email Invitation

To: [Email]

From: PSE Time-of-Use Research

Subject: How is the TOU rate plan from PSE?

Hi [Name],

Thank you for joining the Time-of-Use (TOU) pilot program from Puget Sound Energy. We'd like to hear about your experience with your TOU rate plan. Please participate in this 9-minute survey. After you complete the survey, you can enter a drawing for a chance to win a \$50 e-gift card from a retailer of your choice. One winner will be randomly selected.

Click the link below to take the survey:

[auto-generated link]

Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have difficulties taking the survey, please contact Morgan Adams at Cadmus, the research firm conducting this survey on our behalf. You can reach her at morgan.adams@cadmusgroup.com. If you have any questions about this pilot program, contact Richie Fader at TOU@pse.com.

Thank you in advance for your time.

Richie Fader
Program Coordinator
Puget Sound Energy

A. Start Screen



Welcome! This survey will take 9 minutes or less to complete. Your responses will remain confidential and will only be used for research purposes. When you complete the survey, you can enter into a drawing for a chance to win a \$50 e-gift card.

[Start button]

B. TOU Awareness and Communication

B1. On PSE's Time-of-Use (TOU) rate plan, your electricity costs are based on how much you use during the "peak" and "off-peak" periods. Electricity is more expensive during peak periods on weekdays, and less expensive during weekends, holidays and off-peak periods on weekdays.

To the best of your knowledge, when do peak periods occur during weekdays in winter? Select all that apply. [Multiple answers allowed]

1. 12 a.m. to 7 a.m.
2. 7 a.m. to 10 a.m. [Correct answer]
3. 10 a.m. to 5 p.m.
4. 5 p.m. to 8 p.m. [Correct answer]
5. 8 p.m. to 12 a.m.
6. Don't know [Exclusive answer]

B2. In the past 6 months, have you viewed your home's electric usage history from your PSE online account?

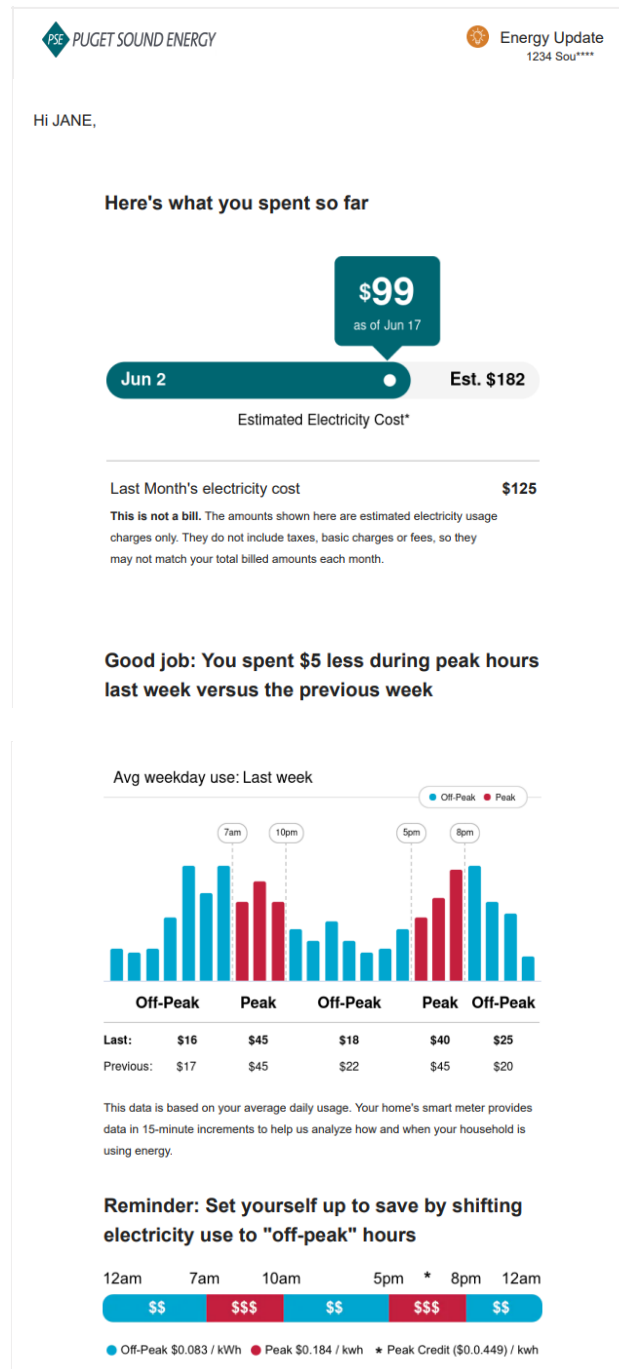
1. Yes
2. No

B3. In the past 6 months, have you visited the **pse.com/lower** webpage for more insights into energy use and ways to save?

1. Yes
2. No

[Randomly assign respondent to receive either B4-B5 or B6-B7]

B4. As part of your TOU rate plan, PSE sends you **weekly update emails** to let you know how much you spent on electricity. Below is an example of a weekly update email. (This email is for a generic home, not for yours.)



Do you remember receiving these **weekly update emails**?

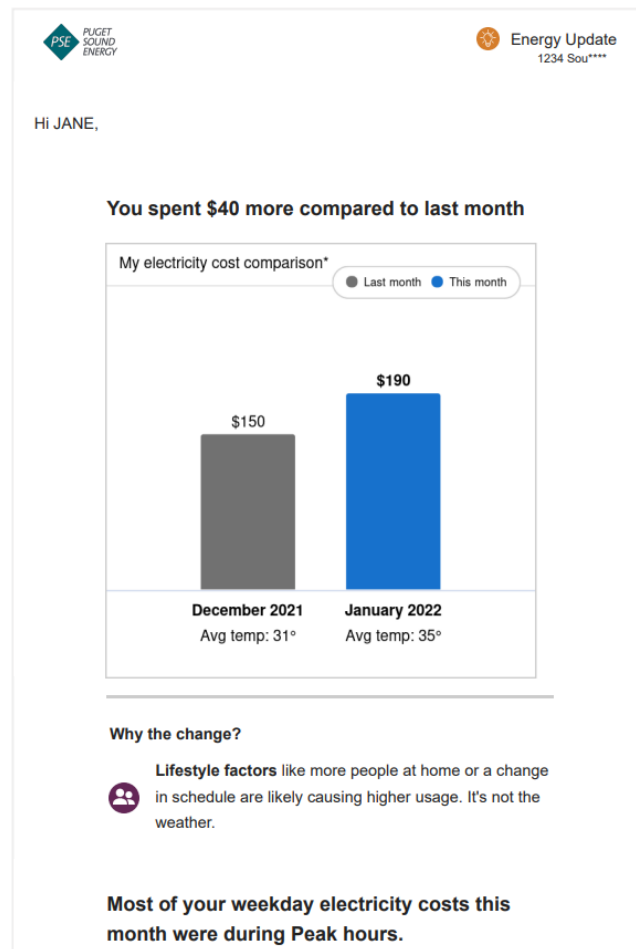
1. Yes
2. No

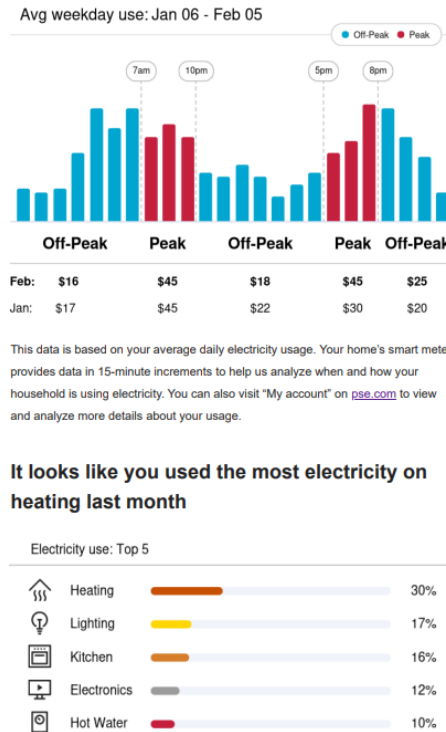
B5. [Ask if B4=1] How would you rate the usefulness of the information provided in the **weekly update emails**?

1. 1 Not at all useful

2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely useful

B6. As part of your TOU rate plan, PSE also sends you **monthly bill summary emails** that compare electricity cost in the current month to the previous month. Below is an example of a monthly bill summary email. (This email is for a generic home, not for yours.)





Do you remember receiving these **monthly bill summary emails**?

1. Yes
2. No

B7. [Ask if B6=1] How would you rate the usefulness of the information provided in the **monthly bill summary emails**?

1. 1 Not at all useful
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely useful

B8. [Display this question to everyone] Are you receiving too many, just the right amount, or not enough TOU rate emails from PSE?

1. Too many emails
2. Just the right amount
3. Not enough emails

4. Don't know

B9. [Display this question to everyone] What advice would you give PSE on how they can make the TOU rate emails better? [Text entry]

C. TOU Participation and Behaviors

C1. PSE's winter peak periods are from 7 a.m. to 10 a.m. and 5 p.m. to 8 p.m. only on weekdays, excluding holidays. In the past 5 months, did your household take any action to reduce electricity use during peak periods or shift electricity use to off-peak periods?

1. Yes
2. No
3. Don't know

C2. [Ask if C1=1] How frequently did your household take action?

1. Daily/every weekday
2. Several days per week
3. One day per week
4. Several days per month
5. One day per month
6. Don't know

C3. [Ask if C1=1] Here is a list of high-impact actions your household could have done. Please select all the actions your household did. [Multiple answers allowed] [Randomize order 1-9]

1. Turned thermostat temperature down a few degrees during peak periods
2. Did less cooking during peak periods
3. Did less dishwashing during peak periods
4. Did less laundry during peak periods
5. Took fewer showers or baths during peak periods
6. Used appliances and electronics less during peak periods
7. Used lights less during peak periods
8. Charged electronics and devices less during peak periods
9. Charged my electric vehicle (EV) less during peak periods

C4. [Ask if C1=1] Did you use any smart devices to help you schedule or automate your electricity use to off-peak periods?

Smart energy saving devices include: smart thermostat, smart plug, smart outlet, smart lights, smart energy monitoring tool, or smart appliances.

1. Yes
2. No
3. Don't know

- C5. [Ask if C4=1] What smart devices did you use to help you schedule or automate your electricity use to off-peak periods? Select all that apply. [Multiple answers allowed]
1. Smart thermostat
 2. Smart plug
 3. Smart outlet
 4. Smart lights
 5. Smart energy monitoring tool
 6. Smart EV charger
 7. Smart appliance (please describe) [Text entry]
- C6. [Ask if C1=1] How easy or difficult was it for your household to reduce or shift electricity use on the TOU rate plan?
1. Very easy
 2. Somewhat easy
 3. Somewhat difficult
 4. Very difficult
 5. Don't know
- C7. [Ask if C6=3 or 4] What difficulties did your household have in reducing or shifting electricity use on the TOU rate plan? Select all that apply. [Multiple answers allowed] [Randomize order 1-8]
1. Feeling colder in the home than normal
 2. Remembering the peak and off-peak periods
 3. Changing our home schedule and habits to match the TOU rate plan
 4. Getting the cooperation of others in my household to participate
 5. Not knowing what actions to take
 6. Not understanding the TOU rate plan or how the program works
 7. Finding other ways to reduce or shift electricity use since we already use little electricity
 8. Having a baby, pet, or a person with medical needs in the home requires equipment to always stay on
 9. Other (please describe) [Text entry]
- C8. [Ask if C1=1] What motivates you to reduce or shift electricity on the TOU rate plan? Select all that apply. [Multiple answers allowed] [Randomize order 1-4]
1. To lower my energy bill
 2. To help PSE deliver reliable power to my community
 3. To reduce my carbon footprint or be more eco-friendly/sustainable
 4. To help keep electricity prices affordable for my community
 5. Other (please describe) [Text entry]
- C9. [Ask if C1=2] Why did your household not reduce or shift electricity use on the TOU rate plan? Select all that apply. [Multiple answers allowed] [Randomize order 1-8]

1. Inside temperature of my home would be too cold
2. Difficult to remember the peak and off-peak periods
3. It is too inconvenient to change our home energy use habits
4. Others in my household did not want to cooperate or participate
5. Don't know what actions to take
6. Don't understand the TOU rate plan or how the program works
7. Already using little electricity so not sure what else I can do
8. Have a baby, pet, or a person with medical needs in the home that require equipment to always stay on
9. Other (please describe) [Text entry]

D. PTR Event Awareness and Communication

[Display section D if TOURate = 317]

D1. You are enrolled in a TOU rate plan with Peak Time Rebates. During a **flex event**, PSE pays you a credit of \$0.449 per kWh for reducing your electricity use. During the winter months, do you remember receiving notification alerts about flex events? (Example notification shown below).

1. Yes
2. No



Hello Customer,

A Peak Time Rebate event is scheduled for tomorrow, February 05, 2024, from 1:17PM to 1:22PM.

We're anticipating higher demand on the electrical grid, and as a Time-of-Use (TOU) customer enrolled in TOU + Peak Time Rebates, you can earn credits on your bill for voluntarily reducing your electricity use during this critical peak time. For each kilowatt-hour (kWh) of electricity you save during the event, you'll earn approximately \$0.45/kWh on your next bill. Visit the [TOU FAQ](#) page for additional information on Peak Time Rebates.

If you choose to participate, please make an effort to avoid using unnecessary devices, appliances or equipment until after the event is over. Get more energy-saving tips at <https://www.pse.com/flextips>.

Thank you for helping us ensure everyone has access to energy when they need it most and supporting our goal of providing 100% carbon-free electricity by 2045.

Thank you,

Puget Sound Energy

D2. [Ask if D1=1] How would you rate the adequacy of the **amount of time** in advance you received the flex event notification alerts?

1. 1 Not at all adequate
2. 2
3. 3
4. 4
5. 5
6. 6

7. 7
8. 8
9. 9
10. 10 Extremely adequate

D3. [Ask if D1=1] How would you rate the **usefulness of the information** provided in the flex event notification alerts?

1. 1 Not at all useful
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely useful

E. PTR Event Participation and Behaviors

[Display section E if TOURate = 317]

E1. PSE called four winter flex events from 7 a.m. to 10 a.m. on these dates:

- Thursday, February 8th
- Friday, February 16th
- Tuesday, February 27th
- Wednesday, March 6th

Did you or others in your household do anything to reduce or shift electricity use during these winter events?

1. Yes, for all events
2. Yes, for some events
3. No, none of the events
4. Don't know

E2. [Ask if E1=1 or 2] How did your household reduce or shift electricity use during the winter flex events? Select all that apply. [Randomize order 1-9]

1. Heated the home before or after events
2. Turned thermostat temperature down a few degrees during events
3. Did chores like cooking, laundry, and dishwashing before or after events

4. Took a shower or bath before or after events
5. Turned off or reduced the use of appliances and electronics during events
6. Turned off or reduced the use of lights during events
7. Charged electronics and devices before or after events
8. Charged my electric vehicle (EV) before or after events
9. Left the house during events

E3. [Ask if E1=1 or 2] How easy or difficult was it to reduce or shift electricity use during the winter flex events?

1. Very easy
2. Somewhat easy
3. Somewhat difficult
4. Very difficult
5. Don't know

E4. [Ask if E3=3 or 4] What difficulties did your household have in reducing or shifting electricity use during the winter flex events? Select all that apply. [Multiple answers allowed] [Randomize order 1-8]

1. Feeling colder in the home than normal
2. Remembering when the events were happening
3. Changing our home schedule and habits to match the events
4. Getting the cooperation of others in my household to participate
5. Not knowing what actions to take
6. Not understanding the peak time events or how they work
7. Finding other ways to reduce or shift electricity use since we already use little electricity
8. Having a baby, pet, or a person with medical needs in the home requires equipment to always stay on
9. Other (please describe) [Text entry]

E5. [Ask if E1=3] What were your reasons for not participating in the winter flex events? Select all that apply. [Multiple answers allowed] [Randomize order 1-8]

1. Inside temperature of my home would be too cold
2. Difficult to remember when the events were happening
3. It is too inconvenient to change our home energy use habits
4. Others in my household did not want to cooperate or participate
5. Don't know what actions to take
6. Don't understand the peak time events or how they work
7. Already using little electricity so not sure what else I can do
8. Have a baby, pet, or a person with medical needs in the home that require equipment to always stay on
9. Other (please describe) [Text entry]

F. Satisfaction

F1. [Ask if TOURate = 317 and if E1 =1 or 2] Was the bill credit amount for the winter flex events consistent with your level of effort?

1. Yes
2. No
3. Don't know

F2. How satisfied are you with your bill savings since enrolling in PSE's TOU pilot program?

1. 1 Not at all satisfied
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely satisfied

F3. Taking everything into consideration, please rate your overall experience with PSE's TOU pilot program?

1. 1 Unacceptable
2. 2
3. 3
4. 4
5. 5 Average
6. 6
7. 7
8. 8
9. 9
10. 10 Outstanding

F4. Please tell us why you gave that rating for the TOU pilot program. [Text entry]

G. Smart Thermostat Installation Verification

[Display section G if SmartTstatRecipient = Y]

G1. As part of the TOU pilot program and enrollment in the Bill Discount program, you should have received a free Google Nest smart thermostat from PSE in the mail. Have you received your Google Nest smart thermostat?

1. Yes
2. No

G2. [Ask if G1=1] Has your Google Nest smart thermostat been installed in your home?

1. Yes
2. No

G3. [Ask if G2=2] Why has the Google Nest smart thermostat not been installed?

1. It is not compatible with my home
2. Tried to install it but could not successfully install it
3. Don't know how to install it
4. Hired a contractor/someone else to install it and they haven't done it yet
5. I plan to install it in the next 3 months
6. Other (please describe) [Text entry]

H. Gift Card Drawing

H1. You've made it through the survey! Would you like to enter in the drawing for a chance to win a \$50 e-gift card?

One winner will be randomly selected. Winner will get to select a \$50 e-gift card from a retailer of their choice.

1. Yes
2. No

H2. [Ask if H1=1] To be entered in the e-gift card drawing, please provide your name, email, and phone number. PSE will not use this information for marketing. This information will only be used to contact you and send you the e-gift card if you are the winner.

You must fill in all three fields below to be entered into the drawing. Any blank fields will forfeit your entry.

1. Name:
2. Email:
3. Phone number:

I. End-of-Survey Message

Your responses have been submitted. [Display if H1=1: You will be notified in a few weeks if you are the lucky gift card winner.] Thank you for your time today.

PSE Time-of-Use Rates Pilot Summer Mid-Progress Survey for Residential Customers

Survey Design Overview

Research Objective	Relevant Survey Items
Measure the level of customer engagement (i.e., rate/event awareness and frequency of participation)	B1, B2, B3, C1, C2, D1, E1, G2, G3
Determine the effectiveness of communication and educational materials on customer awareness and participation	B4, B5, B6, B7, B8, B9, B10, B11, D2, D3
Identify the behaviors that customers are taking/not taking and any barriers to behavior change	C3, C4, C5, C6, C7, C8, E2, E3, E4, E5
Assess customer satisfaction with the pilot program and identify areas of success and areas for improvement	F1, F2, F3, F4

Target Audience

Residential customers who are enrolled in the Time-of-Use pilot program.

Fielding Timeline

October 2024. Two weeks prior to launch, Cadmus will notify Eric Haechrel and provide a notice of customer contact document.

Sampling Plan

The table below shows the proposed sampling plan for the residential summer mid-progress survey. Based on the enrollment counts across treatment groups, the target number of completes and the number of customers to contact for the survey may be subject to change.

Treatment Group	Estimated Population Count	Target Number of Completes	Sample Frame Needed to Reach Target
TOU Residential (Sch. 307)	1,600	100	850
TOU Low-Income Residential (Sch. 307)	1,300	100	850
TOU+PTR Residential (Sch. 317)	2,200	150	1,300
TOU+PTR Low-Income Residential (Sch. 317)	2,100	150	1,300
Three-Period TOU EV Residential (Sch. 327)	1,000	75	700
Total	8,200	575	5,000

Variables/Data to Carry Over into Survey

- CA_ID
- Name
- Email
- TOURate = 307, 317, or 327
- IncomeEligible = Y or N

- Email
- TOURate = 307, 317, or 327
- IncomeEligible = Y or N
- BDREnrolled = Y or N
- SmartTstatRecipient = Y or N
- PremiseID
- PremiseAddress
- TreatmentGroup

Email Invitation

To: [Email]

From: PSE Time-of-Use Research

Subject: How is the TOU rate plan from PSE?

Hi [Name],

Thank you for joining the Time-of-Use (TOU) pilot program from Puget Sound Energy. We'd like to hear about your experience with your TOU rate plan. Please participate in this 9-minute survey. After you complete the survey, you can enter a drawing for a chance to win a \$50 e-gift card from a retailer of your choice. One winner will be randomly selected.

Click the link below to take the survey:

[auto-generated link]

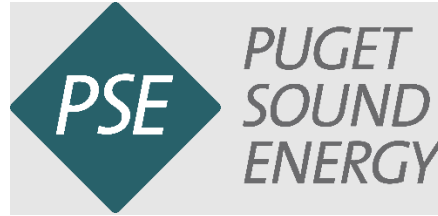
Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have difficulties taking the survey, please contact Liz Ross at Cadmus, the research firm conducting this survey on our behalf. You can reach her at Liz.Ross@cadmusgroup.com. If you have any questions about this pilot program, contact Richie Fader at TOU@pse.com.

Thank you in advance for your time.

Richie Fader
Program Coordinator
Puget Sound Energy

A. Start Screen



Welcome! This survey will take 9 minutes or less to complete. Your responses will remain confidential and will only be used for research purposes. When you complete the survey, you can enter into a drawing for a chance to win a \$50 e-gift card.

[Start button]

B. TOU Awareness and Communication

B1. On PSE's Time-of-Use (TOU) rate plan, your electricity costs are based on how much you use during the "peak" and "off-peak" periods. Electricity is more expensive during peak periods on weekdays, and less expensive during weekends, holidays and off-peak periods on weekdays.

To the best of your knowledge, when do peak periods occur during weekdays in summer? Select all that apply. [Multiple answers allowed]

1. 12 a.m. to 7 a.m.
2. 7 a.m. to 10 a.m.
3. 10 a.m. to 5 p.m.
4. 5 p.m. to 8 p.m. [Correct answer]
5. 8 p.m. to 12 a.m.
6. Don't know [Exclusive answer]

B2. In the past 6 months, have you viewed your home's electric usage history from your PSE online account?

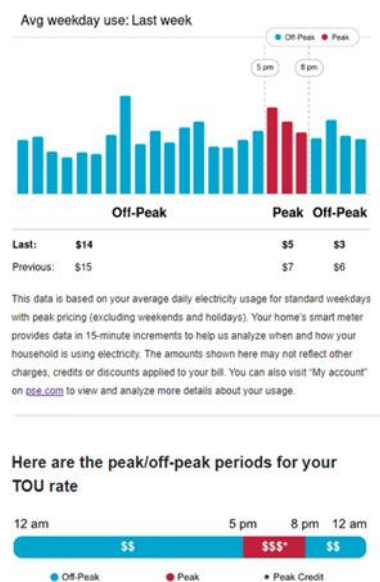
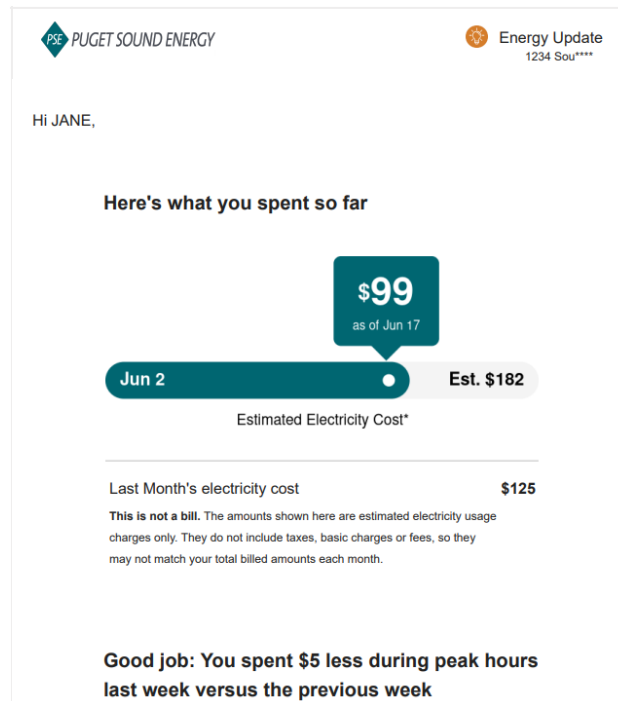
1. Yes
2. No

B3. In the past 6 months, have you visited the **pse.com/lower** webpage for more insights into energy use and ways to save?

1. Yes
2. No

[Randomly assign respondent to receive either B4-B5 or B6-B7]

B4. As part of your TOU rate plan, PSE sends you **weekly update emails** to let you know how much you spent on electricity. Below is an example of a weekly update email. (This email is for a generic home, not for yours.)



Do you remember receiving these **weekly update emails**?

1. Yes
2. No

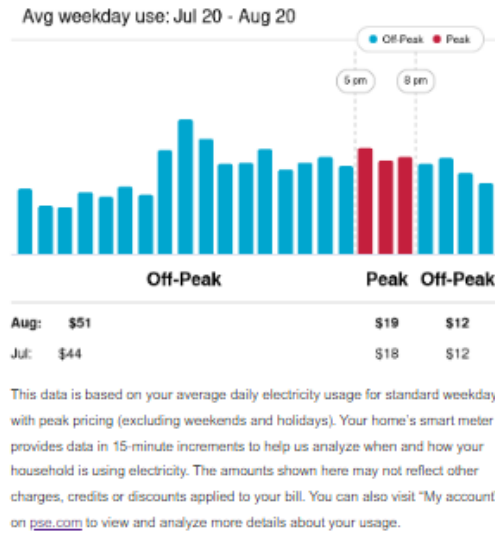
B5. [Ask if B4=1] How would you rate the usefulness of the information provided in the **weekly update emails**?

1. 1 Not at all useful
2. 2

- 3. 3
- 4. 4
- 5. 5
- 6. 6
- 7. 7
- 8. 8
- 9. 9
- 10. 10 Extremely useful

B6. As part of your TOU rate plan, PSE also sends you **monthly bill summary emails** that compare electricity cost in the current month to the previous month. Below is an example of a monthly bill summary email. (This email is for a generic home, not for yours.)





It looks like you used the most electricity on hot water last month



Do you remember receiving these **monthly bill summary emails**?

1. Yes
2. No

B7. [Ask if B6=1] How would you rate the usefulness of the information provided in the **monthly bill summary emails**?

1. 1 Not at all useful
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely useful

B8. [Display this question to everyone] Are you receiving too many, just the right amount, or not enough TOU rate emails from PSE?

1. Too many emails
2. Just the right amount
3. Not enough emails
4. Don't know

B9. **[Display this question to everyone]** What advice would you give PSE on how they can make the TOU rate emails better? **[Text entry]**

C. TOU Participation and Behaviors

C1. PSE's summer peak periods are from 5 p.m. to 8 p.m. only on weekdays, excluding holidays. In the past 4 months, did your household take any action to reduce electricity use during peak periods or shift electricity use to off-peak periods?

1. Yes
2. No
3. Don't know

C2. **[Ask if C1=1]** How frequently did your household take action?

1. Daily/every weekday
2. Several days per week
3. One day per week
4. Several days per month
5. One day per month
6. Don't know

C3. **[Ask if C1=1]** Here is a list of high-impact actions your household could have done. Please select all the actions your household did. **[Multiple answers allowed]** **[Randomize order 1-10]**

1. Turned thermostat temperature up a few degrees during peak periods
2. Cooled the home before or after peak periods
3. Did less cooking during peak periods
4. Did less dishwashing during peak periods
5. Did less laundry during peak periods
6. Took fewer showers or baths during peak periods
7. Used appliances and electronics less during peak periods
8. Used lights less during peak periods
9. Charged electronics and devices less during peak periods
10. Charged my electric vehicle (EV) less during peak periods

C4. **[Ask if C1=1]** Did you use any smart devices to help you schedule or automate your electricity use to off-peak periods?

Smart energy saving devices include: smart thermostat, smart plug, smart outlet, smart lights, smart energy monitoring tool, or smart appliances.

1. Yes

2. No
3. Don't know

C5. [Ask if C4=1] What smart devices did you use to help you schedule or automate your electricity use to off-peak periods? Select all that apply. [Multiple answers allowed]

1. Smart thermostat
2. Smart plug
3. Smart outlet
4. Smart lights
5. Smart energy monitoring tool
6. Smart EV charger
7. Smart appliance (please describe) [Text entry]

C6. [Ask if C1=1] How easy or difficult was it for your household to reduce or shift electricity use on the TOU rate plan?

1. Very easy
2. Somewhat easy
3. Somewhat difficult
4. Very difficult
5. Don't know

C7. [Ask if C6=3 or 4] What difficulties did your household have in reducing or shifting electricity use on the TOU rate plan? Select all that apply. [Multiple answers allowed] [Randomize order 1-9]

1. Feeling hotter in the home than normal
2. Remembering the peak and off-peak periods
3. Changing our home schedule and habits to match the TOU rate plan
4. Getting the cooperation of others in my household to participate
5. Not knowing what actions to take
6. Not understanding the TOU rate plan or how the program works
7. Finding other ways to reduce or shift electricity use since we already use little electricity
8. Having a baby, pet, or a person with medical needs in the home requires equipment to always stay on
9. More humid in the home than normal
10. Other (please describe) [Text entry]

C8. [Ask if C1=1] What motivates you to reduce or shift electricity on the TOU rate plan? Select all that apply. [Multiple answers allowed] [Randomize order 1-4]

1. To lower my energy bill
2. To help PSE deliver reliable power to my community
3. To reduce my carbon footprint or be more eco-friendly/sustainable
4. To help keep electricity prices affordable for my community
5. Other (please describe) [Text entry]

C9. [Ask if C1=2] Why did your household not reduce or shift electricity use on the TOU rate plan?

Select all that apply. [Multiple answers allowed] [Randomize order 1-9]

1. Inside temperature of my home would be too hot
2. Difficult to remember the peak and off-peak periods
3. It is too inconvenient to change our home energy use habits
4. Others in my household did not want to cooperate or participate
5. Don't know what actions to take
6. Don't understand the TOU rate plan or how the program works
7. Already using little electricity so not sure what else I can do
8. Have a baby, pet, or a person with medical needs in the home that require equipment to always stay on
9. Inside of my home would become too humid
10. Other (please describe) [Text entry]

D. PTR Event Awareness and Communication

[Display section D if TOURate = 317]

D1. You are enrolled in a TOU rate plan with Peak Time Rebates. During a **Peak Time Rebate event**, PSE pays you a credit of \$0.449 per kWh for reducing your electricity use. During the summer months, do you remember receiving notification alerts about Peak Time Rebate events? (Example notification shown below).

1. Yes
2. No



Hello CUSTOMER,

A Peak Time Rebate event is scheduled for tomorrow, July 9, 2024, from 5:00PM to 8:00PM.

We're anticipating higher demand on the electrical grid, and as a Time-of-Use (TOU) customer enrolled in TOU + Peak Time Rebates, you can earn credits on your bill for voluntarily reducing your electricity use during this critical peak time. For each kilowatt-hour (kWh) of electricity you save during the event, you'll earn approximately \$0.45/kWh on your next bill. Visit the [TOU FAQ](#) page for additional information on Peak Time Rebates.

If you choose to participate, please make an effort to avoid using unnecessary devices, appliances or equipment until after the event is over. Get more energy-saving tips at <https://www.pse.com/flextips>.

Thank you for helping us ensure everyone has access to energy when they need it most and supporting our goal of providing 100% carbon-free electricity by 2045.

Thank you,

Puget Sound Energy

D2. [Ask if D1=1] How would you rate the adequacy of the **amount of time** in advance you received the Peak Time Rebate event notification alerts?

1. 1 Not at all adequate
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely adequate

D3. [Ask if D1=1] How would you rate the **usefulness of the information** provided in the Peak Time Rebate event notification alerts?

1. 1 Not at all useful
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely useful

D4. [Ask if D1=1] Are you receiving too many, just the right amount, or not enough Peak Time Rebate event communications from PSE?

PSE sends customers day-ahead, event-start, and event-end emails. If you opted to receive text/SMS, event communications are also sent to you via text message.

1. Too many communications
2. Just the right amount of communications
3. Not enough communications
4. Don't know

E. PTR Event Participation and Behaviors

[Display section E if TOURate = 317]

E1. PSE called six summer Peak Time Rebate events from 5 p.m. to 8 p.m. on these dates:

- Monday, July 8th

- Tuesday, July 9th
- Monday, August 5th
- Thursday, August 8th
- Thursday, September 5th
- Friday, September 6th

Did you or others in your household do anything to reduce or shift electricity use during these summer events?

1. Yes, for all events
2. Yes, for some events
3. No, none of the events
4. Don't know

E2. [Ask if E1=1 or 2] How did your household reduce or shift electricity use during the summer Peak Time Rebate events? Select all that apply. [Randomize order 1-9]

1. Cooled the home before or after events
2. Turned thermostat temperature up a few degrees during events
3. Did chores like cooking, laundry, and dishwashing before or after events
4. Took a shower or bath before or after events
5. Turned off or reduced the use of appliances and electronics during events
6. Turned off or reduced the use of lights during events
7. Charged electronics and devices before or after events
8. Charged my electric vehicle (EV) before or after events
9. Left the house during events

E3. [Ask if E1=1 or 2] How easy or difficult was it to reduce or shift electricity use during the summer Peak Time Rebate events?

1. Very easy
2. Somewhat easy
3. Somewhat difficult
4. Very difficult
5. Don't know

E4. [Ask if E3=3 or 4] What difficulties did your household have in reducing or shifting electricity use during the summer Peak Time Rebate events? Select all that apply. [Multiple answers allowed]
[Randomize order 1-9]

1. Feeling hotter in the home than normal
2. Remembering when the events were happening
3. Changing our home schedule and habits to match the events
4. Getting the cooperation of others in my household to participate
5. Not knowing what actions to take

6. Not understanding the peak time events or how they work
7. Finding other ways to reduce or shift electricity use since we already use little electricity
8. Having a baby, pet, or a person with medical needs in the home requires equipment to always stay on
9. More humid in the home than normal
10. Other (please describe) [Text entry]

E5. [Ask if E1=3] What were your reasons for not participating in the summer Peak Time Rebate events? Select all that apply. [Multiple answers allowed] [Randomize order 1-9]

1. Inside temperature of my home would be too hot
2. Difficult to remember when the events were happening
3. It is too inconvenient to change our home energy use habits
4. Others in my household did not want to cooperate or participate
5. Don't know what actions to take
6. Don't understand the peak time events or how they work
7. Already using little electricity so not sure what else I can do
8. Have a baby, pet, or a person with medical needs in the home that require equipment to always stay on
9. Inside of my home would become too humid
10. Other (please describe) [Text entry]

F. Satisfaction

F1. [Ask if TOURate = 317 and if E1 =1 or 2] Was the bill credit amount for the summer Peak Time Rebate events consistent with your level of effort?

1. Yes
2. No
3. Don't know

F2. How satisfied are you with your bill savings since enrolling in PSE's TOU pilot program?

1. 1 Not at all satisfied
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely satisfied

F3. Taking everything into consideration, please rate your overall experience with PSE's TOU pilot program?

1. 1 Unacceptable
2. 2
3. 3
4. 4
5. 5 Average
6. 6
7. 7
8. 8
9. 9
10. 10 Outstanding

F4. Please tell us why you gave that rating for the TOU pilot program. [Text entry]

G. Smart Thermostat Installation Verification

[Display section G if SmartTstatRecipient = Y]

G1. As part of the TOU pilot program and enrollment in the Bill Discount program, you should have received a free Google Nest smart thermostat from PSE in the mail. Have you received your Google Nest smart thermostat?

1. Yes
2. No

G2. [Ask if G1=1] Has your Google Nest smart thermostat been installed in your home?

1. Yes
2. No

G3. [Ask if G2=2] Why has the Google Nest smart thermostat not been installed?

1. It is not compatible with my home
2. Tried to install it but could not successfully install it
3. Don't know how to install it
4. Hired a contractor/someone else to install it and they haven't done it yet
5. I plan to install it in the next 3 months
6. Other (please describe) [Text entry]

H. Gift Card Drawing

H1. You've made it through the survey! Would you like to enter in the drawing for a chance to win a \$50 e-gift card?

One winner will be randomly selected. Winner will get to select a \$50 e-gift card from a retailer of their choice.

1. Yes
2. No

H2. [Ask if H1=1] To be entered in the e-gift card drawing, please provide your name, email, and phone number. PSE will not use this information for marketing. This information will only be used to contact you and send you the e-gift card if you are the winner.

You must fill in all three fields below to be entered into the drawing. Any blank fields will forfeit your entry.

1. Name:
2. Email:
3. Phone number:

I. End-of-Survey Message

Your responses have been submitted. [Display if H1=1: You will be notified in a few weeks if you are the lucky gift card winner.] Thank you for your time today.

PSE Time-of-Use Rates Pilot Enrollment Survey for Small Business Schedule 24 Audience

Survey Sections Overview

Section Name and Question Topics	Survey Item
Enrollment-Specific • How customer heard about the offering • Reasons for enrolling • Feedback on Rate Advisor Tool (comprehensibility, decision-making influence, and satisfaction) • Improvement suggestions for Rate Advisor Tool and better information	Items under Section B
Baseline • Awareness of time-of-use rates • Energy usage behaviors, expectations, and concerns	Items under Section C
Business Characteristics • Business industry type • Number of people working on site at the business • Hours of business • Renter or owner • HVAC equipment • Smart thermostat ownership • EV ownership and charger type • Concern for climate change	Items under Section D

Variables/Data to Carry Over into Survey

- Contract Account
- First Name
- Last Name
- Business Name
- Premise ID
- Business Address
- Email
- Completed On Date
- TOU Rate

Note: Only questions marked with an asterisk * will be mandatory to answer.

A. Survey Introduction Message

As part of this enrollment process, we'd like to ask you a few questions about you and your business. Your answers will help confirm your eligibility for the Time-of-Use (TOU) pilot program and help us to provide the best program experience for you. Please answer each question to the best of your knowledge. [\[Start button\]](#)

[\[Page break\]](#)

B. Enrollment-Specific

B1. How did you hear about the Time-of-Use (TOU) pilot program? Select all that apply. [\[Multiple answers allowed.\]](#)

1. Email from PSE
2. Print mail from PSE
3. PSE.com
4. A neighbor/family/friend/co-worker
5. Other (please describe) [\[Text entry\]](#)

B2. Why are you interested in the Time-of-Use (TOU) pilot program? Select all the reasons that apply. [\[Multiple answers allowed.\]](#)

1. To reduce my energy bills
2. To save energy
3. To help the environment
4. To have more control over how much I pay for energy
5. My family/friend/colleague/neighbor recommended it
6. Other (please describe) [\[Text entry\]](#)

[\[Page break\]](#)

C. Baseline

C1. Before you learned about the Time-of-Use (TOU) pilot program, did you know that PSE's cost to supply electricity to the grid varies by hour of the day? For example, the cost to supply electricity on a typical winter weekday is higher at 6 p.m. when more people are using energy in their homes than at 12 p.m. when more people may be away from their homes.

1. Yes
2. No

[\[Page break\]](#)

C2. Please indicate whether you agree or disagree with the following statements. [\[Response choices: 1=Strongly Agree, 2=Somewhat Agree, 3=Somewhat Disagree, 4=Strongly Disagree, 5=Don't know\]](#) [\[Randomize statement order A-D\]](#)

- A. I regularly track my business' electricity usage online through my online customer account or monthly electricity bills delivered in the mail
- B. I manage my business' electricity usage whenever I can by taking energy-saving steps or installing more efficient products and appliances
- C. It will be easy for me to save money on my electricity bill by shifting my business' usage from hours when the price of electricity is higher to hours when the price is lower
- D. I will need suggestions from PSE about how to shift my business' energy usage from higher "peak" price periods to lower "off-peak" price periods

[Page break]

[Make section D forced response. All other sections do not use forced response.]

D. Business Characteristics

D1. Which of the following best describes your business type?*

- 1. Agriculture and natural resources (timber, fishing, mining)
- 2. Construction
- 3. Financial, legal, consulting, and other professional services
- 4. Government/Education
- 5. Healthcare
- 6. Manufacturing: Food, Metals, Wood, General
- 7. Restaurant/Lodging
- 8. Retail Trade/Merchandise
- 9. Retail Services (e.g., auto body shop, barber shop, movie theater)
- 10. Transportation, Utilities, Communications
- 11. Other (please describe) [Text entry]

[Page break]

D2. How many people work on site at your business?*

- 1. 1
- 2. 2
- 3. 3
- 4. 4
- 5. 5
- 6. 6
- 7. 7
- 8. 8
- 9. 9
- 10. 10+

D3. What are your current business hours? Select all that apply. [Multiple answers allowed]

1. Monday to Friday, 9 a.m. to 5 p.m.
2. Monday to Friday, 9 a.m. to 6 p.m.
3. Monday to Friday, 8 a.m. to 4 p.m.
4. Monday to Friday, 8 a.m. to 5 p.m.
5. Monday to Friday, 10 a.m. to 6 p.m.
6. Saturday, 9 a.m. to 12 p.m.
7. Saturday, 9 a.m. to 5 p.m.
8. Other (please describe) [Text entry]

D4. Does your business own or rent the space it occupies?*

1. Own
2. Rent/lease

[Page break]

D5. What heating system does your business have?* Select all that apply. [Multiple answers allowed]

1. Electric central forced-air furnace
2. Natural gas central forced-air furnace
3. Central forced-air heat pump
4. Ductless heat pump or mini-split
5. Radiant floor heating
6. Baseboard
7. Wall heater
8. Portable space heater
9. Other (please describe) [Text entry]
10. Don't know [Exclusive answer]

D6. What air conditioning system does your business have?* Select all that apply. [Multiple answers allowed]

1. Ductless heat pump or mini-split system
2. Central forced-air heat pump
3. Central forced-air conditioning
4. Window/wall air conditioner
5. Evaporative cooler or swamp cooler
6. Portable air conditioner
7. Other (please describe) [Text entry]
8. None/I do not have air conditioning [Exclusive answer]
9. Don't know [Exclusive answer]

D7. Do you have a smart thermostat at your business site?* A smart thermostat automatically learns your preferences and adjusts the temperature for you when you are not there. Popular smart thermostat brands include Nest, Ecobee, Honeywell Lyric, and Emerson Sensi.

1. Yes, I have a Nest smart thermostat
2. Yes, I have another brand of smart thermostat
3. No, I do not have a smart thermostat
4. Don't know

D8. Does your business have an electric vehicle (EV) or EV fleet?*

1. Yes, we have an EV
2. Yes, we have a fleet of EVs
3. No, my business does not have any EVs
4. Don't know

D9. Do you have EV charging at your business site?*

1. Yes
2. No
3. Don't know

[Page break]

D10. On a scale of 1-10, where 1 is not at all concerned and 10 is extremely concerned, how concerned or not concerned are you about climate change?*

1. 1 Not at all concerned
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely concerned

[Page break]

E. End-of-Survey Message

Those were all the questions we had for you. Thank you for completing the survey. You may continue with the enrollment process.

PSE Time-of-Use Rates Pilot Participant Exit Survey

For Small Business Audience

Survey Sections Overview

Section Name and Question Topics	Survey Item
Original Motivation and Reason for Leaving - Motivation(s) for enrolling - Reason(s) for unenrolling from the program	Items under Section B
Program Expectations and Awareness - Money-saving expectation - Ease/difficulty expectation - Awareness of changing energy-use habits - Awareness of online tools/reports/alerts - Inconvenience for environmental benefit expectation	Items under Section C
Program Engagement - Self-reported level of participation and effort - Ease/difficulty of participation	Items under Section D
Areas for Improvement and Opinion of Utility - Customer-suggested improvements - Likelihood to re-enroll in the future if improvements are made - Program experience's impact on customer opinion of utility	Items under Section E

Variables/Data to Include in the Survey

- First Name
- Last Name
- Business Name
- Contract Account
- Premise ID
- Business Address
- Email
- Enrollment Date
- TOU Rate

Note: Only questions marked with an asterisk * will be mandatory to answer.

A. *Survey Introduction*

Thank you for participating in the Time-of-Use (TOU) pilot program. We are sorry to see you go. As part of the unenrollment process, we'd like to ask you a few questions about your experience. This survey will take 3 minutes. Please answer each question to the best of your knowledge.

[Start button]

[Page break]

B. *Original Motivation and Reason for Leaving*

B1. What motivated you to enroll in the Time-of-Use pilot program? Select all the reasons that apply.

[Multiple answers allowed]

1. To reduce my energy bills
2. To save energy
3. To help the environment
4. To have more control over how much I pay for energy
5. The \$25 enrollment incentive
6. My family/friend/colleague/neighbor recommended it
7. Other (please describe) [Text entry]

B2. *Which of the following describe your reason(s) for leaving the program? Select all that apply.

[Multiple answers allowed]

1. I saw little or no bill savings
2. The Time-of-Use rate schedule was inconvenient for my business
3. The Time-of-Use rate schedule required too much effort to manage my business's energy use
4. It was difficult to shift my business's energy use from "peak" to "off-peak" periods
5. It was hard to get others at my business involved in managing energy use
6. The online tools/report/alerts from the program were not helpful
7. There was a change in my business operations or business occupancy that made it hard to participate
8. I didn't want to participate in Peak Time Rebate events
9. I didn't like receiving Peak Time Rebate event notifications and reminders
10. Something else (please describe) [Text entry]

[Page break]

C. *Program Expectations and Awareness*

C1. Please indicate whether you agree or disagree with the following statements about your expectations when you enrolled in the Time-of-Use pilot program. [Response choices: 1=Strongly Agree, 2=Somewhat Agree, 3=Somewhat Disagree, 4=Strongly Disagree, 5=Don't know]

- A. I expected my business would need to change its energy use habits to save money in this program
- B. I expected it would be easy to shift energy use from "peak" periods to "off-peak" periods

- C. I expected to save a lot on my energy bills under this program
- D. I expected PSE would provide helpful online tools and reports to help me save money under this program
- E. I expected to be slightly inconvenienced or my bills might increase by participating but the benefits to the environment will be worth it

[Page break]

D. Program Engagement

- D1. Did your business do anything to shift energy use from “peak” periods to “off-peak” periods?
- 1. Yes
 - 2. No
 - 3. Don’t know
- D2. [Ask if D1=1] How often did your business attempt to shift energy use from “peak” periods to “off-peak” periods?
- 1. Daily
 - 2. A few times a week
 - 3. A few times a month
 - 4. A few times a year
 - 5. Never
 - 6. Don’t know
- D3. [Ask if D1=1] How difficult or easy was it to shift your energy use from “peak” periods to “off-peak” periods?
- 1. Very difficult
 - 2. Somewhat difficult
 - 3. Somewhat easy
 - 4. Very easy
 - 5. Don’t know

[Page break]

E. Areas for Improvement and Opinion of Utility

- E1. What could PSE do to make the Time-of-Use pilot program better in the future? [Text entry]

- E2. In the future, if PSE were to make changes to the program that addressed your reason(s) for leaving, how likely would you be to re-enroll in the program?
1. Very likely
 2. Somewhat likely
 3. Not too likely
 4. Not at all likely
 5. Don't know
- E3. How has the Time-of-Use pilot program affected your opinion of PSE, if at all?
1. Much less favorable toward PSE
 2. Somewhat less favorable
 3. Does not affect my opinion either way
 4. Somewhat more favorable
 5. Much more favorable toward PSE
 6. Don't know

[Page break]

F. End-of-Survey Message (Not Terminated)

Those were all the questions we had for you. Thank you for completing the un-enrollment process. You will receive a follow-up email right away from PSE confirming the status of your removal from the Time-of-Use pilot program.

PSE Time-of-Use Rates Pilot Non-Enrollment Survey for Small-to-Medium Business Customers

Survey Design Overview

Research Objective	Topic Area in the Survey or Analysis Plan
Understand why these customers did not enroll in the pilot program	- Section B. Awareness of Pilot Program Offering and Marketing - Section C. Reasons for Not Enrolling
Characterize the customers who did not enroll in the pilot program	- Section D. TOU Concept Awareness and Energy Management Behaviors - Section E. Business Characteristics
Identify any differences between enrollees and non-enrollees	Statistical comparison of enrollment survey responses to non-enrollment survey responses on shared questions
Find ways to improve the recruitment marketing and increase conversion	Synthesis of findings from items listed above

Target Audience

Those small-to-medium business customers who were marketed to but did not enroll in the Time-of-Use pilot program.

Fielding Timeline

Mid- to late February 2024. At least one week prior to launch, Cadmus will notify Eric Haechrel and provide a notice of customer contact document.

Sampling Plan

The table below shows the tentative sampling plan for the business non-enrollment survey. Based on the final enrollment for this treatment group, the target number of completes may be subject to change. Cadmus will consult with PSE on the final sampling plan in early December 2023.

Treatment Group	Population Count	Target Number of Completes	Sample Frame Needed to Reach Target
TOU+PTR General Service (Sch. 324)	20,000	75	4,500
Total	20,000	75	4,500

Variables/Data to Carry Over into Survey

- CA_ID (will be removed when uploaded to Qualtrics)
- BusinessName
- Email
- PremiseID
- MarketedTOURate = 324
- FirstMarketingDate

Note: Questions marked with an asterisk * indicate that this was asked in the enrollment survey.

Email Invitation

To: [Email]

From: PSE Time-of-Use Research

Subject: Tell PSE why you did not enroll in TOU and get a chance at \$100

Hi [BusinessName],

Your business was invited to enroll in the Time-of-Use (TOU) pilot program from Puget Sound Energy. We noticed that you did not enroll and would like to understand why. Will you participate in a 5-minute survey? After you complete the survey, you can enter a drawing for a chance to win a \$100 e-gift card from a retailer of your choice. One winner will be randomly selected.

Click the link below to take the survey:

[auto-generated link]

Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have any difficulties taking the survey, please contact Morgan Adams at Cadmus, the research firm conducting this survey on our behalf. You can reach her at morgan.adams@cadmusgroup.com. If you have any questions about the pilot program, contact Richie Fader at TOU@pse.com.

Thank you in advance for your time.

Richie Fader
Program Coordinator
Puget Sound Energy

A. Start Screen



Welcome! This survey will take 5 minutes to complete. Your responses will remain confidential and will only be used for research purposes. When you complete the survey, you may enter into a drawing for a chance to win a \$100 e-gift card.

[Start button]

B. Awareness of Pilot Program Offering and Marketing

B1. The Time-of-Use pilot program is an optional rate plan from PSE designed to help customers save money on their monthly bill by shifting energy use to “off-peak” periods. Before this survey, do you remember hearing about the Time-of-Use pilot program?

1. Yes
2. No

B2. [Ask if B1=1] *How did you hear about the Time-of-Use pilot program? Select all that apply.

[Multiple answers allowed] [Randomize order 1-4]

1. Email from PSE
2. Print mail from PSE
3. PSE.com
4. A neighbor/family/friend/co-worker
5. Other (please describe) [Text entry]

B3. Are you receiving too many, just the right amount, or not enough emails from PSE?

1. Too many emails
2. Just the right amount
3. Not enough emails
4. Don't know

C. Reasons for Not Enrolling

C1. [Ask if B1=1] Which of the following describe your reason(s) for not enrolling in the Time-of-Use pilot program? Select all that apply. [Multiple answers allowed] [Randomize order 1-9] [Forced response]

1. I was concerned my energy bills would increase if I enrolled
2. The potential bill savings aren't enough to make enrolling worthwhile
3. The Time-of-Use rate schedule was inconvenient for my business
4. The Time-of-Use rate schedule required too much effort to manage my business' energy use
5. I thought it would be hard to shift my business' energy use from "peak" to "off-peak" periods
6. Others at my business did not want to be involved in managing energy use
7. I was going to enroll but forgot to or did not have time to enroll
8. I received other program offerings from PSE that interested me more
9. I didn't want to participate in Peak Time Rebate events
10. Something else (please describe) [Text entry]

D. TOU Concept Awareness and Energy Management Behaviors

- D1. *Did you know that PSE's cost to supply electricity to the grid varies by hour of the day?
For example, the cost to supply electricity on a typical winter weekday is higher at 6 p.m. when more people are using energy in their homes/business than at 12 p.m. when more people may be away from their homes/business.
1. Yes
 2. No
- D2. *Please indicate whether you agree or disagree with the following statements. [Response choices: 1=Strongly Agree, 2=Somewhat Agree, 3=Somewhat Disagree, 4=Strongly Disagree, 5=Don't know] [Randomize order A-B]
- A. I regularly track my business' electricity usage online through my online customer account or monthly electricity bills delivered in the mail
 - B. I manage my business' electricity usage whenever I can by taking energy-saving steps or installing more efficient products and appliances

E. Business Characteristics

- E1. *Which of the following best describes your business type?
1. Agriculture and natural resources (timber, fishing, mining)
 2. Construction
 3. Financial, legal, consulting, and other professional services
 4. Government/Education
 5. Healthcare
 6. Manufacturing: Food, Metals, Wood, General
 7. Restaurant/Lodging
 8. Retail Trade/Merchandise
 9. Retail Services (e.g., auto body shop, barber shop, movie theater)
 10. Transportation, Utilities, Communications
 11. Other (please describe) [Text entry]
- E2. *How many people work on site at your business?
1. 1
 2. 2
 3. 3
 4. 4
 5. 5
 6. 6
 7. 7
 8. 8
 9. 9
 10. 10+

E3. *What are your current business hours? Select all that apply. [Multiple answers allowed]

1. Monday to Friday, 9 a.m. to 5 p.m.
2. Monday to Friday, 9 a.m. to 6 p.m.
3. Monday to Friday, 8 a.m. to 4 p.m.
4. Monday to Friday, 8 a.m. to 5 p.m.
5. Monday to Friday, 10 a.m. to 6 p.m.
6. Saturday, 9 a.m. to 12 p.m.
7. Saturday, 9 a.m. to 5 p.m.
8. Other (please describe) [Text entry]

E4. *Does your business own or rent the space it occupies?

1. Own
2. Rent/lease

E5. *What heating system does your business have? Select all that apply. [Multiple answers allowed]

1. Electric central forced-air furnace
2. Natural gas central forced-air furnace
3. Central forced-air heat pump
4. Ductless heat pump or mini-split
5. Radiant floor heating
6. Baseboard
7. Wall heater
8. Portable space heater
9. Other (please describe) [Text entry]
10. Don't know [Exclusive answer]

E6. *What air conditioning system does your business have? Select all that apply. [Multiple answers allowed]

1. Ductless heat pump or mini-split system
2. Central forced-air heat pump
3. Central forced-air conditioning
4. Window/wall air conditioner
5. Evaporative cooler or swamp cooler
6. Portable air conditioner
7. Other (please describe) [Text entry]
8. None/I do not have air conditioning [Exclusive answer]
9. Don't know [Exclusive answer]

E7. *Do you have a smart thermostat at your business site?

A smart thermostat automatically learns your preferences and adjusts the temperature for you when you are not there. Popular smart thermostat brands include Nest, Ecobee, Honeywell Lyric, and Emerson Sensi.

1. Yes, I have a Nest smart thermostat

2. Yes, I have another brand of smart thermostat
3. No, I do not have a smart thermostat
4. Don't know

E8. *Does your business have an electric vehicle (EV) or fleet of EVs?

1. Yes, we have an EV
2. Yes, we have a fleet of EVs
3. No, my business does not have any EVs
4. Don't know

E9. *Do you have EV charging at your business site?

1. Yes
2. No
3. Don't know

E10. *On a scale of 1-10, where 1 is not at all concerned and 10 is extremely concerned, how concerned or not concerned are you about climate change?

1. 1 Not at all concerned
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely concerned

F. Gift Card Drawing

F1. You've made it through the survey! Would you like to enter in the drawing for a chance to win a \$100 e-gift card?

One winner will be randomly selected. The winner will get to select a \$100 e-gift card from a retailer of their choice.

1. Yes
2. No

F2. [Ask if F1=1] To be entered in the e-gift card drawing, please provide your name, email, and phone number. PSE will not use this information for marketing. This information will only be used to contact you and send you the e-gift card if you are the winner.

You must fill in all three fields below to be entered into the drawing. Any blank fields will forfeit your entry.

1. Name:
2. Email:
3. Phone number:

G. End-of-Survey Message

Your responses have been submitted. [IF F1=1: You will be notified in a few weeks if you are the lucky gift card winner.] Thank you for your time today.

PSE Time-of-Use Rates Pilot Winter Mid-Progress Survey for Small-to-Medium Business Customers

Survey Design Overview

Research Objective	Relevant Survey Items
Measure the level of customer engagement (i.e., rate/event awareness and frequency of participation)	B1, B2, B3, C1, C2, D1, E1
Determine the effectiveness of communication and educational materials on customer awareness and participation	B4, B5, B6, B7, D2, D3
Identify the behaviors that customers are taking/not taking and any barriers to behavior change	C3, C4, C5, C6, C7C8, C9, C10, E2, E3, E4, E5
Assess customer satisfaction with the pilot program and identify areas of success and areas for improvement	F1, F2, F3, F4

Target Audience

Small-to-medium business (SMB) customers who are enrolled in the Time-of-Use pilot program.

Fielding Timeline

Late March 2024. Two weeks prior to launch, Cadmus will notify Eric Haechrel and provide a notice of customer contact document.

Sampling Plan

The table below shows the proposed sampling plan for the SMB winter mid-progress survey. Based on the enrollment count, the target number of completes, and the number of customers to contact for the survey may be subject to change.

Treatment Group	Estimated Population Count	Target Number of Completes	Sample Frame Needed to Reach Target
TOU+PTR General Service (Sch. 324)	1,130	75	1,090
Total	1,130	75	1,090

Variables/Data to Carry Over into Survey

- ContractAccount (will be cleansed/converted to CadmusID)
- BusinessName
- Email
- PremiseID
- BusinessAddress
- TOURate = 324
- TreatmentGroup = TOU+PTR General Service
- FuelType

- HeatingType =
- EVStatus = Y or N
- BusinessType =

Email Invitation

To: [Email]

From: PSE Time-of-Use Research

Subject: How is the TOU rate plan from PSE?

Hi PSE Business Customer,

Thank you for enrolling in the Time-of-Use (TOU) pilot program from Puget Sound Energy. We'd like to hear about your experience with your TOU rate plan. Please participate in this 9-minute survey. After you complete the survey, you can enter a drawing for a chance to win a \$50 e-gift card from a retailer of your choice. One winner will be randomly selected.

Click the link below to take the survey:

[auto-generated link]

Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have difficulties taking the survey, please contact Morgan Adams at Cadmus, the research firm conducting this survey on our behalf. You can reach her at morgan.adams@cadmusgroup.com. If you have any questions about this pilot program, contact Richie Fader at TOU@pse.com.

Thank you in advance for your time.

Richie Fader
Program Coordinator
Puget Sound Energy

Reminder Email Invitation

To: [Email]

From: PSE Time-of-Use Research

Subject: Don't forget to tell us about your experience with the TOU rate plan from PSE!

Hello PSE Business Customer,

We recently contacted you to ask about your experience with your rate plan in the Time-of-Use (TOU) pilot program from Puget Sound Energy. This survey will only take 9-minutes. **After you complete the survey, you can enter a drawing for a chance to win a \$50 e-gift card from a retailer of your choice.** One winner will be randomly selected.

Click the link below to take the survey:

[auto-generated link]

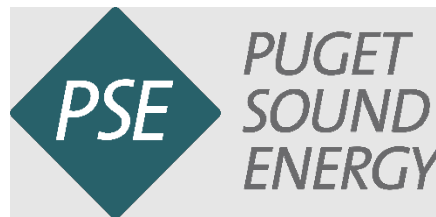
Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have difficulties taking the survey, please contact Morgan Adams at Cadmus, the research firm conducting this survey on our behalf. You can reach her at morgan.adams@cadmusgroup.com. If you have any questions about this pilot program, contact Richie Fader at TOU@pse.com.

Thank you in advance for your time.

Richie Fader
Program Coordinator
Puget Sound Energy

A. Start Screen



Welcome! This survey will take 9 minutes or less to complete. Your responses will remain confidential and will only be used for research purposes. When you complete the survey, you can enter into a drawing for a chance to win a \$50 e-gift card.

[Start button]

B. TOU Awareness and Communication

B1. On PSE's Time-of-Use (TOU) rate plan, your electricity costs are based on how much you use during the "peak" and "off-peak" periods. Electricity is more expensive during peak periods on weekdays, and less expensive during off-peak periods on weekdays, weekends, and holidays.

To the best of your knowledge, when do peak periods occur during weekdays in winter? Select all that apply. [Multiple answers allowed]

1. 12 a.m. to 7 a.m.
2. 7 a.m. to 10 a.m. [Correct answer]
3. 10 a.m. to 5 p.m.
4. 5 p.m. to 8 p.m. [Correct answer]
5. 8 p.m. to 12 a.m.

6. Don't know **[Exclusive answer]**

B2. In the past 6 months, have you viewed your business' electric usage history from your PSE online account?

1. Yes
2. No

B3. In the past 6 months, have you visited **pse.com** for more insights into energy use and ways to save?

1. Yes
2. No

B4. As part of your TOU rate plan, PSE sends you **monthly bill summary emails** that compare electricity cost in the current month to the previous month. Below is an example of a monthly bill summary email. (This email is for a generic business, not for yours.)



Dear PSE Business Customer,

You are {##} months into your new Time-of-Use + Peak Time Rebates (Sch. 324) rate plan.

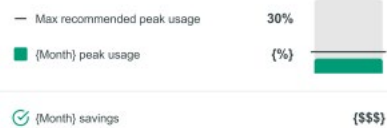
Nice job!

So far you've saved money on the Time-of-Use + Peak Time Rebates (Sch. 324) rate plan and are projected to continue saving over the next 12 months.*

Estimated 12-month savings	{\$\$\$}
Year-to-date savings	{\$\$\$}

You saved money in {Month} by limiting peak usage.

Customers that consume less than 30% of their energy during peak periods generally succeed on a Time-of-Use + Peak Time Rebates (Sch. 324) rate plan.



Keep up the good work!

Winter savings tip

Adjusting to a TOU schedule can be a challenge, especially in the beginning. Think about what might be using the most electricity during peak periods in the colder winter season. If you have an electric heating system, program your thermostat to lower the temperature 3-4°F during peak periods, only heat occupied spaces, and drop the temperature by at least 10°F while away. Try shifting when you use the most energy-intensive appliances and equipment away from peak periods to take advantage of lower rates during off-peak.

Remember, electricity is more expensive during peak periods.



Do you remember receiving these **monthly bill summary emails**?

- Yes
- No

B5. [Ask if B4=1] How would you rate the usefulness of the information provided in the **monthly bill summary emails**?

- 1 Not at all useful
- 2
- 3
- 4
- 5
- 6

7. 7
8. 8
9. 9
10. 10 Extremely useful

B6. Are you receiving too many, just the right amount, or not enough TOU rate emails from PSE?

1. Too many emails
2. Just the right amount
3. Not enough emails
4. Don't know

B7. What advice would you give PSE on how they can make the TOU rate emails better? [Text entry]

C. TOU Participation and Behaviors

C1. PSE's winter peak periods are from 7 a.m. to 10 a.m. and 5 p.m. to 8 p.m. on weekdays except holidays. In the past 2 to 3 months, did your business take any action to reduce electricity use during peak periods or shift electricity use to off-peak periods?

1. Yes
2. No
3. Don't know

C2. [Ask if C1=1] How frequently did your business take action?

1. Daily/every weekday
2. Several days per week
3. One day per week
4. Several days per month
5. One day per month
6. Don't know

C3. [Ask if C1=1] Here is a list of high-impact actions your business could have done during **peak periods**. Please select all the actions your business did. [Multiple answers allowed] [Randomize order 1-6]

1. Turned thermostat temperature down a few degrees during peak periods
2. Reduced the use of hot water during peak periods
3. Used equipment/appliances/electronics less during peak periods
4. Used lights less during peak periods
5. Charged electronics and devices less during peak periods
6. [Display if EVStatus = Y] Charged my electric vehicle (EV) or EV fleet less during peak periods

C4. [Ask if C1=1] Did you use any smart devices to help you schedule or automate your electricity use to off-peak periods?

Smart energy saving devices include: smart thermostat, smart plug, smart outlet, smart lights, smart energy monitoring tool, or smart appliances.

1. Yes
2. No
3. Don't know

C5. [Ask if C4=1] What smart devices did you use to help you schedule or automate your electricity use to off-peak periods? Select all that apply. [Multiple answers allowed]

1. Smart thermostat
2. Smart plug
3. Smart outlet
4. Smart lights
5. Smart energy monitoring tool
6. Smart EV charger
7. Smart appliance (please describe) [Text entry]

C6. [Ask if C1=1] How easy or difficult was it for your business to reduce or shift electricity use on the TOU rate plan?

1. Very easy
2. Somewhat easy
3. Somewhat difficult
4. Very difficult
5. Don't know

C7. [Ask if C6=3 or 4] What difficulties did your business have in reducing or shifting electricity use on the TOU rate plan? Select all that apply. [Multiple answers allowed] [Randomize order 1-9]

1. Employees feeling colder in the space than normal
2. Customers feeling colder in the space than normal
3. Remembering the peak and off-peak periods
4. Changing our work/business schedule and habits to match the TOU rate plan
5. Getting the cooperation of others at my business to participate
6. Not knowing what actions to take
7. Not understanding the TOU rate plan or how the program works
8. Finding other ways to reduce or shift electricity use since we already use little electricity
9. We have equipment or appliances that need to always stay on
10. Other (please describe) [Text entry]

C8. [Ask if C1=1] What motivates you to reduce or shift electricity on the TOU rate plan? Select all that apply. [Multiple answers allowed] [Randomize order 1-4]

1. To lower my energy bill
2. To help PSE deliver reliable power to my community
3. To reduce my carbon footprint or be more eco-friendly/sustainable
4. To help keep electricity prices affordable for my community

5. Other (please describe) [Text entry]

C9. [Ask if C1=2] Why did your business not reduce or shift electricity use on the TOU rate plan?

Select all that apply. [Multiple answers allowed] [Randomize order 1-9]

1. Inside temperature of the space too cold for employees
2. Inside temperature of the space too cold for customers
3. Difficult to remember the peak and off-peak periods
4. It is too inconvenient to change our business' energy use habits
5. Others at my business did not want to cooperate or participate
6. Don't know what actions to take
7. Don't understand the TOU rate plan or how the program works
8. Already using little electricity so not sure what else I can do
9. We have equipment or appliances that need to always stay on
10. Other (please describe) [Text entry]

D. PTR Event Awareness and Communication

D1. You are enrolled in a TOU rate plan with Peak Time Rebates. During a **flex event**, PSE pays you a credit of \$0.449 per kWh for reducing your electricity use. During the winter months, do you remember receiving notification alerts about flex events? (Example notification shown below).

1. Yes
2. No



Hello Customer,

A Peak Time Rebate event is scheduled for tomorrow, February 05, 2024, from 1:17PM to 1:22PM.

We're anticipating higher demand on the electrical grid, and as a Time-of-Use (TOU) customer enrolled in TOU + Peak Time Rebates, you can earn credits on your bill for voluntarily reducing your electricity use during this critical peak time. For each kilowatt-hour (kWh) of electricity you save during the event, you'll earn approximately \$0.45/kWh on your next bill. Visit the [TOU FAQ](#) page for additional information on Peak Time Rebates.

If you choose to participate, please make an effort to avoid using unnecessary devices, appliances or equipment until after the event is over. Get more energy-saving tips at <https://www.pse.com/flextips>.

Thank you for helping us ensure everyone has access to energy when they need it most and supporting our goal of providing 100% carbon-free electricity by 2045.

Thank you,

Puget Sound Energy

D2. [Ask if D1=1] How would you rate the adequacy of the **amount of time** in advance you received the flex event notification alerts?

1. 1 Not at all adequate
2. 2
3. 3

4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely adequate

D3. [Ask if D1=1] How would you rate the **usefulness of the information** provided in the flex event notification alerts?

1. 1 Not at all useful
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely useful

D4. [Ask if D1=1] Are you receiving too many, just the right amount, or not enough flex event communications from PSE?

PSE sends customers day-ahead, event-start, and event-end emails. If you opted to receive text/SMS, event communications are also sent to you via text message.

1. Too many communications
2. Just the right amount of communications
3. Not enough communications
4. Don't know

E. PTR Event Participation and Behaviors

E1. PSE called four winter flex events from 7 a.m. to 10 a.m. on these dates:

- Thursday, February 8th
- Friday, February 16th
- Tuesday, February 27th
- Wednesday, March 6th

Did you or others in your business do anything to reduce or shift electricity use during these winter events?

1. Yes, for all events
2. Yes, for some events
3. No, none of the events
4. Don't know

E2. [Ask if E1=1 or 2] How did your business reduce or shift electricity use during the winter flex events? Select all that apply. [Randomize order 1-7]

1. Heated the space before or after events
2. Turned thermostat temperature down a few degrees during events
3. Turned off or reduced the use of equipment/appliances/electronics during events
4. Turned off or reduced the use of lights during events
5. Charged electronics and devices before or after events
6. Charged my electric vehicle (EV) or EV fleet before or after events
7. Closed the business during events

E3. [Ask if E1=1 or 2] How easy or difficult was it to reduce or shift electricity use during the winter flex events?

1. Very easy
2. Somewhat easy
3. Somewhat difficult
4. Very difficult
5. Don't know

E4. [Ask if E3=3 or 4] What difficulties did your business have in reducing or shifting electricity use during the winter flex events? Select all that apply. [Multiple answers allowed] [Randomize order 1-9]

1. Employees feeling colder in the space than normal
2. Customers feeling colder in the space than normal
3. Remembering when the events were happening
4. Changing our work/business schedule and habits to match the events
5. Getting the cooperation of others at my business to participate
6. Not knowing what actions to take
7. Not understanding the peak time events or how they work
8. Finding other ways to reduce or shift electricity use since we already use little electricity
9. We have equipment or appliances that need to always stay on
10. Other (please describe) [Text entry]

E5. [Ask if E1=3] What were your reasons for not participating in the winter flex events? Select all that apply. [Multiple answers allowed] [Randomize order 1-9]

1. Inside temperature of the space too cold for employees
2. Inside temperature of the space too cold for customers
3. Difficult to remember when the events were happening
4. It is too inconvenient to change our business' energy use habits for events
5. Others at my business did not want to cooperate or participate
6. Don't know what actions to take
7. Don't understand the peak time events or how they work
8. Already using little electricity so not sure what else I can do
9. We have equipment or appliances that need to always stay on
10. Other (please describe) [Text entry]

F. Satisfaction

F1. [Ask if E1 =1 or 2] Was the bill credit amount for the winter flex events consistent with your level of effort?

1. Yes
2. No
3. Don't know

F2. How satisfied are you with your bill savings since enrolling in PSE's TOU pilot program?

1. 1 Not at all satisfied
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely satisfied

F3. Taking everything into consideration, please rate your overall experience with PSE's TOU pilot program?

1. 1 Unacceptable
2. 2
3. 3
4. 4
5. 5 Average
6. 6
7. 7
8. 8
9. 9
10. 10 Outstanding

F4. Please tell us why you gave that rating for the TOU pilot program. [Text entry]

G. Gift Card Drawing

G1. You've made it through the survey! Would you like to enter in the drawing for a chance to win a \$50 e-gift card?

One winner will be randomly selected. Winner will get to select a \$50 e-gift card from a retailer of their choice.

1. Yes
2. No

G2. [Ask if G1=1] To be entered in the e-gift card drawing, please provide your name, email, and phone number. PSE will not use this information for marketing. This information will only be used to contact you and send you the e-gift card if you are the winner.

You must fill in all three fields below to be entered into the drawing. Any blank fields will forfeit your entry.

1. Name:
2. Email:
3. Phone number:

H. End-of-Survey Message

Your responses have been submitted. [Display if G1=1: You will be notified in a few weeks if you are the lucky gift card winner.] Thank you for your time today.

PSE Time-of-Use Rates Pilot Summer Mid-Progress Survey for Small-to-Medium Business Customers

Survey Design Overview

Research Objective	Relevant Survey Items
Measure the level of customer engagement (i.e., rate/event awareness and frequency of participation)	B1, B2, B3, C1, C2, D1, E1
Determine the effectiveness of communication and educational materials on customer awareness and participation	B4, B5, B6, B7, D2, D3
Identify the behaviors that customers are taking/not taking and any barriers to behavior change	C3, C4, C5, C6, C7C8, C9, C10, E2, E3, E4, E5
Assess customer satisfaction with the pilot program and identify areas of success and areas for improvement	F1, F2, F3, F4

Target Audience

Small-to-medium business (SMB) customers who are enrolled in the Time-of-Use pilot program.

Fielding Timeline

Late March 2024. Two weeks prior to launch, Cadmus will notify Eric Haechrel and provide a notice of customer contact document.

Sampling Plan

The table below shows the proposed sampling plan for the SMB summer mid-progress survey. Based on the enrollment count, the target number of completes, and the number of customers to contact for the survey may be subject to change.

Treatment Group	Estimated Population Count	Target Number of Completes	Sample Frame Needed to Reach Target
TOU+PTR General Service (Sch. 324)	1,130	75	1,090
Total	1,130	75	1,090

Variables/Data to Carry Over into Survey

- ContractAccount (will be cleansed/converted to CadmusID)
- BusinessName
- Email
- PremiseID
- BusinessAddress
- TOURate = 324
- TreatmentGroup = TOU+PTR General Service
- FuelType

- FuelType
- HeatingType =
- EVStatus = Y or N
- BusinessType =

Email Invitation

To: [Email]

From: PSE Time-of-Use Research

Subject: How is the TOU rate plan from PSE?

Hi PSE Business Customer,

Thank you for enrolling in the Time-of-Use (TOU) pilot program from Puget Sound Energy. We'd like to hear about your experience with your TOU rate plan. Please participate in this 9-minute survey. After you complete the survey, you can enter a drawing for a chance to win a \$50 e-gift card from a retailer of your choice. One winner will be randomly selected.

Click the link below to take the survey:

[auto-generated link]

Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have difficulties taking the survey, please contact Liz Ross at Cadmus, the research firm conducting this survey on our behalf. You can reach her at Liz.Ross@cadmusgroup.com. If you have any questions about this pilot program, contact Richie Fader at TOU@pse.com.

Thank you in advance for your time.

Richie Fader
Program Coordinator
Puget Sound Energy

Reminder Email Invitation

To: [Email]

From: PSE Time-of-Use Research

Subject: Don't forget to tell us about your experience with the TOU rate plan from PSE!

Hello PSE Business Customer,

We recently contacted you to ask about your experience with your rate plan in the Time-of-Use (TOU) pilot program from Puget Sound Energy. This survey will only take 9-minutes. **After you complete the**

survey, you can enter a drawing for a chance to win a \$50 e-gift card from a retailer of your choice. One winner will be randomly selected.

Click the link below to take the survey:

[auto-generated link]

Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have difficulties taking the survey, please contact Liz Ross at Cadmus, the research firm conducting this survey on our behalf. You can reach her at Liz.Ross@cadmusgroup.com. If you have any questions about this pilot program, contact Richie Fader at TOU@pse.com.

Thank you in advance for your time.

Richie Fader
Program Coordinator
Puget Sound Energy

A. Start Screen



Welcome! This survey will take 9 minutes or less to complete. Your responses will remain confidential and will only be used for research purposes. When you complete the survey, you can enter into a drawing for a chance to win a \$50 e-gift card.

[Start button]

B. TOU Awareness and Communication

- B1. On PSE's Time-of-Use (TOU) rate plan, your electricity costs are based on how much you use during the "peak" and "off-peak" periods. Electricity is more expensive during peak periods on weekdays, and less expensive during off-peak periods on weekdays, weekends, and holidays.

To the best of your knowledge, when do peak periods occur during weekdays in summer? Select all that apply. [Multiple answers allowed]

1. 12 a.m. to 7 a.m.
2. 7 a.m. to 10 a.m.
3. 10 a.m. to 5 p.m.

4. 5 p.m. to 8 p.m. [Correct answer]
5. 8 p.m. to 12 a.m.
6. Don't know [Exclusive answer]

B2. In the past 6 months, have you viewed your business' electric usage history from your PSE online account?

1. Yes
2. No

B3. In the past 6 months, have you visited **pse.com** for more insights into energy use and ways to save?

1. Yes
2. No

B4. As part of your TOU rate plan, PSE sends you **monthly bill summary emails** that compare electricity cost in the current month to the previous month. Below is an example of a monthly bill summary email. (This email is for a generic business, not for yours.)



Dear PSE Business Customer,

Here is your latest Time-of-Use + Peak Time Rebates (Sch. 324) rate plan performance report.

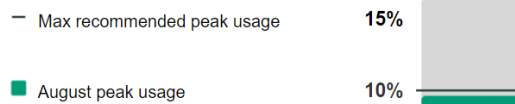
Nice job!

So far you've saved money on the Time-of-Use + Peak Time Rebates (Sch. 324) rate plan and are projected to continue saving over the next 12 months.

✔ 12-month savings*	\$6
✔ Enrollment-to-date savings*	\$12

You saved money in August by limiting peak usage.

Customers that consume less than 15% of their energy during peak periods generally succeed on a Time-of-Use + Peak Time Rebates (Sch. 324) rate plan.



✓ August savings*

\$4

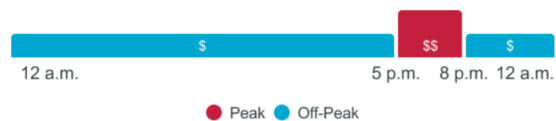
Keep up the good work!

☀ Summer savings tip

Adapting to a TOU summer schedule may be easier than you think. Adjust your thermostat if you have AC by increasing the temperature set point in your building a few degrees during peak summer hours (5:00PM to 8:00PM) to reduce cooling costs. Consider installing a smart thermostat to optimize energy usage. Click [here](#) for more energy-saving tips for your business.

Remember, electricity is more expensive during peak periods.

Summer Weekday (Apr. 1 – Sep. 30)



Do you remember receiving these **monthly bill summary emails**?

1. Yes
2. No

B5. [Ask if B4=1] How would you rate the usefulness of the information provided in the **monthly bill summary emails**?

1. 1 Not at all useful
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9

10. 10 Extremely useful

B6. Are you receiving too many, just the right amount, or not enough TOU rate emails from PSE?

1. Too many emails
2. Just the right amount
3. Not enough emails
4. Don't know

B7. What advice would you give PSE on how they can make the TOU rate emails better? [Text entry]

C. TOU Participation and Behaviors

C1. PSE's summer peak periods are from 5 p.m. to 8 p.m. on weekdays, except holidays. In the past 4 months, did your business take any action to reduce electricity use during peak periods or shift electricity use to off-peak periods?

1. Yes
2. No
3. Don't know

C2. [Ask if C1=1] How frequently did your business take action?

1. Daily/every weekday
2. Several days per week
3. One day per week
4. Several days per month
5. One day per month
6. Don't know

C3. [Ask if C1=1] Here is a list of high-impact actions your business could have done during **peak periods**. Please select all the actions your business did. [Multiple answers allowed] [Randomize order 1-7]

1. Turned thermostat temperature up a few degrees during peak periods
2. Cooled the space before or after peak periods
3. Reduced the use of hot water during peak periods
4. Used equipment/appliances/electronics less during peak periods
5. Used lights less during peak periods
6. Charged electronics and devices less during peak periods
7. [Display if EVStatus = Y] Charged my electric vehicle (EV) or EV fleet less during peak periods

C4. [Ask if C1=1] Did you use any smart devices to help you schedule or automate your electricity use to off-peak periods?

Smart energy saving devices include: smart thermostat, smart plug, smart outlet, smart lights, smart energy monitoring tool, or smart appliances.

1. Yes

2. No
 3. Don't know
- C5. [Ask if C4=1] What smart devices did you use to help you schedule or automate your electricity use to off-peak periods? Select all that apply. [Multiple answers allowed]
1. Smart thermostat
 2. Smart plug
 3. Smart outlet
 4. Smart lights
 5. Smart energy monitoring tool
 6. Smart EV charger
 7. Smart appliance (please describe) [Text entry]
- C6. [Ask if C1=1] How easy or difficult was it for your business to reduce or shift electricity use on the TOU rate plan?
1. Very easy
 2. Somewhat easy
 3. Somewhat difficult
 4. Very difficult
 5. Don't know
- C7. [Ask if C6=3 or 4] What difficulties did your business have in reducing or shifting electricity use on the TOU rate plan? Select all that apply. [Multiple answers allowed] [Randomize order 1-9]
1. Employees feeling hotter or less comfortable in the space than normal
 2. Customers feeling hotter or less comfortable in the space than normal
 3. Remembering the peak and off-peak periods
 4. Changing our work/business schedule and habits to match the TOU rate plan
 5. Getting the cooperation of others at my business to participate
 6. Not knowing what actions to take
 7. Not understanding the TOU rate plan or how the program works
 8. Finding other ways to reduce or shift electricity use since we already use little electricity
 9. We have equipment or appliances that need to always stay on
 10. Other (please describe) [Text entry]
- C8. [Ask if C1=1] What motivates you to reduce or shift electricity on the TOU rate plan? Select all that apply. [Multiple answers allowed] [Randomize order 1-4]
1. To lower my energy bill
 2. To help PSE deliver reliable power to my community
 3. To reduce my carbon footprint or be more eco-friendly / sustainable
 4. To help keep electricity prices affordable for my community
 5. Other (please describe) [Text entry]

C9. [Ask if C1=2] Why did your business not reduce or shift electricity use on the TOU rate plan?

Select all that apply. [Multiple answers allowed] [Randomize order 1-9]

1. Inside temperature of the space too hot or humid for employees
2. Inside temperature of the space too hot or humid for customers
3. Difficult to remember the peak and off-peak periods
4. It is too inconvenient to change our business' energy use habits
5. Others at my business did not want to cooperate or participate
6. Don't know what actions to take
7. Don't understand the TOU rate plan or how the program works
8. Already using little electricity so not sure what else I can do
9. We have equipment or appliances that need to always stay on
10. Other (please describe) [Text entry]

D. PTR Event Awareness and Communication

D1. You are enrolled in a TOU rate plan with Peak Time Rebates. During a **Peak Time Rebate event**, PSE pays you a credit of \$0.449 per kWh for reducing your electricity use. During the summer months, do you remember receiving notification alerts about Peak Time Rebate events? (Example notification shown below).

1. Yes
2. No



Hello CUSTOMER,

A Peak Time Rebate event is scheduled for tomorrow, July 9, 2024, from 5:00PM to 8:00PM.

We're anticipating higher demand on the electrical grid, and as a Time-of-Use (TOU) customer enrolled in TOU + Peak Time Rebates, you can earn credits on your bill for voluntarily reducing your electricity use during this critical peak time. For each kilowatt-hour (kWh) of electricity you save during the event, you'll earn approximately \$0.45/kWh on your next bill. Visit the [TOU FAQ](#) page for additional information on Peak Time Rebates.

If you choose to participate, please make an effort to avoid using unnecessary devices, appliances or equipment until after the event is over. Get more energy-saving tips at <https://www.pse.com/flextips>.

Thank you for helping us ensure everyone has access to energy when they need it most and supporting our goal of providing 100% carbon-free electricity by 2045.

Thank you,

Puget Sound Energy

D2. [Ask if D1=1] How would you rate the adequacy of the **amount of time** in advance you received the Peak Time Rebate event notification alerts?

1. 1 Not at all adequate
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely adequate

D3. [Ask if D1=1] How would you rate the **usefulness of the information** provided in the Peak Time Rebate event notification alerts?

1. 1 Not at all useful
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely useful

D4. [Ask if D1=1] Are you receiving too many, just the right amount, or not enough Peak Time Rebate event communications from PSE?

PSE sends customers day-ahead, event-start, and event-end emails. If you opted to receive text/SMS, event communications are also sent to you via text message.

1. Too many communications
2. Just the right amount of communications
3. Not enough communications
4. Don't know

E. PTR Event Participation and Behaviors

E1. PSE called six summer Peak Time Rebate events from 5 p.m. to 8 p.m. on these dates:

- Monday, July 8th

- Tuesday, July 9th
- Monday, August 5th
- Thursday, August 8th
- Thursday, September 5th
- Friday, September 6th

Did you or others in your business do anything to reduce or shift electricity use during these summer events?

1. Yes, for all events
2. Yes, for some events
3. No, none of the events
4. Don't know

E2. [Ask if E1=1 or 2] How did your business reduce or shift electricity use during the summer Peak Time Rebate events? Select all that apply. [Randomize order 1-7]

1. Cooled the space before or after events
2. Turned thermostat temperature up a few degrees during events
3. Turned off or reduced the use of equipment/appliances/electronics during events
4. Turned off or reduced the use of lights during events
5. Charged electronics and devices before or after events
6. Charged my electric vehicle (EV) or EV fleet before or after events
7. Closed the business during events

E3. [Ask if E1=1 or 2] How easy or difficult was it to reduce or shift electricity use during the summer Peak Time Rebate events?

1. Very easy
2. Somewhat easy
3. Somewhat difficult
4. Very difficult
5. Don't know

E4. [Ask if E3=3 or 4] What difficulties did your business have in reducing or shifting electricity use during the summer Peak Time Rebate events? Select all that apply. [Multiple answers allowed]
[Randomize order 1-9]

1. Employees feeling hotter or less comfortable in the space than normal
2. Customers feeling hotter or less comfortable in the space than normal
3. Remembering when the events were happening
4. Changing our work/business schedule and habits to match the events
5. Getting the cooperation of others at my business to participate
6. Not knowing what actions to take
7. Not understanding the peak time events or how they work

8. Finding other ways to reduce or shift electricity use since we already use little electricity
9. We have equipment or appliances that need to always stay on
10. Other (please describe) [\[Text entry\]](#)

E5. [\[Ask if E1=3\]](#) What were your reasons for not participating in the summer Peak Time Rebate events? Select all that apply. [\[Multiple answers allowed\]](#) [\[Randomize order 1-9\]](#)

1. Inside temperature of the space too hot or humid for employees
2. Inside temperature of the space too hot or humid for customers
3. Difficult to remember when the events were happening
4. It is too inconvenient to change our business' energy use habits for events
5. Others at my business did not want to cooperate or participate
6. Don't know what actions to take
7. Don't understand the peak time events or how they work
8. Already using little electricity so not sure what else I can do
9. We have equipment or appliances that need to always stay on
10. Other (please describe) [\[Text entry\]](#)

F. Satisfaction

F1. [\[Ask if E1 =1 or 2\]](#) Was the bill credit amount for the summer Peak Time Rebate events consistent with your level of effort?

1. Yes
2. No
3. Don't know

F2. How satisfied are you with your bill savings since enrolling in PSE's TOU pilot program?

1. 1 Not at all satisfied
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 Extremely satisfied

F3. Taking everything into consideration, please rate your overall experience with PSE's TOU pilot program?

1. 1 Unacceptable
2. 2
3. 3
4. 4

- 5. 5 Average
- 6. 6
- 7. 7
- 8. 8
- 9. 9
- 10. 10 Outstanding

F4. Please tell us why you gave that rating for the TOU pilot program. [Text entry]

G. Gift Card Drawing

G1. You've made it through the survey! Would you like to enter in the drawing for a chance to win a \$50 e-gift card?

One winner will be randomly selected. Winner will get to select a \$50 e-gift card from a retailer of their choice.

- 1. Yes
- 2. No

G2. [Ask if G1=1] To be entered in the e-gift card drawing, please provide your name, email, and phone number. PSE will not use this information for marketing. This information will only be used to contact you and send you the e-gift card if you are the winner.

You must fill in all three fields below to be entered into the drawing. Any blank fields will forfeit your entry.

- 1. Name:
- 2. Email:
- 3. Phone number:

H. End-of-Survey Message

Your responses have been submitted. [Display if G1=1: You will be notified in a few weeks if you are the lucky gift card winner.] Thank you for your time today.

Appendix B. Evaluation Modeling

This appendix provides details of the savings methodology for the TOU impact evaluation and billing analyses.

Impact Evaluation

The evaluation team estimated both hourly and average TOU demand impact models across all eligible rate schedules, along with PTR event impacts for hybrid rates. Demand impact models were run for separate season (winter vs. summer) and period (weekday vs. weekend/holidays) combinations. All demand impact models had standard errors that were clustered on each customer (standard error adjustment used to account for potential correlations in a customer's hourly consumption).

The team estimated TOU energy impacts using similar model specifications for customers on Schedules 307 and 327 and included Peak Time Rebate event day indicators for customers on Schedules 317 and 324. For all models, Cadmus used hourly metering data aggregated from 15-minute interval data. For hourly TOU impacts, the evaluation team ran 96 individual models for all rates (two seasons, two periods, and 24 hours in a day). For average TOU impacts, the evaluation team ran just four models for each rate.

The evaluation team included data for only the days that treatment customers were in the TOU treatment. Additionally, if a treatment customer opted out, their records along with those of their matched non-participant were dropped from the regression analysis.

For TOU-only rates, estimates were based on the following regression model that controls for customer-specific hourly pre-period consumption to measure hourly TOU demand impact for the whole rate schedule:

$$kw_{it} = \beta_{1h} * Treatment + \beta_{2h} * (Pre - Period Hourly Consumption_{ih}) + \beta_{3h} * CDH65_{it} + \beta_{4h} * HDH65_{it} + \sum_{n=1}^t \beta_{5hn} * (Day - Hour Timestamp_{hn}) + \varepsilon_{it}$$

Where:

kw_{it}	=	Demand in hour of sample t for participant i
β_{1h}	=	Change in demand expected for each hour h of the day for treatment customers
$Treatment$	=	Indicator variable for treatment customers
β_{2h}	=	Change in demand associated with a change in pre-period hourly consumption in hour h of the day
$Pre - Period Hourly Consumption_{ih}$	=	Pre-period hourly consumption for each hour h for participant i
β_{3h}	=	Change in demand associated with a change in CDH65 values in hour h of the day (only for the summer period)

$CDH65_{it}$	=	Cooling degree hours with a 65°F setpoint observed for each hour t (only for the summer period) for participant i
β_{4h}	=	Change in demand associated with a change in HDH65 values in hour h of the day
$HDH65_{it}$	=	Heating degree hours with a 65°F setpoint observed for each hour t for participant i
β_{5hn}	=	Explanatory power of hourly demand for all relevant timestamps on observed kw_{it}
$Day - Hour Timestamp_{hn}$	=	Timestamp n that falls in the season, period, and hour being analyzed
ε_{it}	=	Error term

To estimate the average TOU demand impact for TOU-only rates, the evaluation team ran the following generalized equation:

$$kw_{it} = \beta_1 * Treatment * onpeak + \beta_2 * Treatment * offpeak + \beta_3 * Treatment * superoffpeak + \beta_4 * (Pre - Period Hourly Consumption_i) + \beta_5 * CDH65_{it} + \beta_6 * HDH65_{it} + \sum_{n=1}^t \beta_{7n} * (Day - Hour Timestamp_n) + \beta_8 * onpeak + \varepsilon_{it}$$

Where:

kw_{it}	=	Demand in hour of sample t for participant i
β_1	=	Change in average demand expected for treatment customers during on-peak periods (this estimate is collected only in the summer/winter weekday periods when on-peak hours are defined)
$Treatment$	=	Indicator variable for treatment customers
$onpeak$	=	Indicator variable for on-peak hours defined by rate schedule tariff sheets
β_2	=	Change in average demand expected for treatment customers during off-peak periods
$offpeak$	=	Indicator variable for off-peak hours defined by rate schedule tariff sheets
β_3	=	Change in average demand expected for treatment customers during super off-peak periods
$superoffpeak$	=	Indicator variable for super off-peak hours defined by rate schedule tariff sheets (only for Schedule 327 customers)
β_4	=	Change in average demand associated with a change in pre-period hourly consumption
$Pre - Period Hourly Consumption_i$	=	Pre-period hourly consumption for participant i

β_{5h}	=	Change in average demand associated with a change in CDH65 values (only for the summer period)
$CDH65_{it}$	=	Cooling degree hours with a 65°F setpoint observed for each hour t (only for the summer period) for participant i
β_6	=	Change in average demand associated with a change in HDH65 values
$HDH65_{it}$	=	Heating degree hours with a 65°F setpoint observed for each hour t for participant i
β_{7n}	=	Explanatory power of hourly demand for all relevant timestamps on observed kw_{it}
$Day - Hour Timestamp_n$	=	Timestamp n that falls in the season, period being analyzed
β_8	=	Change in average demand expected for the on-peak period regardless of treatment status
ε_{it}	=	Error term

For the hourly analysis of TOU x PTR hybrid rates, the evaluation team used the following equations:

$$kw_{it} = \beta_{1h} * Treatment + \beta_{2h} * (Pre - Period Hourly Consumption_{ih}) + \beta_{3h} * CDH65_{it} + \beta_{4h} * HDH65_{it} + \sum_{n=1}^t \beta_{5hn} * (Day - Hour Timestamp_{hn}) + \sum_{j=1}^s \beta_{6hj} * Event_j + \varepsilon_{it}$$

Where:

kw_{it}	=	Demand in hour of sample t for participant i
β_{1h}	=	Change in demand expected for each hour h of the day for treatment customers
$Treatment$	=	Indicator variable for treatment customers
β_{2h}	=	Change in demand associated with a change in pre-period hourly consumption in hour h of the day
$Pre - Period Hourly Consumption_{ih}$	=	Pre-period hourly consumption for each hour h for participant i
β_{3h}	=	Change in demand associated with a change in CDH65 values in hour h of the day (only for the summer period)
$CDH65_{it}$	=	Cooling degree hours with a 65°F setpoint observed for each hour t (only for the summer period) for participant i
β_{4h}	=	Change in demand associated with a change in HDH65 values in hour h of the day
$HDH65_{it}$	=	Heating degree hours with a 65°F setpoint observed for each hour t for participant i
β_{5hn}	=	Explanatory power of hourly demand for all relevant timestamps on observed kw_{it}

$Day - Hour Timestamp_{hn}$ = Timestamp n that falls in the season, period, and hour being analyzed

β_{6hj} = Change in demand associated with hour h of PTR event day j (these coefficients measure demand response impacts)

$Event_j$ = Set of variables indicating whether hour fell during hour h of event day j

ε_{it} = Error term

To estimate the average TOU demand impact and PTR event impacts for TOU x PTR hybrid rates, the evaluation team ran the following generalized equation:

$$kw_{it} = \beta_1 * Treatment * onpeak + \beta_2 * Treatment * offpeak + \beta_3 * (Pre - Period Hourly Consumption_i) + \beta_4 * CDH65_{it} + \beta_5 * HDH65_{it} + \sum_{n=1}^t \beta_{6n} * (Day - Hour Timestamp_n) + \beta_7 * onpeak + \beta_8 * Treatment * Event + \varepsilon_{it}$$

Where:

kw_{it} = Demand in hour of sample t for participant i

β_1 = Change in average demand expected for treatment customers during on-peak periods (this estimate is only collected in the summer/winter weekday periods where on-peak hours are defined)

$Treatment$ = Indicator variable for treatment customers

$onpeak$ = Indicator variable for on-peak hours defined by rate schedule tariff sheets

β_2 = Change in average demand expected for treatment customers during off-peak periods

$offpeak$ = Indicator variable for off-peak hours defined by rate schedule tariff sheets

β_3 = Change in average demand associated with a change in pre-period hourly consumption

$Pre - Period Hourly Consumption_i$ = Pre-period hourly consumption for participant i

β_{4h} = Change in average demand associated with a change in CDH65 values (only for the summer period)

$CDH65_{it}$ = Cooling degree hours with a 65°F setpoint observed for each hour t (only for the summer period) for participant i

β_5 = Change in average demand associated with a change in HDH65 values

$HDH65_{it}$ = Heating degree hours with a 65°F setpoint observed for each hour t for participant i

β_{6n} = Explanatory power of hourly demand for all relevant timestamps on observed kw_{it}

$Day - Hour Timestamp_n$	=	Timestamp n that falls in the season, period being analyzed
β_7	=	Change in average demand expected for the on-peak period regardless of treatment status
β_8	=	Change in average demand expected during PTR event periods (all PTR event hours are during on-peak hours)
$Event$	=	Indicator variable for whether hour fell during a PTR event day period
ε_{it}	=	Error term

To compute TOU Energy Impacts, the evaluation team aggregated AMI data to the daily level and ran separate regressions for each rate, season, and weekday and weekend/holiday. The team used the following equation:

$$kWh_{it} = \beta_1 * Treatment + \beta_2 * (Pre - Period Daily Consumption_i) + \beta_3 * CDD65_{it} + \beta_4 * HDD65_{it} + \sum_{n=1}^t \beta_{5n} * (Day_n) + \beta_6 * Treatment * Event + \varepsilon_{it}$$

Where:

kWh_{it}	=	Daily consumption of sample t for participant i
β_1	=	Change in daily consumption expected for treatment customers
$Treatment$	=	Indicator variable for treatment customers
β_2	=	Change in consumption associated with a change in pre-period daily consumption
$Pre - Period Daily Consumption_i$	=	Pre-period daily average consumption for participant i
β_3	=	Change in consumption associated with a change in CDD65 values (only for the summer period)
$CDD65_{it}$	=	Cooling degree days with a 65°F setpoint observed for each day t (only for the summer period) for participant i
β_4	=	Change in consumption associated with a change in HDD65 values
$HDD65_{it}$	=	Heating degree hours with a 65°F setpoint observed for each day t for participant i
β_{5n}	=	Explanatory power of daily consumption for all relevant timestamps on observed kWh_{it} – day-of-sample fixed effect
Day_n	=	Day n that falls in the season, period being analyzed – attempting to estimate a day-of-sample fixed effect
β_6	=	Change in consumption associated expected for participants on PTR events days (only for Schedules 317 and 324)
$Event$	=	Indicator variable for whether day is a PTR event day
ε_{it}	=	Error term

Billing Analysis

For the *ex ante* billing analysis, the evaluation team ran a simple model using weather data to predict consumption in the program pre-period. The data team used pre-period hourly AMI data for all participants and matched non-participants along with actual hourly weather data from the same period. The evaluation team ran regression models on a per-customer basis for each season, weekday or weekend/holiday, and hour of the day (Hour 0 to Hour 23). The equation used was specified as follows:

$$kw_{it} = \beta_{1h} * CDH65_{it} + \beta_{2h} * HDH65_{it} + \varepsilon_{it}$$

Where:

kw_{it}	=	Demand in hour of sample t for participant i
β_{1h}	=	Change in demand associated with a change in CDH65 values in hour h of the day (only for the summer period)
$CDH65_{it}$	=	Cooling degree hours with a 65°F setpoint observed for each hour t (only for the summer period) for participant i
β_{2h}	=	Change in demand associated with a change in HDH65 values in hour h of the day
$HDH65_{it}$	=	Heating degree hours with a 65°F setpoint observed for each hour t for participant i
ε_{it}	=	Error term

The evaluation team saved the coefficients from the above model and generated hypothetical consumption totals under normalized weather conditions. We then applied these totals against the standard Schedule 7/24 rates and against the participant's TOU rate to determine if they would save more under TVR in the pre-period assuming no load shifting. The goal was to determine which rates generate more structural winners or losers.

The *ex post* billing analysis did not use regression models. The regression coefficients generated from the *ex ante* analysis were used in the *ex post* analysis for both participants and the matched non-participants, who were the same as were used in the TOU energy impacts section. The evaluation team multiplied the saved *ex ante* coefficients against actual program period weather data to generate a counterfactual hourly consumption value. We then applied the counterfactual hourly consumption against the Schedule 7 rate and assigned TOU rate (matched participants and non-participants were assigned the same TOU rate) to get the respective bill totals. Hourly bill totals were aggregated to the monthly and annual levels. The evaluation team computed the difference (delta) between standard rate bills and TOU bills for both participants and non-participants.

$$\Delta BP = \text{Annual Schedule 7 bill total} - \text{Annual TOU rate bill total (for participants)}$$

$$\Delta BNP = \text{Annual Schedule 7 bill total} - \text{Annual TOU rate bill total (for non-participants)}$$

We took the difference between these deltas to determine which groups of customers would save more under TOU rates ($\Delta BP - \Delta BNP$)

The shadow billing analysis did not require statistical modeling. The evaluation team received before and during the TVR program monthly billing data for the various peak periods along with associated rates. The team simply had to apply the correct TOU rates for the relevant peak period and month (accounting for overlap in seasonal shoulder months) to compute TOU billing totals. We computed hypothetical Schedule 7 charges by multiplying usage rates by usage amounts.

Appendix C. Non-Participant Matching

To verify that our matching algorithms produced valid non-participant comparison groups, the evaluation team plotted treatment customers' program pre-period (10/1/2022–9/30/2023) average hourly demand against matched non-participants' pre-period average hourly demand. For Schedules 307 and 317, Cadmus separated income eligible and income ineligible customers and matched participants with non-participants in each of these income groups. Matching for Schedule 327 was split between non-EV and EV owners, due to differences in consumption patterns between these two groups. There were no subgroup splits for matching the Schedule 324 group. The resulting graphs (Figure 82 to Figure 88) show Cadmus was able to produce good matches for all treatment groups across TOU rate schedules.

Figure 82. Matching for Schedule 307 Income Ineligible Customers

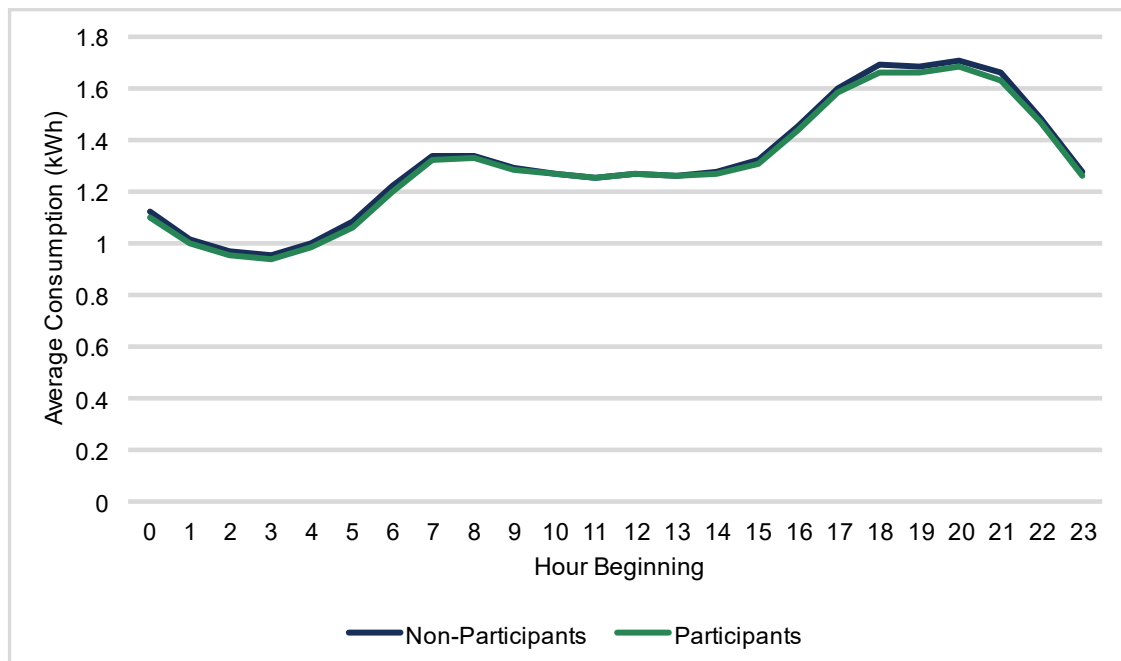


Figure 83. Matching for Schedule 307 Income Eligible Customers

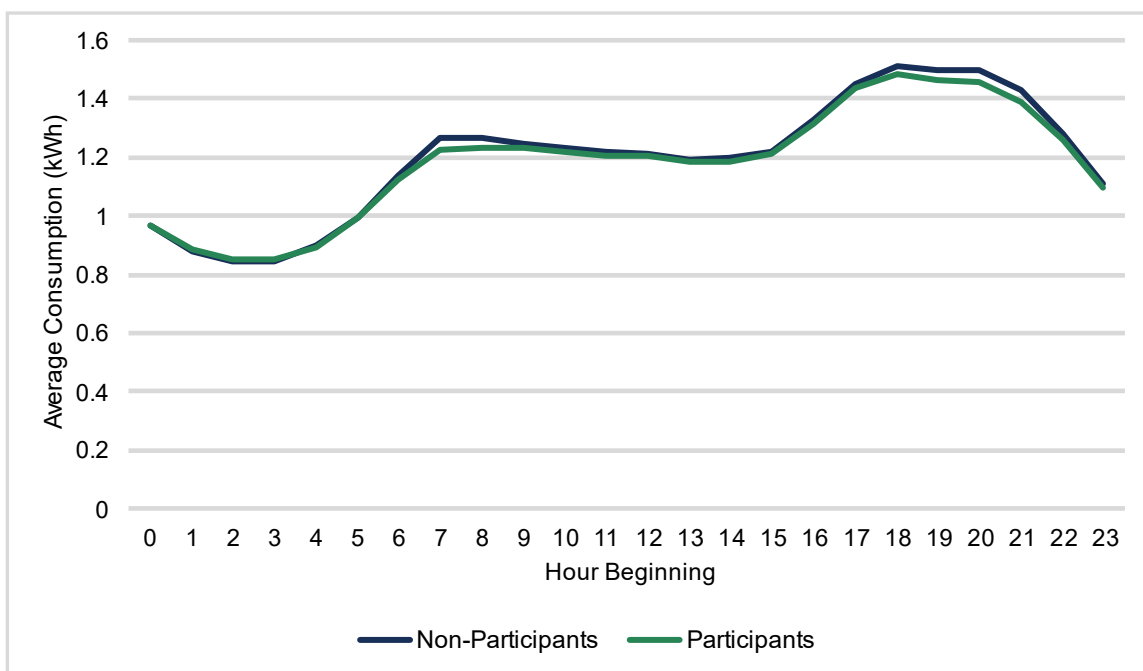


Figure 84. Matching for Schedule 317 Income Ineligible Customers

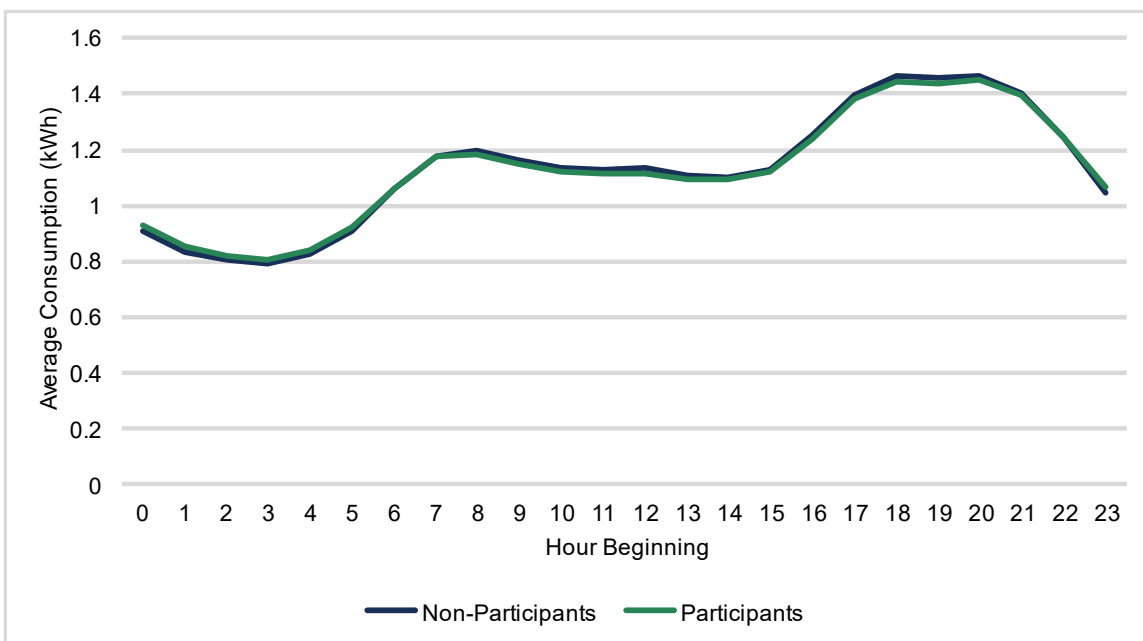


Figure 85. Matching for Schedule 317 Income Eligible Customers

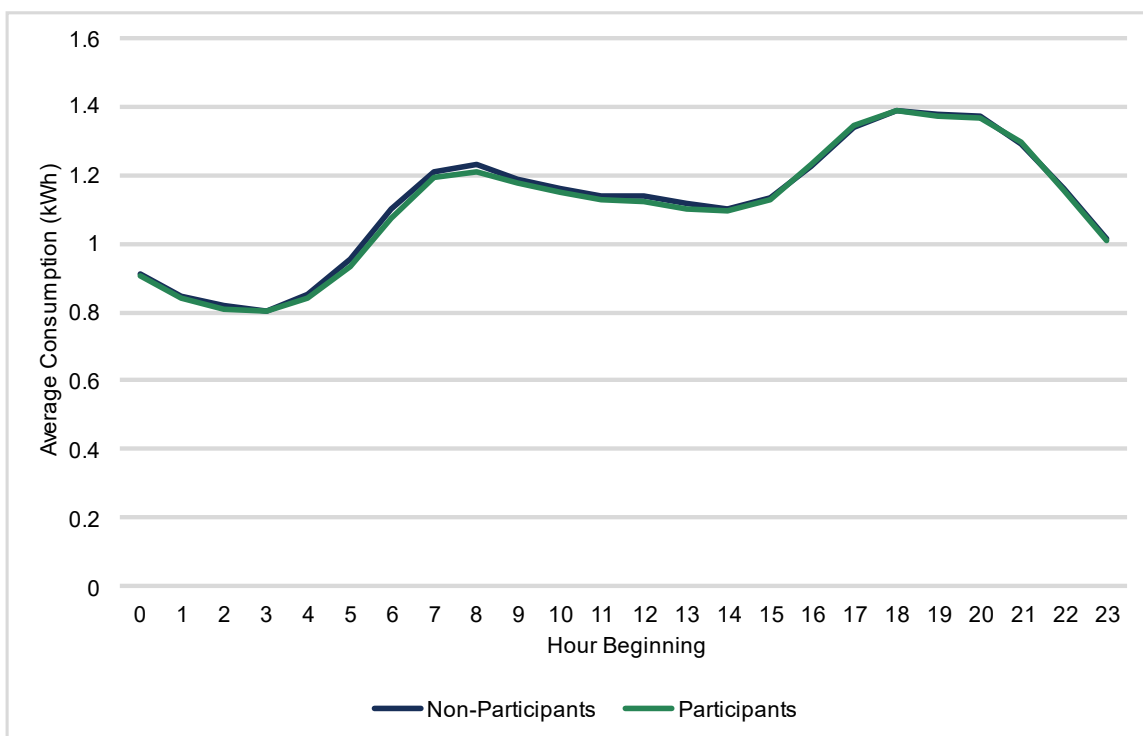


Figure 86. Matching for Schedule 327 EV Owning Customers

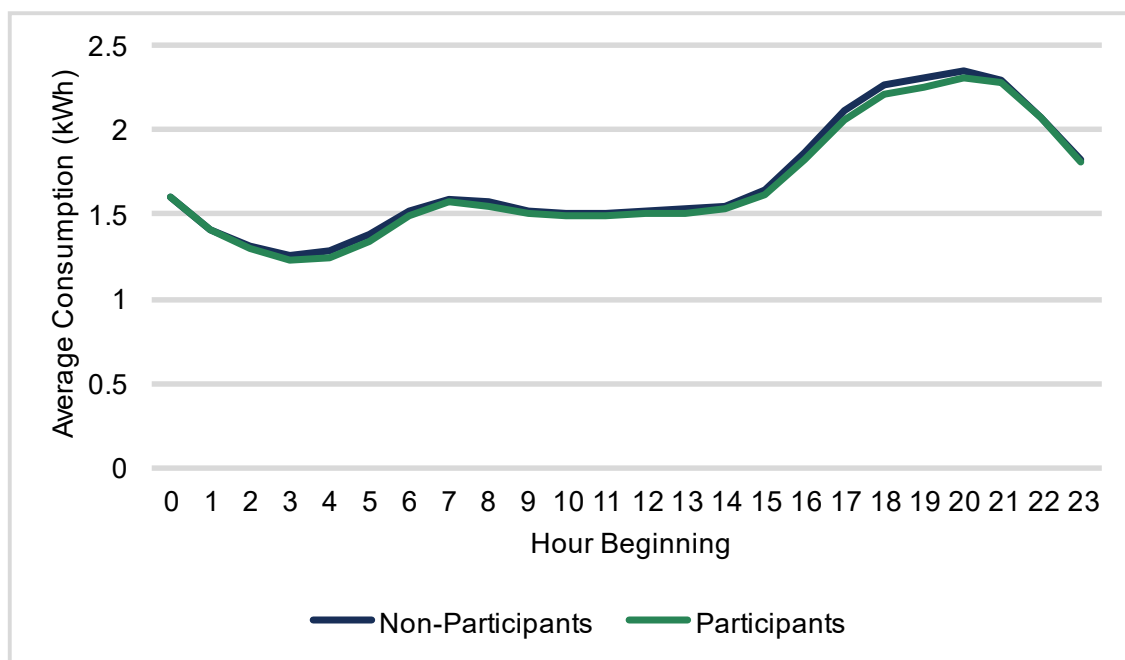


Figure 87. Matching for Schedule 327 non-EV Owning Customers

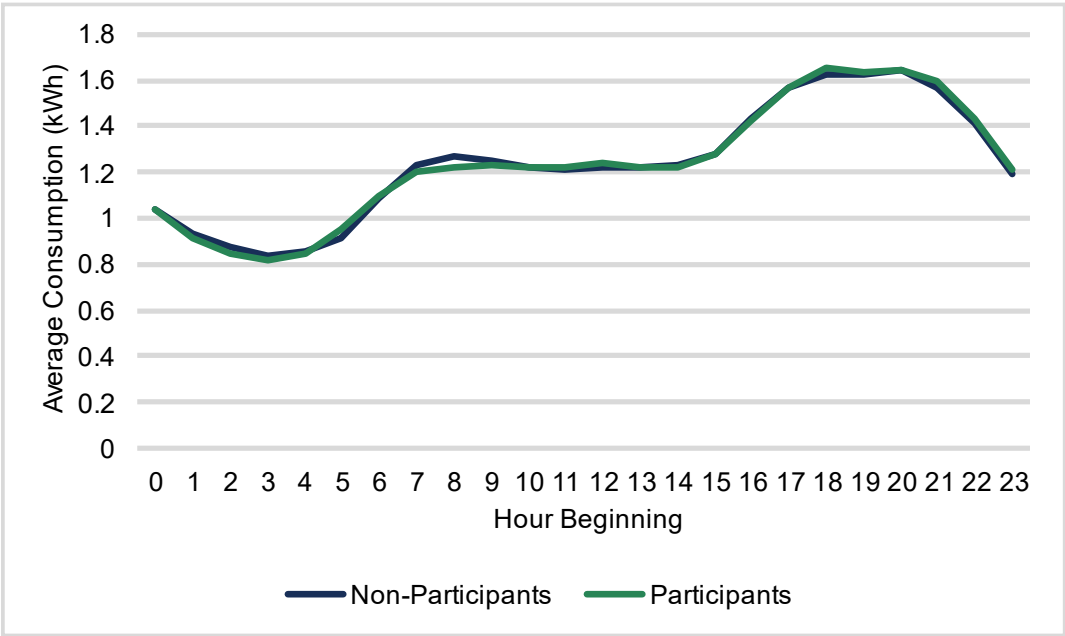


Figure 88. Matching for Schedule 324 Customers

