

Time-Varying Rates Pilot Year One Findings

Interested Party Engagement 1

March 26, 2025



**PUGET
SOUND
ENERGY**

For discussion purposes only

Introductions & Ground Rules

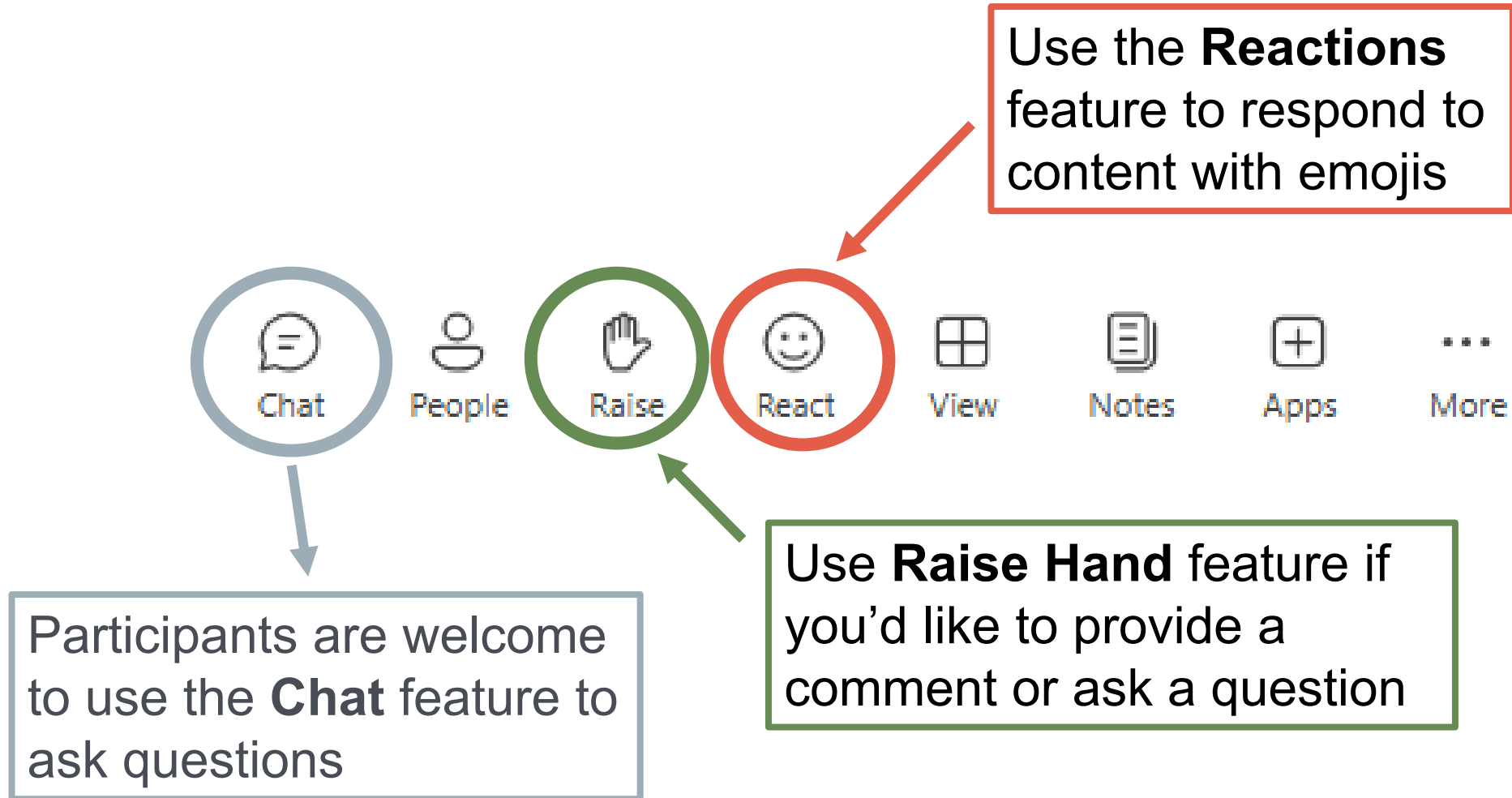
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Ground Rules:

- Meeting is being recorded; please mute yourself
- Come with a clean slate and open mind
- Engage constructively and courteously towards all participants
- Respect the role of the presenters to guide the discussion
- Avoid use of acronyms and explain technical questions
- Leave the meeting with a clear sense of next steps

Welcome to our Virtual Meeting!



Agenda

- ◆ Safety Moment
- ◆ Time-Varying Rates History
- ◆ Pilot Design & Customer Engagement
- ◆ Year One Customer Survey & Impact Findings
- ◆ Future State Strategy

Ladder Safety and How It Affects Everyone

The numbers speak for themselves.



people treated each year for
ladder-related falls*



deaths from ladder
falls each year**



annual cost to the U.S. for work loss,
medical, legal, liability, and pain and
suffering **expenses from falls**

Whether you're using a ladder at home or at work, these numbers affect YOU.

2 most common ladder accidents include:



1. Missing the last step when climbing down



2. Overreaching

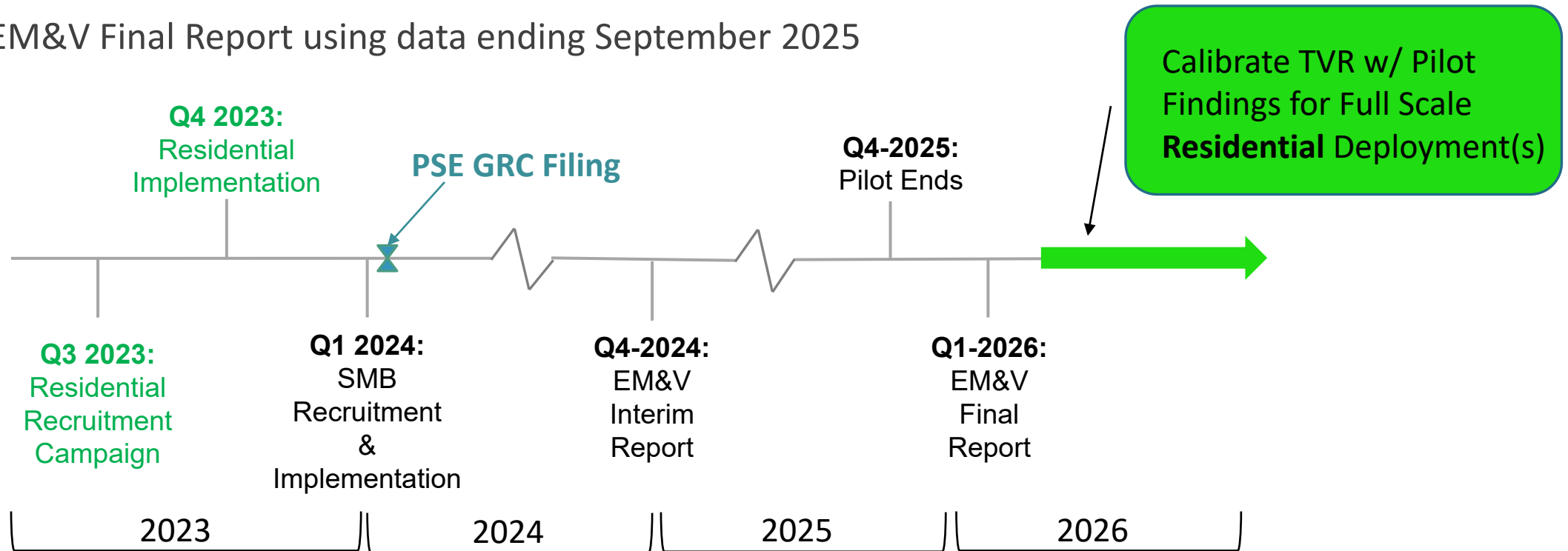
Time-Varying-Rates History

TVR Pilot Timeline

Pilot Duration October 2023 through September 2025

> EM&V Interim Report using data ending September 2024

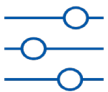
> EM&V Final Report using data ending September 2025



TVR Pilot Objectives

System Cost Minimization	Lower system costs by influencing customer usage patterns
Customer Choice	Increase customer choice by offering more rate options
Equity and Accessibility	Enhance equity and accessibility by providing customers the means to control their energy costs through alternative rate designs
Renewables Integration	Expand renewable generation integration by providing demand-side pricing tools
Winter Peaking Utility Insights	Collect TVR customer response for PSE's winter-peaking service territory

TVR Pilot Overview

	Two-year Pilot 2023 – 2025	Customer Recruitment and Enrollment: Aug – Sept 2023 • Pilot Year 1: Oct 2023 – Sept 2024 • Pilot Year 2: Oct 2024 – Sept 2025
	Implementers	Brattle Group, Uplight, and GridX
	Target Populations	Residential, residential income eligible, and small commercial customers
	Treatment	Three pricing treatment types and six pilot treatments: • 2-Period TOU (Residential, Residential LMI) • 2-Period TOU + PTR (Residential, Residential LMI, SMB) • 3-Period TOU with Super Off Peak (Residential EV)
	Low Income	Residential income eligible customer pilot enhancements • Enabling technology (50%) • Bill protection (50%)

Interested Party Engagement & Customer Research

3 Rounds Of Interested Party Engagement

- Opportunities to share objectives and develop ideas in a collaborative environment
- Venue to hear and incorporate important interested partys' concerns and feedback in advance

5 Virtual Focus Groups

- Residential Customers (low/med/high income), SMB owners, EV drivers
- Understand how customers think about TVRs and their potential impact on usage behaviors
- Test TVR product concepts to assess overall interest, appeal, and barriers to acceptance
- Validate recommendations for rate/pilot design

Key Themes & Findings

- Customer choice, meaningful price signal + savings opportunities
- Environmental benefits (e.g., integrating renewables)
- Equity and accessibility

Rate Designs

Energy rates reflect those approved in most recent rate case (Schedule 7 - \$0.13 first 600 kWh, \$0.15 thereafter)

	Residential TOU Schedule 307	Residential TOU+PTR Schedule 317	Residential 3-Period TOU Schedule 327	Commercial TOU+PTR Schedule 324
Winter (Oct–Mar)				
Peak (7am–10am & 5pm–8pm weekdays)	\$0.50	\$0.27	\$0.48	\$0.26
Off-Peak (All other hours, weekends & holidays)	\$0.10	\$0.12	\$0.12	\$0.11
Super Off-Peak (11pm–7am all days)			\$0.07	
Summer (Apr–Sep)				
Peak (5pm–8pm weekdays)	\$0.32	\$0.24	\$0.26	\$0.23
Off-Peak (All other hours, weekends & holidays)	\$0.10	\$0.12	\$0.12	\$0.11
Super Off-Peak (11pm–7am all days)			\$0.07	
Full Year				
Peak Time Rebate (Event-based)	\$0.00	(\$0.67)	\$0.00	(\$0.66)
Peak: Off–Peak Ratios				
Winter	4.9 : 1	2.2 : 1	6.7 : 1.7 : 1	2.3 : 1
Summer	3.1 : 1	1.9 : 1	3.6 : 1.6 : 1	2.0 : 1
Estimated Peak Impacts (Brattle’s Arcturus model)				
Winter	5.5%	3.5%	5.5%	3.5%
Summer	3.4%	3.3%	3.4%	3.3%
PTR Event Day		6.0%		6.0%

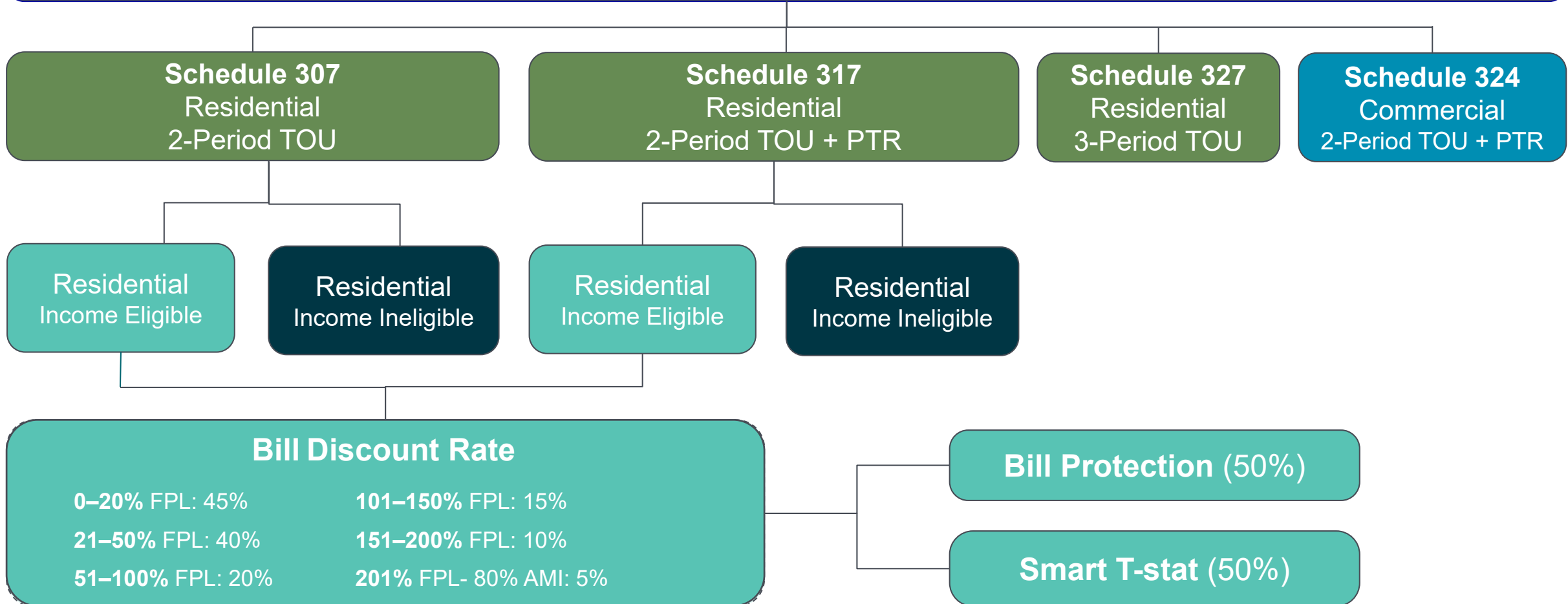


Pilot Design & Customer Engagement

TVR Pilot Design

Rate Implementation Phase (24 mos)

Pilot Recruitment Target Population 155k residential + 50k commercial



Recruitment Strategy

Customer Segmentation Report	Customers recruited from random sample of eligible customers w/ matched control group
Recruitment Waves	Pre-selected customers broken into multiple recruitment waves until recruitment targets/enrollment caps are reached
Rate Education Report	Customers in each wave were sent personalized recruitment materials & invited to participate
Enrollment	Customers must complete enrollment survey for EM&V & the first 7,500 customers will receive a \$25 bill credit
Post 10/1/23	“Organic” unsolicited customers can choose to enroll in available rates

Pilot Treatment Groups

- Undertook statistical power calculations to determine the minimum sample size required for each of the pilot treatments (low case and high case)
- Random sampling with a matched control group

Customer Class	Rate	Min Sample Size	Max Enrollment Cap	PY1 Enrollments
Residential	TOU	1,000	2,000	1,600
	TOU+PTR	1,500	3,000	2,500
Residential - Income Eligible (IE)	TOU	1,000	2,000	1,300
	TOU+PTR	1,500	3,000	2,300
Residential	3-Period TOU	500	1,000	1,000
Small & Medium Business (SMB)	TOU+PTR	2,000	4,000	1,100
Total		7,500	15,000	9,800

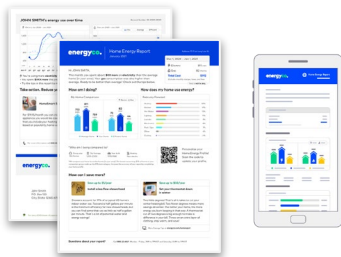
Engagement Strategy for TVR Pilot

Personalized, connected rates customer journeys that drive outcomes

CUSTOMER JOURNEY

Build Awareness

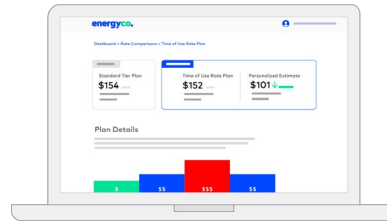
Personalized Rate Education



Rate Education Reports
Print & Email Versions

Inspire Confidence

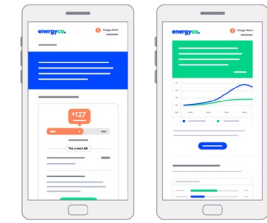
Rate Comparisons



Rate Advisor Web Tool
Shadow Billing & "What-if" Analysis

Motivate Action

Deepen Load Shift



Rate Coach Emails and TOU Alerts
Weekly, Monthly, and High Bill Alerts

OUTCOMES

Rates
Adoption

Increase participation
in opt-in Rates.
Ease transition
to opt-out Rates.

5.2%

Of targeted customers
enrolled in a TOU rate

Shadow
Billing

Personalized bill
comparisons build rate
switching confidence

94%

Of TVR enrollees
reported using the Rate
Advisor Tool

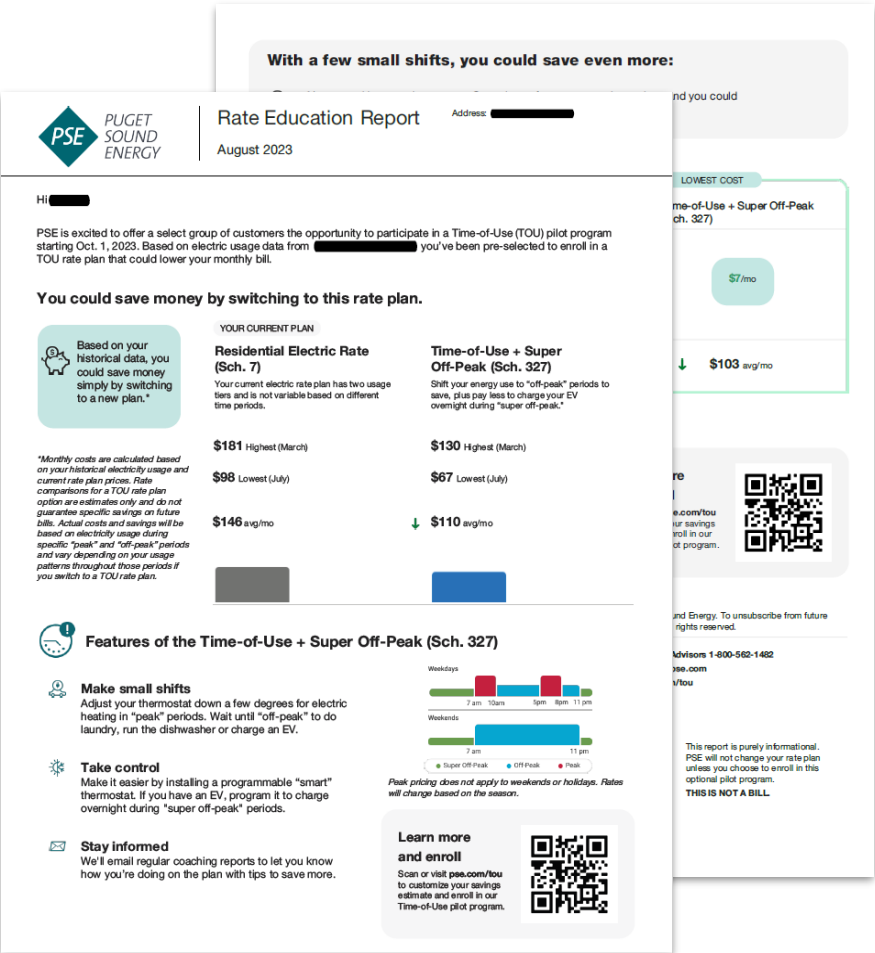
Load
Shift

Set customers up
for success on their
new TOU rate

94%

Of TOU customers
took action to shift
usage

Rate Education Reports



Rate Advisor Web Tool

Time-of-Use (Sch. 307)

Your Current Plan

Residential Electric Rate (Sch. 7)

\$162 avg/mo

Based on your usage from the past 12 months.

This Plan

Time-of-Use (Sch. 307)

\$164 avg/mo

Based on your usage from the past 12 months.

Personalized Estimate

\$133 (↓ \$31) avg/mo

Based on your behavior selections.

[Edit Selections](#)

Plan Details

Time-of-Use (TOU) is an optional rate plan featuring "peak" and "off-peak" periods during the day when electricity rates are higher or lower to reflect the varying cost of supplying energy during that time. If you shift your use during designated "peak" periods to times of the day when electricity rates are lower, you may lower your monthly electric bill. Pay less than your current rate during all other "off-peak" periods and on weekends/holidays.

The usage costs per kWh includes TOU base energy rates only. Any credits or surcharges implemented by other tariff schedules which are added to the rate(s) shown below are available on the [Rates schedule summaries page](#) and allow you to view a specific rate schedule summary of itemized prices by selecting the service type and linking to the current price summary.

* Summer Weekday Usage Costs per kWh (Apr - Sept)



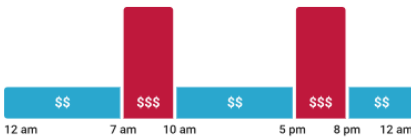
● Off-Peak (12 a.m. - 5 p.m. & 8 p.m. - 12 a.m.)

\$0.064*

● Peak (5 p.m. - 8 p.m.)

\$0.197*

* Winter Weekday Usage Costs per kWh (Oct - Mar)



● Off-Peak (12 a.m. - 7 a.m., 10 a.m. - 5 p.m., & 8 p.m. - 12 a.m.)

\$0.064*

● Peak (7 a.m. - 10 a.m. & 5 p.m. - 8 p.m.)

\$0.313*

*Displayed rate does not include additional taxes, trackers, riders, surcharges and credits that will be added to the rate at the time of billing.

Rate Coach Email Sequence

Welcome Email



Energy Update
1542 y***

Hi ALEXANDER S,

Welcome to your new Time-of-Use + Peak Time Rebates (Sch. 317) rate plan! As of 2024-06-12, your electricity costs are based on how much you use during the "peak" and "off-peak" periods noted below.

Your new Time-of-Use + Peak Time Rebates (Sch. 317) rate plan

Electricity is 2x more expensive during peak periods on weekdays, and less expensive during off-peak periods on weekdays, weekends and holidays.

12 am 5 pm 8 pm 12 am

\$5

\$5

\$5

\$5

\$5

Off-Peak

Peak

Peak Credit

When and how you use electricity matters

Here's what you can do to set yourself up for success on your new TOU rate plan.

Wait 8 Make small shifts

Avoid using the most energy-intensive appliances and electric heating/cooling systems during "peak" periods. Try waiting until "off-peak" to:

- Do laundry or wash dishes
- Take showers or baths
- Pre-warm your home before turning down the thermostat
- Charge an electric vehicle

Alerts when your electricity use and costs are tracking higher than normal so you can make adjustments

You can also visit [pse.com/lower](#) for more insights into your energy use and ways to save.

Did you find this email useful?

Yes

No

Weekly Update



Energy Update
1542 y***

Hi ALEXANDER S,

Here's what you spent so far on your TOU rate plan

\$18

as of Oct 05

Sep 13

Est. \$21

Estimated electricity cost only*

Last month's electricity cost

\$18

This is not a bill. The amounts shown here are estimated electricity usage charges, including applicable taxes, basic charges and fees. They may not include other charges, credits or discounts, and may not match your total billed amounts each month.

Compare your peak/off-peak electricity use and estimated costs last week versus the previous week

Avg weekday use: Last week

Off-Peak

Peak

Off-Peak

Peak

Off-Peak

Last: \$0 \$1 \$1 \$1 \$0

Previous: \$0 \$0 \$1 \$0 \$0

Winter savings tip

As the weather starts to cool down, we want to remind you that our Time-of-Use (TOU) winter rate schedule is from October 1 to March 31 and your energy usage will be billed at different rates depending on the time of day. Consider lowering your temperature by a few degrees during peak hours and upgrading to a Wi-Fi enabled thermostat, which can optimize your heating usage and help you stay cozy while saving energy!

Here are the peak/off-peak periods for your TOU rate

12 am 7 am 10 am 5 pm 8 pm 12 am

\$5

\$5

\$5

\$5

\$5

Off-Peak

Peak

Peak Credit

Did you find this email useful?

Yes

No

Bill Summary



Energy Update
1542 y***

Hi ALEXANDER S,

You spent \$4 more compared to last month

My electricity cost comparison*

Last month This month

\$18 \$22

September 2024 October 2024

Avg temp: 60° Avg temp: 55°

Outside temperatures that are 5° cooler and other factors (changes in schedule, the amount of people at home, etc.) are causing higher electricity usage.

Most of your weekday electricity costs this month were during Peak hours

Avg weekday use: Sep 13 - Oct 14

Off-Peak

Peak

Off-Peak

Peak

Off-Peak

Oct: \$1 \$2 \$4 \$2 \$1

Sep: \$1 \$1 \$2 \$1 \$2

you used the most electricity on 1 month

Top 5

Lighting

Kitchen

Electronics

Laundry

Other

31%

27%

19%

11%

9%

Did you find this email useful?

Yes

No

High Bill Alert



Usage Alert
1542 y***

Your use this month is estimated to be \$21. That is \$3 more than last month.

Here's what you spent so far on your TOU rate plan

\$16

as of Oct 5

Sep 13

Est. \$21

Estimated electricity cost only*

Last month's electricity cost

\$18

This is not a bill. The amounts shown here are estimated electricity usage charges, including applicable taxes, basic charges and fees. They may not include other charges, credits or discounts, and may not match your total billed amounts each month.

When and how you use electricity matters

Find more ways to increase your efficiency, manage your use and lower your bill.

[Learn More](#)

So far, you've spent \$2 during "peak" hours.

Avg weekday use: Sep 13 - Oct 03

Off-Peak

Peak

Off-Peak

Peak

Off-Peak

Current: \$1 \$1 \$2 \$1 \$1

Previous: \$1 \$1 \$2 \$1 \$2

Manage your TOU Usage Alerts

Change how frequently you receive personalized usage updates and customize your bill threshold to trigger an alert in the Time-of-Use Preference Center.

[Manage TOU Alerts](#)

Did you find this email useful?

Yes

No

Open Q&A



Year One Customer Surveys

TVR Pilot Participant Surveys

Enrollment Survey (2023)	PSE surveyed all enrollees upon their enrollment: Information about the household prior to participation
Non-enrollment Survey (2024)	Cadmus surveyed customers who received outreach/marketing for the pilot but who did not enroll (why not?)
Winter Experience (Year 1 - 2024)	Cadmus surveyed participants about their experience with the pilot after their first season with TVR rates (Winter)
Summer Experience (Year 1 - 2024)	Cadmus surveyed participants about their experience with the pilot after their second season with TVR rates (Summer)
<i>Winter and Summer Experience surveys will be run again in Year 2 (2025)</i>	<i>Cadmus will survey pilot participants again in Year 2 Looking for trends and persistence over time</i>

TVR Pilot Participant Surveys - Residential

Customers Used the Tools

94% of TOU participants used the Rate Advisor tool to evaluate rate options

- **88%** found rate comparisons easy to understand
- **84%** said rate comparisons influenced their enrollment decision

*Only **34%** of non-enrollees recalled seeing the Tool*

High Recall and Usefulness Ratings

	Recall Rate	Usefulness (10-point scale)
TOU Weekly Updates	90% (Winter) 98% (Summer)	7.1 (Winter) 7.2 (Summer)
TOU Monthly Summaries	92% (Winter) 94% (Summer)	7.3 (Winter) 7.6 (Summer)

Building TOU Rate Literacy

Over 80% of Rate Coach recipients correctly identify morning and evening on-peak periods during the winter TOU season

90% of Rate Coach recipients correctly identify evening on-peak periods during the Summer season

Customers Took Action

92% (Summer) to 94% (Winter) took action to reduce usage during on-peak periods

- Most shifted **laundry and dishwashing**
- Most EV drivers shifted **charging schedule**

Of those who took action, **71% (Winter) to 79% (Summer)** agreed it **was easy to shift usage** (fewer changed temp setting in Summer)

Survey Differences by Income Groups

Income Eligible Customers

- More satisfied with bill savings
 - +0.5 to +0.9 higher ratings on 10-point scale
- Find load shifting less inconvenient
- More concerned about cold in winter
- More likely to be electric-only customers

Income Ineligible Customers

- Less satisfied with savings
- More concerned about changing their schedules and their level of effort relative to savings
- Among non-enrollees, more likely to say that potential savings are not enough and not concerned about bill increases

TVR Pilot Participant Survey - Commercial

Commercial Enrollment

Businesses responded to print more than email

- **78% of enrollees** recalled learning about TVR from printed mailings
- 80% of non-enrollees recalled TVR outreach, and **74%** of them said they heard about TVR via email from PSE

Recall and Usefulness Ratings

	Recall Rate	Usefulness (10-point scale)
TOU Monthly Summaries	68% (Winter) 90% (Summer)	7.4 (Winter) 6.4 (Summer)

Survey response rate fell by half from Winter to Summer

TOU Rate Literacy Less than Residential

About 50% correctly identify both morning and evening on-peak periods during the Winter season

56% correctly identify evening on-peak periods during the Summer season

27% (Winter) to 36% (Summer) thought 10am-5pm was on-peak (FALSE)

Commercial Customers Took (Less) Action

58% (Summer) to 63% (Winter) took action to reduce usage during on-peak periods

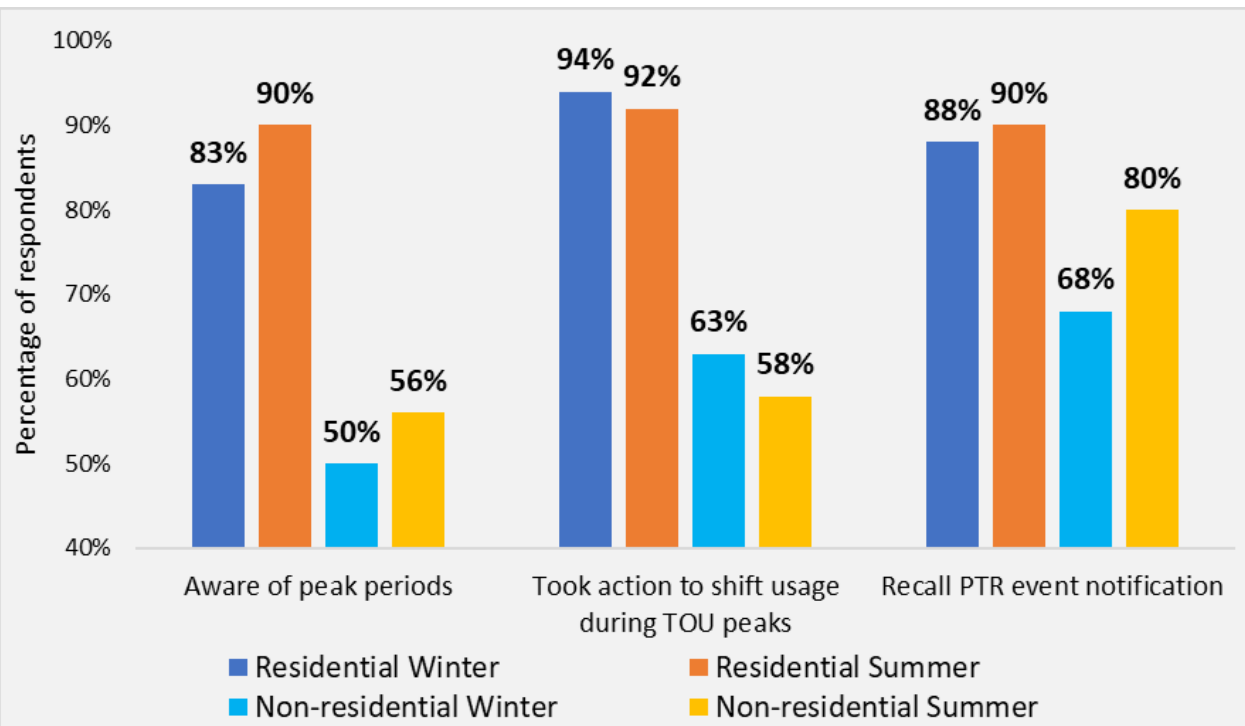
- Most shifted **equipment**, about half used **less lighting**
- *Biggest difficulty was equipment that needs to stay on*

Of those who took action, **62% (Summer) to 65% (Winter)** agreed it was easy to shift usage

Survey Differences: Residential vs. Nonresidential

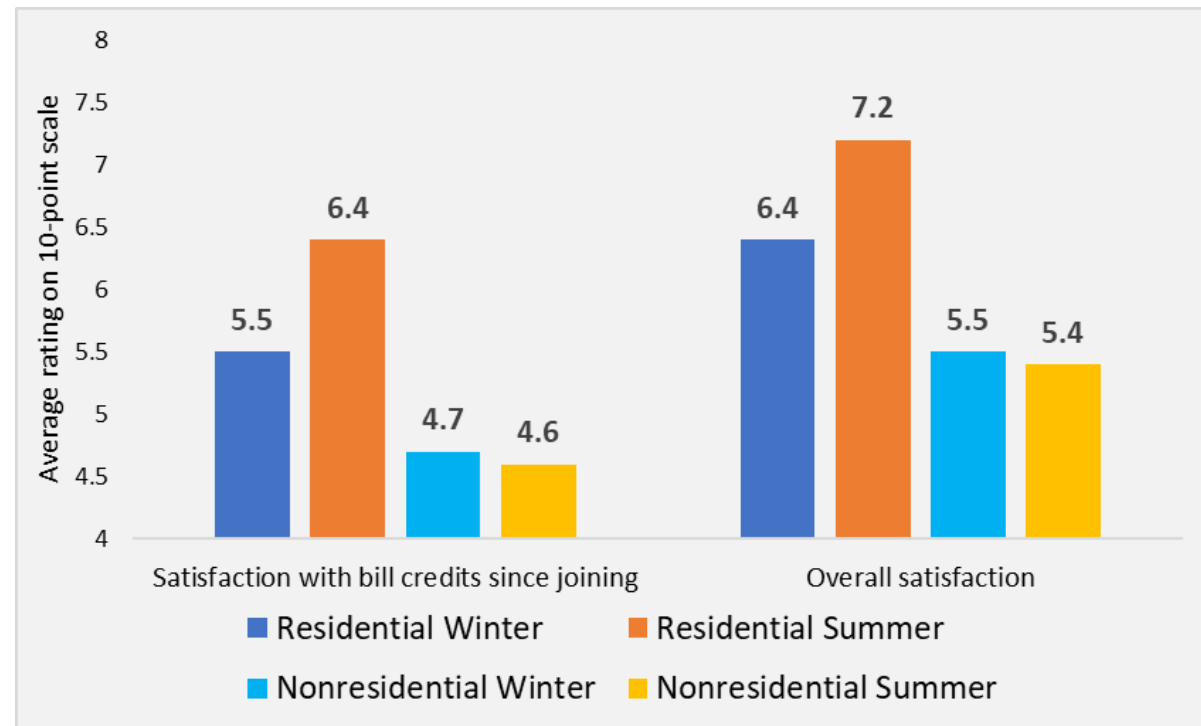
Residential participants are more engaged

- Aware of peaks
- Actively shifting usage from peaks
- Recall PTR events



Residential participants are more satisfied

- Residential ratings were higher in Winter, and improved after Summer
- Nonresidential ratings were lower and did not improve



TVR Pilot Participant Surveys: Smart Devices

Enabling Tech: Smart Thermostats & EV Chargers

- **98% of residential enrollees have wi-fi internet**
- **74%** of 327 (super off-peak) had smart thermostats
- **53%** of Income Ineligible (307+317) had smart thermostats
- **37%** of Income Eligible (307+317) had smart thermostats
- **30%** of Businesses (324) had smart thermostats
- **84%** of 327 (super off-peak) have EVs, **97%** charge at home

Use of Smart Devices to Shift Load

Used **smart devices to shift load off peak:**

- About **35%** of Income Ineligible (307+317)
- About **25%** of Income Eligible (307+317)
- And **62%** of Super off-peak (327)
- Businesses: **36% Winter and 50% Summer**
- **About 80%** using smart devices use **smart thermostats**
- **68%** of Super-off peak also use **smart EV chargers**
- Also using smart plugs (29% res), smart lights (28% res)

Opt-out Free Smart Thermostats

11 BDR customers who received opt-out smart thermostats took the Winter survey:

- 100% recalled receiving the thermostat
- But only **9%** (one household) installed it

Opt-in Free Smart Thermostats

10 BDR customers who received opt-in smart thermostats took the Summer survey:

- 90% recalled receiving the thermostat
- But only **10%** (one household) installed it



Year One Impact Findings

Impact Evaluation Methodology

Objectives

- Estimate average electricity demand (kW), energy (kWh), and bill impacts (\$) for each pilot treatment group

Step 1: Nonparticipant Matched Comparison Groups

- Selected nonparticipant matched comparison group for each pilot treatment group
- Nonparticipants were eligible for pilot, but did not receive marketing and did not enroll organically
- Nonparticipants filtered for each group by income eligibility, likely EV owners (for Sch. 327)
- Matched based on each customer's average, non-holiday daily load shapes in year prior to PY1 (pre-period)
- Result: comparison group with similar daily load shape to TVR enrollees (hourly differences less than +/-5%)

Step 2: Difference-in-Differences Panel Regression Models

- Separate regressions for each group, season, day type, and hour of the day
- Result: TVR pilot demand and energy impacts that control for weather, pre-TVIR consumption patterns, and unobservable, non-pilot changes in energy consumption (via the matched comparison groups)
- Statistical significance of results (90% confidence intervals for each result)

TOU Demand Reduction: Winter

Figure 1. TVR Year 1 Winter Average TOU Demand Reductions by Rate and Period (kW)

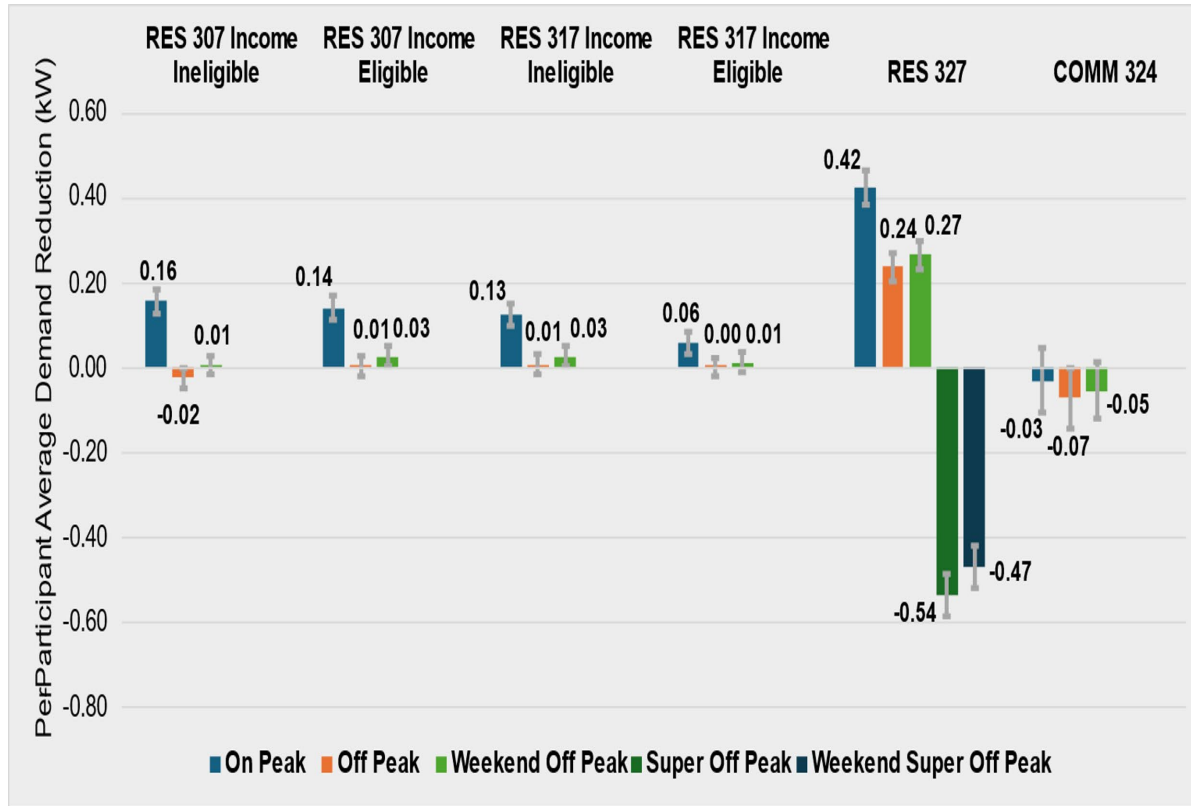
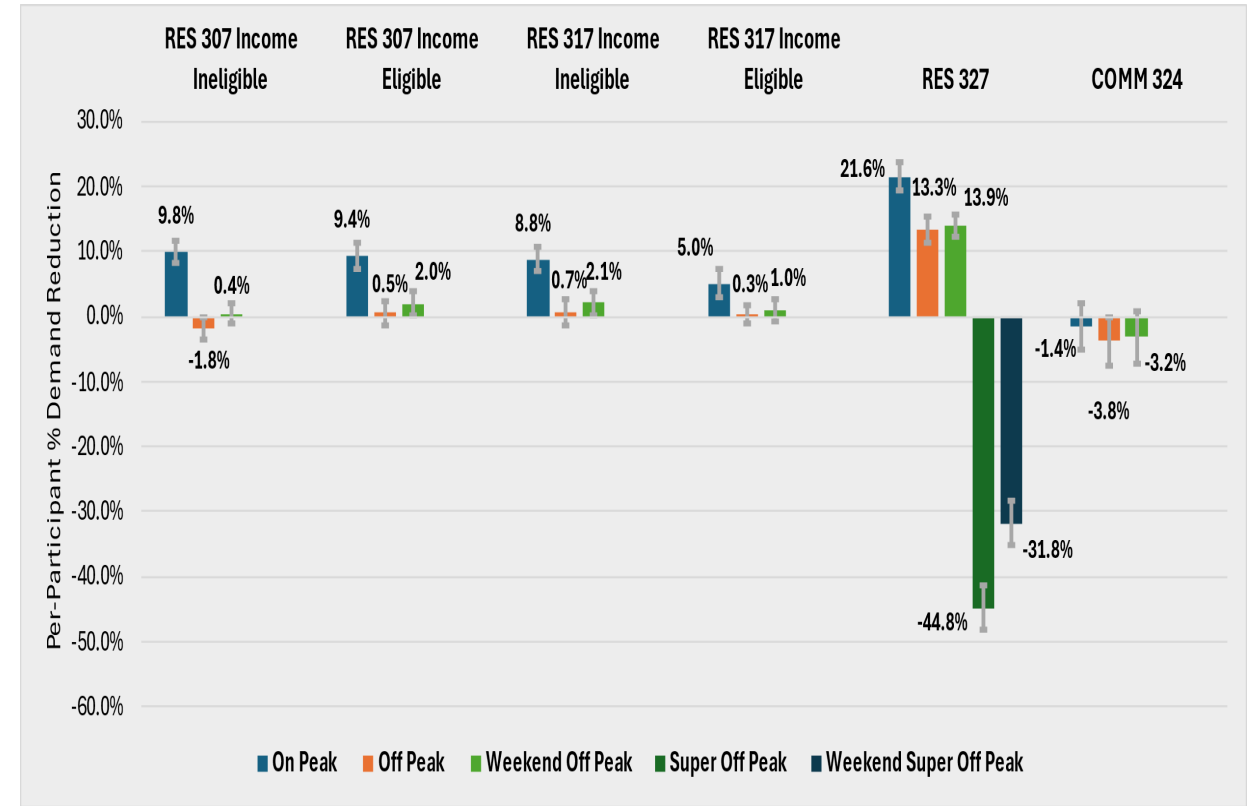


Figure 2. TVR Year 1 Winter Average TOU Demand Reductions by Rate & Period (%)



*grey line indicates statistical confidence interval: bars that cross zero are not statistically different from zero (no effect)

TOU Demand Reduction: Summer

Figure 1. TVR Year 1 Summer Average TOU Demand Reductions by Rate & Period (kW)

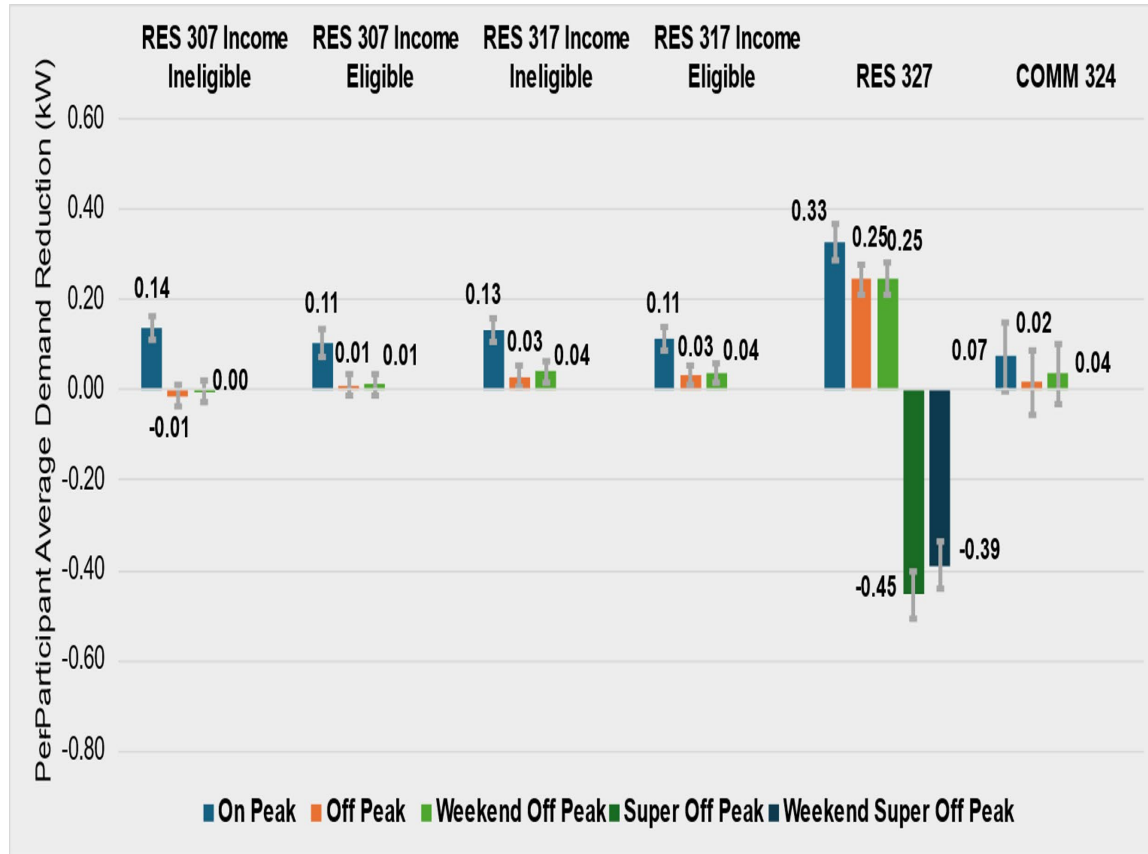
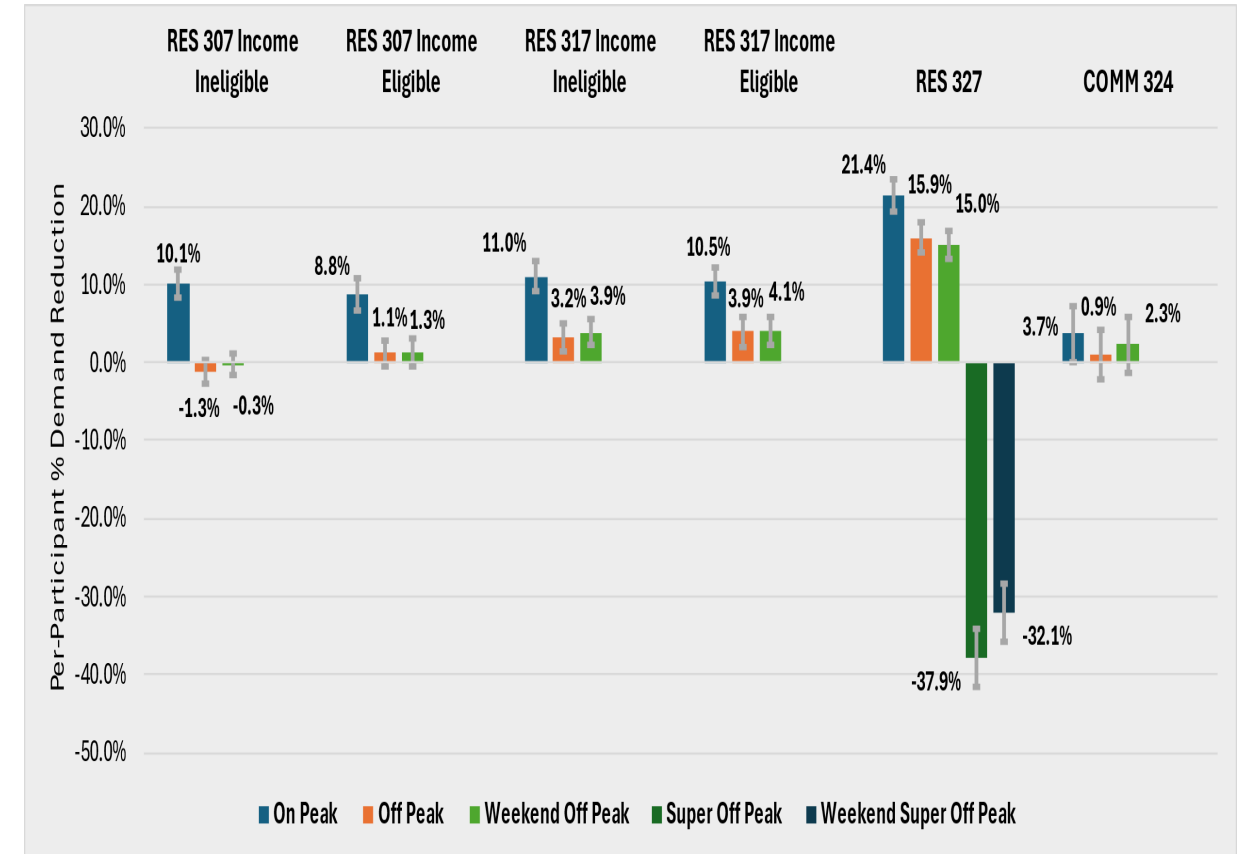


Figure 2. TVR Year 1 Summer Average TOU Demand Reductions by Rate & Period (%)

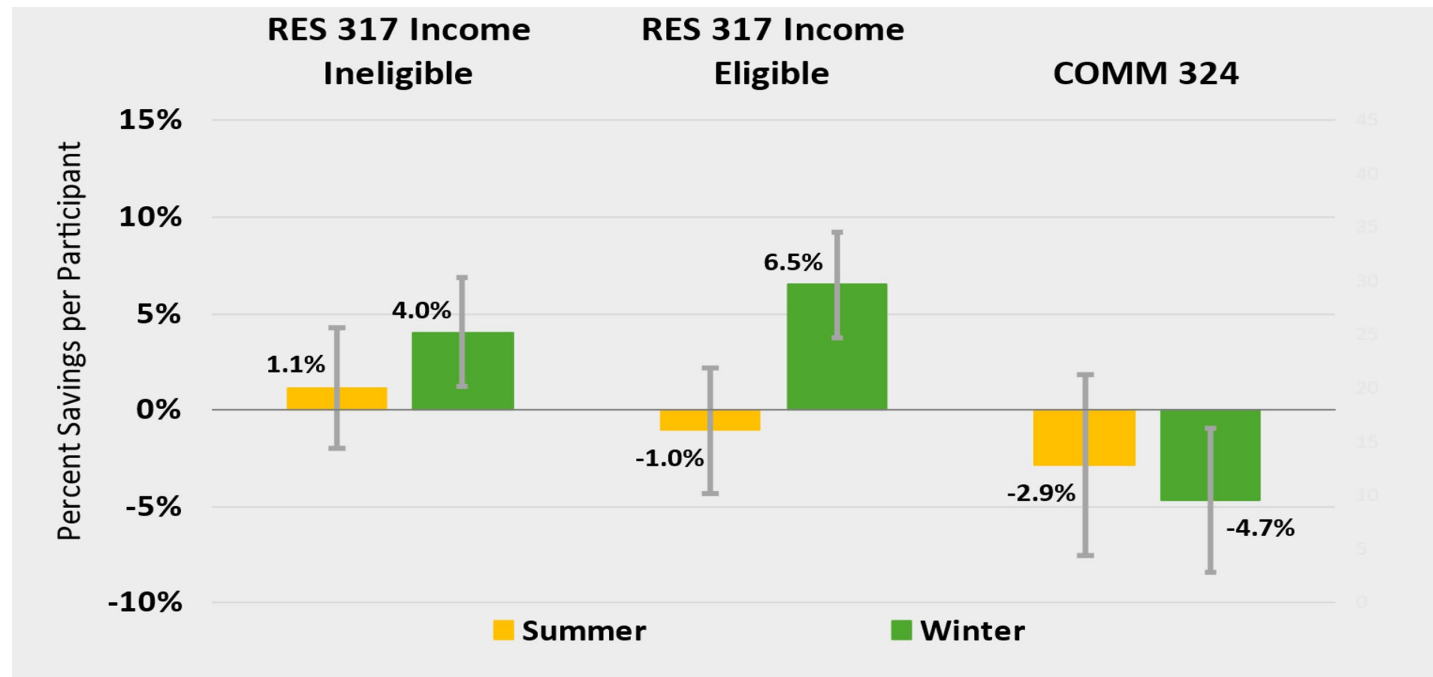


*grey line indicates statistical confidence interval: bars that cross zero are not statistically different from zero (no effect)

Peak Time Rebate (PTR) Events

- PTR events produced significant demand reductions during the winter for residential participants (Schedule 317), however summer PTR events did not produce significant reductions.
- Non-residential participants (Schedule 324) did not achieve any PTR savings during either event season.
- Residential Income Eligible customers achieved higher PTR savings during winter events compared to the Income Ineligible group.

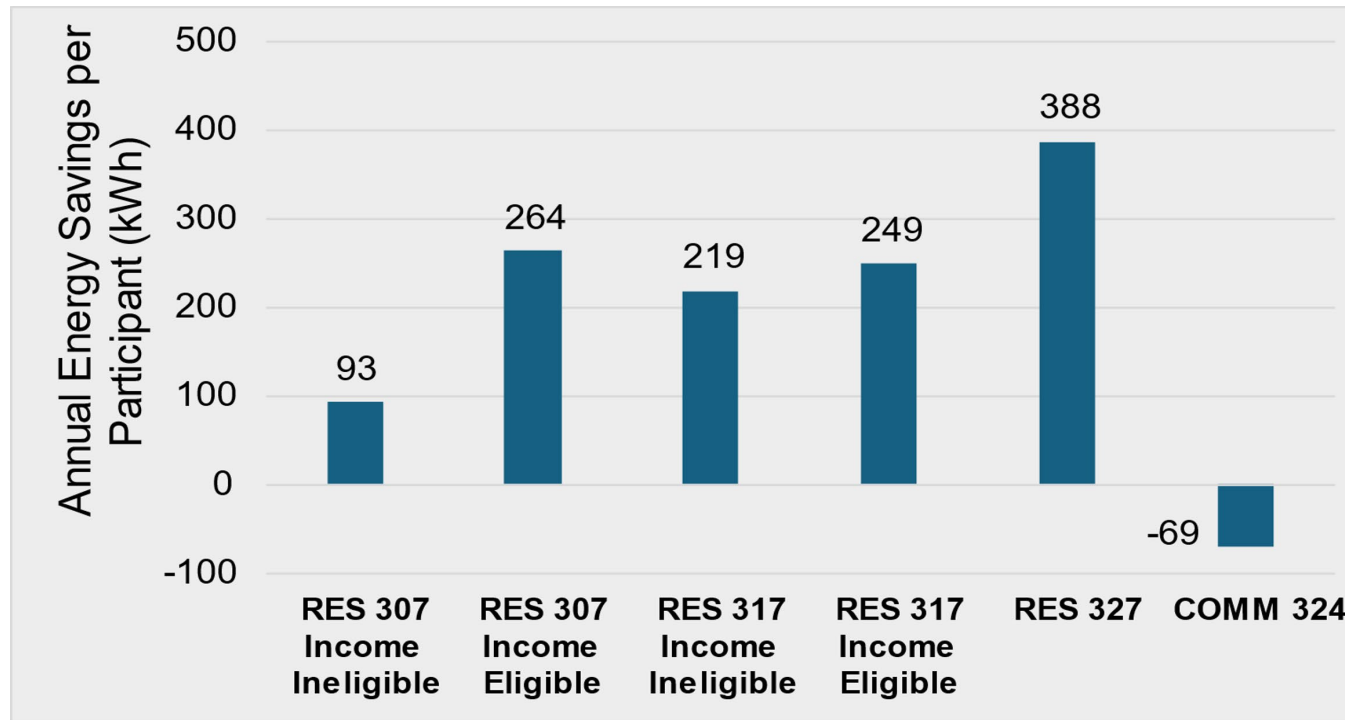
Figure 3. Average PTR Demand Savings by Rate and Season (%)



TOU Energy Savings: kWh

- Participants on all residential TVR rates achieved annual kWh energy savings.
 - Participants on Schedule 327 (super off-peak) had the highest annual energy savings and the treatment group with the second-highest annual energy savings were Income Eligible Schedule 307 (TOU-only) participants.
- Non-residential participants (Schedule 324) did not have significant energy savings.

Figure 4. TVR Year 1 Annual Energy Savings (kWh)



Summary of Key Findings

Schedule 307 (Residential TOU):

- **Significant load shifting** from TOU peaks (kW), **saving energy** overall (kWh), similar impact by income group but **Income Eligible more satisfied**

Schedule 317 (Residential TOU+PTR):

- **Significant load shifting** from TOU peaks (kW), **saving energy** overall (kWh), similar impact by income group but **Income Eligible more satisfied**
 - PTR events reduced demand significantly in winter (incremental over TOU), but not by a significant amount in summer

Schedule 327 (Residential TOU Super Off-Peak):

- Largest loads shifted, driven by charging EVs overnight during super off-peak period – high impact and relatively high satisfaction.

Schedule 324 (Nonresidential TOU+PTR):

- **No significant load shifting or energy savings, lowest engagement, lowest satisfaction**
 - Many likely benefit structurally from this rate because their consumption is already off-peak
 - No significant impact for summer PTR events, negative impact for winter PTR events

PY1 EM&V Next Steps

“Shadow Bill” Analysis

- Shows how much each TVR participant’s actual, annual PY1 consumption would have cost on standard rates
 - Does not account for overall efficiency impacts (energy savings) from TVR
- BDR participants who received Bill Protection get refund on 90% of the difference in their total annual energy charges (between Sch. 7 and TVR) if they paid more under TVR than they would on the standard rate

Ex Ante Bill Analysis

- Shows distribution of expected bill impacts assuming no behavior change (no load shifting due to TVR; no non-pilot consumption changes)
- Interpretation: What percentage of participants structurally benefit from TVR, even without any behavior change?

Ex Post Bill Analysis

- Shows distribution of estimated bill impacts given TVR behavior change, based on pre-TVOR customer specific modeled consumption.
- Controls for weather and reflects energy efficiency due to TVR, but cannot control for individual, non-pilot consumption changes such as occupancy or added loads like EVs.



Lessons Learned & Future State Strategy

PY1 Lessons Learned and Opportunities

Lessons Learned & Challenges

- Combination of personalized rate comparisons and enrollment incentive results in successful recruitment
- End-to-end testing for all use cases in customer journey prior to launch critical for success
- Integrated marketing and communications key to ensure consistent messaging across programs
- Build customer service capacity and deliver robust training for all customer facing teams
- Include disclaimers on estimated potential billing impacts

Opportunities Looking Forward

- Refine program-to-program interactions and develop clear customer communications on eligibility
- Enable TOU bundling with Demand Response and Distributed Energy Resources programs
- Allow billing proration for TOU enrollments/un-enrollments
- Refine AMI estimation rules and standards

Time-of-Use Scaled Deployment Roadmap

