Biennial Electric Conservation Achievement Review (BECAR) of the Puget Sound Energy 2020-2021 Electric Conservation Program Portfolio

Final Report

MAY 12, 2022

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Executive Summary

This report presents the methods and results of the Biennial Electric Conservation Achievement Review (BECAR) of the Puget Sound Energy (PSE) 2020-2021 electric conservation program portfolio.

In 2019, the Washington Utilities and Transportation Commission (WUTC) issued Order 01 in Docket UE-190905 approving PSE's 2020-2021 biennial conservation target, subject to conditions. Part of this process involves selecting a third-party independent consultant to complete the BECAR review, with the consultant being managed by PSE and WUTC staff with additional input from the Conservation Resource Advisory Group (CRAG). In May 2020, PSE selected Evergreen Economics as the third-party consultant to conduct the BECAR process for the 2020-2021 biennium.

This report is the last for the 2020-2021 BECAR cycle; it summarizes the methods, findings, and recommendations resulting from the Evergreen team's review of the 2020 and 2021 program year achievements.

There were four primary tasks completed for the 2020-2021 BECAR period:

1. **Unit energy savings (UES) review.** The Evergreen team conducted a review of the deemed UES values that were in use for PSE's 2020 conservation programs. The objectives of this review were to ensure that UES values were being applied correctly in the tracking data, that the most current and accurate values were being used, and that the values relied on assumptions that were appropriate for the measure application.
2. **Portfolio savings review.** This task involved a review of PSE's portfolio savings as they appeared in PSE's 2020 Annual Report and 2021 Annual Report. The objective of this task was to confirm that PSE's reported savings for each year matched what was recorded in the program tracking data.
3. **Previous BECAR recommendation response review.** For this task, the Evergreen team compiled and reviewed the recommendations that were made in the 2018-2019 BECAR report. We then contacted PSE staff to follow up on what actions, if any, have been taken to address these recommendations and what actions are planned for the future. Finally, the Evergreen team made a determination as to whether the recommendation has been adequately addressed or if additional action is needed.
4. **Evaluation report response review.** The Evergreen team reviewed the Evaluation Report Responses (ERRs) for program evaluation reports completed in 2020 and compiled the recommendations and PSE responses contained in each. For each program, we reached out to the relevant PSE staff person as needed to find out what actions have been taken to follow up on the recommendations since the completion of the ERR.

BECAR Conclusions

Our BECAR conclusions are provided below, based on each of the primary review activities.

Unit Energy Savings Review

Overall, we found that the UES values in use by PSE were applied correctly and were based on reasonable assumptions. Specific recommendations were made in an interim memo to PSE detailing our findings, and PSE responded to those recommendations. Both the recommendations and PSE's responses are provided in Appendix A of this report. Based on PSE's responses, there are no additional recommendations at this time for measure-specific UES values.

Portfolio Savings Review

For the portfolio savings review task, we were able to confirm that the total 2020 and 2021 kWh values reported by PSE matched the numbers in the tracking data summary.

Previous BECAR Recommendation Response Review

Some of the prior BECAR recommendations related to continuing with the UES updates and providing the ERR for each evaluation recommendation; both of these activities are continuing. An additional recommendation involved continuing to monitor progress on some of the longer-term evaluation recommendations that needed to be addressed in future evaluations (i.e., after the last BECAR report was completed).

For the most part, PSE has addressed these longer-term recommendations, either by accepting them or else providing a valid reason for not making the change. There are some instances where PSE has not followed through on the recommendation, and these are noted in our report for future review. Of these, PSE has indicated that some of the recommendations will be addressed as part of the next program evaluation.

Evaluation Report Response Review

The Evergreen team found that the recommendations made in the evaluation reports of the Commercial and Industrial Retrofit, Multifamily New Construction, Home Energy Reports, and Large Power User programs have mostly been addressed by PSE or will be addressed in the future. As with the prior BECAR recommendations, there are some cases where the previous evaluation recommendations will need to be addressed as part of the next program evaluation, and these instances are noted in our report below. Future BECAR reviews should confirm that PSE followed through on these recommendations in the next evaluation cycle. There are a couple of other instances where PSE has yet to adopt a previous evaluation recommendation. Beyond continuing to monitor progress on the remaining longer-term recommendations, we do not have any additional suggestions based on the review of the 2020 evaluation reports and ERRs.

1 Introduction

This report is the final one in the 2020-2021 BECAR cycle; it summarizes the methods, findings, and recommendations resulting from the Evergreen team's review of the conservation achievements for the 2020 and 2021 program years.

The following are the primary objectives of the 2020-2021 BECAR:

- Provide independent review of unit energy savings (UES) values and their application to PSE program measures;
- Verify that PSE's reported annual savings corresponds to program tracking data; and
- Review and provide recommendations on PSE's responses to evaluation recommendations and previous BECAR recommendations.

1.1 Data Sources

To achieve the objectives listed above, a number of different data sources were used to support the reviews described in this report:

- **2018-2019 BECAR Final Report.** This report details the activities, findings, and recommendations of the previous BECAR cycle.
- **2020-2021 Biennial Conservation Plan.** The current PSE Biennial Conservation Plan describes the programs and measures offered and activities undertaken by PSE in the 2020-2021 program years.
- **2020 and 2021 Annual Conservation Reports.** These annual reports summarize PSE's achievements resulting from the conservation programs and activities for 2020 and 2021. they include information on expenditures; savings; cost effectiveness; and evaluation, measurement, and verification activities.
- **PSE staff.** A handful of phone interviews and email exchanges were conducted with PSE program staff to determine the current status of actions taken to address previous BECAR and evaluation recommendations.
- **PSE program tracking database extracts.** PSE provided a final year-end dataset for both 2020 and 2021.
- **Business case documentation.** Business cases containing information on measure savings, assumptions, and calculations were provided by PSE and reviewed by the Evergreen team.
- **Evaluation Report Responses (ERRs).** The Evergreen team reviewed ERRs completed by PSE in 2020. These were for evaluations covering earlier program years that have been completed since the last BECAR report. ERRs for the following evaluations were reviewed:

- 2018-2019 Commercial and Industrial Retrofit Compliance Program Evaluation
- 2019-2020 Evaluation of the Multifamily New Construction Program
- 2018-2019 Large Power User Compliance Program Evaluation
- 2018 & 2019 Home Energy Report Savings Memos

Using these data sources, four primary tasks were completed for the 2020-2021 BECAR period:

1. **Unit energy savings review.** As the first task in the BECAR process, the Evergreen team conducted a review of the deemed UES values that were in use for PSE's 2020 conservation programs. The objectives of this review were to ensure that UES values were being applied correctly in the tracking data, that the most current and accurate values were being used, and that the values relied on assumptions that were appropriate for the measure application.
2. **Portfolio savings review.** This task comprises a review of PSE's portfolio savings as they appeared in the PSE 2020 Annual Report and 2021 Annual Report. This review was done to confirm that PSE's reported savings each year matched what was recorded in the program tracking data.
3. **Previous BECAR recommendation response review.** For this task, the Evergreen team compiled and reviewed the recommendations that were made in the 2018-2019 BECAR report. We then contacted PSE staff to follow up on what actions, if any, have been taken to address these recommendations and what actions are planned for the future. Finally, the Evergreen team made a determination as to whether the recommendation has been adequately addressed or if additional action is needed.
4. **Evaluation report response review.** The Evergreen team reviewed the Evaluation Report Responses (ERRs) for program evaluation reports completed in 2020 and compiled the recommendations and PSE responses contained in each. For each program, we reached out to the relevant PSE staff person to find out what actions have been taken to follow up on the recommendations since the completion of the ERR. Evaluation work scheduled in 2021 was not completed until early 2022, and evaluation reports and ERRs were filed with the Annual Conservation Report in April 2022. Consequently, there was not enough time for PSE to implement appropriate responses to the recommendations and for the Evergreen team to evaluate those responses. The ERR review for the 2021 program evaluations should be completed as part of the next BECAR cycle.

An optional task, **in-depth review of selected energy savings**, was not needed for the 2020-2021 BECAR process. As an optional task, this is reserved for special cases where additional review of measures beyond what is covered in the other four tasks is necessary. For the 2020-2021 BECAR period, no measures or programs were identified by PSE, the WUTC, or the CRAG for in-depth review of energy savings, so this optional task was not conducted.

2 Methods and Findings

This section presents the methods and findings of each of the tasks completed for the 2020-2021 BECAR period:

1. Unit energy savings (UES) review
2. Portfolio savings review
3. Previous BECAR recommendation response review
4. Evaluation report response review

2.1 Unit Energy Savings Review

As the first task of the 2020-2021 BECAR process, the Evergreen team conducted a review of the deemed UES values that were in use for PSE's 2020 conservation programs. The objectives of this review were to ensure that UES values were being applied correctly in the tracking data, that the most current and accurate values were being used, and that the values relied on assumptions that were appropriate for the measure application. This review was conducted in the summer of 2021.

As a first step in the UES review, the Evergreen team requested a summary of the program measures installed in program year 2020 (PY2020).[1] This included detail on the program, measure type, quantity installed, per unit savings, total savings, source of savings, version start and end date, and measure lifetime. Based on these year-to-date data, we selected a subset of measures for further review. Measures were prioritized for review if they made up a large portion of PY2020 savings, had deemed UES values, had a source of savings other than the RTF, were recently updated, and/or were recommended for additional review in a previous BECAR report. The selection also included a variety of measure types including HVAC, water heating, thermostats, and lighting measures.

The 18 measures selected for review along with their source of savings, UES value, share of PY2020 savings, and summary of documentation provided by PSE are summarized in Table 1.

Based on our review, we developed a series of recommendations on the selected UES values. These recommendations along with PSE's responses are provided in Appendix A of this report.

[1] PSE provided these data in March 2021.

Table 1: Measures Selected for 2021 UES Review

EES Measure ID	Sector	End Use	Measure Name	Source of Savings	UES (Measure Cases)	UES (Calculated)	Measure Life	PY2020 Savings (kWh)	PY2020 Savings %
10014-5	Residential	Lighting	RETL: Lamp - LED - Reflector	PSE-deemed	28.1	28.1	9	7,000,771	3.2%
10008-6	Residential	Lighting	RETL: Lamp - LED - A Lamp	PSE-deemed	11.3	11.3	12	6,235,340	2.8%
10628-4	Commercial	Lighting	LTGO: Lamp - TLED - 2 3 or 4 foot	PSE-deemed	31.8	31.8	12	3,446,770	1.6%
10609-3	Residential	Lighting	RETL: Fixture - LED - T8	PSE-deemed	2.5	28.6	15	3,146,179	1.4%
10003-6	Residential	Lighting	RETL: Fixture - LED - Retrofit Kit	PSE-deemed	25.6	25.6	12	2,872,290	1.3%
12322-1	Residential	HVAC	Heat Pump - Ductless - from Zonal - 9.0 or greater HSPF - HZ1CZ1 - SF or DX	RTF Deemed	1,997.0	1,997.0	15	2,026,955	0.9%
12326-1	Residential	HVAC	Heat Pump - from E FAF - SF or DX	RTF Deemed	3,517.0	3,517.0	15	1,540,446	0.7%
12114-4	Commercial	Lighting	SBDI: Lamp - TLED - 4 ft - 4x - from 4 ft T8 32w BBF 4x	PSE-deemed	255.0	255.0	12	1,374,705	0.6%
12856-1	Residential	HVAC	Heat Pump - Ductless - Tier 2 - Less than 65 kBtuh - EH - Res - EX	Calculated	N/A	1,555.9	15	841,736	0.4%

EES Measure ID	Sector	End Use	Measure Name	Source of Savings	UES (Measure Cases)	UES (Calculated)	Measure Life	PY2020 Savings (kWh)	PY2020 Savings %
12868-1	Residential	HVAC	Heat Pump - Split - Tier 2 - Less than 65 kBtuh - EH - Res - EX	Calculated	N/A	5,293.4	15	614,030	0.3%
12672-1	Residential	Water Heating	Showerhead - 1.51 to 1.8 gpm - RP - Any WH - Res - C	PSE-deemed	56.2	56.2	3	565,260	0.3%
12871-1	Residential	Water Heating	Water Heater - Heat Pump - EH - Res	Calculated	N/A	1,565.1	13	295,799	0.1%
12736-1	Residential	Controls	Thermostat - Smart - EH - Res	PSE-deemed	506.0	506.0	11	295,504	0.1%
12528-2	Residential	Appliances	Clothes Washer - Energy Star - Any WH - Any Dryer - Res - C	RTF Deemed	142.0	142.0	14	252,050	0.1%
12363-1	Commercial	HVAC	Heat Pump - Ductless - Comm	PSE-deemed	1,589.0	1,589.0	15	163,127	0. 1%
12240-1	Commercial	HVAC	CMID: Air Conditioner - AC - Btuh 240k to 760k - Tier 3	Calculated	N/A	4,204.7	15	96,708	<0.1%
12357-1	Commercial	Controls	Thermostat - Web Enabled - HP Heating - Comm	RTF-deemed	116.0	116.0	10	43,500	<0.1%
Total								**30,811,169**	**13.9%**

2.2 Portfolio Savings Review

The Evergreen team conducted a review and confirmation of PSE's portfolio savings as they appeared in its 2020 Annual Report and 2021 Annual Report. For both years, our review process followed these steps:

1. PSE provided Evergreen with an extract of its participant database that showed the count and savings for individual measures for each program for PY2020 and PY2021.
2. PSE provided a copy of its Annual Report (*2020 Annual Report of Energy Conservation Accomplishments April 9, 2021)* and Excel file (*UE-190905-PSE-Exhibit-1-Savings-and-Expenditures-2020*) showing the total savings reported for PY2020 and for each program category. For 2021, analogous files were provided: *2021 Annual Report of Energy Conservation Achievements* and Excel file (*UE-190905-PSE-Exhibit-1-Savings-and-Expenditures-2021*).
3. Evergreen aggregated the participant data to obtain the total savings for each program or measure, using the schedule number from the Annual Reports and the *ElectricOrderName* field in the tracking data as the aggregating variables.
4. Evergreen compared its own savings totals with those PSE published in the Annual Reports and the Exhibit 1 Excel files referenced above.

The result of our verification of PSE's reported savings is shown below in Table 2 for PY2020 and in Table 3 for PY2021, and includes the program name and schedule number that we used to confirm the savings totals against the tracking data. For the most part, we were able to confirm the total kWh savings values reported by PSE for each program for both PY2020 and PY2021.

In some cases, programs were tracked as sub-programs within the tracking data, and then the savings were aggregated in the Annual Reports. These instances are noted in the tables below, and in all these cases, we were able to replicate the savings included in the Annual Reports for the aggregated program totals. There was one other instance with the Self Direct (High Voltage) program in 2020 where the savings numbers were off slightly by 1,000 kWh, which we attribute to rounding. We did not find any similar discrepancies in 2021.

Table 2: PY2020 Savings Total Verification Results

Schedule	Program/Measure Name	Sum of Total kWh from Tracking Data	Notes
201	Low Income Weatherization	1,241,190	
214	Residential Lighting	24,551,432	
214	Space Heat	9,213,853	
214	Water Heat	753,472	

Schedule	Program/Measure Name	Sum of Total kWh from Tracking Data	Notes
214	Home Energy Assessments	997,645	Called HomePrint in tracking data
214	Home Appliances	1,270,160	
214	Web-Enabled Thermostats	476,282	
214	Showerheads	1,052,265	
214	Weatherization	1,454,129	
214	Home Energy Reports	46,876,400	
215	SF New Construction	44,259	
215	Energy Star Mfr Homes	165,381	
217	Multi-Family Retrofit	7,745,387	
218	Multi-Family New Construction	3,770,496	
249	Residential Pilots	204,000	Called Retail Choice in tracking data
250	C&I Retrofit	55,260,774	Total in the Annual Report is the sum of C&I Retrofit, Bus Lighting Grants, Ind Energy Management, Ind System Optimization from the tracking data
251	C&I New Construction	18,376,433	
253	Commercial SEM	13,718,635	
254	NEEA Programs	12,702,00	
258	Self Direct	3,874,133	Labeled as the High Voltage program in tracking data, total off by 1,000 kWh likely due to rounding
262	Lighting to Go	7,076,184	
262	Commercial Kitchen & Laundry	174,334	
262	Commercial HVAC	230,928	

Schedule	Program/Measure Name	Sum of Total kWh from Tracking Data	Notes
262	Commercial Midstream	507,186	
262	Small Business Direct Install	8,835,444	
292	Transmission & Distribution Pilot	428,257	
	Grand Total	**221,000,658**	

Table 3: PY2021 Savings Total Verification Results

Schedule	Program/Measure Name	Sum of Total kWh from Tracking Data	Notes
201	Low Income Weatherization	1,066,699	
214	Residential Lighting	1,162,760	
214	Space Heat	17,242,039	
214	Water Heat	2,913,617	
214	Home Appliances	1,772,026	
214	Web-Enabled Thermostats	2,420,124	
214	Showerheads	72,191	
214	Weatherization	1,328,478	
214	Home Energy Reports	2,026,000	
215	SF New Construction	79,646	
215	Energy Star Mfr Homes	128,180	
217	Multi-Family Retrofit	6,706,310	
218	Multi-Family New Construction	844,510	
249	Commercial Pay for Performance Pilot	607,491	

Schedule	Program/Measure Name	Sum of Total kWh from Tracking Data	Notes
250	C&I Retrofit	57,575,866	Total in the Annual Report is the sum of C&I Retrofit, Clean Building Accelerator, Bus Lighting Grants, Ind Energy Management from the tracking data
251	C&I New Construction	9,061,654	
253	Commercial SEM	6,675,979	Total in the Annual Report is the sum of Commercial SEM and the Commercial Pay for Performance (Commercial Program Sector) in the tracking data
254	NEEA Programs	10,249,200	
258	Self Direct	7,475,425	Labeled as the High Voltage program in tracking data
	Self Direct (Non 449)	5,521,586	Labeled as the High Voltage program in tracking data
262	Lighting to Go / Bus Lighting Markdowns	14,889,788	
262	Commercial Kitchen & Laundry	505,664	
262	Commercial HVAC	1,099,468	
262	Commercial Midstream	379,203	
262	Small Business Direct Install	15,105,791	
262	Lodging Rebates	605,487	
292	Generation, Transmission & Distribution	2,294,877	
	Grand Total	**169,810,058**	

2.3 Previous BECAR Recommendation Response Review

The Evergreen team compiled and reviewed the recommendations that were made in the 2018-2019 BECAR. We then contacted PSE staff to follow up on what actions, if any, have been taken to address these recommendations. If we found that the recommendations had not yet been addressed, we inquired as to whether there are any plans to take action in the future and if not, the reason for not addressing the recommendation. We then made a determination as to whether the recommendation has been adequately addressed, or if additional action is needed.

Some of the prior BECAR recommendations related to continuing with the UES updates and providing the ERR for each evaluation recommendation; both of these activities are continuing. An additional recommendation involved continuing to monitor progress on some of the longer-term evaluation recommendations that needed to be addressed in future evaluations (i.e., after the last BECAR report was completed). These longer-term recommendations are summarized in Table 4.

Table 4: Past BECAR Recommendations

Program (Evaluation Report Date)	Recommendation (page #)
Resource Conservation Manager Program (June 4, 2018)	Test for savings differences between schools and other government buildings (p. 42)
Multi-family Program (March 15, 2019)	Develop and track HTR indicators for harder to reach MF sub-segments (p. 4 of report w/ PSE ERR) Update gas UES values in 2020 for thermostatic showers and adapters (p. 4 of report w/ PSE ERR) Update window measures savings for gas heated homes (p. 4 of report w/ PSE ERR) Enhance participant data tracking to follow-up with customers and increase conversion to retrofit projects (p. 6 of report w/ PSE ERR) Update savings for specific measures included in table (pp. 7-10 of report w/ PSE ERR)

Program (Evaluation Report Date)	Recommendation (page #)
Web-Enabled Thermostat Program (November 20, 2019)	Update deemed savings value for gas customers to 21 therms (p. 4) Conduct additional impact research for electric heating customers using an expanded participant pool and consumption data (pp. 6-7) Conduct additional impact research for gas heating customers using an expanded participant pool and consumption data (pp. 6-7) Evaluate the influence of PSE's efforts to promote 'set it and forget it' message (p. 8) Deliver 'set it and forget it' message on PSE's website via short videos or links to other resources (p. 8) Conduct more research to determine best customer targeting strategies (p. 8)
Home Energy Assessment Program (November 20, 2019)	Adopt a multi-pronged approach for messaging savings recommendations to customers (p. 14) Improve marketing efforts that encourage word-of-mouth advertising (p. 15) Provide customers more information prior to the assessment (p. 15)
Home Energy Reports Program (November 15, 2019)	Explore claiming savings from move-out homes (p. 31) Examine trend of decreased savings for expansion groups thru a comprehensive review of outcomes/strategies and models (p. 32)

Below, we provide the current status of each of these recommendations based on recent updates from PSE.

Resource Conservation Manager Program (currently named the Commercial Strategic Energy Management Program)

Recommendation #1: *Test for savings differences between schools and other government buildings*

PSE Response: The hypothesis behind this recommendation is that if government facilities have higher savings potential than schools, the program might direct more marketing resources to increase the enrollment of government facilities, or making changes to the CSEM program implementation to increase savings in schools.

The CSEM program ultimately decided not to pursue this approach, for the following reasons:

Because of the behavioral nature of the CSEM savings market, PSE has found that the biggest factor to achieving savings is not whether the facility is a government entities or a school. It is the customer having an energy champion in its organizational staff to advocate for energy efficiency. Some years, the highest savings come from school entities. Others, it comes from government entities. A city or a school can perform very well in the CSEM program until the energy champion leaves the organization. If the staff taking over the CSEM responsibility is not as committed, as diligent as the previous energy manager, the outcome will be a drop in energy savings from that organization. While government facilities may have higher savings potential than schools, there is no shortage of resources to go after both submarkets. So, an incremental increase in marketing resources dedicated to government facilities vs schools would not yield an incremental increase in participation from one vs the other. PSE actively pursues both submarkets with adequate amount of dedicated resources in marketing staff, outreach staff, municipal liaison staff and account executives support. And we continue to have success in recruiting customers in both sub markets.

Evergreen Assessment: PSE has a reasonable justification for not adopting the evaluation recommendation.

Multifamily Program

Recommendation #1: *Develop and track HTR indicators for harder to reach MF sub-segments*

PSE Response: The effort to track HTR subgroups in the Multifamily Retrofit program was directly impacted by subsequent CETA legislation. What began as a program idea became part of a larger research effort for PSE to maintain consistency in how our customers are categorized and what benchmark to use. In Q4 of 2021 the MFR program is partnering with the LIW program on a pilot effort for a modified strategic outreach plan. Additionally PSE's Customer Insights team has developed a dashboard that identifies Highly Impacted Communities (HICs) and Vulnerable Populations for CETA compliance purposes and is looking at ways to incorporate Multifamily customers. Traditionally, HTR multifamily customers have been challenging to identify due to data constraints, but Customer Insights recently found customers that fall below 80% AMI. Now that we have a list of qualified moderate income customers that can be tracked, the MFR program is increasing our incentives for those customers where possible.

Evergreen Assessment: PSE has not adopted this recommendation, but has made improvements in its tracking systems for this sector that could facilitate creating metrics and tracking them in the future.

Recommendation #2: *Update gas UES values in 2020 for thermostatic showers and adapters*

PSE Response: These measures were updated for 2020 with current RTF values. However, due to Covid-19 the direct install program was paused. Program staff is evaluating reviving the program for 2022 with current RTF values.

Evergreen Assessment: PSE has addressed this recommendation.

Recommendation #3: *Update window measures savings for gas heated homes*

PSE Response: These measures were updated for 2020 and again for 2021.

Evergreen Assessment: PSE has addressed this recommendation.

Recommendation #4: *Enhance participant data tracking to follow-up with customers and increase conversion to retrofit projects*

PSE Response: The program is now following up every referral, especially where contractors have reported "unable to reach customer". The past year has been challenging for property managers and owners due to eviction moratoriums relating to Covid-19 and the MFR program has offered a number of Limited Time Offers to drive projects.

Evergreen Assessment: PSE has addressed this recommendation

Recommendation #5: *Update savings for specific measures included in table*

PSE Response: The MFR program updates all prescriptive RTF savings values with available data prior to the September 1st cutoff.

Evergreen Assessment: Evergreen confirmed that these savings values have been updated.

Web-Enabled Thermostat Program

Recommendation #1: *Update deemed savings value for gas customers to 21 therms*

PSE Response:

After reviewing the evaluation's testing methods, PSE decided to stay with the Energy Trust of Oregon (ETO) methodology that found customers had an average 6% savings. PSE questioned the modeling methods use by the evaluation to determine savings as the results in the ODC report were not weather adjusted.

Also, PSE is actively engaged with NEEA research to establish a new savings estimate for web-enabled thermostats. The final Northwest Smart Thermostat Research Study was published on November 16, 2021. Key findings included statistically significant energy savings, although energy savings were insufficiently correlated with specific thermostat metrics.

Evergreen Assessment: PSE's response to this recommendation is reasonable.

Recommendation #2: *Conduct additional impact research for electric heating customers using an expanded participant pool and consumption data*

Recommendation #3: *Conduct additional impact research for gas heating customers using an expanded participant pool and consumption data*

PSE Response (both #2 & #3): As noted above, PSE funded and supported a regional Smart Thermostat Research Study investigating the savings impacts from web enabled thermostats across multiple utility territories. The study uses a broader participant pool and reviews participant consumption data by coordinating with manufacturers and enrolling opt-in customers. The final Northwest Smart Thermostat Research Study, managed by NEEA, was published on November 16, 2021. Key findings included statistically significant energy savings, although energy savings were insufficiently correlated with specific thermostat metrics.

The WET program is also due to be re-evaluated in 2022-23. PSE will request that the evaluator include an expanded participant pool in order to mitigate the issues with statistical significance found in the prior evaluation.

Evergreen Assessment: PSE has taken steps to address this recommendation, and the next BECAR should examine whether an expanded participant pool was adopted as requested in the next evaluation.

Recommendation #4: *Evaluate the influence of PSE's efforts to promote 'set it and forget it' message*

PSE Response: PSE has not yet undertaken research in these specific areas, but requested it be part of the next evaluation, which is scheduled to be conducted in the 2022-23 biennium.

Evergreen Assessment: PSE has not yet addressed this recommendation, and the next BECAR process should examine whether this research was conducted in the 2022-23 biennium as anticipated by PSE.

Recommendation #5: *Deliver 'set it and forget it' message on PSE's website via short videos or links to other resources*

PSE Response (#4 & #5): PSE has expanded upon the 'set it and forget it' messaging by collaborating with manufacturers to create and send follow up emails to program participants on a quarterly basis. The email campaign advises customers on how to achieve the maximum savings with their specific thermostat model. PSE is pursuing the development of video content in the future.

Evergreen Assessment: This response is reasonable and the effectiveness of these new actions should be examined in the next evaluation of this program.

Recommendation #6: *Conduct more research to determine best customer targeting strategies*

PSE Response: The program has undertaken work to improve customer outreach and targeting, particularly in the area of inclusion and DEI design. PSE leverages propensity marketing and demographics from the Customer Insight team to effectively market to customers. Targeted outreach has also been done to manufactured home communities and vulnerable populations. A moderate-income incentive program was also created to make the technology more accessible to customers. In the 2022-23 planning cycle, DEI and specific elements will be included in the design and implementation of the program.

Evergreen Assessment: PSE has addressed this recommendation.

Home Energy Assessment Program

Recommendation #1: *Adopt a multi-pronged approach for messaging savings recommendations to customers*

Recommendation #2: *Improve marketing efforts that encourage word-of-mouth advertising*

Recommendation #3: *Provide customers more information prior to the assessment*

PSE Response: PSE has discontinued the Home Energy Assessment program.

Evergreen Assessment: Given that this program has been discontinued, these recommendations are no longer relevant.

Home Energy Reports Program

Recommendation #1: *Explore claiming savings from move-out homes*

PSE Response: PSE has not yet explored claiming savings from move-out homes. We continue to refill customer segments due to move-out attrition.

Evergreen Assessment: This is a reasonable response to this recommendation, as not pursuing savings from move-out homes results in a more conservative estimate of savings for the program. It is also unclear whether the savings realized from move-out homes is worth the cost of tracking and estimating impacts for this subgroup.

Recommendation #2: *Examine trend of decreased savings for expansion groups thru a comprehensive review of outcomes/strategies and models*

PSE Response: In 2020, PSE conducted a new rank experience with the non-urban 2015 segment to explore the ability to claim deeper savings. The group maintained savings. Additionally, we are exploring reducing paper reports for 2022/23 biennium for the legacy wave.

Evergreen Assessment: PSE has responded to this recommendation.

2.4 Evaluation Report Response Review

For each evaluation report completed by an independent evaluator, PSE program staff compile their responses to each recommendation made in the evaluation report; this constitutes PSE's Evaluation Report Response (ERR). The Evergreen team reviewed the ERRs for program evaluation reports completed in 2020 and compiled the recommendations and PSE responses contained in each. For each program, we reviewed the ERRs from PSE on each recommendation, and then followed up with PSE staff if additional information was needed.

Note that we did not do a similar review for evaluation reports completed in 2021 as there has not been sufficient time for PSE to take meaningful actions to address the latest recommendations. We recommend that the 2021 evaluation recommendations be reviewed as part of the next BECAR process.

There were several program evaluation reports completed in 2020 that were covered as part of this review:

1. 2018-2019 Commercial and Industrial Retrofit Compliance Program Evaluation
2. 2019-2020 Evaluation of the Multifamily New Construction Program
3. 2018-2019 Large Power User Compliance Program Evaluation
4. 2018 & 2019 Home Energy Report Savings Memos

The verbatim recommendations from the program evaluations (in italics), PSE responses, and Evergreen's assessment of the follow-up activities are described below by program.

2.4.1 2018-2019 Commercial and Industrial Retrofit Compliance Program Evaluation Report

Recommendation #1: *Include measure quantity data and subprogram type in the program tracking data.*

"Our review of the program tracking databases revealed that PSE thoroughly tracks completed projects and collects the necessary project detail, such as customer information, project dates, detailed measure description, savings, and incentives. However, Program tracking data lacked 2 key data fields:

- *Incented measure quantity – the field was in the data but it was not populated with information. The lack of this information precludes the ability to track the quantity of measures installed against the quantity expected which is helpful in monitoring and assessing the program performance throughout a given program year.*
- *Subprogram type – the field was not in the data and the evaluation team, as a result, could not link all projects to specific subprograms. Without this link, the evaluation team could*

not design a sampling strategy for each sub-program for the engineering analyses. Having a dedicated field referencing the subprogram(s) associated with each project provides two key benefits: 1. This would better enable PSE Program management staff to track and monitor subprogram performance against goals throughout a biennium and make decisions throughout implementation in response; and 2. This would enable evaluation to assess the savings performance of each subprogram against goals, understand the reasons why a subprogram over or underperformed against expectations, and recommend ways to garner more energy savings on a subprogram level."

PSE Response: In the case of incented measure quantities, several of PSE's incented measures are custom measures based on whole-building and engineering calculations. As such, they might include several measures including lighting, HVAC, etc., but savings are reported as one number, the "project" savings. As such, programs will avoid entering measure quantities so as not to confuse internal data tracking systems. In other applications, for example the cost-effectiveness model, this is overcome by simply adding a "1" in the measure quantity field for custom projects. To assist future evaluations, PSE will review the program tracking data with the evaluators, and ensure that these custom projects contain the value necessary for tracking savings. In the case of this evaluation, the lack of measure quantity did not affect the savings calculations for the C/I portfolio.

As to the subprogram type, this again did not affect the savings calculations in this evaluation, but ODC is correct to point out that it would make subprogram tracking easier to include that field. As such, the Evaluation team will work with EE's systems and information group to see if the subprogram type can be added to the data extracts.

Evergreen Assessment: PSE's response regarding custom projects including multiple measures is consistent with what we have observed in other evaluations; its response and offer to add the subprogram field in future data requests is reasonable.

Recommendation #2: *Update the ISOP program theory logic model (PTLM) to include recent changes to the ISOP program.*

"We recommend that the following subprogram processes are updated in the ISOP PTLM:

- *Addition of SEM Offering: A subset of industrial customers who have already participated in ISOP also participate in the Enhance It subprogram. Enhance It provides a behavior-based approach to energy efficiency that focuses on O&M improvements;*
- *Removal of Sensei: PSE did not offer the Sensei energy management software; and*
- *Addition of Timeline for Project Completion: The customer has 120 days to complete the project to receive the full incentive, customers that complete projects after 120 days are only eligible to receive 50% of the incentive."*

PSE Response: The 2018/19 ISOP program has been retired and replaced by a revamped and expanded ISOP program for the 2020-21 biennium superseding the referenced logic model. Current program documentation is available at https://www.pse.com/business-incentives/commercial-industrial-programs/industrial-system-optimization-program.

Evergreen Assessment: The link does not contain the program logic model, but the new version of the program suggests that the prior recommendations may no longer be relevant. The next evaluation of this program should include an update to the logic model to reflect the new program design.

Recommendation #3: *Ensure the program savings used are the latest versions from the RTF, and that lighting calculators are updated with the most recent HVAC interaction factors.*

- *Apply the savings from the RTF version available during PSE's deemed savings planning period (e.g., September prior). PSE applied savings to anti-sweat heater (ASH) controls from an older version of the Regional Technical Forum (RTF) (v.2.2 instead of v3.1)*
- *Ensure all lighting projects use the lighting calculator with the most updated HVAC interaction factors.*
- *Monitor performance savings to ensure that baseline savings are removed to avoid double counting.*

PSE Response:

- In order to maintain consistency among multiple program delivery mechanisms, PSE used savings values established in the active business case at the time these projects were constructed. Business cases are updated regularly as part of PSE's planning process. As such, PSE savings claims for similar custom grant measures will use the same claims found in the active business case for that program period.
- HVAC interaction factors are regularly reviewed and updated. The Business Lighting HVAC factors were calculated from the BPA/RTF factors and adjusted using PSE territory factors.
- PSE disagrees with this project evaluation/recommendation. The referenced project was originally created as a two-part base/performance HVAC controls project. During the course of the project, PSE revised the grant to be a performance-only controls measure. The base savings and incentive payment was cancelled (as documented in PSE's project management and tracking program) and a new grant that combined the base savings and performance savings was issued. Project closeout then occurred using PSE's standard pre- and post-installation bill history regression analysis. Since the original base savings was not claimed, it is valid to claim all savings from the measure implementation. As this project was verified and closed out using a post-installation bill history regression analysis, the realization rate for this project should be 100%.

Evergreen Assessment: Several of the recommendations related to having UES values consistent with the RTF. This is a topic we have also covered in the UES review, and we found that values are all up to date. PSE's response to the baseline calculation for an individual project appears reasonable, although we did not review the individual project baseline calculations to confirm.

Consideration #1: *Add additional KPI metrics that include participation, contractor knowledge, and the number of contractors offering ARC services.*

"Energy and gas savings are the primary metrics that PSE program staff use to measure performance for this subprogram. Program staff expressed an interest in developing additional performance metrics – such as participation, contractor knowledge and awareness, and the number of contractors offering ARC services – to help measure success and guide program delivery in the future. The evaluation team agrees that these KPIs should be added to the list of measures used to assess program performance." ARC, P. 40

PSE Response: PSE has expanded its marketing and outreach efforts in order to increase awareness and encourage program participation for all offerings. As many HVAC contractors offer multiple energy efficiency measures (ARC included), awareness of this offering is expected to increase.

PSE routinely assesses program performance through regularly scheduled forecasting meetings and will consider adding specific measure KPIs as appropriate.

Evergreen Assessment: It appears that PSE is taking appropriate steps to address this recommendation, although at the time of this report it is unclear if additional KPIs have been added for this program. The next evaluation report should report on the new KPIs; attempt to measure progress in terms of increased contractor participation, awareness, and knowledge; and confirm the offering of ARC services.

2.4.2 2018-2019 Large Power User Compliance Program Evaluation Report

Consideration #1: *Increase monitoring of projects with disproportionate impacts on savings.*

"To the degree possible, the program should consider flagging and monitoring particularly large or especially risky projects based on past experience and other indicators upon project completion, as this can help identify changes to building conditions or project measures that can negatively impact the savings. This information can help program staff make appropriate adjustments to assist in better alignment of ex post savings with ex ante, thus minimizing negative shocks for the program at the evaluation stage. Such monitoring however should not be detrimental to program cost-effectiveness or overly burdensome for program staff to implement. Such monitoring could be done via follow-on outreach to the participating facility staff and/or follow-on review of the facility consumption data." P. 7

PSE Response: In the Large Power User (LPU) program, PSE evaluates customer-supplied energy efficiency projects, validates energy savings claims prior to construction, and verifies project performance during the verification and closeout phases truing up savings claims when necessary. During the verification and closeout phases, PSE will use site visit information and collected data to verify the grant payment conditions were met. When all projects requirements for verification are satisfied, PSE pays the incentive with the expectation that resulting energy savings will persist. Occasionally due to circumstances beyond PSE's control, efficiency measures are overridden or cease to deliver expected energy savings.

Post-closeout follow-on monitoring often involves additional resources and time commitments that can be burdensome to customer facility staff. Also, specific measure energy savings may not be apparent through facility consumption data review.

PSE will continue to review submitted projects focusing on supporting data, standard engineering calculations, past experience and post-installation documentation to validate energy savings. For projects with a high savings uncertainty, PSE may require additional measure-specific data or an extended verification period prior to grant payment.

Evergreen Assessment: It appears that PSE will adopt the recommendation on a case-by-case basis, which is reasonable. The original recommendation was designed to guard against large adjustments to savings in the evaluation phase, and ultimately the degree to which PSE follows this recommendation will be shown in the realization rates (i.e., the more project monitoring done by PSE, the closer the project realization rates will be to 1.0).

Consideration #2: *Align evaluation cycles with program cycles*

"The LPU program is administered on a four-year cycle giving the participants two years to plan out and spend their funding allocation and an additional two years to implement and install the proposed energy-saving measures. The end of 2018 marked the end of the 2015-2018 program cycle, and the beginning of 2019 marked the start of the 2019-2022 cycle. The 2018-2019 biennium therefore captured portions of two cycles. Such misalignment of the evaluation cycle with the implementation cycle presents certain challenges in terms of assessing program performance against participation and savings goals. More specifically, while the program met its goal for the 2015-2018 cycle, it was too early for program staff to gauge program performance based on 2019 alone and with three more years remaining in the cycle." P. 6

"Program staff should consider aligning the evaluation cycle with the program cycle as a way to allow for more effective assessment of program performance and providing timely recommendations to inform planning of the new cycle." P. 7

PSE Response: LPU ends its current four-year cycle in 2022, and the upcoming evaluation will feature projects through the end of the cycle. PSE and our evaluator are exploring using projects

"in the pipeline" to be completed in 2022, so that the LPU program can be evaluated in 2022-23 cycle. The evaluator is developing a sampling strategy to ensure later-stage projects are not missed.

Evergreen Assessment: This response is reasonable and can be confirmed in 2024 when this program is next evaluated.

2.4.3 Evaluation of the 2019-2020 Multifamily New Construction Program

Recommendation #1: *While project documentation was very good overall, there are still opportunities for improvement. We recommend that builders delay removal of the labels of the windows' U-value ratings until verification photos of newly installed windows are taken. CLEAResult is aware of this issue and is already working to improve this process.*

PSE Response: CLEAResult will let the project contact know that window stickers should remain on until the inspection. Also, CLEAResult will pursue obtaining alternative verification of window U-values, such as a window order packing slip or invoice. CLEAResult has been using invoices as an alternate verification method for programs with other utilities since 2019.

Evergreen Assessment: This response is reasonable, and the program actions should be confirmed in the next evaluation.

Recommendation #2: *Several decision-makers mentioned that they did not become involved in the MFNC program until after the design phase was underway or complete, resulting in lost savings opportunities for building shell measures, such as increased levels of insulation. This underscores the importance of PSE's early design assistance (EDA), which was added to the program in 2020. PSE should aggressively promote EDA going forward and recruit participants as early as possible. This would provide the opportunity to achieve deeper savings per project and greater savings overall.*

PSE Response: While the program introduced EDAs during the 2018-2019 cycle, it took some time to get off the ground. During the 2020-2021 program cycle, we have seen increased uptake of EDAs, with seven completed in 2020. Moving forward, we plan to continue promoting EDA as the first and best step for projects to take. Additionally, as we continue to develop relationships with developers, we will be able to engage them earlier on in the construction planning process.

Most of the EDA uptake so far has been from affordable housing projects. CLEAResult suggested the following strategies to increase EDA uptake from market-rate developers:

- Increased periodic outreach to past program participants to update them on program offerings and ask about new or upcoming projects. We have seen success in EDA participation by asking contacts with an existing enrolled project what they are working on next.

- Improved access to project data. Earlier, timely outreach to projects in schematic design via Dodge Analytics subscription information. The Dodge Analytics report provides contact information and construction stage for new construction projects.
- Utilization of a long-term cost savings tool to illustrate the financial benefit of choosing energy efficiency measures (outside of the one-time cash incentive).
- Pilot an offering with cities with highest new construction rates on expedited permitting if projects complete an EDA. For example, ETO worked with the Portland Housing Bureau to include EDAs as a mandatory piece of their Green Building Policy. Consider developing similar policies with cities or counties that we serve.

Evergreen Assessment: This response is reasonable, and the effectiveness of the increased EDA promotion should be assessed in the next evaluation.

Recommendation #3: *A more stringent code will go into effect in February 2021, and CLEAResult is adapting the program design to align with this code accordingly. We suggest the MFNC program expand its offerings to include measures listed in the energy efficiency section of the new code, including high-performance service water heating and dedicated outdoor air system measures. This would also be in keeping with participant interests. While participants expressed satisfaction with the program, they also indicated that they would have interest in participating in a more cutting-edge program that offers more emerging technologies. This will require earlier project identification so the program can influence the project during the design phase.*

PSE Response:

- The MFNC program workbook now includes a dedicated outdoor air system (DOAS) measure, and we've had one project submit for a central heat pump hot water system through the PSE Custom Grant pathway.
- While solar and EV charging don't necessarily fall under the energy efficiency umbrella, as more buildings start to pursue these options, it would make sense for the MFNC program to collaborate more with the PSE departments that oversee solar and EV infrastructure.

Evergreen Assessment: This response is reasonable.

Recommendation #4: *CLEAResult is planning to update their prototypes to accommodate new code changes. To evaluate cost-effectiveness and support for deeper-savings measures, it may be useful for CLEAResult to additionally develop a set of prototypical simulation models that incorporate measure combinations for deeper savings. These models would not only identify which combinations are cost-effective, but CLEAResult could use these models to demonstrate the payback of these deeper-saving measure combinations to potential participants.*

PSE Response: This concept will be discussed with CLEAResult for the next program cycle (2022-2023). We agree that adding a cost-savings component to the multifamily calculator would be beneficial for projects.

Evergreen Assessment: There is no immediate action taken on this recommendation; this should be assessed as part of the next evaluation of this program.

Recommendation #5: *Electrification is expected to accelerate in Washington state. The MFNC program saw uptake of in-unit ductless heat pump and heat pump water heater measures, and we expect even more uptake of these measures going forward. CLEAResult should lower the heat pump water heater deemed energy savings value by substituting assumptions from program data into Regional Technical Forum equations. For buildings with centralized water heater systems, a heat pump water heater system measure could be developed for inclusion in the program.*

PSE Response:

- The MFNC workbook already applies an adjustment to the RTF assumption for number of people in the household. RTF assumption is 2.57 persons per household, and the program adjusts that to 80% (HH size of 2.07) based on 2015 RECs data.
- For the central heat pump water heater system, we will continue to incentivize that through the Custom Grant pathway, with hopes to integrate it into the MFNC workbook after we have sufficient data to establish deemed savings values.

Evergreen Assessment: This response is reasonable.

2.4.4 PSE Home Energy Report (HER) Savings Memos (2018 & 2019)

There were no recommendations from the 2018 HER Savings Memo; the following were from the 2019 memo.

Recommendation #1: *PSE should coordinate collaboration between DNV GL and its program implementer to clarify data handling and cleaning rules as well as methods used to generate savings estimates. Such collaboration will ultimately improve quality checks of evaluation results.*

PSE Response: PSE continues close coordination between internal staff, the program evaluator, and program implementer to refine data quality, data handling and data cleaning as well as the savings analysis methodology. In 2021, for example, DNV and the program met with Opower to discuss different ways of analyzing the data. Based on those discussions, future evaluations will be using a lagged dependent variable model in their regression analysis, which we believe will represent a more accurate picture of the data.

Evergreen Assessment: PSE's has responded to this recommendation.

Recommendation #2: *We recommend a thorough review of retail lighting rebate offerings to determine if a survey needs to be delivered to estimate upstream joint savings.*

PSE Response: PSE has engaged DNV in discussions about this topic. We agreed that as retail lighting rebates decline significantly in current and future years, the need for accounting for joint savings will be rendered moot. Therefore 2021 will be the last year that the evaluator conducts upstream analysis to account for this.

Evergreen Assessment: This response is reasonable, provided that savings claimed from retail lighting are significantly reduced or eliminated after 2021.

Recommendation #3: *We recommend a survey that considers general energy efficiency related purchasing and use behavior among HER treatment and control customers to identify the mechanisms of HER savings.*

PSE Response: PSE has discussed survey options with the evaluator for subsequent analyses. HER evaluation surveys, which are conducted every other year, now incorporate questions regarding purchasing behavior.

Evergreen Assessment: PSE has addressed this recommendation.

Recommendation #4: *DNV GL also recommends a customer segmentation study to better understand which customer groups contribute to savings and to inform improved program design.*

PSE Response: The program is working with PSE's Customer Insights group to incorporate segmentation related to vulnerable communities, DEI, and underserved populations in line with our Equity Advisory Group and our CETA compliance requirements. PSE expects that these efforts will begin in earnest in the 2022-2023 biennium.

Evergreen Assessment: This response is reasonable, and follow-up should be conducted in future years to determine how the information obtained from PSE's Customer Insights group has been considered for use in the HER program.

Recommendation #5*: Given the decline in per household savings observed in most waves, we recommend studying weather normalized HER savings to determine if per household savings are weather-dependent and if weather normalization can be used to improve forecasts of expected savings.*

PSE Response: PSE and DNV have had discussions about including this in the last year. DNV will begin adding weather normalization into their models using HDD and CDD inputs beginning with the 2021 evaluation.

Evergreen Assessment: This response is reasonable, and the addition of the HDD and CDD variables should be confirmed once the 2021 evaluation report is available.

Recommendation #6: *A study that examines the persistence of HER savings in homes occupied by previous HER treatment customers, who have since moved out, would be useful to identify additional savings that the program may be generating.*

PSE Response: PSE and the evaluators continue to discuss how best to conduct and prioritize such an evaluation and use our research dollars effectively. At this time PSE feels this is not a high priority research item, but is open to conducting this research in the future should priorities change.

Evergreen Assessment: PSE is not acting on this recommendation, but its response is reasonable given the low expectation of savings for this activity.

DSMc ID Measure Name	BECAR Findings	PSE Final Response
12240 CMID: Air Conditioner - AC - Btuh 240k to 760k - Tier 3	• The UES is not documented in the Commercial HVAC Measure Case. • The UES units are unknown and not documented (but appears to be tons of cooling capacity). The calculated values were based on measure quantity, but their values were not able to be verified.	Savings for the Midstream HVAC measures are calculated and claimed based on the capacity and efficiency of the unit. PSE utilizes the deemed savings calculations recommended by the DOE Uniform Methods project. A typical installation and estimated savings are provided for the measure in order to assess measure level cost-effectiveness (average of 159 kWh/ton according to Midstream HVAC Measure Table Spreadsheet in the SoS - MID tab of the APPROVED Measure Case). However, each savings value is calculated separately per unit and is recorded in the tracking data.
12868 Heat Pump - Split - Tier 2 - Less than 65 kBtuh - EH - Res - EX	• The workbooks referenced in the SOS-MID sheet did not appear to have the matching measure. • The UES is not listed in the Heat Pump Measure Case, but was calculated to be 5,293.36 kWh in the program year summary.	This is one of the measures listed as "NEW" at the bottom of the Midstream HVAC Measure Table Spreadsheet in the SOS-MID tab (Res. Retrofit, Air Cooled, HP, Split System, <5.4 Tons). Savings for the Midstream HVAC measures are calculated and claimed based on the capacity and efficiency of the unit. PSE utilizes the deemed savings calculations recommended by the DOE Uniform Methods project. Typical installation and estimated savings are provided for the measure in order to assess measure level cost-effectiveness (average of 1,843 kWh/ton according to

DSMc ID Measure Name	BECAR Findings	PSE Final Response
		the SoS - MID tab of the APPROVED Measure Case). However, each savings value is calculated separately per unit and is recorded in the tracking data.
12871 Water Heater - Heat Pump - EH - Res	• The UES value could not be verified with the workbooks referenced in the SOS-SF & NF sheet. • Measure 12871 - Water Heater - Heat Pump - EH - RES is not listed in the "Approved Measure Cases" spreadsheets. This measure has been compared with measure 12682 - Water Heater - Heat Pump - NEEA Specs - Tier 3 - EH – Res. • The UES is listed as 1,225.00 kWh in the Heat Pump Measure Case, but was calculated to be 1,565.07 kWh in the program year summary. • Cost/unit is listed as $629.17 in the Heat Pump Measure Case, but was calculated to be $751.56 in the program year summary.	12871 is a midstream measure that was originally in the Water Heat Comm Measure Case in 2020. It was not moved to Residential SF until 2021, which is why is could not be found in the SOS – SF sheet in 2020. The savings are calculated using the methodology provided in the SOS_MID tab of the APPROVED_Measure Case_Water Heat Comm_2020.xlsx spreadsheet (included in supporting files). This measure should NOT be compared to 12682, which is an RTF-deemed measure. Savings for the Midstream HVAC measures are calculated and claimed based on actual equipment efficiencies. A typical installation and estimated savings are provided for the measure in order to assess measure level cost-effectiveness (an average of 1,511 kWh/ton according to the SOS_MID tab of the APPROVED Measure Case). However, each savings value is calculated separately per unit and is recorded in the tracking data.
12357 Thermostat - Web Enabled - HP Heating - Comm	• Incentive/unit is listed as $200.00 in the Thermostat Measure Case, but is calculated to be $91.73 in the program year summary data.	The measure quantity in the tracking data represents the tons of capacity, not the number of thermostats. Savings are calculated per ton, but the incentive is delivered based upon the number of thermostat units. The calculated incentive per unit from the tracking data

DSMc ID Measure Name	BECAR Findings	PSE Final Response
		is equal to the incentive per ton, not the incentive per thermostat.
12326 Heat Pump - from E FAF - SF or DX	• The UES is listed as 3,517 kWh in the Heat Pump Measure Case, but is listed as 3,711 kWh in the SOS-DHP sheet.	The SoS-DHP tab contains an embedded RTF file (ResSFExistingHVAC_v4_2.xlsm), in which the incorrect row was highlighted. The correct measure is contained in Row 15 - "Convert FAF w/o CAC to Heat Pump… Cooling Zone 1." PSE territory is located in Cooling Zone 1, not Cooling Zone 3. The correct savings value was used in the measure case, but the incorrect source was highlighted in the Source of Savings.
12856 Heat Pump - Ductless - Tier 2 - Less than 65 kBtuh - EH - Res – EX	• The workbooks referenced in the SoS-MID sheet did not appear to have the matching measure. • The UES value was not listed in the Heat Pump Measure Case, but was calculated to be $1,555.89 in the program year summary.	We assume Evergreen meant to say the UES value was 1,555.89 kWh, not dollars. This is one of the calculated measures listed as “NEW” at the bottom of the Measure Table tab in the spreadsheet linked from the SoS-MID tab (row 66). Savings for the Midstream measures are calculated and claimed based on the capacity and efficiency of the unit. A typical installation and estimated savings are provided for the measure in order to assess measure level cost-effectiveness (average of 793 kWh/ton according to Midstream HVAC Measure Table Spreadsheet in the SoS - MID tab of the APPROVED Measure Case). However, each savings value is calculated separately per unit and is recorded in the tracking data.

DSMc ID Measure Name	BECAR Findings	PSE Final Response
12736 Thermostat - Smart - EH – Res	• The workbooks referenced in the SOS-SF-Retail sheet did not appear to have the matching measure. • There are two "Thermostat - Smart - EH - Res" measures with the same measure ID number. The "Thermostat - Smart - EH - Res" - Web Enabled Thermostats measure was used in this analysis. • Incentive/unit is listed as $75.00 in the Thermostat Measure Case, but was calculated to be $74.84 in the program year summary.	This measure uses a blended measure savings based upon mix of heating types using PSE tracking data. The blended savings are calculated in the second embedded workbook. PSE 2017-2019 redemption data are provided in the third embedded workbook. PSE is unsure if Evergreen is noticing the gas measure or the Moderate Income (MI) measure as a duplicate, but there is only one approved standard electric Smart thermostat (12736). PSE does not deliver a rebate for more than the total purchase price. In this case, projects with a total purchase price lower than $75.00 brought down the average rebate amount by $0.16.
12322 Heat Pump - Ductless - from Zonal - 9.0 or greater HSPF - HZ1CZ1 - SF or DX	• Incentive/unit is listed as $800.00 in the Heat Pump Measure Case, but was calculated to be $798.82 in the program year summary.	PSE does not deliver a rebate of more than the total purchase price. In this case, projects with a total purchase price lower than $800 brought down the average rebate amount by $1.18.
12114 SBDI: Lamp - TLED - 4 ft - 4x - from 4 ft T8 32w BBF 4x	• The workbooks referenced on the Measure Case SOS-Retail sheet are not functioning. • Measure ID has two cases in the Lamp Measure Case - single family and multiple. The single family case is "not available," while the multiple is "approved." Multiple was used for this review.	This measure should reference the SoS-SBDI TLED tab, not the SOS-Retail tab. Generally, the Approval Status is marked "Not Available" if the measure is an older version or is being retired. The "Approved" versions should always be referenced.

DSMc ID Measure Name	BECAR Findings	PSE Final Response
	• Incentive/unit is listed as $50.00 in the Lamp Measure Case, but was calculated to be $51.70 in the program year summary data.	The incentive/unit is $100, and the tracking data match this amount.
12672 Showerhead - 1.51 to 1.8 gpm - RP - Any WH - Res – C	• The workbooks referenced in the SOS-SF-Retail sheet did not appear to have the matching measure. • Incentive/unit is listed as $7.00 in the Showerhead Measure Case, but was calculated to be $5.59 in the program year summary data.	Check the second workbook in the SOS-SF-Retail sheet; then check the Electric - Combined Savi Per 1 tab, scroll down to line 62, which contains the Period 1 kWh savings for the measure (56.2 kWh). The Period 2 kWh savings are in the second tab (22.9 kWh) The $7.00 electric incentive (and the $3 gas incentive) is subject to a price floor such that no qualified showerhead can be sold below the minimum price of $4.99/unit. Therefore the actual delivered incentive will be less than the stated maximum rebate in the measure case.
10628 LTGO: Lamp - TLED - 2 3 or 4 foot	• The workbooks referenced on the Measure Case SOS-L2G sheet are not functioning. • Incentive/unit is listed as $2.00 in the Thermostat Measure Case, but is calculated as $2.40 in the program year summary data.	Please reference Final_Retrofit to TLED Business Case 2017.pdf for UES SoS for this measure. Effective June 1st, PSE initiated an LTO to increase the incentive on TLEDs from $2 to $4 in alignment with Business Lighting. This LTO became a permanent incentive amount for 2021. In some cases, the customers are getting $4.00/unit quantity, so the units do not appear to match, but do if you take the LTO into consideration. Also, note that Evergreen states they are referencing the Thermostat measure case and not the TLED measure case, but this may have been a mistake.

DSMc ID Measure Name	BECAR Findings	PSE Final Response
10609 RETL: Fixture - LED – T8	• Missing workbook referenced on Measure Case SOS_RETL sheet. • Version 3 of this measure was retired on 1/31/2020 and version 4 started on 2/1/2020. The version 3 incentive/unit is listed as $5.00 in the Fixture Measure Case document, but is calculated as $1.30 in the program year summary data. • Measure 10608 "RETL: Fixture - LED - T8 Retrofit" has a measure life of 12, where it uses a measure life of 15 elsewhere.	The missing workbooks have been added to supporting documentation. PSE's residential retail lighting rebates do not exceed 20% of the starting retail price. PSE also has set a price floor for each measure category based on the price at which customers would buy a bulb without the appeal of a rebate. Therefore, actual rebate amounts are often less per unit than the maximum stated rebate. See 2020 Retail Channel Retail Lighting Policy in supporting documentation. PSE updated the measure life to 15 years to match the Business Lighting program's measure life for new LED fixtures.
10003 RETL: Fixture - LED - Retrofit Kit	• Missing workbook referenced on Measure Case SOS_RETL sheet. • File location links are not functional in the Measure Case SOS_RETL sheet. • This measure is found in "QC APPROVED Measure Case – Light Fixture" file, but not in the "APPROVED Measure Case – Light Fixture" file.	Workbooks have been added to supporting documentation. The retrofit kit measure was retired in early 2020, so it would not be present in the 2nd round of measure case updates.
10014 RETL: Lamp - LED – Reflector	• Missing workbook referenced on Measure Case SOS_RETL sheet. • Incentive/unit is listed as $3.25 in the Lamp Measure Case, but was calculated to be $2.05 in the program year summary data.	Workbooks have been added to supporting documentation. PSE's residential retail lighting rebates do not exceed 20% of the starting retail price. PSE also has set a price

DSMc ID Measure Name	BECAR Findings	PSE Final Response
		floor for each measure category based on the price at which customers would buy a bulb without the appeal of a rebate. Therefore, actual rebate amounts are often less per unit than the maximum stated rebate.
10008 RETL: Lamp - LED - A Lamp	• Missing workbook referenced on Measure Case SOS_RETL sheet. • Incentive/unit is listed as $1.75 in the Lamp Measure Case, but was calculated to be $1.06 in the program year summary data.	Workbooks have been added to supporting documentation. PSE's residential retail lighting rebates do not exceed 20% of the starting retail price. PSE also has set a price floor for each measure category based on the price at which customers would buy a bulb without the appeal of a rebate. Therefore, actual rebate amounts are often less per unit than the maximum stated rebate.