PSE IRP Feedback Report
Webinar 4: Demand Side Resources
July 14, 2020

7/28/2020

The following stakeholder input was gathered through the online Feedback Form, from July 7 through July 21, 2020. PSE's response to the feedback can be found in the far right column. To understand how PSE incorporated this feedback into the 2021 IRP, read the Consultation Update, which will be released on August 4, 2020.

Feedback Form Date	Stakeholder	Comment	PSE Response
7/8/2020	James Adcock	It is very difficult to read the Draft Demand Side Resources document due to the very large use of TLAs -- Three Letter Acronyms -- which are unexplained in the document. There is also the use of unexplained "random" numbers, such as "8760" Don't use Three Letter Acronyms without giving definition to those acronyms in the document that uses them. Don't use unexplained "random" numbers, such as "8760" without explaining them in the document. Perhaps prior to the meeting you can send out to participants a temporary "dictionary of acronyms and magic numbers" that explains what all your TLAs and "random" numbers in this document? -- So that we don't spend all the meeting time just asking and answering questions like "What does 'GSHP' Mean" and "What does the number '8760' mean?" And then in the final document you can include this "dictionary of acronyms and magic numbers" in that final document.	Thank you for the suggestion. Concerning your examples, 8760 is the hours in a (non-leap) year and used in modeling. GSHP stands for ground source heat pumps.
7/14/2020	Doug Howell, Sierra Club	Please run two sensitivities: 1. Slide 26. Run two more sensitivities on the ramp rate from 10-years to 8-years and 6-years. 2. Non-energy benefits for energy efficiency. Run a sensitivity to show what is the value of non-energy benefits from energy efficiency. The recent EPA study shows that these benefits are about 2 cents/KWh.	Thank you for the suggestions concerning sensitivities. Your three suggested sensitivities have been added to the list of sensitivities for further discussions at the August 11 webinar. Your suggestion of bundling less cost-effective measures with more cost-effective ones to achieve deeper penetration into the market is a

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		In addition, PSE needs to provide assurance that the CRAG and the implementation team are maximizing EE potential for each building such that you still have greater benefits than costs so that you are not just swapping out light bulbs but bundling that with other measures and still come out cost effective.	valid argument. The conservation resource advisory group (CRAG) is a separate process than the IRP public participation process. They work directly with PSE's implementation team to approve their program portfolio. Your suggestion would be something the CRAG process would address.
7/14/2020	Brian Grunkemeyer FlexCharging	I'd like to better understand the cost of your Residential EV direct load control conservation measure. If you're installing hardware in the home, I understand that's not cheap. However, $362/kW-yr seems a little high to me. At FlexCharging, we have a software-only vehicle telematics solution where we can provide managed charging based on the driver's schedule first, then fall back on the utility's needs. This should lead to better customer acceptance and higher adoption. We may be able to provide services for around $250/car/year for the service, plus $50/car/year for driver incentives and some program marketing & administration costs. We believe we can get more than 1 kW-yr per vehicle. I'd like to see how this lines up with your numbers. I'm happy to walk through the numbers with someone.	Cadmus can estimate the levelized cost using the values provided by FlexCharging and compare those to the values we used in a side-by-side comparison. PSE and Cadmus will be reaching out to follow-up with you and will report progress in the Consultation Update.
7/14/2020	James Adcock	We really do need PSE to "vet" their audio systems, and all other aspects of their meeting presentation technology, prior to the start of the meeting so that we don't waste the time and effort of 60+ participants. Unfortunately, this continues to be an on-going problem for many years, where PSE "audio" system continue to fail during IRP meetings.	Thank you for your comments.
7/16/2020	Elaine Armstrong, Citizen's Climate Lobby	What is PSE doing, in good faith and at all speed, to reduce their greenhouse gas emissions, reduce reliance on fossil fuels and create a 100% green and reusable energy sources? What you are doing now is increasing reliance on natural gas. There should be no more new plants that use fossil fuels. You need to create ways to use solar, wind, geothermal etc. Entire nations are able to do this. Surely PSE can.	PSE is modeling 80% renewable resources by 2030 and 100% by 2045 to meet the Washington Clean Energy Transformation Act (CETA). PSE is also modeling portfolio sensitivities around different clean energy futures which will be discussed at the August 11, 2020 webinar on scenarios and sensitivities.

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		Build no new fossil fuel plants. Create clean energy sources with the eye to be entirely greenhouse gas emission-free by 2040. Do more to support homeowners to overcome the giant cost of installing solar on their homes.	
7/19/2020	Willard Westre, Union of Concerned Scientists	Slide 19 – At 2:29pm in the webinar I asked verbally two questions that were not documented in the Q&A report, nor the responses to them. My first question was directed to Lakin Garth with regard to his extensive experience in working with other utilities. I asked him if, in addition to Electric and Gas sources of conservation there was another source, namely, fuel switching between Gas and Electric (e.g. replacing gas furnaces with electric heat pumps). His answer was yes, that this was another viable source. My second question was why wasn't this data included in the presentation. His answer was to refer to PSE staff, implying that the decision was made by PSE. Fuel switching as a conservation resource should not be off-the-table for PSE as this represents a very substantial percentage of the residential and commercial conservation that can be achieved. The use of gas for heating is a major component of PSE's total. Switching to electric heat pumps results in an energy saving of up to 75% and is not costly when timed with end-of-life-replacement. PSE does not effectively offer rebates for this conservation. That was not always the case – in 2010 I received a $1500 rebate for replacing my gas furnace with an electric heat pump. That rebate is not available now. Sometime since 2010, PSE has dropped this major future source of conservation from its plan, significantly reducing its overall conservation effort. Recommendation: PSE develop an aggressive fuel-switching component to its conservation plan, including replacement of gas heating systems with heat pumps. This would help PSE bolster its conservation resources and reduce	PSE responses by paragraph and referenced slide numbers: Fuel conversion from gas to electric is a combination of a gas savings measure and an electric load building measure. This is not a true conservation measure and PSE would not characterize it resulting in 75% energy savings. Fuel conversion is mostly driven by carbon reduction objectives, assuming that the electric supply would be non-emitting. PSE would not generally characterize these measures as low cost since adding electric space heating equipment will likely result in upgrades to the electrical circuits and more expensive heat pump equipment. PSE will be considering a sensitivity where some amount of gas loads are converted to electric. Further discussions will occur at the August 11 webinar on scenarios and sensitivities. The rebate of $1500, that PSE used to offer, was not for converting to electric, but rather for choosing a more efficient electric system, like a high efficiency ductless heat pump, which has a higher cost. The incentive encouraged customers to adopt a more efficient system. In other words,

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		its requirement for new CETA-required generation resources. Additionally, it would reduce PSE's overall carbon emissions which is critical to achieving zero emissions by 2040. Slide 35 – This slide shows a cumulative achievable technical efficiency potential of 142MW for the year 2026. The Dec 11 presentation Slide 21 shows 336Mw for 2026. Can you explain the reduction in potential efficiency?	if you converted to electric but chose an inefficient electric system you would not have qualified for the rebate. Slide 35: The slide from the December 11, 2018 presentation included all demand side resources including codes and standards. Please also note that for 2026 of the previous study, there were 6 years of conservation since the study started in 2020 (2020-2026), and the current study has only four years of conservation since its starts in 2022 (2022-2026).
7/19/2020	Anne Newcomb	Thank you for including me in the PSE IRP! I will be on a backpacking trip :-) for July 21st but I look forward to participating in the rest! Having lived in Puget Power and PSE territory most of my life I greatly appreciate your track record of offering energy efficiency programs to your customers. Considering it is estimated energy efficiency can reduce demand between 5-30% and possibly more, I highly recommend significantly increasing your investments in energy efficiency programs over the next 5-10 years and include these specific offerings: ○ Fully-subsidized and high-quality energy audits including calibrated blower door tests and thermographic inspections. ○ Well-subsidized window replacements. ○ Well-subsidized resilient and long lasting insulation. Spray foam has the highest R-value and may never need replacement which makes for a great investment too! In addition to energy efficiency, smart grid AI and machine learning technology is the way of the future. BPA has investing in and is using Auto Grid (https://www.auto-grid.com/) to help balance demand. I can see PSE is also working to create a smarter grid including the newly installed smart meters. What smart grid technology is PSE using now and what is your	Thank you for your thoughts and suggestions! PSE is taking a holistic approach to grid modernization that includes several smart grid technologies in addition to traditional infrastructure improvements. Examples of our investments in smart technologies include substation SCADA (Supervisory Control and Data Acquisition), distribution automation, and an Advanced Distribution Management System (ADMS). Substation SCADA is a program that enhances PSE's telecommunications infrastructure to remotely monitor and control our substation equipment in real time. PSE is planning for all substations to be equipped with SCADA improvements by 2025. Distribution Automation (DA) – often described as a "self-healing grid" – is technology that provides monitoring and control of our distribution circuits to help us detect outages more quickly and address them faster and more effectively. Advanced Distribution Management System (ADMS) is a computer-based platform that will enable an integrated real-time approach

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		roadmap/plan for utilizing this technology to help achieve a clean energy future?	to distribution grid management and optimization, and for the integration of more distributed energy resources. The ADMS platform is currently in deployment and is expected to be complete in 2022. These technologies will help achieve a clean energy future.
7/19/2020	Rob Briggs, Vashon Climate Action Group	Comment #1 – Evaluate higher ramp rates for energy efficiency programs I strongly support Doug Howell's suggestion that the IRP evaluate the option of accelerating the ramp rate to 6 and 8 years for efficiency measures rather than 10 years. Doing so will evaluate a policy capable of reliably delivering early emissions reductions that have been consistently shown to be effective employment generators. Doing so would also balance other emissions reduction policies and measures that inherently have longer lead times and entail greater technical risk and/or economic uncertainty.	Response #1: Thank you for this comment. Modeling accelerating ramp rates as additional sensitivities is being considered and will be discussed at the August 11 webinar on scenarios and sensitivities.
		Comment #2 – Evaluate gas to electricity fuel switching programs The IRP needs to include the assessment of measures that entail switching loads from natural gas to electricity. While this may not have been included in previous IRPs, the writing is clearly on the wall that fossil methane use will be greatly curtailed or eliminated for climate reasons in the future. While one can imaging future power plant technology that could capture and sequester carbon, there is no plausible technology that could do that for distributed uses of natural gas. Washington State has committed to decarbonize its economy, and in California some regulations have already been enacted to shift loads from gas to electricity and many more are now being proposed. The IRP process was created to prevent egregious errors from being made in infrastructure spending, like Washington Public Power System. Rate payers continue to pay millions of dollars per year for mistakes made nearly 40 years. It would be utter folly to fail to include this inevitable and enormously consequential process of curtailing use of fossil methane through fuel	Response #2: PSE will be considering a sensitivity where some amount of gas loads are converted to electric. This will be further discussed at the August 11 webinar on scenarios and sensitivities.

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		switching in a process mandated to plan energy systems 20 years into the future.	
		Comment #3 – Excessive use of acronyms and abbreviations and poor graphic presentation If the purpose of the IRP webinars is to inform stakeholders and field their input, then it would behoove PSE and its contractors to decrease the use of acronyms, particularly those that are not explained. When participants' attention is consumed attempting to parse specialized abbreviations or language, they are not able to attend to the substance of what is being communicated. Slide 44 is a good example of excessive use of unexplained abbreviations and poor graphic design. I note that none of the abbreviations are explained at the bottom of the page, as would be appropriate. Use of these abbreviations in oral presentation, as was done extensively in this last webinar, is doubly problematic because of the near impossibility of both listening and at the same time searching the presentation document to see if the abbreviation was explained. Slide 44 attempts to do too much and as a result doesn't effectively communicate any of the things the audience might reasonably want to know. Any comparison between IRPs doesn't work because the measures don't align. What measures were added or subtracted for 2021? On which measures have assumptions changed? What measures are most impactful? What measures were most cost-effective? Answers to all these questions are hidden by poor presentation.	Response #3: PSE notes that use of acronyms and abbreviations and graphics can be a barrier to understanding and will make efforts to improve meeting materials for all audiences as we are able. Slide 44: The following list defines the abbreviations: ▪ EV: electric vehicle ▪ DLC: direct load control ▪ HPWH: heat pump water heater ▪ C&I: commercial and industrial ▪ DR: demand response ▪ ERWH: electric resistance water heater ▪ CPP: critical peak pricing ▪ BYOT: bring-your-own-thermostat In terms of measures that were added for 2021, slide 45 notes that behavioral demand response, electric vehicle service equipment direct load control, and both grid-enabled and switch technologies were applied to both electric resistance and heat pump water heaters. No measures were removed. The most impactful measures are shown on slide 46.

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			Slide 44 shows each demand response product's levelized cost from lowest to highest from top-to-bottom. The cost-effective amount of conservation will be determined from the IRP portfolio analysis.
		Comment #4 – Better evaluation of electric vehicle load management Interestingly, the measure on the graph on page 44 that appears to be the least cost-effective and to have only very modest impact—residential electric vehicle direct load control—is one that I would have assumed would be among the most cost effective and most impactful. It appears to have an associated cost of $362/kW-yr. Electric vehicles using level 2 chargers pose large loads—larger than residential water heaters and comparable to central air conditioners and heat pumps. Yet charging vehicles in most cases is not time dependent, hence customers likely need little incentive to shift the time at which they charge. Would you please provide the data sources that were used to establish the very high cost for load management for EV charging. There is enormous up-side potential in using the charging of electric vehicles to improve the efficiency and reduce emissions from the electric power sector and also large down-side risk if those loads occur at the wrong times. This seems like a critical assumption to get right, because public policy is likely to shift radically in the coming years to favor EVs, and it seems critical that PSE have a plan in place to manage them. Would you please provide references for the data sources that were used to establish the very high cost for load management for EV charging.	Response #4. Cadmus will provide the assumptions used for residential electric vehicle charging DLC in the consultation update.
7/20/2020	Virginia Lohr, Vashon	I have reviewed Webinar #3: Transmission Constraints Q&A. It states that all questions were answered. I do not recall hearing an answer to my question:	The level of public participation per IAP2 is available in the IRP schedule filed with the WUTC and posted on pse.com:

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	Climate Action Group	"Was there a way for us to know PSE's level of public engagement intended for this meeting before the meeting?" I now have 2 questions: 1. Was my question actually answered during the webinar? 2. What is the answer to my question?	https://oohpseirp.blob.core.windows.net/media/Default/PDFs/UE-200304-UG-200305-PSE-Appendix-A-(07-08-2020).pdf PSE has routinely defined the level of public engagement at the beginning of the presentation and will consider adding the level more prominently on the website in the future. 1. PSE acknowledges that the question was asked in the chat and the response was not documented in the chat. 2. The IAP2 level of public participation for the July 14 webinar was Consult.
7/20/2020	Joni Bosh, NWEC	NW Energy Coalition (NWEC) appreciates the opportunity to provide feedback on the presentation on demand side resources of July 14th, 2020. We start with three general points on the presentation. 1. It was unfortunate that there was not enough time to discuss stakeholders' questions for four of the five topics; it may be worth considering having fewer topics per session and adding sessions. 2. Please explain the process and schedule for completing the 2021 IRP Conservation Potential Assessment. How will the CPA be adjusted when the final load forecast for the 2021 IRP is available? 3. NWEC requests that the workbooks related to the July 14 presentation be made available via the 2021 IRP web site. Once posted, we request sufficient time to review the material with a comment form deadline of at least 5 working days, and preferably 10 working days. It is particularly important to have access to the Demand Side Resource workbooks and any related materials. Other information and data used for IRP inputs, such as generation cost estimates, typically rely on national assessments such as the NREL Annual Technology Baseline, or generic assumptions from public data compiled by PSE staff and consultants.	Response #1. Thank you for this suggestion. Response #2: The CPA was started in January and the webinar was the culmination of that work. The company F2020 load forecast was simultaneously under development during this time. The load forecast informs the new construction measures based on the customer growth, and not the retrofit measures. A draft was available in late May and it was used to estimate the new construction opportunities in the CPA. The final load forecast did not change much from the draft: the annual energy loads did not change, and the peaks are a little lower than the draft peaks used in the CPA, by 0.30%. These changes are not material and will not change the results of the CPA. More details of the load forecast will be presented at the September 1, 2020 meeting. Response #2. Response included in above response.

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		However, demand side resource estimates must be localized and depend on the specific characteristics of PSE's customer base and the historic, current and projected costs and other factors involved in acquiring these resources. For that reason, it is particularly important to review the detailed data underlying the conclusions of the July 14 presentation and eventual inclusion of inputs into the IRP modeling going forward. As a result, the comments here are provisional responses to the material presented on July 14, and we reserve the right to provide further comments after reviewing the supporting material. Our comments and requests are presented by slide below, identified by page number and title.	Response #3. PSE can provide some workbook components that have measure details and assumptions used in the CPA. PSE will reach out to NWEC to discuss this request further.
		Slide 14 - Updates in 2021 CPA: T&D deferral benefit The deferral amount has substantially changed. Please provide the specific assumptions that have altered since the last IRP when the value used was $64.77/kW-yr.	Slide 14: PSE updated the analysis for the 2021 IRP and is currently assessing what information can be made public. Additional information may be provided in the Consultation Update.
		Slide 20 - Types of Energy Efficiency Potential One of the most important reasons for our request to review the workbooks and related materials for the energy efficiency analysis is to be able to trace the process from assessment of technical potential for measures and programs to the achievable technical potential and then the achievable economic potential. Among other things, this will enable comparison to the NW Council's analysis and other utility IRPs in the region.	Slide 20: PSE acknowledges and will be reaching out to you to discuss.
		Slide 27 – Step 6. Develop Supply Curves for IRP Modeling If measures are bundled by levelized cost ranges, please explain how PSE will capture and reflect peak energy values for each measure? An illustrative example might help with that explanation.	Slide 27: The levelized costs currently include the peak demand benefits of deferred T&D. The avoided generation capacity benefits are applied within the portfolio model.
		Slide 30 – Electric Energy Efficiency Potential Please provide the worksheets behind this summary. NWEC also requests an explanation of when and how the assessment of the social cost of greenhouse gases required by CETA is included in this analysis, and how	Slide 30: The SCGHG will be an input in the portfolio model and will be applied to all resources including demand side resources. The effect of SCGHG is to increase the cost of fossil

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		that will be reflected in changes to achievable economic potential for energy efficiency at later stages of the IRP process.	fuel based resources and thus would favor more conservation. Eventually, the avoided cost that are developed from the post IRP process for use in conservation program planning will include the SCGHG adder.
		Slide 31 – Comparison to 2019 CPA The difference between 2019 and 2021 is a 20% reduction in Total Achievable technical potential. While most of this is explained as changed in commercial forecasts, please explain in detail the assumptions behind the reduced potentials for industrial and residential as well.	Slide 31: Overall residential potential is largely unchanged between the 2019 CPA (306 aMW) and 2021 CPA (314 aMW through 2041). Industrial potential is lower due to re-classification of some commercial customers from the industrial sector in the 2019 study.
		Slides 36, 37, 38 – Top Residential/Commercial/Industrial Electric Measures NWEC is concerned with the context and some of the specific detail in these tables. The second column is “Weighted Average Levelized Cost ($/kWh)” but the time period is not indicated, nor whether these are cumulative costs. It is difficult to interpret the sign and scale of many of the indicated values, for example, $0.40/kWh for residential windows, a negative value (-$0.064) for clothes washers, but a positive value ($0.275) for clothes dryers.	Slide 36, 37, and 38: The measure categories in the tables on slides 36, 37, and 38 are comprised of many individual measure applications. These are aggregated into measure categories to ease reporting. Because every individual measure includes its own levelized cost, we created savings-weighted levelized cost at the measure category level. These costs are levelized over the 24-year electric study horizon. Residential windows are a relatively expensive efficiency measure; clothes washers have a negative levelized cost, primarily because of the relatively high value of the non-energy impact of water savings, whereas clothes dryers do not accrue any NEIs and have a relatively higher incremental cost than clothes washers.
		Slide 42 – Demand Response Projects NWEC requests that PSE include in the IRP some discussion of the additional benefits of aligning programmatic DR with effective time of use rate design. There has been considerable analysis of these interactive effects,	Slide 42: PSE will add a discussion on time of use rate in the draft IRP report.

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		and current program efforts, for example the Portland General Electric DR Testbed, are assessing the overall gain from a coordinated approach rather than having program and rate design be developed separately.	
		Slide 44 – Comparison to the 2019 CPA We refer to our earlier comments about the importance of reviewing the underlying workbooks for this analysis, in particular for demand response. That proved to be important in the work of the NW Council's Demand Response Advisory Committee in reviewing inputs for the 2021 Northwest Power Plan, based on a template system for DR analysis provided by Cadmus. At this time, we provide initial comment on one DR measure, grid-enabled water heaters, while reserving the right to provide further comment on this and other measures after reviewing the DR workbooks and supporting materials. The grid-enabled water heater measure has rapidly emerged to be a leading DR resource for PSE. The recent adoption of the CTA-2045 interface module requirement for all new electric water heaters in Washington by January 2022 elevates the importance and availability of this measure even higher. The July 14 presentation indicates a total peak reduction potential of over 60 MW. There is no indication of time duration for the supply curve, but we assume that to be through 2041. As a result of the CTA-2045 requirement, NWEC assumes a much higher resource potential and much faster realization. Taking a very simple approach, we assume 600,000 electric water heaters currently for PSE residential customers and a 12-year resource life, with 50,000 replacements per year. Using the NW Council estimate of 0.5 kW average peak reduction per unit (assuming 4.5 kW demand per unit and a coincidence factor of about 12%), that equates to a technical potential of 25 MW per year and a total potential of 300 MW. This is far greater than the 60+ MW indicated on Slide 44. We recognize that achievable economic potential will be affected by customer acceptance and other reasons, but additional factors also should be	Slide 44: This slide shows 71 MW of residential water heat direct load control. The 71 MW are achievable technical potential which includes an assumption that program participation is equal to 25% of the eligible customer population (i.e. residential customers with electric water heating). This program participation value is the same assumption employed by the Council in its draft 2021 Plan demand response supply curves. Dividing the 71 MW by 25% equals about 284 MW of technical potential, a value similar to NWEC's estimate.

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		considered. For example, a recent report for the Northwest Energy Efficiency Alliance (screen shot below) indicates that about 70% of water heaters are replaced for burnout, but another 30% are purchased for other reasons. New residential units should also be accounted for. Because of the magnitude and favorable cost of the grid-enabled water heater resource, it is important to refine the analysis before setting the inputs for the 2021 IRP. Water Heater Market Characterization Report, #E18-305, April 2018, prepared for NEEA by Russell Research:	

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		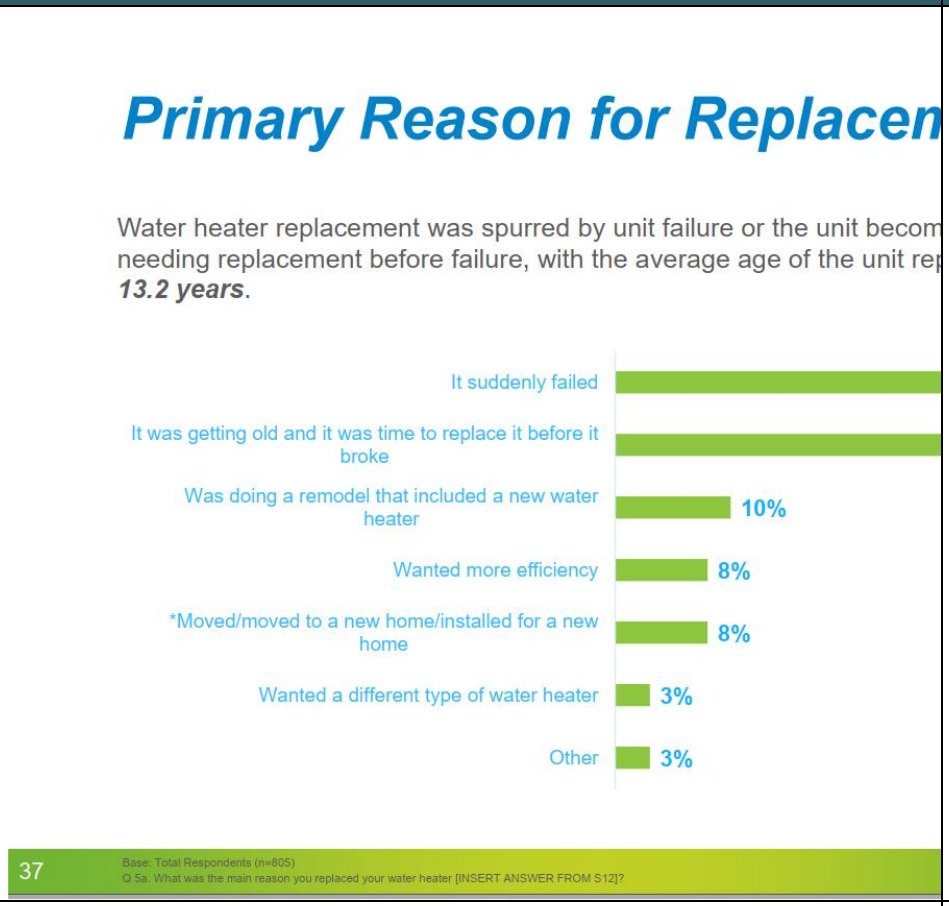	
		Slide 45 – Comparison to the 2019 CPA One point on the slide indicated "Lowered space heating DLC per unit kW impacts." Please describe the previous and current values and what led to this result.	Slide 45: The previous study used a value of 1.74 kW, which was derived from a PSE pilot in a very specific part of its service territory (Bainbridge Island) that is over a decade old. The new value, 1.09 kW, is the same value used by the Council in its draft 2021 Plan's demand response supply curves and originates from a

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<tr><td></td><td></td><td></td><td>more recent evaluation of PGE’s program. We believe this value is more appropriate and applicable to PSE’s service territory than the Bainbridge Island pilot value.</td></tr>
<tr><td></td><td></td><td>Slide 49 – Distributed PV Methodology
While the Bass diffusion model is widely used, we have three concerns. First, it may not fully capture the anticipated value perceived by customers of hedging against future rate increases.
Second, it may not account for non-price factors driving customer adoption, for example, environmental responsibility. And third, because it is based on an annualized simple payback calculation, first-cost plays a deciding role.
We are unclear whether the methodology incorporates the NREL Annual Technology Baseline (ATB) values for future PV costs, or it relies on the previous Annual Energy Outlook estimates.
We have reviewed the recently issued 2020 ATB, and find that significant cost reductions have occurred compared even to the 2019 ATB for residential solar at their Seattle standard location.
The following table shows the life cycle cost of energy (LCOE $/MWh) values for 2020, 2025 and 2030. The cost decline trend throughout the decade is substantial, and as previously stated, we believe the midpoint between the Low and Mid-range (2019 ATB) or Advanced and Moderate range (2020 ATB) is the most appropriate for modeling purposes.

<table><tr><td></td><td>2020</td><td>2025</td><td>2030</td></tr><tr><td>2019 Low</td><td>117</td><td>77</td><td>39</td></tr><tr><td>2019 Mid</td><td>134</td><td>103</td><td>72</td></tr><tr><td>2020 Advanced</td><td>117</td><td>76</td><td>37</td></tr><tr><td>2020 Moderate</td><td>119</td><td>84</td><td>50</td></tr><tr><td>NWEC Proposed</td><td>118</td><td>79</td><td>44</td></tr></table></td><td>Slide 49: Due to the uncertainty regarding future incentive and tax credit availability, PSE plans to model several solar PV sensitivities, including the potential estimated by the Bass diffusion curve, as shown in slide 49 of the presentation.
Regarding the NREL price forecast, the results presented are based on the 2019 ATB cost forecast; the 2020 ATB data set was not yet publicly available at the time of our analysis; however, Cadmus proposes to update the BAU scenario to the 2020 NREL ATB moderate forecast and run a separate sensitivity using the 2020 advanced forecast.</td></tr>
<tr><td></td><td></td><td>Slide 49 – Achievable Potential Assumptions</td><td>Slide 49: This incentive is mostly energy value as solar pV does not contribute to PSE winter</td></tr>
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		Please explain the choice of the $0.048/kWh incentive for the subsequent analysis. This amount appears to provide only capacity value and should also include energy value.	system peak. PSE will address this further with a sensitivity requested using an updated 2020 ATB data in place of the PSE incentive.
		Slide 51 – Distributed Solar PV Achievable Potential This chart only addresses the amount of potential new PV going forward. It would be helpful to provide additional information about what PSE has already attained over the last 20 years and adoption trends to date	Slide 51: The requested data will be included in the Consultation Update.
		Slide 66 – Distribution Efficiency Potential Is there an effective difference between volt/var optimization (VVO) and conservation voltage reduction (CVR)? What have been the results from pursuing CVR programmatically?	Slide 66: VVO has a mechanism to dynamically maintain the set point for the conservation voltage reduction even when growing number of distributed energy resources on the circuit. Whereas CVR was a more static system setting and the savings could be reduced with the penetration of more distributed energy resources which impact the electrical characteristics of the distribution system. So far, the CVR is working but looking into the future, VVO will likely become more important.
		Slide 69 – Stakeholder Feedback on DSR Sensitivities Proposed sensitivity 2 is for "Distributed Solar PV – with PSE ownership." Since this would be a new program with many important elements and issues, please explain the basic concept and whether it would expand solar access to low and moderate income and other disadvantaged segments that would expand DSR resource potential.	Slide 69: PSE will include your suggestion provided during the webinar for a sensitivity with a lower cost curve. PSE will likely propose to replace the PSE incentive sensitivity with the lower cost curve sensitivity. The Clean Energy Implementation Plan (CEIP) would allow for discussions on how best to offer programs to disadvantaged segments of PSE customers.
7/20/2020	Michael Laurie, Watershed LLC	Do the load forecasts take into account the likelihood that commercial building occupancy will be significantly less than it was pre-COVID and that overall demand will likely be less for several years into the future because of	PSE responses by paragraphs and referenced slide numbers:

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		the economic impact of COVID and because many more people will be working from home permanently? If not why not? Do any of the efficiency and renewables estimates take into account that we may likely have a Democrat president and Democrat controlled Congress which will likely lead to significant federal incentives for more efficiency and renewables? Biden has put together a major Green New Deal Plan that significantly eclipses the federal spending on efficiency after the housing crash in 2008. If you have not taken this into account, what is your justification for ignoring what could be a huge impact on efficiency starting next year? Could you show us your calculations, inputs, and assumptions that you used to estimate the non-PSE programmatic conservation that will occur due to Washington legislation that has passed recently including new energy codes, C-PACER, CETA, commercial building performance standard, and more. This is critical because if this is underestimated it could lead to overbuilding supply side resources. It is not helpful to anyone to know that you will include it in the modeling. Please show us the numbers and details even if that means showing us a simplification of how the model will deal with it. To me a simplification means at least at Excel workbook that makes estimates of the efficiency savings that will occur due to each program and it documents what those assumptions are based on. Ideally a 3rd party should carry out energy modeling of base case energy use and reduced energy use due to these programs for several representative building types as was done in the study linked below on the energy code impacts. https://www.sbcc.wa.gov/sites/default/files/2020-04/SBCC-BaselineStudy_FinalReport-APPENDIX%20E_Part-2_2-20200323.pdf Have you looked at the Rocky Mountain Institute's case study of the major retrofit of the Empire State Building to include the measures they implemented in your analysis of what is technically feasible? And are you working to ensure that the measures implemented in that building are studied and encouraged in the commercial buildings of PSE customers. And if not,	Per our economic forecasts based on Moody's and other regional sources (which include assumptions about the effects of the pandemic), we anticipate slower commercial customer additions and a small shift of load from the commercial class to the residential class due to unemployment and employment contractions in the medium term (i.e., people spending more time at home). The load forecast is based on the assumption that the pandemic state is temporary (resolved before 2022), however, we acknowledge there may be permanent behavioral changes, post-pandemic, and will adjust the forecast when legitimate steady state becomes more clear. The load forecast details will be further discussed at the September 1 webinar. The IRP is an iterative, long term planning process. Changes to federal standards will be adopted in the assumptions when passed into law. The draft report will include a more detailed accounting of non-programmatic conservation that will occur from Washington State energy legislation. PSE is familiar with the major retrofit of the Empire State. Our study is focused on PSE service area conditions, fuel mix, building & system vintages, labor costs, etc. PSE implementers are required by state law (Energy Independence Act) to implement cost

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		why are you leaving so much conservation on the table when others like in New York are taking action on it? https://www.esbnyc.com/sites/default/files/ESBOverviewDeck.pdf What is the relationship between the CPA and IRP effort versus program implementation? Are the program implementers at PSE required to show a good faith effort to carry out what the IRP concludes is cost effective? If so, is there a publicly available report where the implementers document that? If not why not?	effective amount of conservation coming out of the IRP. They work with a stakeholder group called the conservation resource advisory group (CRAG) to set the targets using the IRP cost effective conservation results, and they file the Biennial Conservation Plan with the WUTC, which is available to the public.
		Slide 36 includes one measure called "Whole Home". Whole home what? What is that?	Slide 36: The Whole Home measure applies to new single family and manufactured home and is an incentive based on achieving 20-30% energy efficiency over the state energy code baseline.
		Slide 39, Back to my point about considering a likely Democratic federal administration in your analysis, I think it is critical to consider that there will be a lot more new federal standards when and if that happens. Why aren't you including this in one of your options going forward?	Slide 39: Typically, most conservation potential assessments, including those performed by the Northwest Power and Conservation Council, do not attempt to predict the impact of non-existent future federal standards or state and local building codes.
		Slide 45 - Agree with Don Marsh's point. PSE please explain what thinking and evidence led to you reaching a different conclusion than other utilities reached on this subject.	Slide 45: The explanation regarding customer acceptance was listed solely with respect to smart appliance direct load control. We are not currently aware of any secondary research that indicates customers' acceptance of having smart appliances controlled by their local utility. The most recent Smart Electric Power Alliance 2019 Utility Demand Response Market Snapshot included a survey question that indicated 0% of 95 utility survey respondents indicated that voice-enabled smart home devices have been integrated into new or existing demand response programs.

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		Have you considered the possibility of some uses of natural gas will be banned in new construction as has happened in a number of jurisdictions in California? If not why not? Could you do a sensitivity analysis of conservation achievable if conservation can be done without a loss of revenue to PSE. I am thinking here about the MEETS approach. (Metered Energy Efficiency Transaction Structure): This is efficiency that also does not have to meet PSE's cost effectiveness bar because it is not PSE paying for it as an alternative to a gas plant or renewables. It is a private investor group doing it to make money from efficiency with no loss of revenue to PSE. After a quick review of the PSE July 14th presentation this looks to be one of the Achilles heals of PSE's effort because they are focused on carrying out cost effective, technically feasible conservation that does not have barriers. But MEETS includes conservation that does not have to meet their cost-effectiveness criteria and that will not be up against the typical barriers that most conservation is limited by. Why isn't PSE willing to at least carry out a pilot project of this deep retrofit approach like Seattle City Light is currently doing? And a sensitivity analysis of conservation potential if conservation spending was recognized as capital spending, thus allowing PSE to make a profit on conservation spending. Some people have proposed the idea that conservation spending be considered capital expenditures because that would allow PSE that make a profit on it. How would this impact conservation spending? I think it could have a huge impact leading to so much conservation spending that the case for new natural gas plants would be unnecessary. Thank you for your time on these important issues. All the best.	PSE is considering a fuel conversion sensitivity from gas to electric. The possible scenarios and sensitivities will be discussed at the August 11 webinar. PSE already has a decoupling mechanism is place: https://www.utc.wa.gov/docs/Pages/PSEDecouplingUE121697.aspx It is primarily a delivery mechanism for conservation measures and this discussion belongs in the design and implementation of programs. Concerning the idea to run a sensitivity on earning a return on conservation, we can discuss this during the August 11 webinar on scenarios and sensitivities (electric and gas).
7/21/2020	Kyle Frankiewich, WUTC	**Commission Staff Feedback for Puget Sound Energy 2021 IRP Webinar #4: Demand Side Resources – July 14, 2020** Questions and comments from presentation:	PSE responses to questions and comments by referenced slide number:

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		• Slide 11: Elizabeth explained that one advantage of Plexos is that the program is open-source, so all resources are visible and able to be coded in. Accurately representing these unique resources - coding these inputs - then becomes critical. Please share the parameters used for the various DR resources, as well as any documentation used to support the parameters used.	Slide 11: PSE has not finished setting up the Plexos model and the DR programs have not been coded yet. The information will be available at a later date.
		• Slide 13: Where did PSE's figures come from? What went into them? Are they stale or is this a fresh analysis for the 2021 IRP? Please provide the work papers supporting PSE's deferral benefit estimates.	Slide 13: PSE updated the analysis for the 2021 IRP and is currently assessing what information can be made public. Additional information may be provided in the Consultation Update.
		• Slide 18: It appears that CCP is the only type of alternative rate design approach explored within CADMUS's CPA. This may be acceptable if PSE intends to fully explore the potential for TOU and dynamic rates elsewhere in the IRP. What aspect of PSE's work plan includes this piece?	Slide 18: We don't test rate designs in the IRP. The CPP program assumes that the company will attain a time differentiated rate in the near future. That is an assumption upon which the CPP is based in the IRP. The CPP program may or may not be the driver for a future change to a time differentiated rates.
		• Slide 27: Are all costs and benefits levelized by PSE's WACC? If so, it may be more appropriate to model the carbon emissions cost (and carbon emission reduction benefits) using a 2.5% discount rate to align with U-190730. (may be covered in 7/21 meeting)	Slide 27: Yes all costs are levelized using the WACC. U-190730 relates to the use of inflation factors in adjusting the SCGHG. We have done a sensitivity in the past using the social discount rate and we can consider one in this IRP. The scenarios and sensitivities will be discussed at the August 11 meeting.
		• Slide 29: Baselines should rightly be adjusted for new water heater standards; does the EE and DR program implementation side of PSE have the capability to acquire these opportunities?	Slide 29: PSE needs clarity concerning this question. PSE will be reaching out to WUTC to gain some insight.
		• Slide 35: Please describe the whole home measure category. What is weighted average levelized cost? What is being weighted and averaged? Does this imply a market forecast with hourly prices? I didn't get to ask in the interest of time.	Slide 35: The whole home measure relates to whole building performance incentive to build 20-30% above the WA state energy code. Built Green program: The table on slide 36 presents the results for different residential measure categories, some of which are comprised of

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			many different individual measure applications; for the whole home measure category, this would include new single family and manufactured homes that are either 20% or 30% better than code. Therefore, we also created weighted average levelized costs, which is an average levelized cost for each individual measure application, weighted by that application's total achievable technical potential.
		• Slide 42: Please describe the difference between CPP and behavioral DR. Is behavioral DR simply asking/informing?	Slide 42: Critical peak pricing (CPP) is typically included in a tariff whereas behavioral demand response, which is neither time of use nor critical peak pricing, is a demand response program that notifies customers day-ahead via text or email of an upcoming event and encourages them to save energy during a specific time horizon.
		• Slide 44: This is a very useful graph. What are kW-yr costs like on supply side, generally? For peaker / CCCT / 10 MW battery? How do these kw-yr figures compare to the $/kWh measures above? Or is that EE apples and DR oranges? (see recommendation about Pacific Power's aborted idea on calculating the capacity value of EE)	Slide 44: PSE does not have the levelized cost of supply resources, it is calculated at the end of the process using the model outputs.
		• Slide 46: Why limit CPP participation? Can residential customers with gas space heat provide value through a DLC program?	Slide 46: Cadmus is not aware of any gas CPP program. Part of the limitation is that the two primary gas end uses (water and space heating) can also be directly controlled whereas CPP is not a firm resource. Another part of the limitation is that gas is traded on a daily basis and system peaks are daily. If a CPP program is applied to end users, the daily use may not change. The gas use after the CPP event may be higher to bring the space or water temperature back to the set point.

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		• Slide 49: Does PSE intend to generate other components of the DER assessment required under CETA? Do empirical data support the use of a homo economicus assumption about customer adoption of solar? What is a Bass diffusion model function? A key input to this analysis is the falling cost of solar. Does that input align with PSE's supply-side solar assumptions? Does PSE intend to explore the value of customer-sited (and possibly customer cost-shared) energy storage, especially paired with solar? This seems like an important DER to fully understand. The impact of alternative rate design paired with DERs must also be fully analyzed.	Slide 49: PSE will discuss distributed energy resources (DER) at the August 11 meeting. Depending upon the study, empirical data likely indicate a number of factors influencing both commercial and residential customer solar adoption, including estimated payback. The Bass diffusion model function is a Bass diffusion model variant that models customers' sensitivity to payback and the annualized simple payback for each year of the study horizon. Utility-scale and customer-sited solar PV costs vary widely and are not the same; customer-sited PV costs also vary between residential and commercial customers. In both cases, the PV analysis includes a forecast of future solar PV prices, which do decline substantially over the study period.
		• Slide 50: Where does $0.048/kWh rate come from? Does changing this rate yield dramatically different adoption rates? Does this rate align with the company's PURPA rates? If not, what is included here that is not included within the company's PURPA avoided costs?	Slide 50: We have estimated the avoided cost based on the draft 2019 IRP work we did. This lines up more with cost effectiveness used for customer programs. This is not seen as a PURPA avoided cost. Based on feedback from you and NWEC during the webinar, we will eliminate this PSE incentive sensitivity and consider a lower cost curve sensitivity in its place.
		• Slide 60: Seems gas EE costs have come down while total potential has grown. Why?	Slide 60: The potential has gone up due to market changes that impacted couple measures. Gas potential is lumpy in that changes in one or two measures can have an impact on the supply

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			curve. The lower gas costs don't affect the measures costs, but will come into play when we run the IRP model to determine the cost effective amount of conservation.
		• Slide 61: As with EE, please explain what is being weighted and averaged in the levelized cost column. Do these calculations include all quantifiable non-energy benefits? Appears so given that aerators have a negative cost. What NEIs were included?	Slide 61: Individual measure applications are being weighted within large measure categories. For example, individual measures may have varying incremental costs and/or energy savings depending on which housing segment is being treated or the baseline measure it is replacing. The individual measure levelized costs are weighted by each measure's total achievable technical potential. These calculations do include all quantifiable non-energy impacts; measures with low incremental costs but significant NEIs, like aerators, may have negative levelized costs.
		• Slide 66: How long did it take for first 17 substations? What controls are being adopted in 2022? Is the tech not ready to be adopted now or in 2021? Has PSE estimated the added cost of pulling these projects forward in time, i.e. to get 24 aMW of savings before 2026 instead of by 2034? Is that option (and the corresponding added cost) selectable by the resource optimization model? Do these upgrades also enable more solar and other DER resources?	Slide 66: The Advanced Distribution Systems Management (ADSM) system will be installed in 2022 and it will ensure stability and accommodate more DERs on the system, and will allow additional savings in the distribution efficiency measures. No, early completion is not adjustable inside the IRP model.
		• Slide 67: why is levelized price the appropriate way to bundle? What does 20yr vector mean? is a 'bundle' of subsidized private solar at small cost the best way to model distributed PV as a selectable resource? What does 'applied in the portfolio models' mean?	Slide 67: The levelized cost is standard industry practice for creating supply curves. A vector is a 20 or 24-year stream of savings that is used as the input in the portfolio model and it is a resource option available in the first year of the study. Distributed solar is a must take resource and is not being "selected." The application of SCGHG in the IRP models was addressed at the July 21 webinar.
		• Slide 68: It seems like there is a lot of analysis that is being described in these bullet points. How is a DR program group's ELCC	Slide 68: PSE will discuss the resource adequacy model and the effective load carrying

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		determined? Are other resources also decremented based on an ELCC analysis? What is the ramp-up time for a DR program? What are the DR program sizes available to the portfolio model? How did PSE determine that these sizes are appropriate?	capacity (ELCC) of demand response (DR) and other resources at the September 1 meeting. The ramping and quantity is shown and discussed on slide 44 and additionally on slide 84 in the appendix. The amount of DR is the result of the potential assessment.
7/21/2020	Kyle Frankiewich, WUTC	Recommendations:	PSE responses concerning recommendations by number:
		1. Equity analysis in IRP: CETA requires an equity assessment within the IRP, as described in RCW 19.280.030(1)(k). This requirement is not waivable, and is not on hold while rulemakings and Department of Health's cumulative impact analysis work is ongoing. Modeling is a decision support tool, and system needs should consider all constraints and requirements, including equity needs. At the very least, PSE needs to assess whether it's selected portfolio increases or decreases disparities in the geographic distribution of system benefits and burdens. This is a very different challenge from past IRPs, which is why it seems like a good idea to discuss how to approach this new challenge early and often. How does PSE plan to countenance this equity constraint? Please consider adding a separate IRP meeting to discuss equity issues and the company's proposed approach for assessing equity impacts.	1. Thank you for the recommendation. PSE is still assessing the best process to ensure that equity is appropriately addressed through the 2021 IRP.
		2. CPA before load forecast: Many participants expressed concern about this topic. To assuage these concerns, PSE should compare the preliminary load forecast used as a CPA input with the finalized forecast to see whether the CPA results are reasonable. a. We also agree with commenters that changes from 2019 CPA to 2021 CPA are hard to understand if most of the shifts in conservation potential are brought about by changes in the load forecast. b. Also, we want to recognize the unavoidable bind PSE is in – if PSE had started with imperfect load forecast that didn't	2. (a) The impact from the changes to the load forecast are relatively small. The major changes were due to updates to the measures themselves, and their savings assumptions. Three of the major changes were discussed on slide 34. (b) PSE used a draft version of the 2020 load forecast in the results presented on July 14th. We expect the final will be the same as the draft and if not, then very close to it. In the event that

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		include finished CPA figures, participants may wonder why preliminary figures were being presented when they aren't fully baked.	there is a major change in the final we will inform the stakeholders of the change. In either case, Cadmus will update its analysis based on the final load forecast and we will detail the changes to the potential based on the final forecast.
		3. Ramp rate for discretionary EEMs: Some commenters have noted that the 10 year ramp for discretionary EEMs is arbitrary. I don't know that it's wrong, but it would be good to hear why 10 yrs is more appropriate than 4 or 6 yrs, especially knowing that the value of conservation may (or may not!) jump in 2026 and 2031 due to CETA's restrictions on fossil-based supply-side resources. Some sensitivities to see the impact of adjusting these ramp rates would also be helpful.	3. The 10 year ramp was determined around the 2007 IRP. PSE will consider the faster ramp rates of 6 years and 8 years as sensitivities. This topic will be discussed further at the August 11 webinar.
		4. Uncertainties regarding customer acceptance (of DR, CPP, solar): these assumptions are soft and fungible; PSE could shift perceptions of programs if it decided it was worth the time and investment. Should vet these assumptions based on empirical data elsewhere and assumptions of other utilities.	4. The major customer uncertainty for demand response listed was that of smart appliance direct load control. We are unaware of any fully implemented program or evaluation of customer acceptance of this control technology. For other demand response products, the program participation rates – which account for likely customer acceptance – are all based on secondary research of similar programs from other utilities and have been checked against regional assumptions on the Council's 2021 Plan draft demand response supply curves and other recent, NW utility IRPs.
		5. Sensitivities around private solar: install price; incentive offering; including knock-on effects	5. PSE will be doing a sensitivity with a lower cost curve of solar PV. Additional discussion regarding the sensitivities will occur at the August 11 meeting.
		6. Scenario banning new gas use: I'm not expecting the company to plan around this possibility, but understanding how the plan would have to pivot if a ban or partial ban was put in place can only be helpful.	6. PSE will be discussing portfolio sensitivities at the August 11 webinar and stakeholders will have an opportunity to provide feedback regarding the sensitivities that should be

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			included. One of the sensitivities is a fuel conversion from gas to electric, we are not looking at a gas ban scenario.
		7. TOU and dynamic rates: Please clarify when and where these options will be analyzed.	7. These options are analyzed outside the IRP in the rates and regulatory group of the company.
		8. DR water heaters: Fred with NWEC's observations on the rough scale of this potential resource are persuasive. Please reconcile the forecast in this CPA of about 60 MW total over 20 yrs with his back-of-the-envelope estimate of about 25 MW a year.	8. Slide 44 shows 71 MW of residential water heat direct load control. The 71 MW are achievable technical potential which includes an assumption that program participation is equal to 25% of the eligible customer population (i.e. residential customers with electric water heating). This program participation value is the same assumption employed by the Council in its draft 2021 Plan demand response supply curves. Dividing the 71 MW by 25% equals about 284 MW of technical potential, a value similar to NWEC's estimate.
		9. DR and conservation capacity cost as net of energy savings: In its 2019 IRP, Pacific Power briefly proposed a novel way to derive the capacity cost of EE and DR resources. They used a 20yr hourly energy price forecast and an EEM's load curve to project whether the EEM was cost-effective purely on an energy basis. When it was not, they took the incremental $/MWh cost relative to their energy price forecast and paired that with the EEM's load curve again to determine a $/kW-yr price for the capacity component of an EEM's benefit. I don't want to see this implemented as a way to determine cost-effectiveness, but as a way to value the capacity value of an EEM, it may be useful. Would the company be willing to explore this approach?	9. We input the conservation supply curve as an hourly load shape and the portfolio model takes into account both the capacity and energy value of the energy efficiency in selecting resources. The demand response is input as a capacity resource and its primary value is due to capacity. The ancillary benefit streams will be netted out of the cost.

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Questions not answered during the webinar			
7/14/2020	Brian Grunkemeyer, FlexCharging	Question queued up for slide 36: I don't see anything about Demand Flexibility approaches. Specifically, there's no EV load management measure, and it's unclear whether the Heat Pump Water Heater measure is taking advantage of all the great work the BPA has been doing on aggregating water heaters as Demand Flexibility devices.	Slide 36 presents the energy efficiency potential results for the residential sector. It does not include load management; however, slides 41 through 47 cover the demand response portion of the potential assessment, which includes electric vehicle service equipment direct load control. Slide 46 shows that residential water heating direct load control is the single largest end use resource for demand response potential and includes both grid-enabled electric resistance water heaters and heat pump water heaters, both of which are ANSI/CTA-2045 capable. The underlying analysis uses per unit kW impact assumptions from the BPA/PGE study.
7/14/2020	Don Marsh	Documentation of PSE's models and assumptions is so important because some of the conclusions PSE comes to seem to be at variance with what is happening with other utilities across the country. For example, Pacificorp is going much more for battery storage than PSE is. Why is that? Is there something different about PSE's service territory? We need to understand.	PacifiCorp service area is very different than PSE's service area. Their plan shows utility scale battery storage which is also included as a front of the meter option in the 2021 IRP.
7/14/2020	Kevin Jones	Will the CADMUS analysis be re-done if there are significant issues with the PSE load forecast? Technical advisors have typically raised concerns about PSE load forecast. How are these results valid?	If errors are found that need to be corrected, then PSE will make best efforts to make those corrections.
7/14/2020	Court Olson	We would like to know when we can plan on hearing a new analysis that includes the heating fuel switching trend that is growing. This is a big flaw in the analysis. What future session will this be presented in?	Fuel switching is being included as a sensitivity and will be discussed at the August 11 webinar on scenarios and sensitivities.
7/14/2020	Bill Westre	Ramp rates - Have other utilities used shorter ramp rates?	PSE is not aware of shorter ramp rates being used.
7/14/2020	Michael Laurie	Have you looked at the case study of the major retrofit of the Empire State Building to include the measures they implemented in your analysis of what is technically feasible?	PSE is familiar with the major retrofit of the Empire State and our study is focused on local

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			NW (actually PSE service area) conditions, fuel mix, building & system vintages, labor costs, etc.
7/14/2020	Elyette Weinstein	What percentage of annual contributions does PSE contribute to the NW Energy Efficiency Alliance?	According to the filing with the WUTC (Docket Number: EES0012019), PSE paid approximately $7.2 million to NEEA in 2019 and their total utility contributions were approximately $40 million (https://neea.org/annual-report/2019
7/14/2020	Court Olson	How is the unique efficiency impact for an aggregation of measures going to be used to adjust the PSE future efficiency forecast? This is important as future CETA deadlines and C-PACER programs ramp up and deep efficiency improvements catch on in the buildings market place. The 2021 IRP must take this into account, so when will we see appropriate revised efficiency forecasting?	PSE appreciates your observation that we are not using bundling of measures in the CPA. The conservation supply curve is ordered lowest cost to highest cost so we can test the marginal cost resource to determine the cost effective amount of conservation. We will not have a forecast with these bundles in the CPA. However, what you are suggesting can be considered on the implementation level with programs, and the CPA does not prevent this in any way. Programs can be designed to include highly cost-effective measures with hard to reach measures or deep measures.
7/14/2020	Michael Laurie	What is the relationship between the CPA and IRP effort versus program implementation? Are the program implementers at PSE required to show a good faith effort to carry out what the IRP concludes is cost effective? If so is there a publicly available report where the implementers document that?	PSE implementers are required by state law (Energy Independence Act) to implement cost effective amount of conservation coming out of the IRP. They work with a stakeholder group called the conservation resource advisory group (CRAG) to set the targets using the IRP cost effective conservation results, and they file the Biennial Conservation Plan with the WUTC, which is available to the public.
7/14/2020	Kevin Jones	Gurvinder - you did not really answer my question - would PSE provide the load data used in the CADMUS analysis? Will this be the same or different than the load forecast provided in September? If different we would like to	The load forecast was provided as a draft as it takes a lot of effort to get the forecast completed, so there is a small chance that the load forecast may see some minor changes from what was

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		understand the differences. If the same, why will PSE not provide the data now?	used in CPA versus what is finally approved. But the load forecast change will not and does not have a material impact on the CPA numbers. If there is a change in the load forecast from the one used in the CPA, we will inform you of that.
7/14/2020	Don Marsh	Slide #30. How do the 2023 values compare to NWPCC assumptions? How do they compare to assumptions for neighboring utilities, like Seattle City Light? They seem a little low to me.	These values have to be compared within context. A high number can also indicate that the utility has not being engaged in aggressive conservation in the past and thus a lot of conservation still remains. The numbers for Seattle City Light are at the technical potential level, and if one uses the 85% achievability factor assumed in the SCLs numbers for achievable technical potential are as follows: Residential = 21%, Commercial = 20%, and Industrial = 7%. PSE's corresponding numbers are 18%,18% and 8%.
7/14/2020	Court Olson	You missed the legislating update for HB2405 which put C-PACER into law. This needs to be included in your analysis. When will your analysis be adjusted accordingly?	Thank you for bringing this to our attention, the next legislation seems to have passed this spring. Any impacts will be reviewed and PSE will provide a discussion in the IRP book of the implication to the next CPA.
7/14/2020	Joni Bosh	Repeating my question from slide 24 here again - If measures are bundled by levelized costs, how do you plan to reflect/capture peak energy values? By measures? By bundles? Slide 27	The measures are shaped using 8760 hourly shapes before they are bundled. The region has been relying on ELCAP data library and some shapes from the RBSA. Thus the bundles are also an aggregated 8760 hourly shape, where the peak is part of the shape.
7/14/2020	Court Olson	Your commentary thus far indicates that several things were overlooked and not included in estimating the achievable energy efficiency over the next twenty years. When will these projections be revised to include the increasing trend of deep efficiency improvements which we expect over the next twenty years?	The CPA has a comprehensive look at all possible measures that could be done. The idea of deep retrofits belongs in the implementation side, whereby the aggregation of very cost-effective measures with not so cost-effective

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			ones can lead to more comprehensive retrofits. The programs teams are working with pay for performance measures and engaging with them may answer the questions you are posing here.
7/14/2020	Kevin Jones	Slide 33: Is the 26% to 8% drop in achievable Industrial technical potential due to industrial to commercial reclassification?	Yes.
7/14/2020	Don Marsh	Slide #34: I think you're saying that most of the drop in electric potential is because of lower growth in various categories. So the load forecast should be significantly lower than we saw in 2019. But for now, we just have to guess. Like blind men describing an elephant.	The load forecast is not the major driver in the reduced conservation on slide 34. It is not a factor in the items discussed on this slide. Load forecast will be discussed at the September 1 webinar.
7/14/2020	Court Olson	Slide 34 seems to only consider new construction. Some of us expect an increasing likelihood of retrofitting existing buildings. It appears that you are missing this likely occurrence over the next 20 years which will likely eclipse the savings impacts from more efficient new buildings. When will your forecast be adjusted to accommodate this likely future trend? To follow up on my question on air leakage consideration, please provide the data source for the detailed envelope factors that Camus says that they use. Thanks.	PSE appreciates your observation that we are not using bundling of measures in the CPA. The conservation supply curve is ordered lowest cost to highest cost so we can test the marginal cost resource to determine the cost effective amount of conservation. So we will not have a forecast with these bundles in the CPA. However, what you are suggesting can be considered on the implementation level with programs. Programs can be designed to include highly cost effective measures with hard to reach measures, or deep measures. The underlying air leakage assumptions were derived from various Regional Technical Forum unit energy savings workbooks including, for example, the Residential Single Family Weatherization workbook, v4.1: https://nwcouncil.app.box.com/v/ResSFWeatherization-v4-1
7/14/2020	Doug Howell	Slide 26. That does not answer the question about why can't PSE further accelerate the ramp rate from 10 years to six or eight years.	You have requested 6 and 8 year ramping as sensitivities and PSE has included your request

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			in the list of sensitivities. Further discussion will occur at the August 11th meeting.
7/14/2020	Court Olson	The answer to my question on the 10 year life for measures rather than 20 years, the assumption that measures will only have a weighted average of 10 years is incorrect in my experience. This needs to be revised. When can we expect to see this impact period extended from 10 years to 20 years?	The CPA uses standard measure life data for equipment, as used by the regional technical forum (RTF), NWPCC, NEEA, etc. You are correct that often the equipment is used beyond its useful life. In those cases the efficiency also degrades over time. The CPA assumes that equipment is replaced at the end of its life with same efficiency as was installed in the first year.
7/14/2020	Michael Laurie	Slide 36 includes one measure called "Whole Home". Whole home what? What is that?	The whole home measure relates to whole building performance incentive to build 20-30% above the WA state energy code. Built Green program. https://www.pse.com/rebates/new-construction-grants/high-performance-homes
7/14/2020	Michael Laurie	Slide 39 Back to my point about a likely Democratic federal administration, I think it is critical to consider that there will be a lot more new federal standards when and if that happens.	The IRP is an iterative, long term planning process. Changes to federal standards will be adopted in the assumptions when passed into law.
7/14/2020	Kyle Frankiewich	slide 42: what's the difference between CPP and behavior DR? If behavioral DR is similar to home energy reports, is it effectively just asking / informing customers of the benefit of shifting load?	Critical peak pricing (CPP) is typically included as a tariff whereas behavioral demand response, which is neither time of use nor critical peak pricing, is a demand response program that notifies customers via text or email of an upcoming event and encourages them to save energy during a specific time horizon.
7/14/2020	Kate Maracas	Slides 42-43: To what extent does PSE rely on demand response aggregators to deploy the DR products? Could broader use of aggregators increase customer adoption?	At the present, PSE has only conducted pilots demand response programs. PSE will use a request for proposals (RFP) process to solicit the best offerings and programs for its customers, and bidders will have the opportunity to aggregate their DR offerings.
7/14/2020	Don Marsh	Slide 45, does "behavioral load response" = time of use rates? Or is this just critical peak pricing?	Slide 45 mentions behavioral demand response, which is neither time of use nor critical peak

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			pricing. Rather, it is a type of demand response program that notifies customers day-ahead via text or email of an upcoming event and encourages them to save energy during a specific time horizon.
7/14/2020	Kate Maracas	Slides 42-44: do many of these programs rely on AMI (automated metering infrastructure)? If so, is investment in AMI an impediment to broader customer adoption?	Some do rely on AMI, but AMI helps in the measurement and communication for all programs. AMI deployment is not an impediment. PSE is expected to complete its AMI deployment by 2023, one year into the start of this CPA study period. https://www.pse.com/pages/meter-upgrade
7/14/2020	Kevin Jones	Slide 45: Is uncertain customer acceptance a CADMUS or PSE assumption and what is the basis for the assumption?	Thank you for your comment. The explanation regarding customer acceptance was listed solely with respect to smart appliance direct load control. We are not currently aware of any secondary research that indicates customers' acceptance of having smart appliances controlled by their local utility. The most recent Smart Electric Power Alliance 2019 Utility Demand Response Market Snapshot included a survey question that indicated 0% of 95 utility survey respondents indicated that voice-enabled smart home devices have been integrated into new or existing demand response programs.
7/14/2020	Doug Howell	Demand Response: Do the DR benefits include: avoided generation and TX upgrades; avoided distribution upgrades; storage function; line loss reduction from energy savings; ancillary services at generation level such as frequency regulation and spinning reserve; and ancillary services for distribution of voltage control?	Yes. Please refer to the pie chart from Brattle group's presentation at the UTC DR workshop on slide 68. The majority, as in more than 95%, of the savings from demand response accrue from capacity, avoided transmission and distribution, and energy savings. Then there are the other benefits you mention: ancillary services, which include regulation and spinning reserves. In this IRP we will use the Plexos flexibility model to

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			estimate the ancillary benefits associated with the DR programs being considered in the IRP.
7/14/2020	Court Olson	Not including the potential for demand control on smart appliances misses a DR potential. Can this potential be included in a revision to the DR calculations?	No. See below response to Michael Laurie's question reference slide 45.
7/14/2020	Don Marsh	Don Marsh Comment: Slide 45 - "uncertainties regarding customer acceptance" is PSE's standard explanation. However, many utilities find customers love demand response programs that provide lower monthly bills. PSE is using assumptions that are decades out of date.	Thank you for your comment. The explanation regarding customer acceptance was listed solely with respect to smart appliance direct load control. The sixteen demand response products included in the study all explicitly assumed some level of customer acceptance, typically reflected in program participation assumptions that are included in the achievable potential estimation.
7/14/2020	Michael Laurie	Slide 45 - Agree with Don Marsh's point. PSE please explain what thinking and evidence led to reach a different conclusion than other utilities reached.	We would welcome any additional information regarding utilities currently offering demand response programs for smart appliances and/or any evaluations of these programs. The most recent Smart Electric Power Alliance 2019 Utility Demand Response Market Snapshot included a survey question that indicated 0% of 95 utility survey respondents indicated that voice-enabled smart home devices have been integrated into new or existing demand response programs.
7/14/2020	Kevin Jones	Slide 38: What is the basis of the assumption that energy efficiency occurs before Demand Response? What is your estimate of delayed DR employment while waiting for EE upgrades?	Whether we do demand response first or energy efficiency, there is an interaction between the two. So we have to account for it. Even if demand response takes place before, during or after (as assumed here) energy efficiency we need to account for the reduced load due to the interaction.
7/14/2020	Court Olson	Slide 49: Where to you get your PV market penetration function for each year?	It is a relatively, commonly-used Bass diffusion model function that measures a customer's

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			sensitivity to payback and the annualized simple payback for each year of the study.
7/14/2020	Court Olson	Slide 59: Could you please define what you mean by combined heat and power?	Combined heat and power (CHP) is when a customer installs a generation system whose waste thermal heat is recovered for use to serve thermal load on site. By recovering the waste heat from the generation process, you increase the overall efficiency of the CHP.
7/14/2020	Court Olson	Slide 60: Are you projecting a decline in natural gas use due to switching to heat pumps? If not, when will you adjust your calculations to include this trend?	We have not included this. It is not cost effective to convert to heat pumps, unless one is doing an end of life replacement, in which case the incremental costs associated with equipment and electrical service upgrades may or may not be cost effective. We are keeping an eye on this conversion, but don't see much natural conversions to date that will have a meaningful impact on our gas loads. A major shift will likely be affected through legislative mandates, which are not presently on the books and have not been included in the forecasts. Finally, we are considering a sensitivity at the August 11th webinar.
7/14/2020	Michael Laurie	Slide 62: Have you considered the possibility of some uses of natural gas will be banned in new construction as has happened in a number of jurisdictions in California?	We include codes and standards that in the books at the time of the CPA. At the moment we don't have any laws banning natural gas, now or to go into effect in the future. Thus, we have not included anything presently. We will do this again in a couple years and have the chance to review any legislation updates that ban natural gas and can include that accordingly.
7/14/2020	Fred Huette	for slide 63: is there an effective difference between volt/var optimization (VVO) and conservation voltage reduction (CVR), if so has PSE looked specifically at CVR	Yes, PSE has typically just done CVR, but now with the Advanced Distribution Systems Management (ADSM) infrastructure roll out, CVR is done in combination with the reactive power

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			management on the circuit. Since we are now doing both volts and vars, it's called VVO.
7/14/2020	Kate Maracas	+1 to Don Marsh. Also, the increased capabilities of grid-forming inverters that will inevitably be deployed after implementation of IEEE 1547 standards will have a significant impact on solar PV's (distributed and utility scale) ability to provide flexibility and ancillary services. How is PSE considering both the cost reductions and advanced technical capabilities?	The analysis currently does not consider the capability of grid-forming inverters; however, PSE and its contractor are monitoring the implementation of IEEE 1547 interconnection standards and may consider inclusion of the impact of these technologies in the next IRP.