2023 Electric Progress Report Feedback

This document captures public feedback from the December 12, 2022 Integrated Resource Plan (IRP) public webinar on Draft Electric Portfolio Results and Draft Chapter Three: Resource Plan of the 2023 Electric Progress Report, published January 24, 2023.

Feedback from Interested Parties

The following organizations and individuals submitted feedback to PSE on the Draft Electric Portfolio Results webinar and the Draft Chapter Three: Resource Plan of the Electric Progress Report. Click on any name (listed in alphabetical order by first name) to review their feedback.

- Alondra Regalado, Western Energy Storage Taskforce (WEST)
- Amy Wheeless, Northwest Energy Coalition (NWRC)
- Bradley Cebulko
- Deepa Sivarajan, Climate Solutions
- Don Marsh
- Fred Hudik
- Jim Adcock
- Joel Nightingale, Washington Utilities and Transportation Commission
- Kelly Hall, Climate Solutions
- Michael Rooney, Rye Development
- Sashwat Roy, Renewable Northwest
- Sergio Duenas, Western Energy Storage Taskforce (WEST)
- Stephanie Chase, Public Counsel Unit, Office of the Attorney General

Feedback Themes

Table A.1 describes the major public feedback themes identified by PSE throughout the 2023 Electric Progress Report process.

Table A.1 Feedback Themes

#	Feedback Topic	PSE Response
A	Review timeline	PSE will work to build in additional time for members of the public and interested parties to review IRP documents and have adequate time to provide feedback in future IRP cycles.
B	Accessibility and plain language	PSE is committed to removing participation barriers and attracting more members of the public into the resource planning process. In this IRP cycle we took steps to improve readability and accessibility for all and moving forward this will be a continued priority.
C	Inflation Reduction Act	PSE included Inflation Reduction Act (IRA) provisions for the distributed solar investment tax credits in the 2023 Electric Progress Report, as these are clear and have been used in the past. However, the bulk of the IRA provisions related to energy efficiency still need to go through a rulemaking process, and this is not expected to be completed till mid-2023. PSE will stay informed about the IRA rulemaking processes and will incorporate the provisions in future CPA studies.
D	CETA compliance	The preferred portfolio, which requires over 6,700 MW of new generation by 2030, is a portfolio of diverse resources that can fulfill our CETA commitments and achieve carbon neutrality by 2030 and a carbon-free electric energy supply by 2045.
E	Alternative fuels	We explored the use of alternative fuels including biodiesel and green hydrogen in the 2023 Electric Progress Report. These fuels enable combustion resources to provide carbon-free peaking capacity, which will be essential for a clean, reliable resource portfolio. In this report, we captured key characteristics of alternative fuels such as price and availability. Having established the potential benefit of alternative fuels in this report, we aim to further refine the assumptions for alternative fuels in future IRP cycles.
F	Peaking capacity	CETA-qualifying peaking capacity is functionally like natural gas peaking capacity but operates using non-emitting hydrogen or biodiesel fuel. Peaking capacity is a small portion of our overall capacity but critical to meeting peak demand.
G	Small modular nuclear (SMR)	Although not part of the preferred portfolio, we see advanced small modular nuclear reactors as potentially a necessary part of our region's future energy supply mix. PSE will continue to investigate the technology as a potential fit for future resource needs.
H	Effective Load Carrying Capability (ELCC)	Estimation of the ELCC of resources is subject to both intra- and inter- resource interaction impacts. In this report, we estimated the influence of intra-resource interactions with saturation

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		curves, where each additional megawatt added for a specific resource type reduced the ELCC of future additions of that same type. Inter-resource interactions, where addition of one resource type influences the ELCC of a different resource type, are more complex to model. We are exploring the potential impact and methodologies to account for inter-resource interactions in future IRP cycles. We also aim to better characterize the ELCC of energy-limited resources, such as batteries, through alternative modeling methods in future IRP cycles.

December 12, 2022 Webinar Feedback

Table A.2 records responses to unanswered questions heard during the **December 12, 2022** webinar and questions submitted via the feedback form and irp@pse.com.

Table A.2 Questions and Comments from December 12, 2022 webinar on Draft Electric Portfolio Results

Date	Interested Party	Comment	How PSE used this feedback
12/12/22	James Adcock	Will natural gas and hydrogen peakers also dispatch for other utility's needs AKA "dispatch to market" or will they be reserved to only dispatch to meet PSE's peak power needs? Will Puget only use them to meet PSE's natural gas needs or will they be using the new plants to generate power for other utilities, increasing PSE's emissions. When PSE builds new natural gas plants, they are not making commitments to meet other utilities' needs.	The IRP process is a planning process and does not reflect decisions or new commitments for resources. The modeling for this Electric Progress Report assumes PSE would use peakers to meet customer needs. Use of these facilities to provide peaking capacity for other utilities is not a consideration in our planning process. In the analysis presented, we limited the dispatch of plants to ensure we were not being overly optimistic about the amount of hydrogen available. However, once a blended fuel (gas/hydrogen) plant is in place, it may dispatch to market. In the final IRP, PSE examines the impact to dispatch of assuming the peakers in the final preferred resource plan are able to dispatch on natural gas, without the hydrogen constraint.

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12/12/22	James Adcock	What is PSE's assumed "electricity to electricity" round-trip efficiency of hydrogen to be generated from electricity and then burned in peakers to re-generate electricity? On the hydrogen generation storage, efficiency is about 30%. If that is not correct please provide a better understanding of what the assumptions are.	In the 2023 Electric Progress Report, PSE is treating hydrogen as a commodity that can be purchased at a set price. In future IRPs, as PSE gets more information about hydrogen infrastructure, we will consider additional cost assumptions.
12/12/22	James Adcock	I still don't understand if PSE's modeling fully captures the natural gas emissions of PSE's new combined natural gas and hydrogen peakers as they will be actually operated by PSE. Certainly if PSE's modeling does not actually capture the real emissions from those peakers as those peakers will actually be operated, then that would be an error in PSE's modeling.	PSE's modeling correctly captures emissions resulting from generation to meet PSE customer needs. If peaking capacity were used to provide power to other utilities, the emissions resulting would be the responsibility of the purchasing utility not PSE. In the model, we are tracking the emissions of the natural gas portion of the blending and account for the SCGHG and CCA prices associated with those emissions from natural gas.
12/12/22	Bradley Cebulko	Is PSE at a point in its analysis where it could predict the amount (MWh) of curtailment it expects annually throughout the planning horizon? I ask as it relates to forecasts of green hydrogen production.	We have taken an initial look at curtailment of wind and solar resources in the 2023 Electric Progress Report Preferred Portfolio. We estimate virtually zero curtailment through the model year 2030 and increasing to an estimated 25 million MWh by 2045, which is less than four percent of the total possible wind and solar generation available that year.
12/12/22	Don Marsh	For your modeling assumptions for Small Modular Nuclear, what are you using for Levelized Cost of Energy? I'm worried about cost risks here. Do you know the costs?	Levelized cost of Energy (LCOE) is a partial measure - it does not reflect capacity value nor does it reflect the time of day/year when the unit generates electricity. The LCOE is not used for modeling; all the cost assumptions for resources are included in Appendix D: Generic Resource Alternatives. For informational purposes, we calculate the LCOE afterwards, The LCOE for small modular nuclear in this report is estimated at $160/MWh, please see Appendix H: Electric Analysis and Portfolio Model of the 2023 Electric Progress Report for additional detail.

Date	Interested Party	Comment	How PSE used this feedback
12/12/22	James Adcock	Slide 55: Isn't building even "just" three new natural gas peaker plants a whole lot of new natural gas generation?	No, it is important to consider the difference between energy and capacity. A gas peaker that is able to blend to full hydrogen is not the same as a baseload resource, like a combined cycle gas plant or a baseload gas boiler plant. In the 2023 Report Chapter Three: Resource Plan, we looked at what would happen in a worst-case scenario where the frame peaker had to run on natural gas. In this event, for the limited hours the plant must run for peak contribution, the equivalent forecasted emissions would be 16,000 metric tons annually. This is in comparison to an equally sized combined cycle plant that would produce 500,000 metric tons annually.
12/14/22	Don Marsh	Dear IRP team, I would like to commend PSE and the IRP team for the Electric Progress Report presentation provided at the Dec. 12 webinar. It is exciting to see real progress towards clean energy goals which seem much more realistic than the plan described in PSE's 2021 IRP. As mentioned in the meeting, stakeholders still have significant concerns regarding PSE's chosen "Customer Benefit Indicators." The current indicators are overly technical, duplicative, and not aligned with the benefits that customers most highly value. From PSE's presentation, I have distilled five indicators that are more likely to be understood and appreciated by customers: 1. Cost/Economic impact 2. Safety/Health 3. Customer-experienced Reliability (generation, transmission, distribution) 4. Stability/Feasibility 5. Equity Note that the Stability/Feasibility indicator measures implementation risk. If a portfolio relies on technology that	Thank you for your comment. PSE developed the list of customer benefit indicators (CBIs) through a collaborative process with our Equity Advisory Group and stakeholders in support of the Clean Energy Implementation Plan (CEIP). The CEIP is currently being adjudicated with a decision expected in early 2023. The CBIs used in the Portfolio Benefits Analysis are the subset of CBIs for which there are clear correlations in the modeling software (AURORA). It would be inappropriate for PSE to use different CBIs at this time. Following the Commission's decision, and through the 2023 Biennial CEIP Update process we may revisit CBIs as required by Commission order.

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		hasn't been developed or proven, there is a risk that the portfolio will not work out the way PSE predicts, and there will be costs to changing the plan down the road. One could argue that these indicators should have equal weights, because it's hard to imagine the public would be well-served by ignoring or deemphasizing any one of these. Unfortunately, the current indicators do not map cleanly to these categories. Here is the list of CBIs (as indicated in the CBI spreadsheet) and my critique: GHG Emissions o All of the portfolios achieve CETA goals of carbon neutrality by 2030 and carbon free by 2045. GHG emissions might vary a little along the way, but this shouldn't be a big differentiator. • SO2 Emissions o This is part of my proposed Safety/Health indicator. • NOx Emissions o This is part of my proposed Safety/Health indicator. • PM Emissions o This is part of my proposed Safety/Health indicator. • Jobs o This is a part of my Cost/Economic impact indicator, but a much smaller consideration than the overall cost of a portfolio. Job creation is not a primary goal for PSE. • Cost o This is the main component of my Cost/Economic impact indicator. • DR Peak Capacity o This is related to my Reliability indicator, but only a part of it.	

Date	Interested Party	Comment	How PSE used this feedback

		• DER Solar Participation
		  ○ DER Solar Participation is an implementation detail that most of the public won't care about directly. If it improves emissions, increases reliability, or reduces costs, then it should contribute to those indicators.
		• Energy Efficiency Added
		  ○ This is also an implementation detail, not a direct benefit in and of itself.
		• Demand Response Participation
		  ○ This is also an implementation detail, not a direct benefit in and of itself.
		• DER Storage Participation
		  ○ This is also an implementation detail, not a direct benefit in and of itself.
		I hope it is obvious that these indicators might indirectly measure some benefit to society or to PSE, but they aren't customer focused. The last five indicators overweight DERs, creating skewed results when evaluating portfolios. The first four indicators may overweight local emissions to the detriment of cost.
		I propose that PSE instead use the five CBIs that I described above. The IRP team can use a combination of previous CBIs to justify how a particular score is calculated. Each of the final CBIs should have a score between 0 and 10, with 10 being the best.
		For example, the Cost/Economic CBI score could be inversely proportional to where a portfolio lands in the range of costs ($21 billion to $34 billion). In this case, the reference portfolio would have a score of 10, while the "100 percent non-emitting by 2030" portfolio would earn a zero. The 11.2 portfolio would have a score of 8. To be truly customer-friendly, costs should be expressed in how much the average customer will pay per month. That is what customers really care about.	

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		My proposal isn't the only possible solution, but it's important that PSE have CBIs that are simple to understand and properly measure what customers actually care about. I ask that stakeholders be provided with a new CBI spreadsheet with the current portfolios and updated CBIs at the earliest possible opportunity.	
12/17/22	Fred Hudik	I'm under the strong opinion that nuclear power is the only realistic source for powering the transition to the all-electric terrestrial (non airplane) energy grid. Fission now (perhaps Thorium reactors?), fusion when technically achievable. I have no direct or controlling business or financial interests in nuclear power or the energy sector.	Thank you for your comment. PSE is exploring all potential non-emitting generation sources, including small modular nuclear (SMR). Please see our answer to Feedback Theme G.
12/19/22	Joel Nightingale on behalf of Washington Utilities and Transportation Commission staff	Good morning PSE IRP team, Thank you for the opportunity to provide feedback during the 2023 IRP Progress Report process. Please see the below feedback from UTC Staff based on content from the IRP meeting last week (12/12). 1. What assumptions does PSE's IRP model make about the cost and risk of hydrogen and biodiesel over time? 2. What mix of hydrogen vs natural gas is assumed to be used in the peakers (whether existing or new) throughout the modeled period? Is there a gradual transition or a more 'step-wise' switch over? 3. If the peakers eventually transition to 100% hydrogen, what is the assumed capital cost of conversion (e.g., cost of replacing the turbine for compatibility with 100% H2 fuel)?	1. Assumptions on the cost and availability of green hydrogen and biodiesel are provided in Appendix D: Generic Resource Alternatives of the 2023 Electric Progress Report. 2. The blend rate of green hydrogen and natural gas is provided in Appendix D: Generic Resource Alternatives of 2023 Electric Progress Report. 3. The costs for retrofit of existing combustion turbines have not been accounted in this planning cycle due to lack of available information, more detail will be provided in future IRP cycles. New combustion turbines are assumed to combust a range of fuels including hydrogen based on information shared by OEMs. 4. No, OEMs are still refining turbine designs to optimize the combustion of H2 which is reflected in our assumptions to introduce H2 blending in 2030. However, pilot projects such

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		4. Does PSE know of any frame peakers running on 100% hydrogen in service today? Or any soon to be in service? 5. The Western Power Pool announced on 12/8 that PSE will be among the first utilities to formally commit as a Western Resource Adequacy Program (WRAP) participant. How does its participation in WRAP affect PSE's resource decisions, particularly regarding peaking capacity resources? 6. As part of the meeting materials for the 3/22 IRP meeting, PSE provided a spreadsheet called "Generic Resource Cost Adjustments." Tabs in that spreadsheet for several resources were labeled as "work in progress." Staff would like to see an updated spreadsheet that includes the assumptions used in its modeling for those generic resources. If possible, please add the cost curves for demand side resources to this updated spreadsheet's "cost curves" tab. a. In the "Hybrid" tab of the above-mentioned spreadsheet, it appears PSE is adding the capital cost ($/kW) values for utility-scale solar and a utility-scale battery system to calculate a hybrid system's capital costs. NREL's ATB includes a cost curve for "Utility-Scale PV-Plus-Battery." Why did PSE not use those values in its resource assumptions? 7. How is the peak capacity reduction value of energy efficiency accounted for in PSE's IRP modeling? For example, is the value of an HVAC measure (that aligns well with summer and winter peaks) given a higher value than a water heater measure (that is more constant throughout the year)? Were load shapes considered when bundling conservation measures?	as the Longview Energy Terminal in Ohio indicate that progress is being made. 5. The Western Resource Adequacy Program (WRAP) is addressed in Chapter Eight: Electric Analysis of the 2023 Electric Progress Report. That focuses on the impact to resource needs of the initial non-binding metrics, as all RA metrics required to do a portfolio analysis are not yet available. PSE will continue to integrate with the WRAP in future IRP cycles. 6. PSE published updates to the generic resources cost assumptions in advance of the September 13, 2022 Stakeholder Meeting. Both an updated spreadsheet and an accompanying memo detailing generic resource assumptions are in the Meeting Materials section under the September 13, 2022 Meeting, here. These materials are republished alongside the 2023 Electric Progress Report as part of Appendix I: Electric Analysis Inputs and Results. 6a. The 2022 ATB did not provide capital cost nor O&M costs for 2 of the 3 hybrid configurations presented in the 2023 Electric Progress Report. To calculate these costs, PSE combined the costs for each component within the hybrid system and used the respective capacities to generate a weighted average. Additionally, some capital cost components for individual resources received a discount in the hybrid system (ie. grid connection, balance of system). The 2022 ATB did provide a capital cost and a fixed O&M cost associated with a solar plus 4-

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		8. Staff suggests PSE model the following portfolios: a. 11.5 without forcing in SMRs b. 11.2 without forcing in SMRs Staff appreciates PSE's examination of additional diverse portfolios. The transition to 100% clean energy will, undoubtedly, rely on ongoing advances in technology. This creates risk and opportunity, which makes long term planning both more important and more uncertain than ever.	hr Li-ion battery storage hybrid system. Though the literature indicated these costs were based on stand-alone solar and battery costs, the precise method of combining these costs was not presented in the 2022 ATB and we were unable to replicate the ATB results. To maintain consistency with other hybrid systems in the 2023 Electric Progress Report, PSE presents the solar plus battery storage hybrid resource using a weighted average. 7. The demand side resources are modeled for an hourly shape to meet the energy demands and for the peak contribution for both the summer and winter peaks. A full discussion on the measures and the peak contributions can be found in the 2023 Report, Appendix E: Conservation Potential and Demand Response Assessments. 8. Thank you for the feedback, these portfolios have been incorporated into the final 2023 Electric Progress Report.
12/20/22	Amy Wheeless on behalf of Northwest Energy Coalition (NWEC)	On behalf of the NW Energy Coalition, thank you for the opportunity to provide feedback on PSE's electric portfolio analysis. Here are a few comments to consider as you move forward with this IRP update: • Overall, we think that this IRP analysis has taken some of our comments and recommendations from the last IRP and is moving in a better direction – for example, we're pleased to see that demand response and energy storage and making up a good chunk of the resource mix, and that there is reduced reliance on the market. • However, we remain skeptical of PSE's peaking capacity strategy (i.e., reliance on availability of	1. Thank you for your comment. 2. Thank you for your sharing your concern over the availability of alternative fuels. Please see Appendix D: Generic Resource Alternatives of the 2023 Electric Progress for more details on alternative fuels. We will continue to refine our assumptions on alternative fuels in future IRP cycles. 3. Please see our answer to Feedback Theme C.

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		alternative fuels with no supporting fuel market analysis). The risk that new peaking capacity resources would be built and the fuel would then be unavailable seems to not be adequately studied. If the Company were to move forward with building a peaker and cleaner fuels were not available, customers will be disproportionately put at risk for those costs and increased emissions. • With a demand forecast that doesn't reflect the federal IRA or increasing electrification in buildings (which the gas IRP is modeling and the recent GRC settlement would also indicate is happening), the corresponding demand-side resources seem too low to reasonably meet PSE's expected needs, mitigate risks, and incorporate the full benefits of these resources. For example, we question whether PSE has fully incorporated the following values of demand-side resources into its least-cost / least-risk analysis: ○ Some **power system attributes**, including adequacy, flexibility, and resilience. ○ **Hedging against the risk that other resources**, like utility scale wind, solar, or storage, may not be available and reliable within the time needed to meet power system needs. ○ **Uncertainty about future sustained low market prices**: During a week when Mid-C prices are over $250/MWh, we are sharply reminded that falling behind on our conservation acquisition exposes customers to fuel price volatility. ○ **Decarbonization targets** in Washington State and in local jurisdictions that PSE serves. ○ **Equity**: Energy efficiency and conservation directly reduces energy burden,	4. For the final preferred portfolio, the conservation was increased above the lowest cost reference portfolio. See electric progress report Chapter Three: Resource Plan. 5. A revised version of the portfolio benefit analysis is included in Appendix I: Electric Analysis Inputs and Results of the 2023 Electric Progress Report. 6. Thank you for your feedback, the portfolio benefit analysis is intended to indicate portfolios which may provide more equitable outcomes and is a single element of the overall IRP analysis. 7. Transmission constraints are discussed in Chapter Five: Key Analytical Assumptions of the 2023 Electric Progress Report.

Date	Interested Party	Comment	How PSE used this feedback
		while supply-side resources do not. How is this reflected in the underlying analysis? ○ **Value of maintaining a robust EE infrastructure**: Maintaining the ability for programs in the region to deliver energy efficiency is critical, even if savings temporarily become more expensive. ○ **Mitigating against extreme weather events**: Though the climate change analysis better incorporates seasonal average temperatures, climate change also means more extreme weather events, including cold and heat. More conservation and efficiency can mitigate against those peak demand events effects on the system. • To the above, we understand it is challenging to update the demand forecast at this stage, but PSE risks leaving efficiency resources on the table in the short-term. At a minimum, we recommend the Company give at least conservation a risk adder to incorporate the benefits above that are not adequately incorporated. • Please post an updated CBI tool spreadsheet with these portfolios detailed when the portfolios are finalized. • The CBI analysis is interesting as a first start in this update. However, given that we are unsure of the status of intended outcomes and of the distributional benefits, we recommend using it as a directional tool, rather than a decision tool in this update. • At a future meeting, we would like to better understand PSE's transmission constraints and the impacts it's having on resource selection.	

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		Thank you for considering these comments, we look forward to working with you more. You may post these comments publicly; we did not use the feedback form as it had a character limit much shorter than this comment.	
12/21/23	Kelly Hall on behalf of Climate Solutions	Climate Solutions appreciates the opportunity to comment on the December 12, 2022, Electric Portfolio Draft Results IRP Stakeholder presentation. As Puget Sound Energy looks towards achieving compliance with the Clean Energy Transformation Act (CETA), innovating the gas sector, and meeting state policy goals, it is important that PSE develop an informative and viable Integrated Resource Plan (IRP). Consequently, PSE must ensure that their modeling approach, resource scenarios, and assumptions accurately reflect the conditions and evolutions of the gas sector. **The Electric and Gas IRPs should account for the impacts of the Inflation Reduction Act (IRA) into both the supply side resources, as well as the demand side resources and load forecast.** Consistent with our comments on the September 13, 2022 IRP presentation, we are concerned that PSE is not accounting for all of the impacts of the IRA. In particular, the impacts to the electric and natural gas load forecasts, electric demand-side resources (DSR), and gas to electric conversions. PSE had confirmed that the IRA *has* been applied to the production tax credit (PTC) for renewable resources including wind, solar, nuclear, and energy storage, but the IRA has not changed assumptions for DSR, nor for the demand forecasts of either electric or gas portfolios. It is important that the IRP consider the impacts of the IRA on supply side resources and demand side resources, and update the load forecast accordingly. The IRA will undoubtedly accelerate the adoption of energy efficiency even if the total conservation potential for DSR remains unchanged. In the immediate term, including the time	1. Thank you for your feedback. Please see our response to Feedback Theme C. 2. Thank you for the suggestions to augment our portfolio benefit analysis. We will take these ideas into consideration in future planning cycles. 3. We will continue to refine our assumptions for alternative fuels in future IRP cycles. 4. One of the sensitivities that PSE ran to remove the three peaking plants by 2030 resulted in over 5,000 MW of energy storage to account for the same 700 MW of peak contribution. This is a significant amount of energy storage resources and we question the available of this much energy storage given competition in the market and supply. In order to achieve the CETA target for 2030, we need to be looking at commercially available resources as of today. Which is why hydrogen is not part of the solution for 2030, but is needed to achieve the 2045 target of 100 percent. Renewable diesel — frequently referred to as R99 — is a commercially available fuel that can be combusted in various existing and new peaking plants. We will continue to monitor and engage with regional R99 manufacturers to determine the limits of the R99 fuel supply.

Date	Interested Party	Comment	How PSE used this feedback
		period in which PSE will set its conservation targets, there will be an increase in the adoption of conservation measures that must be accounted for to develop an accurate IRP. **It is unclear whether PSE's CBI analysis fully accounts for the full range of benefits that customers would experience from increased DSR and energy efficiency, and the potential *harms* from alternative fuels.** There are many harms from building new gas plants for capacity that PSE intends to convert to zero-GHG alternative fuels in the future. In line with equity mandates, PSE should account for: • NOx emissions. Biodiesel and RNG may be lower or zero-carbon fuels, but their combustion still releases air toxics like nitrogen oxides (NOx) into the air, which are an important precursor for particulate matter. Similarly, blending hydrogen into natural gas as a combustion fuel will require a higher temperature for combustion, as hydrogen burns at a higher temperature than methane, and this increase in temperature will result in higher NOx emissions as well. • Siting and impacts to overburdened communities. PSE's assumptions for biodiesel are generic resource assumptions, but PSE needs to consider if it is even feasible to build biodiesel plants given the equity mandates that apply to both IRP and CEIP planning, which require PSE to limit air pollution emissions in overburdened communities (as defined by CETA). • Equity and reduced energy burden for overburdened communities. Demand-side resources provide a unique opportunity to reduce energy burden meaningfully for overburdened communities. These benefits should play a role in the preferred resource portfolio selection.	We anticipate an increase in R99 supply in 2024 as the transportation sector is rapidly electrified and alternative fuels, such as R99, become increasingly available to other industries.

		PSE must consider limitations and risks of using green hydrogen as a replacement for existing gas use. PSE has made several assumptions about the viability of hydrogen that are not consistent with the existing uses, feasibility, and cost-effectiveness of hydrogen, including: • Hydrogen costs. The present cost of green hydrogen is high compared to alternative resources, and the highest value of hydrogen will be in sectors that are currently difficult to decarbonize, such as industry and aviation, rather than in residential and commercial heating, which are currently feasible and cost-effective to electrify. • Availability of green hydrogen. Green hydrogen is expected to be in high demand, initially to replace existing uses of hydrogen created from fossil fuels, and later for hard-to-decarbonize sectors like industry and aviation. We are not confident that hydrogen can be used in great quantities for decarbonization natural gas distribution systems. • Modeling hydrogen thermal plants. Washington rules require the company to model commercially available resources, and the commercial availability of thermal gas plants run on hydrogen is limited. • Referring to existing non-hydrogen thermal units as "existing hydrogen". The least-cost scenario outlined on slide 25 assumes that existing non-hydrogen thermal units can be converted to hydrogen in the future, and labels these as "existing hydrogen" to achieve the 2045 CETA goals. This is problematic as there is no guarantee that these thermal units can be converted to hydrogen. • Blending limitations and the need to retrofit pipelines and appliances. On slide 40, PSE indicates that modeling assumes hydrogen blending with natural gas	

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		begins at 30% blend by energy (which will require a higher blend by volume) in 2030 and grow to 100% by 2045. PSE needs to account for the infrastructure and appliance changes that higher blends of hydrogen will require, both for PSE and on the consumer end. **Portfolios relying on battery storage are considered "infeasible due to real-world limitations", while under-studied alternative fuels mentioned above are not.** PSE has ruled two non-emitting portfolios by 2030 (Portfolio 10 and Portfolio 12) as "infeasible due to real-world limitations, specifically because PSE claims that they will not be able to acquire the necessary battery storage capacity by 2030 due to competition from other utilities and sectors. However, "real-world limitations" and competition for resources are not as heavily considered for alternative fuels like hydrogen and biodiesel, both of which are not expected to be available in sufficient quantities or for low enough prices by 2030. This discrepancy, and PSE's failure to account for future competition with other utilities over limited quantities of alternative fuels, sets Portfolios 10 and 12 up as significantly more expensive despite these faulty assumptions. This also undermines PSE's strategies to use alternative fuels to cover peaking capacity without any market analysis of the availability and costs of these fuels in the future. Thank you for the opportunity to comment, and we look forward to continuing to work with PSE on the 2023 Gas IRP and 2023 Electric IRP Update.	

Feedback on Draft Chapter Three: Resource Plan

Table A.3 records questions and comments on **Draft Chapter Three: Resource Plan of the 2023 Electric Progress Report** between January 24 and February 7 via the feedback form or irp@pse.com.

Table A.3 Draft Electric Progress Report Public Comments (in alphabetical order by interested party)

1. Alondra Regalado and Sergio Duenas on behalf of Western Energy Storage Task Force (WEST), February 7, 2023

No.	Category	Comment	How PSE used/may use this feedback
1.1		I. INTRODUCTION & SUMMARY. The Western Energy Storage Taskforce (WEST) is an advocacy effort funded by a subset of members of the California Energy Storage Alliance (CESA). CESA is a 501(c)(6) organization representing over 100 member companies across the energy storage industry. Through WEST, we seek to ensure energy storage in all its forms is properly represented in planning and procurement venues across Western markets. Our subject-matter expertise seeks to inform planning and procurement venues across western states through compelling, evidence-based, technology-neutral advocacy. Overall, WEST's comments can be summarized as follows: • PSE should update its storage effective load carrying capability (ELCC) curve to a solar + storage surface for their ELCC analysis in order to better represent the diversity benefits of storage in relation to the penetration of renewable generation. • PSE should update Figure 3.10 and Table 3.2 of Chapter 3: Resource Plan Draft to better communicate the information for stakeholder comprehension.	Thank you for your feedback. Please see our response to Feedback Theme H.
1.2	ELCC	**II. PSE should update its storage ELCC curve to a solar + storage surface for their ELCC analysis in order to better represent the diversity benefits of storage in relation to the penetration of renewable generation.** During the December 12th presentation on the draft portfolio results of the EPR, PSE staff presented their ELCC results. The graph on Slide 35 of the presentation expressed Winter ELCC values by the amount of Nameplate Capacity in megawatts (MW), as well as depicting each	Thank you for your feedback. Please see our response to Feedback Theme H.

No.	Category	Comment	How PSE used/may use this feedback
		tranche of storage penetration. PSE found that as more storage capacity is added into the system, ELCC values drop drastically. This saturation effect is commonly seen in ELCC analysis that do not accurately capture the interactions between variable energy resources (VERs), and thus overestimate the diminishing returns of storage. Furthermore, WEST is concerned that the estimated winter peaking need is inflated due to the deficiencies of the ELCC method employed by PSE for energy storage. These inaccurate storage ELCC values cause inaccurate peak capacity contributions, which ultimately leads PSE's modeling to select exaggerated amounts of nameplate storage capacity to meet needs. To resolve this, PSE must modify its ELCC methodology and update their capacity expansion modeling assumptions to reflect the interdependent effects increasing penetrations of VERs have on the reliability contributions of energy storage resources. WEST urges PSE staff to examine a solar plus storage surface for their ELCC analysis, to adequately represent the reliability contributions of storage resources in relation to the penetration of other VERs (particularly solar). A solar-storage ELCC surface properly recognizes that storage peaking capacity contributions are a function of the penetration of storage and the availability of other renewables. This is demonstrated by a study by the National Renewable Energy Laboratory (NREL), which found that higher solar penetrations increase the amount of four-hour energy storage that can be added at 100% ELCC.[1] The surface approach is aligned with analyses done in other jurisdictions and facilitated by the consultants PSE is working with, such as Astrape Consulting. For example, the Public Company of New Mexico (PNM), another jurisdiction WEST is actively participating in, recently presented their wind-solar-storage surface during a January 17th, 2023, stakeholder meeting.[2] Astrape provided PNM with an ELCC surface that estimates the portfolio ELCC considering three variables; namely, the penetration of solar, storage and wind. The surfaces provided PNM the ability to calculate marginal ELCCs for any of the	

No.	Category	Comment	How PSE used/may use this feedback
		three technologies at any combination within the ranges simulated. As noted in slide 57 of the January PNM meeting, increasing amount of solar capacity has a positive impact on storage ELCC values.[3] Thus, updating PSE's method is warranted as it currently underestimates the ELCC of storage additions, particularly in latter tranches. This underestimation has material effects in PSE's Resource Draft Plan, since lower ELCC values inflate the amount of solar and storage resources that would be needed to mitigate winter peaking needs. Thus, WEST encourages PSE to develop the solar-storage surface for each storage duration, including longer duration storage assets as they could be uniquely suited to meet winter- peak long-duration energy needs more effectively. As such, WEST recommends evaluating storage ELCCs based on a solar-storage surface methodology that considers 4-, 8-, 10-, and 12-hour storage solutions.	
1.3	Accessibility	**III. PSE should update Figure 3.10 and Table 3.2 of Chapter 3: Resource Plan Draft to better communicate the information for stakeholder comprehension.** WEST requests more data be made available for stakeholders to make more thorough recommendations and feedback. Specifically, WEST is interested in PSE elaborating on Figure 3.10 of Chapter 3: Resource Plan Draft that illustrates the near- and long-term capacity additions of the diversified portfolios. WEST would like to see a clearer picture, given that the portfolios are very similar, and this type of data visualization does not help stakeholders distinguish between the portfolios. WEST requests that PSE provide a table with each metric or at the minimum add data labels for each resource type. In addition, WEST asks that PSE disaggregate the distributed energy resources (DERs) into solar DER and storage DER.	Thank you for your feedback. The figures in Chapter Three: Resource Plan are newly updated.
1.4	CBI, clarification	With regards to the Customer Benefit Index (CBI) study, PSE only provides the results for the Reference Case, 11.A5 Diversified Portfolio and 11.B2 Diversified Portfolio. WEST asks that Table 3.2: Portfolio CBI Metrics be expanded to include all of the diversified portfolio and "No Advanced Nuclear" portfolios. We believe that this information is crucial	Thank you for your feedback. This information is included in the Portfolio Benefit Analysis workbook and Appendix I: Electric Analysis Inputs and Results. We've amended Chapter

No.	Category	Comment	How PSE used/may use this feedback
		in allowing stakeholders to more accurately compare portfolios and deduce which portfolio best fits the needs of the system and ratepayer interests.	Three: Resource Plan to include all diversified portfolios.
1.5		WEST looks forward to collaborating with Puget Sound Energy and other stakeholders in the development of the 2023 Electric Progress Report. [1]See NREL, The Potential for Battery Energy Storage to Provide Peaking Capacity in the United States, available at: https://www.nrel.gov/docs/fy19osti/74184.pdf [2]See PNM January Stakeholder Meeting https://www.pnmforwardtogether.com/assets/uploads/2023.01.09-Slides-IRP-PAG-Steering-10-EE-AEG-Astrape-Summer-22.pdf [3] Ibid, at 57.	Thank you for your feedback.

2. Amy Wheeless on behalf of Northwest Energy Coalition, February 7, 2023

No.	Category	Comment	How PSE used/may use this feedback
2.1		The NW Energy Coalition (NWEC) appreciates the opportunity to comment on the Puget Sound Energy's draft Integrated Resource Plan (IRP) electric update. Below are some overall comments and a few requests for the Company to consider as it updates the draft over the next seven weeks.	Thank you for your feedback.
2.2	Climate data	**Climate Data**: We appreciate that the Company has taken steps to better incorporate climate change into its planning. As expected, more forward looking climate modeling changes expected summer peaks and hydroelectric availability. We look forward to further refinement on climate modeling for the next IRP, and encourage the Company to work with nearby utilities, with the NW Power and Conservation Council, and with regional experts, such as the University of Washington Climate Impacts Group,	Thank you for your feedback. PSE is committed to further refining its climate modeling in future IRPs.

No.	Category	Comment	How PSE used/may use this feedback
		to develop a coordinated approach to climate data and modeling for utility planning.	
2.3	Electrification	**Load forecasts and joint planning**: For this IRP update, we understand that the Company has updated its transportation electrification forecast, but has focused on any projected impacts from building electrification into its gas IRP process instead of incorporating here. This disconnect highlights the challenge of treating the electric and gas systems as separate when they are increasingly interconnected through policy and technology. We recommend that the Company to do more to integrate electric and gas system planning in the next update and to work with stakeholders to address any regulatory barriers to doing so.	Thank you for your feedback. PSE anticipates its resource planning for the electric and gas system will become more integrated in future IRP cycles.
2.4	Peaking capacity	**Hydrogen peakers in preferred portfolio**: As we indicated in our December comments to the Company, we are skeptical of PSE's peaking capacity strategy to rely on the availability of alternative fuels with no supporting fuel market analysis to indicate that these resources will be available or cost-effective. If the Company were to move forward with building a peaker and cleaner fuels were not available in the time horizon anticipated (currently assumed to be 2030 for hydrogen), customers will be disproportionately put at risk for those costs and increased emissions. More concrete analysis is needed in this IRP update to justify pursuing this strategy in the nearer term.	Thank you for your feedback. Please see our answer to Feedback Theme F.
2.5	SMR	**Small Modular Nuclear Reactors (SMRs)**: Similar to the above, while SMRs are not listed in PSE's preferred portfolio, they are considered as an alternative to explore in the Company's action plan. We have not seen sufficient information that the use—including the disposal of spent fuel and other residuals—of SMRs is one that is least cost and least risk for the company and customers.	Thank you for your feedback. We have removed SMRs from our preferred portfolio for this report and will continue to study this technology for future IRP cycles. Please see our answer to Feedback Theme G.
2.6		**Distributed energy resources and demand response**: Overall, we are pleased to see that this IRP update provides more focus and expected near-term use of distributed energy resources (DERs) and demand response (DR), and appreciate the analysis of customer benefit	Thank you for your feedback.

No.	Category	Comment	How PSE used/may use this feedback
		indicators (CBIs) that have prompted changes to the Company's preferred portfolio to reflect the benefits to customers.	
2.7	IRA	We note that the preferred portfolio anticipates a large increase in distributed solar after 2030; the federal government, through the Inflation Reduction Act, has recently extended the solar investment tax credit for systems installed 2022-2032, which will likely bring more distributed solar systems on in the nearer term. For this IRP update, PSE should clarify which assumptions it has included from recently passed federal legislation into its supply- and demand-side assumptions. For the next IRP—or even before—PSE should do a deep dive into federal investments and how it will change supply and demand-side resource assumptions. We are puzzled by the declining rate of DR per year after 2025. The NW Power and Conservation Council estimates that approximately 10 percent of the region's peak demand can be met with cost-effective demand response, even under conservative electrification assumptions. At a minimum, we recommend that PSE pursue its pro rata share of the region's cost-effective DR capacity. Going forward, we expect that a more coordinated approach to integrated system planning will yield more cost-effective DR, as electrification load is accounted for holistically in the model.	Thank you for your feedback. Please see our response to Feedback Theme C. You can read more about how PSE incorporated the IRA in Chapter Four: Legislative and Policy Change. Thank you for your feedback on demand response (DR). DR in the IRP came from Cadmus Group study. You can read more about this study in Appendix E: CPA and Demand Response Assessment.
2.8	Electrification	**Conservation**: As we noted in our December comments, we are concerned that, because the demand forecast does not reflect increasing building electrification or new federal investments in buildings, that the preferred portfolio's conservation acquisition is too low to reasonably meet PSE's expected needs, mitigate risks, and incorporate the full benefits of these resources. We recommend the Company give conservation a "risk adder" to incorporate the benefits above that are not adequately incorporated and make this update for this IRP update.	Based on consideration of our portfolio benefit analysis, we increased conservation in the final preferred portfolio. Numbers for the electrification analysis are contained in the Gas Utility IRP.
2.9	SCGHG	**Use of Social Cost of Greenhouse Gases in the Model**: As we have expressed in past IRP comments and in other venues, PSE is not properly applying the social cost of greenhouse gases (SCGHG) in its	Thank you for the feedback. We did run a portfolio optimization with the SCGHG as a dispatch cost. Those results are included in

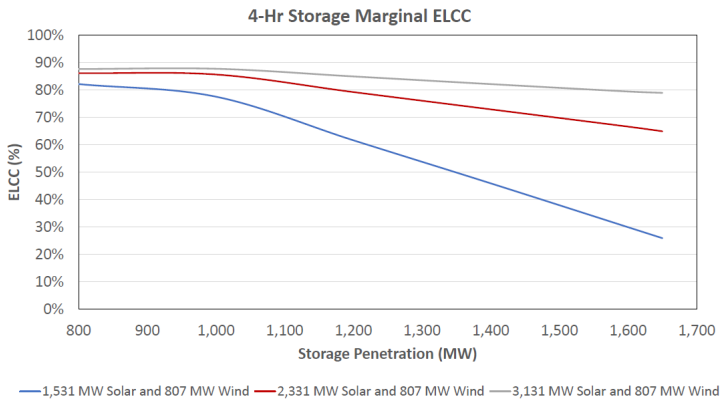
No.	Category	Comment	How PSE used/may use this feedback
		long-term capacity expansion model. This misalignment means that PSE is overestimating the amount of its near-term gas plant dispatch, and underestimating the optimal amount of renewable resources in the lowest reasonable cost portfolio. For this IRP update, PSE should continue to run sensitivities I and J from the 2021 IRP, which place the SCGHG on dispatch in the LTCE model, rather than incorporating it as a fixed cost adder.	Chapter Eight: Electric Analysis in sensitivity 15.

3. Deepa Sivarajan and Kelly Hall on behalf of Climate Solutions, February 7, 2023

No.	Category	Comment	How PSE used/may use this feedback
3.1		Climate Solutions appreciates the opportunity to comment on the Draft 2023 Electric IRP Chapter 3: Resource Plan. As Puget Sound Energy (PSE) looks towards achieving compliance with the Clean Energy Transformation Act (CETA), innovating the gas sector, and meeting state policy goals, it is important that you develop an informative and viable Integrated Resource Plan (IRP). Consequently, you must ensure that your modeling approach, resource scenarios, and assumptions accurately reflect the conditions and evolutions of both the electricity and gas sectors.	Thank you for your feedback.
3.2		We are pleased to see that the preferred portfolio maximizes customer benefit indicators and add 6,000 MW of clean renewable resources like solar and wind to meet the 2030 CETA targets. We are also encouraged by the increased use of some demand-side resources like distributed energy resources (DER) and demand-response to help manage peak loads and build resiliency. Additionally, we are pleased to see PSE incorporate previous feedback on adding the Inflation Reduction Act (IRA) as an input on the supply-side (though we urge PSE to add its impacts to the demand side as well) and incorporating recent changes to state building codes to better understand future building energy needs.	Thank you for your feedback.

No.	Category	Comment	How PSE used/may use this feedback
3.3	Peaking capacity	In order to further improve the Final Electric IRP, we have the following critiques and suggestions. **The Draft IRP's reliance on alternative fuels for peaking capacity, as well as plans for expanding gas infrastructure and building new gas plants, is risky for your customers.** The Draft IRP justifies the construction of new gas plants by estimating that they are needed to meet projected winter peak demands, as well as calling this peaking capacity "CETA-compliant". Building a new gas plant with a 30-year lifetime with the expectation that it will run completely on alternative clean fuels by 2045 to comply with CETA – only 20 years after the construction of the plant – is highly risky and highly uncertain. In this second IRP after the passage of CETA, you appear to be taking a step backwards from CETA compliance by building additional gas plants in the near-term without answering the vital questions that are necessary to justify their use over the following decades. The Draft IRP needs to demonstrate how you will have a cost-effective fuel supply for that plant in each year that it blends alternative fuels through the end of life of the plant. The Draft IRP must also demonstrate how the gas plant can comply with air emissions requirements and not increase adverse environmental impacts to overburdened communities.	Thank you for your feedback. Please see our answer to Feedback Theme F.
3.4		We also believe that the Draft IRP may be inflating winter peak demand through its assumptions. We question the assumptions around winter peak demand and alternative fuels in the following ways: **1. The Draft Electric IRP may be overestimating the impacts of winter peak demand on resource adequacy.** While there is no doubt that winter peak demand will rise in the future with increased electrification, the Draft IRP's assumptions are not adequate to accurately model the degree of the increase.	Thank you for your comment. We have incorporated the impacts of climate change on our demand forecast and we observe that PSE will remain a winter peaking utility. For further information on our demand forecast please see Chapter Six: Demand Forecast of the 2023 Electric Progress Report.

No.	Category	Comment	How PSE used/may use this feedback
3.5	IRA	**a) The Draft IRP's model is biased towards supply-side resources while not sufficiently accounting for the additional potential on the demand side.** Consistent with our comments on December 21, 2022 IRP presentation, we are concerned that the IRA has not changed any of the modeling assumptions for the electric demand forecast, nor for demand-side resources (DSR). Meanwhile, the IRA has been applied to the production tax credit (PTC) for renewable resources including wind, solar, nuclear, and energy storage. The IRA will undoubtedly accelerate the adoption of energy efficiency even if the total conservation potential for DSR remains unchanged. In the immediate term, including the time period in which you will set conservation targets, there will be an increase in the adoption of conservation measures that must be accounted for to develop an accurate IRP. Additionally, you are not adequately accounting for future load management options, including the prospect of redesigned future rates to effectively manage peak load and better match clean energy generation to demand.	Which specific customer segments will be eligible for subsidies on demand side resources, how those customer segments may respond to those subsidies is not yet clear. When we have a clearer picture of how those subsidies will be distributed and how those specific customer segments may respond to those subsidies, those impacts will be reflected in future IRPs. With regard to impacts on energy efficiency planning, WUTC staff suggested it may not be appropriate to reflect government subsidies when applying the Total Resource Cost test. Should policies change in the future, PSE will reflect those policies in future planning cycles.
3.6	ELCC	**b) The Draft IRP may be underestimating the value of storage by not adopting the "surface"methodology for calculating the effective load-carrying capacity (ELCC) of solar and wind Storage.** The Draft IRP's current model increases storage penetration while keeping the energy capacity expansion of solar and wind static, without increasing renewable generation simultaneously. This calculation method then shows diminishing returns in ELCC for solar and wind storage and inflates the need for alternate peaking capacity during the winter. A "surface" analysis, such as the analysis Astrape recently conducted for PNM, found that the value of energy storage for increases as more solar capacity is added. PSE should develop surfaces to more accurately capture the value of solar and wind storage.	Thank you for your feedback. Please see our response to Feedback Theme H.

No.	Category	Comment	How PSE used/may use this feedback
		 Figure 1 From Astrape Analysis for PNM	
3.7	Peaking capacity	**b) The Draft IRP does not account for changes that will need to be made to gas plants in order to replace gas with green hydrogen for peaking capacity.** Washington requires that utilities model commercially available resources, and the commercial availability of thermal gas plants to run on hydrogen is limited, thereby undermining assumptions that existing thermal gas plants can be converted to hydrogen and comply with CETA. The draft IRP also results in plans to build an additional gas plant with the expectation that it too will be converted entirely to hydrogen. If, instead, the new gas plant cannot be converted and must be retired, it will lose value on its estimated 30-year lifespan and create stranded asset risk for customers. Instead of investing in risky thermal resources for peaking capacity, we urge you to further examine your assumptions on storage and other clean energy resources that can provide peaking capacity as mentioned above.	Thank you for your comment. We will work to refine our generic resource and alternative fuel assumptions for future IRP cycles. This may include a Technology Assessment to better understand the opportunities and limitations of various peaking capacity resources such as hydrogen peakers and energy storage systems.
3.8	Peaking capacity	**2. The Draft IRP's reliance on alternative fuels to meet peaking capacity is risky, particularly to justify building new gas plants and expanding gas infrastructure**.	Thank you for your feedback. Please see our answer to Feedback Theme F.

No.	Category	Comment	How PSE used/may use this feedback
		The Draft IRP's "CETA-qualifying Capacity Additions" (Figure 3.5) for its preferred portfolio shows the addition of 711 MW of biodiesel peaking capacity by 2030 and also assumes that 2,056 MW of existing (gas) thermal units can be converted entirely to green hydrogen by 2045 to comply with CETA. However, the Draft IRP fails to account for risks to the cost-effectiveness and feasibility of replacing gas with alternative fuels, as well as failing to consider the health risks to overburdened communities from combusting hydrogen and RNG. You should conduct an additional analysis to determine the feasibility and equity impacts of increased alternative fuel use.	
3.9		**a) The Draft IRP's assumptions may overestimate the cost-effectiveness of green hydrogen and RNG in the long-term.** While green hydrogen may be cost-effective in the short-term due to PTCs, these tax credits are unlikely to continue through 2050. The preferred portfolio's current price estimates for RNG are also at the low end of current cost ranges, and competition with other hard-to decarbonize sectors such as transportation will likely raise the costs. The Draft IRP also does not account for how green hydrogen and RNG will be transported and stored, likely raising costs as well.	Thank you for your feedback. Please see our answer to Feedback Theme F.
3.10	Equity	**c) In considering PSE's customer benefit indicators (CBIs) and impacts to overburdened communities, as required by CETA, the Draft IRP fails to address health and safety impacts from combusting alternative fuels and siting new plants**. Biodiesel and RNG may be lower- or zero-carbon fuels, but their combustion still releases air toxics like nitrogen oxides (NOx) into the air, which are both criteria pollutants and important precursors for particulate matter. This increases outdoor air pollution, and can also harm indoor air quality if RNG is used in gas cooking appliances. Similarly, blending hydrogen into natural gas as a combustion fuel will require a higher temperature for combustion, as hydrogen burns at a higher temperature than methane, and this increase in temperature will result in higher NOx emissions as well.	Thank you for the suggestions to augment our portfolio benefit analysis. We will take these ideas under consideration in future planning cycles. Please see our answer to Feedback Theme E.

No.	Category	Comment	How PSE used/may use this feedback
		The Draft IRP's assumptions for biodiesel peakers are currently generic resource assumptions, but you need to consider if it is even feasible to build biodiesel plants given the equity mandates that apply to both IRP and Clean Energy Implementing Plan (CEIP) processes, which require PSE to limit air pollution emissions in overburdened communities as defined by CETA.	
3.11	Alternative fuels	**d) The Draft IRP may be overestimating the climate benefits of RNG and green hydrogen.** The Draft IRP should account for the upstream methane leaks associated with the collection and processing of biogas feedstocks for RNG to ensure that the climate benefits of RNG are accurately measured. Additionally, to include hydrogen as a peaking resource, the Draft IRP should account for the lower energy density of hydrogen that will limit higher blends with natural gas, further diminishing its impact as a zero-emission fuel.	Thank you for your feedback. Please see our answer to Feedback Theme E.
3.12	Electrification	**To remedy issues with the Draft Electric IRP, we recommend that the final IRP:** **1. Integrate the electric and gas IRP processes to ensure that the impacts of electrification are captured accurately on both the demand and supply side.** We see a strong interaction between the demand forecasts for each side of the utility as well as Conservation Potential Assessments. The Draft Electric IRP should incorporate projected impacts from future building electrification as has been done with the Draft Gas IRP. In general, the gas and electric IRP processes should be integrated more holistically.	Thank you for your feedback. PSE anticipates its resource planning for the electric and gas system will become more integrated in future IRP cycles.
3.13	IRA, ELCC, alternative fuels	**2. Clarify modeling assumptions, incorporate additional analysis, and conduct studies on the feasibility of proposed resources**.	1. Thank you for your feedback. Please see our answer to Feedback Theme C. 2. Please see our answer to Feedback Theme H.

No.	Category	Comment	How PSE used/may use this feedback
		The Draft IRP should incorporate additional inputs for modeling, including: 1. Applying the impacts of the IRA to the electric demand forecast and demand-side resources. 2. Adopting the "surface" methodology for calculating the effective load-carrying capacity (ELCC) of solar and wind storage. 3. Apply a higher price for RNG to better account for the projected range in prices. 4. Incorporate the upstream carbon impacts of RNG from methane leaks associated with the collection and processing of biogas feedstocks.	3. RNG is not modeled in the Electric Progress Report. The fuel prices used for hydrogen and biodiesel are provided in Appendix D: Generic Resource Alternatives. 4. RNG is not modeled in the Electric Progress Report. However, we do include the upstream emissions on natural gas. A full discussion is included in Chapter Five: Key Analytical Assumptions.
3.14	Alternative fuels	At minimum, the Draft IRP should answer the following questions for any new generation projects that include the combustion of RNG or green hydrogen fuel: 1. When will the conversion to RNG or green hydrogen be made? 2. What is the concrete estimate of the costs of converting the generation technology to be capable of utilizing RNG or green hydrogen versus utilizing conventional fuels? 3. Can the Draft IRP demonstrate performance of the underlying technology's ability to avoid contributing to local air pollution? If not, how does PSE plan to mitigate air pollution impacts?	1. The IRP assumes that in 2039 the first hydrogen peaker will be built. Existing plants will not convert to green hydrogen starting in 2030 and phased in through 2044. 2. As green hydrogen is an emerging technology, there are still things we do not know about it, including costs. We are going to continue to analyze green hydrogen in future IRP cycles. 3. All new generation projects analyzed in the IRP are CETA compliant.
3.15	Feedback timeline	**3. Improve public engagement by increasing transparency allowing sufficient time to provide comments.**	Thank you for your feedback. Please see our answer to Feedback Theme A.

No.	Category	Comment	How PSE used/may use this feedback
		The engagement process for the Draft Electric and Gas IRPs has not been sufficient for stakeholders to provide meaningful feedback and input. At the December 12, 2022 IRP meeting, you provided a preferred portfolio in the “Draft Results of Electric Portfolio” that did not comply with CETA, then did not provide an updated portfolio ahead of the release of the Draft Electric IRP. Additionally, only two weeks were initially given to provide comments on both the Draft Electric and Gas IRPs; while the deadline for the Draft Gas IRP was extended by an additional week, this is still not sufficient time to review and provide responses for both drafts. We are concerned that this timeline undermines the concept of stakeholder engagement through this rushed process and lack of transparency.	

4. Jim Adcock, January 27, 2023

No.	Category	Comment	How PSE used/may use this feedback
4.1	Peaking capacity	On Page 3.3 of the Chapter 3 of the Draft 2023 Electric Progress Report Resource Plan, PSE refers to "CETA Compliant Peaking Capacity." I have no idea what this means. How is this different from standard Natural Gas Peaking Capacity? What makes it "CETA Compliant" as opposed to other Peaking Capacity -- which I guess would be standard Natural Gas Peaking Capacity which is not CETA Compliant? Can this "CETA Compliant" Peaking Capacity be operated off Natural Gas? What would PSE do to ensure that it isn't?	CETA Compliant Peaking Capacity in the 2023 Electric Progress Report is intended to represent combustion resources which will produce zero carbon emissions by 2045. In this case, we’ve modeled a biodiesel peaker, which uses biodiesel as its sole fuel source for the life of the plant and blended natural gas and green hydrogen peakers, which will transition to 100% green hydrogen by 2045.
4.2	CETA	In the Draft Chapter 3 it states (3.13) that PSE plans to make progress towards the "80 percent clean by 2030" requirements of CETA. Can PSE please state in so many words in the Final Chapter 3 that PSE actually intends to meet the stated requirements in CETA to actually *be* "80 percent clean in 2030" ? IE that PSE isn't going to say end up at 70 percent -- and then claim that they will just make up the difference using RECs?	Figure 3.5 in Chapter Three: Resource Plan of the final 2023 Electric Progress Report illustrates the forecasted CETA eligible resources surpassing the 80% of delivered load target in 2030.

5. Joel Nightingale on behalf of Washington Utilities and Transportation Commission, February 7, 2023

No.	Category	Comment	How PSE used/may use this feedback
5.1	Review timeline	**Duration of review**: Staff does not believe that two weeks is a sufficient timeline for interested persons and parties to read, analyze, and provide comprehensive comments on a draft IRP progress report (especially in light of the simultaneous comment review of the draft 2023 Gas IRP). Staff notes that, while PSE is asking interested parties for a two-week turnaround for comments on its Chapter 3 draft, PSE has not yet posted responses to the public feedback it received following its 12/12/2022 advisory group meeting (as of 2/7/2023).	Thank you for your feedback. Please see our answer to Feedback Theme A.
5.2		**Scope and procedure of review**: Only providing one chapter of the progress report severely limits the ability of commenters to provide meaningful feedback, especially given that much of the backup data and analysis was not included in the published draft of Chapter 3 (e.g., underlying AURORA modeling files, Conservation Potential Assessment, updated generic resource input assumptions, etc.).	Thank you for your feedback.
5.3	Clarification, accessibility	**Presentation of information**: • Where charts are provided, please cite sources (i.e., worksheets and tab references where the numbers came from). Staff does not see any supporting worksheets that show the source data for Figure 3.6, for example. • In charts where a variety of portfolios are displayed, please clearly indicate which one represents the preferred portfolio (e.g., Figure 3.12) • Please review the charts for the final to ensure that the colors used are sufficiently different from each other to identify different resources from one another. • While we understand that an IRP is a necessarily complex document, Staff encourage PSE to take steps to improve the accessibility of its IRP Progress Report's content by using plain language where possible, rewording overly-complex sentences, etc.	Thank you for your comments. Supporting information is provided as part of the final Electric Progress Report. We provided Chapter Three: Resource Plan as a courtesy to interested parties and to solicit initial feedback. We deemed Chapter Three, along with the Excel files for the portfolio analysis and customer benefit indicators most relevant for the feedback we sought.
5.4	Peaking capacity	Chapter 3: Resource Plan	CETA Compliant Peaking Capacity in the 2023 Electric Progress Report is intended to represent combustion resources which will produce zero carbon emissions by 2045. In this

No.	Category	Comment	How PSE used/may use this feedback
		• It is unclear to Staff what PSE considers "peaking capacity additions" to mean. It appears that in different places, this term or very similar terms are used to mean different things. ○ In Table 3.1, PSE uses the term "CETA Compliant Peaking Capacity" with no definition. ○ In Figure 3.5, PSE uses the term "CETA-qualifying Capacity Additions" which appears to reflect a slightly broader subset of the resources in PSE's preferred portfolio, apparently adding storage to the definition. ○ In Figure 3.6, PSE uses the term "New Peaking Capacity" which appears to, again, exclude storage. What it does include is not clear. ○ The term "peaking capacity" is confusing, especially in light of the discussion of "Nameplate vs Peak Capacity" starting on pg 3.10, which makes clear that *all* resources contribute to peak to some degree. Staff suggest clarifying the language throughout this chapter to be as precise and straightforward as possible.	case, we've modeled a biodiesel peaker, which uses biodiesel as its sole fuel source for the life of the plant and blended natural gas and green hydrogen peakers which will transition to 100% green hydrogen by 2045. The definitions for "CETA compliant peaking capacity" and "nameplate capacity" have been updated in our Definitions and Acronyms document.
5.5	Peaking capacity, CETA	Staff find it somewhat troubling that none of the above terms ("CETA Compliant Peaking Capacity," "CETA-qualifying Capacity Additions," "New Peaking Capacity") appear to include demand response whose primary purpose is reducing peak demand, and – unlike the other resources apparently included in these definitions – CETA *requires* PSE to pursue all cost-effective, reliable, feasible demand response.	In most cases, demand response programs are broken out as a separate category. Demand response programs are considered in this Electric Progress Report and do contribute to reduction of peak demand. Demand response is used for peak savings, to reduce the peak demand and is considered a demand-side resource, so we did not group it with the supply-side peaking capacity when making the informational chart in Chapter Three: Resource Plan. Figure 3.9 and 3.10 show how demand response and all other resources contribute to meeting peak capacity.
5.6	Peaking capacity, CETA	Staff suggest that the row in Table 3.1 titled "CETA Compliant Peaking Capacity" should be broken down by resource type just like every other	Thank you for your feedback. The fuel source for the peaking capacity resources is broken down in Figure 3.6. of Chapter Three: Resource Plan.

No.	Category	Comment	How PSE used/may use this feedback
		resource type (similar to the breakdown of "hybrid" into different types of "hybrids").	
5.7	Clarification	It is unclear in the "03a_EPR23_Portfolio_Data_Draft" spreadsheet which thermal "NG/H2 Blend" resources PSE considers "existing" vs. "new" (as shown in Figure 3.1). PSE should make clear which resource decisions represent (1) completely new facilities, (2) modifications to existing facilities, or (3) existing facilities without modifications.	These spreadsheets are all new resource additions. This is clarified in the final 2023 Electric Progress Report.
5.8	Clarification	Pg 3.12 - PSE states that a diversified portfolio can help mitigate risk (something Staff agrees with generally), but the Company does not describe or point to analysis that shows how each resource adjustment that it makes to the reference portfolio works to achieve that goal. This leaves the reader to in a position to "take PSE's word for it" that *the specific adjustments* PSE made to the least cost reference case (which almost by definition, increase the portfolio cost) achieve the stated risk mitigation. Staff encourage PSE to expand on this explanation in the final draft of this 2023 IRP Progress Report.	We provide additional context regarding the portfolio analysis in Chapter Eight: Electric Analysis. We also further refined Chapter Three: Resource Plan in regards to diversification.
5.9		Staff would like to see a description of the method PSE used to evaluate new technologies for possible inclusion in its generic resource modeling, and a list of technologies that PSE considered. To be clear, Staff does not object to PSE's inclusion of certain emerging technologies outside of the NREL ATB, we just believe that there needs to be consistency in the evaluation of these emerging technologies. Staff expect the final IRP progress report to include a robust discussion of both the benefits and the unknowns/risks from each emerging technology, including expected tipping points in development that may make the preferred portfolio unfeasible. Because PSE is including relatively unknown technologies[1] for its peak capacity needs, Staff suggest this discussion include other emerging options that could meet these needs (e.g., long-duration energy storage technologies).	We used the NREL ATB for all emerging technologies with the exception of the recip peaker. We have been modeling recip peakers in the IRP for at least ten years but have yet to see them in the NREL ATB. We are working towards creating an emerging technology assessment for future IRP cycles.
5.10	Clarification	Based on slide 31 from 9/13/2022 IRP AG meeting, DR products with net levelized costs near or below $0/kW-year appear to have a total	Slide 31 from the 9/12/22 meeting shows the demand side resources as a cumulative

No.	Category	Comment	How PSE used/may use this feedback
		nameplate capacity of 2,059 MW. Why is it that portfolio A5, which – according to Figure 3.9 – adds "all DR programs," only shows 446 MW of DR by 2045 (cell AM406, "Builds Detail" tab, "03a_EPR23_Portfolio_Data_Draft.xlsx")?	number, not incremental. Meaning, the numbers on the chart have already been added together to show the total available demand response. The last number of 439 MW on the chart is the total cumulative number.
5.11	Clarification	Figure 3.11: Staff suggest PSE include in the body of the document or in the chart's legend a description of what each bubble's size is meant to indicate (based on "03b_EPR_PortfolioBenefitAnalysis_Draft.xlsx", Staff understand it to be the portfolio's CBI index/$).	We have included the bubble size meaning in the Figure 3.11 legend. Staff is correct in their interpretation: the efficiency measure (an adjusted CBI index/$) determines the area of each portfolio bubble size.
5.12	IRA	Inflation Reduction Act (IRA): Though it doesn't need to be in Chapter 3 necessarily, Staff expects to see a robust discussion of how the impacts of the IRA were – or were not – included in the analysis of this IRP Progress Report, whether quantitatively or qualitatively. Discussion of the IRA should include the approximate magnitude of expected impacts, such as accelerated adoption of demand side resources and EVs, that PSE was unable to include in the demand forecast and potential assessments. For Chapter 3, it would be helpful to discuss whether passage of the IRA had an impact on the choice of preferred portfolio.	Thank you for your feedback. We examine the impacts of the IRA on our analysis in greater detail in Chapter Four: Legislative and Policy Change.
5.13	Clarification	It is unclear to Staff why the definition for "nameplate capacity" is tied to a specific resource type (natural gas fired unit) when the term is clearly used across all resource types in the body of Chapter 3. [1]See discussion of hydrogen and SMRs starting on the bottom of page 3.12 under the subheading "Advanced Nuclear (SMR)"	Thank you for pointing out this oversight in our definitions document. The definition of nameplate capacity has been updated.

6. Michael Rooney on behalf of Rye Development, February 7, 2023

No.	Category	Comment	How PSE used/may use this feedback
6.1		The companies working to develop the Swan Lake and Goldendale pumped hydro storage projects (the "Projects") appreciate Puget Sound Energy's ("PSE") work that went into preparing the 2023 Draft Electric Progress Report ("Draft Report") and the opportunity to comment herein. The Projects commend and appreciate the work that PSE and the Washington Utilities Commission ("Commission") did to update how	Thank you for your feedback.

No.	Category	Comment	How PSE used/may use this feedback
		pumped storage was valued in its IRP modeling, which clearly resulted in a more accurate modeling of storage (particularly, pumped storage), as evidenced by pumped storage's selection in the preferred portfolio of the Draft Report.	
6.2	ELCC	**I. The Draft Report Shows that the Updates to the ELCC Estimates More Accurately Capture the Value of Pumped Storage for PSE's System.** The Projects commend and appreciate the work that PSE and the Commission have done to more accurately value storage—and pumped storage projects—as part of the preferred portfolio included in the Draft Report. Throughout the Projects' past engagement in PSE's IRP and RFP proceedings, the Projects have raised concerns with: (1) PSE's assigned ELCC value to pumped storage; (2) PSE's high net levelized cost attributed to storage resources, particularly pumped storage; (3) PSE limiting pumped storage's operational range to 70% of these resources' potential capacity; (4) assumptions used by PSE to demonstrate and meet its capacity need; and (5) the impact of any modeling adjustments on the RFP timeline, and how said modeling updates may (or may not) impact the RFP resource selection. The Projects appreciate how responsive PSE, the Commission, and Commission Staff were to these concerns, and the subsequent efforts to reevaluate the accuracy of PSE's ELCC methodology, which resulted in PSE's implementation of modeling improvements and updates to its ELCC calculations. The 400 MW of pumped hydro that is included in the draft preferred portfolio of the Draft Report are an indication that pumped storage is a valuable and cost-effective addition to PSE's system. Pumped storage resources are uniquely well-positioned to operate reliably through these types of events, given their long discharge durations, flexible and dispatchable capacity, and ability to operate through extreme temperatures and weather events, unlike many other renewable and/or storage resources. The Projects thank PSE, the Commission, and Commission Staff for undertaking the process to	Thank you for your feedback. Please see our response to Feedback Theme H.

No.	Category	Comment	How PSE used/may use this feedback
		update PSE's ELCC methodology, which clearly resulted in a more robust and accurate assessment of the many benefits pumped storage resources provide, resulting in these resources being included in the preferred portfolio contained in the Draft Report.	
6.3		**II. The Final Report Should Advance the Consideration of Pumped Storage Resources as Amongst the Most Reliable, Cost-Effective Resources.** As the Projects have repeatedly emphasized to PSE and the Commission, pumped storage is uniquely positioned to provide the type of diversity utilities like PSE need to maximize the benefits of investments in renewable energy because resources like the Projects are large, gridscale, dispatchable, flexible, clean resources that can be operated in tandem with renewable energy resources to provide around-the-clock energy and capacity.	We recognize that pumped hydro is reliable, but our analysis demonstrated that it is not the most cost-effective compared to other storage and capacity resources. You can see further discussion of our analysis in Chapter Eight: Electric Analysis.
6.4		Additionally, pumped storage, and the Projects in particular, are multi-generational assets, that will operate for 80-100 years. That diversity, and longevity is necessary to reliably serve customers through increasingly extreme weather events. The Projects remain concerned about the Draft Report's over-reliance on batteries as a capacity resource. For example, the Draft Report includes 1,400 MW of Li-ion batteries through 2045, but only 400 MW of pumped storage[1]. While the Projects understand that batteries have an important role to play in the preferred portfolio, the scale of PSE's proposed investment in batteries may create unnecessary risk for ratepayers due to the environmental and life-cycle costs associated with those storage resources. Additionally, the Projects continue to have concerns about whether batteries can perform as needed for reliability and raw capacity purposes, particularly in the amount proposed by PSE. Therefore, the Projects recommend that PSE consider altering the preferred portfolio to select a more diverse and balanced storage portfolio that includes more pumped storage, given the size and viability of pumped storage projects adjacent to its system.	Thank you for your feedback. Diversifying storage is beneficial for our electric portfolio and we understand the benefits of pumped storage.

No.	Category	Comment	How PSE used/may use this feedback
6.5		**III. Conclusion** The Projects appreciate PSE's updates to its ELCC modeling and is glad to see the value of pumped storage being more accurately modeled, and subsequently selected, in the preferred portfolio contained in the Draft Report. Additionally, the Projects recommend that PSE advance its consideration of pumped storage as these resources are amongst the most reliable, least cost resources available in the region. [1]2023 Draft Electric Progress Report, Chapter 3 at p. 3.12.	Thank you for your feedback.

7. Sashwat Roy on behalf of Renewable Northwest, February 7, 2023

No.	Category	Comment	How PSE used/may use this feedback
7.1		Renewable Northwest appreciates the opportunity to provide feedback on Chapter 3 – Resource Plan specifically pertaining to the draft preferred portfolio and overall portfolio modeling effort. 1. We are encouraged by the selection of clean and non emitting capacity resources including solar, wind, hybrid renewables and energy storage to meet 2030 CETA targets. We believe that this action should be followed by an open, competitive and fair Request for Proposal process which provides opportunities for PSE and its customers to engage in commercial arrangements with project developers to extract the maximum value including through Power Purchase Agreements, Tolling and Build-Transfer Agreements.	Thank you for your feedback.
7.2	Peaking capacity, CETA	2. We are concerned about the interpretation of 474 MWs of "CETA-compliant non-emitting peaker" selected in the modeling. PSE has not shared with stakeholders in the ERP meetings on a definitive commercial resource that they are confident on procuring for customers that is CETA-compliant. PSE has also not shared the exact cost estimates of fuels (and infrastructure) like biomass and hydrogen that	Thank you for your feedback. Please see our response to Feedback Theme F.

No.	Category	Comment	How PSE used/may use this feedback
		will be required to operate these “peaker plants”. In fact, the Draft Gas IRP mentions that “green hydrogen has a practical upper limit of around 15-20% for blending into the gas system by volume without significant infrastructure changes.” These infrastructure costs have not been folded into the overall costs of the “non-emitting peakers” studied in the Electric IRP. We recommend that PSE explain their cost and technology assumptions around these peaker plants especially if they are considering building new natural gas infrastructure that may have a stranded asset risk in the future due to supply chain issues related to fuel delivery.	
7.3	Emerging technology	3. We believe that instead of investing in speculative resources which may or may not achieve commercialization in the near future, PSE should consider additional hybrid and storage procurement as well as long-duration energy storage technologies like Form’s iron-air battery product which has recently signed partnerships with Colorado and Minnesota utility Xcel Energy[1]. These projects are intended to come online by 2025 pending regulatory approval. Thus, PSE should run an additional sensitivity that considers iron-air batteries by 2026 in addition to hybrids and energy storage to meet the winter resource adequacy needs that PSE has identified in their modeling. As part of this effort, PSE should increase outreach towards these developers to gain understanding of the technical specifications and preliminary cost assumptions associated with these Projects.	Thank you for your feedback.
7.4	Energy storage	4. Energy storage is increasingly being deployed for the purposes of providing firm capacity and supporting resource adequacy. Long-duration energy storage technologies are an extremely important component of meeting CETA targets because with the pace of increasing renewable penetration (including solar and wind) in Puget’s system, it provides a cost-effective opportunity to absorb renewable energy when demand is lower and to dispatch it during peak periods in winters when PSE finds itself requiring resources. Avista, in their recent IRP assigned the 100-hour Iron-oxide battery an ELCC of 98% in the months of December and January with a capacity price of around	Thank you for your feedback. We will reevaluate generic resources for the 2025 IRP.

No.	Category	Comment	How PSE used/may use this feedback
		$250/kW-year which is cost-competitive with other long-duration storage technologies.	
7.5	ELCC	5. Additionally, the ELCC values of energy storage resources including long-duration energy storage should only diminish marginally or even increase due to their ability to shape dispatch during peak demand periods. Detailed probabilistic approaches[2] have found that 4-hour duration storage devices can provide high capacity credit in many parts of the United States that are summer-peaking. Although PSE considers itself a winter-peaking utility, recent climate trends suggest that utilities in the Pacific Northwest are increasingly seeing a rise in cooling degree-days i.e. more peak load conditions during the summer months. This creates additional need for energy storage resources of both short and long-duration to provide capacity. The passing of the Inflation Reduction Act also creates additional opportunities for all types of energy storage resources which are now eligible for the 30% Investment Tax Credits which improve the economics even further.	Thank you for your feedback. Please see our response to Feedback Theme H.
7.6	Peaking capacity, CETA	Thus, we recommend that PSE take into consideration the points we raise about the viability of the "CETA-compliant peaker plants" and instead conducts additional modeling runs to study the cost-effective and lower risk option of meeting their winter resource adequacy and CETA requirements using additional renewable and a mix of short and long-duration energy storage options. [1]Form Energy Partners with Xcel on Two Energy Storage Projects. https://www.renewableenergymagazine.com/storage/form-energy-partners-with-xcel-on-two-20230130 [2]NREL. 2021. https://www.nrel.gov/docs/fy22osti/80583.pdf	Thank you for your feedback.

8. Stephanie Chase on behalf of Public Counsel Unit, Office of the Attorney General

No.	Category	Comment	How PSE used/may use this feedback
8.1	Clarification	Regarding the least-cost reference portfolio: Throughout the document, there are a number of references to the least-cost reference portfolio.	You can find additional detailed information on the reference portfolio in Chapter Eight: Electric Analysis.

No.	Category	Comment	How PSE used/may use this feedback
		Many of the references are comparing other portfolios to the reference portfolio, but some also describe the resources selected by the reference portfolio. Will a more general description of the reference portfolio be included in the final update? It may be helpful to understand more fully what the least-cost reference portfolio looks like to evaluate the preferred portfolio choice.	
8.2	SMR, alternative fuels	Public Counsel would also like to see more description of the steps that PSE is taking to develop hydrogen resources or small modular nuclear resources. What are the possible back up plans if hydrogen resources do not develop in the timeline that PSE is anticipating? What other infrastructure upgrades is PSE anticipating with hydrogen adoption?	Thank you for your feedback. Please see our responses to Feedback Theme G and Feedback Theme E.
8.3		The preferred portfolio anticipates bringing on a significant number of distributed energy resources (over 87,000 new solar participants). How many customers in PSE's service territory currently have solar on their homes? Do "new participants" include community solar subscribers as well as individual homeowners?	As of May 2022, we have more than 13,500 participants (including residential, industrial, and commercial) in our Net Metering Program, 99% of which have solar installations. This number serves as our best proxy for the number of PSE customers who have solar on their rooftops. However, we'd like to clarify that the majority of our Net Metering Program participants funded their own solar installations. Our forecast of similar customer-funded installations is estimated in the Conservation Potential Assessment and adds an additional 1,393 MW by 2045. The 87,000 new distributed solar participants described in our preferred portfolio is a proxy derived from the 731 MW of new, distributed solar resources. These resources PSE will develop via new and existing customer programs. As of May 2022, over 81,700 customers subscribe to our Green Power and Solar Choice customer programs. We additionally

No.	Category	Comment	How PSE used/may use this feedback
			fund solar installations through our Green Power Community Grants, and have launched four Community Solar sites in the past two years. To achieve the distributed solar in our preferred portfolio, we likely will need to continue expanding these customer programs, as well as develop new ones. The details regarding how we will acquire new participants is outside the scope of this 2023 Electric Progress Report. Appendix D: Generic Resource Alternatives includes further details on our existing customer programs, and Appendix E: Conservation Potential and Demand Response Assessments includes our Conservation Potential Assessment.
8.4	clarification	On page 3.3, there is mention of reliance on newer technologies such as small modular nuclear and hydrogen as a fuel to reach carbon-free energy supply by 2045; however, there is a disconnect between the narrative and the tables and charts presented on the preferred portfolio which does not show any nuclear. It is explained much later on why nuclear is not in the preferred portfolio (because of high costs right now). It would be helpful to provide a brief explanation for readers about why small modular nuclear reactors are not in the preferred portfolio earlier on in the chapter or to save the mention of reliance on small modular nuclear entirely for later on when it is discussed in detail.	Thank you. This has been updated in Chapter Three: Resource Plan.
8.5	Clarification	On page 3.12, under the “Energy Storage” paragraph block, there is discussion about the addition of 400 MW of new Montana wind. It is unclear why 400 MW of Montana wind was added, and it also does not make sense to the reader why this is described in a section that discusses energy storage. We would recommend that this discussion on the 400 MW of new Montana wind be elaborated upon in another section or under a different header.	Montana wind is included because we are optimizing transmission capacity from Montana to PSE through the addition of both storage and wind. There is an expanded explanation of this in Chapter Eight: Electric Analysis.
8.6	Portfolio cost	On page 3.2, the figure 3.12 shows that the preferred portfolio has the highest costs over the next six years when compared to three other portfolios; however, figure 3.11 shows that it has a relatively lower	Thank you. This has been updated in Chapter Three: Resource Plan.

No.	Category	Comment	How PSE used/may use this feedback
		overall total portfolio cost. It might be helpful to see a chart of the portfolio costs over a longer timeframe to see when and by how much the preferred portfolio may be expected to be less costly than comparable portfolios.	