Integrated Resource Plan (IRP) Stakeholder on Demand Forecast: Summary

v. 8/12/2022

Meeting Information

- Tuesday, July 12 from 1 p.m. – 4 p.m.
- Links to:
  - Meeting materials (e.g. hot sheet and presentations)
  - Meeting recording

Summary of July 12 IRP Meeting

- **Recap from July 12 IRP**
  This information can be found on slides 7-8 of the presentation
  - PSE shared the new date for the Resource Adequacy IRP meeting. It was rescheduled to August 24.
  - PSE reviewed feedback from the June 6 IRP meeting, including:
    - Improving the feedback loop between PSE and IRP stakeholders
    - Exploring other methods of environmentally friendly storage
  - PSE shared an update on some next steps following its stakeholder assessment.

- **Demand Forecast in the IRP**
  This information can be found on slides 10-13 of the presentation.
  - PSE provided an overview of how the demand forecast relates to work in the IRP. PSE uses the demand forecast to establish resource needs. Next, PSE determines demand-side programs and supply-side resources in response to this forecast.

- **Overview of the Demand Forecast**
  This information can be found on slides 14-18 of the presentation.
  - PSE shared an overview of the demand forecast. The IRP will include information about demand side resources.
  - In response to prior stakeholder feedback, PSE developed new methodology to develop future temperature assumptions that reflect climate change, as well as include summer peaks.

- **Natural Gas Results**
  This information can be found on slides 18-25 of the presentation.
  - PSE reviewed energy and peak demand forecast composition and energy demand compared to the 2021 IRP for natural gas.

- **Electric Results**
  This information can be found on slides 26-33 of the presentation.
  - PSE reviewed electric energy demand forecast composition, the forecast compared to the 2021 IRP, energy demand forecast after demand side

resources, and the winter and summer peak demand forecasts. Factors included:
  - An increase in demand due to forecasted EV adoption.
  - Customer growth.
  - Climate change.

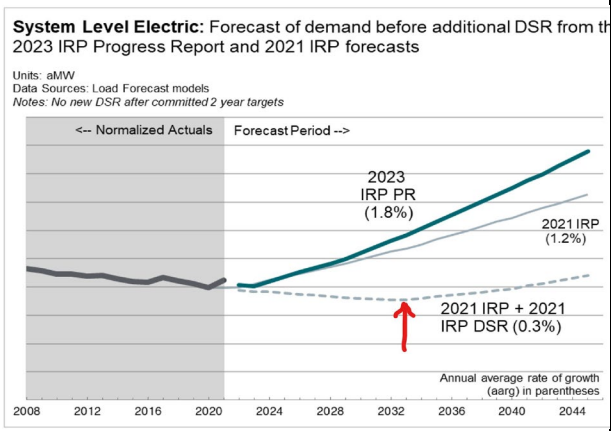
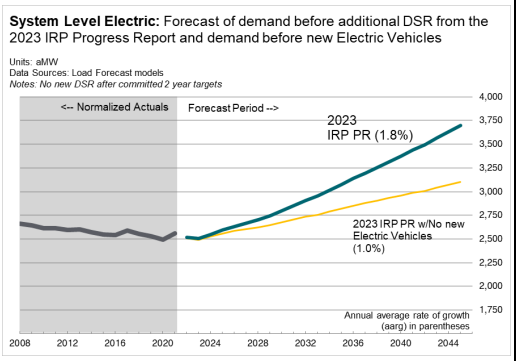
- **Demand Forecast Assumptions**
  This information can be found on slides 35-43 of the presentation.
  - PSE reviewed the demand forecast assumptions and shared updates on methodology:
    - A major change was the inclusion of climate change. Each year looks backwards 15 years and forwards 15 years. This results in more heating and cooling degree days.
    - More light-duty EVs are expected.
    - There is more optimistic economic outlook for this IRP.

- **Electric Vehicle (EV) Forecast**
  This information can be found on slides 43-65 of the presentation.
  - Guidehouse shared a presentation on the Electric Vehicle (EV) forecast, which included:
    - Adoption methodology
    - Clean Fuel Standard
    - Adoption Results
    - Load Forecast Methodology
    - Load Forecasting Results

- **Next steps:**
  - Sophie Glass closed the meeting and shared the next steps for the IRP stakeholder feedback process.
    - July 14: A recording and transcript of the chat will be available.
    - July 22: Feedback forms are due.
    - August 12: A feedback report of comments and summary will be posted to pse.com/irp

Feedback Report

Purpose: The following table records the Integrated Resource plan (IRP) stakeholder unanswered questions and PSE responses from the Demand Forecast discussion with IRP stakeholders and the meeting's feedback form. Meeting materials are available on the project website.

Date	Stakeholder	Question	Comment	PSE Response
7/14/2022	Don Marsh	1	 The graph presents a forecast of electric demand "before additional DSR," PSE has included the dashed line to illustrate the significant reductions due to Demand Side Resources in the previous IRP. Instead of rising at an average annual rate of 1.2%, the post-DSR projection from the 2021 IRP rises at only 0.3%. However, if the negative trend from 2021-2033 had continued throughout the forecast period, the overall rate of growth would have been approximately -0.4%. That would be a stunning result given expected population and economic	 PSE develops demand forecasts based on the best available information and in compliance with state regulations. The intent of this presentation was to illustrate the trends in energy demand without demand-side resources (DSR). The slope of PSE's load forecast with DSR from the 2021 IRP was presented for reference and illustrates increasing demand after 10 years because PSE accelerates acquisition of cost-effective conservation into the first 10 planning years in its Biennial Conservation Plan pursuant to the

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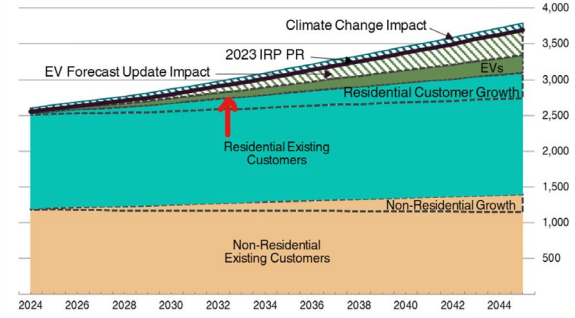
			growth of the Puget Sound region during coming decades. But what causes the downward trend to reverse after 2033? When I asked this question during the meeting, Stephanie Price, PSE's Senior Economic Forecasting Analyst, claimed that it was largely due to the explosive growth of electric vehicles. **This explanation is not credible.** On the previous slide (27), a graph shows that PSE is not expecting a dramatic change in demand growth attributed to EVs in 2033: **System Level Electric:** Forecast of demand before additional DSR from the 2023 IRP Progress Report ("IRP PR") Units: aMW Data Sources: Load Forecast models *Notes: No new DSR after committed 2 year targets*  Because there is no sudden growth in the dark green wedge representing EV load in 2033, and because EV load remains a relatively small portion of the total load, it	Energy Independence Act, chapter 19.285 RCW. The curve could be smoothed by reducing the pace of conservation acquisition or the slope of the line could also be flattened by assuming new conservation resources that do not yet exist. However, these approaches would be inappropriate because the IRP rules require the IRP to use commercially available resources for DSR forecasting. PSE's Biennial Conservation Plan (BCP), which represents programs PSE is implementing to achieve conservation goals, follows the approach taken in the IRP and is updated every two years to reflect changes in available conservation technology. The types and levels of DSR applied to the final 2023 demand forecast are yet to be determined; therefore, upcoming stakeholder meetings to review results of the Conservation Potential Assessment and/or the final

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			is unlikely that EVs are responsible for the trend reversal shown in the slide that followed. In the meeting I stated my belief that the upward swing in the forecast is an illusory artifact of PSE's policy of modeling electrical efficiency opportunities only during the first 10 years of the 20-year demand forecast. These efficiency opportunities include home weatherization, switching to LED lightbulbs, and other DSR measures that could occur any time during the next 20 years. PSE pursues all those opportunities during the first 10 years of the forecast but none thereafter. Gurvinder Singh, a Senior Energy Management Engineer at PSE, said this policy has proven to be "beneficial for ratepayers" during the meeting. While I have no quarrel with accelerating energy efficiency efforts for the benefit of all ratepayers, no one benefits from the assumption that these efficiency benefits will be abandoned during the second decade of the forecast period. It is more realistic to assume that efficiency efforts will continue in 2033 and will reduce demand in the following years at roughly	results of the demand forecast with DSR are the appropriate venues to discuss this topic.

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			the same pace. When we eventually get to work on the 2032 IRP, I expect there will be another 10 years of electrical efficiency opportunities to pursue that weren't accounted for in today's IRP. This forecasting problem has affected every IRP I have participated in during the past seven years and has been noted by industry consultants. For example, the following graph was prepared by Synapse for the City of Newcastle in a land use hearing for PSE's Energize Eastside project in January 2022. (See page 18 of the document included in PSE's Energize Eastside website. For the 2013, 2015, and 2019 IRPs (as well as the 2017 IRP which was not shown), the dramatic rise in PSE's demand forecast consistently appears ten years after the IRP date. It sticks out like a sore thumb. The linear increase in the forecast constantly moves forward in time for each subsequent IRP, showing the illusory and incorrect effect of this assumption relative to actual demand trends, which are flat or declining. Another consultant, Dr. Randell Johnson, CEO of Acelerex, found this flaw in PSE's	

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			forecasting methodology illustrative of forecasting problems that occur in IRP forecasts throughout the industry. He wrote a blog post about the problem (avoiding mentioning PSE by name). Read the post here: https://acelerex.com/blog/model-error-peak-demand-forecast-in-irps/. Why does this matter? Because many projects must be planned at least ten years before the actual need. For example, PSE's Energize Eastside project was announced in 2013, but it will not be completed and in service before 2023. The project was justified using long-term demand projections that have proven to be incorrect for many years. That project alone will cost ratepayers hundreds of millions of dollars. To avoid unnecessary projects and undue burdens on ratepayers, the problem must be corrected. Due to the seriousness of this matter for ratepayers and the environment, I am including UTC staff in this communication. If the 2023 IRP includes this forecasting flaw, we will ask the Commission to reject the IRP. Let's	

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			correct the flaw now and avoid that unfortunate outcome.	
7/22/2022	Deepa Sivarajan, Washington Clean Buildings Policy Manager, Climate Solutions	2	Climate Solutions appreciates the opportunity to comment on the July 12, 2022, Demand Forecast IRP Stakeholder presentation. The electric and gas sectors are continuing to go through a period of dynamic change, as technological innovations and the impact of climate change is influencing what types of fuel people are using to meet their energy needs. Accurately forecasting future electric and gas demand is critical for minimizing the risk of stranded assets and ensuring that PSE meets its customers demand at a lowest reasonable cost. Below, we address four areas of PSE's gas and electric demand forecasts that we believe need refinement prior to the Company issuing its draft Gas IRP and draft Electric IRP Update.	Thank you for your feedback.
7/22/2022	Deepa Sivarajan, Washington Clean Buildings Policy Manager,	3	The Climate Commitment Act should impact the gas and electric load forecasts. During the meeting, we asked how the Climate Commitment Act (CCA) will influence PSE's electric and gas load forecasts. The Company responded that	Thank you for your comments. The forecast that PSE presented is a starting point and an input into the IRP analysis. The output from the IRP analysis provides the gas to electrification loads and these will be reflected as the impact on the forecast. These impacts will be

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	Climate Solutions		the CCA is modeled as an emissions restriction and therefore it will not be reflected in the load forecast. PSE acknowledged that there would be feedback loop, in which compliance with the CCA would increase costs and incentivize energy efficiency, conservation, and fuel switching, but said that would be picked up through the conservation potential assessment (CPA), which occurs after the load forecast. PSE continued that PSE would address this issue again in the gas meeting in September. We have concerns with PSE's response. We agree that some of the impacts from the CCA will be picked up in the electric and gas CPAs. However, we do not believe that the CPA will fully capture the impact to demand if a customer switches fuels. As an example, let's assume that a customer is switching from a gas furnace to an electric heat pump for heating their home. This action impacts both the electric and gas demand of the utility. The electric CPA will have made assumptions about end-use technology adoption during the planning horizon, including assumptions about the adoption	presented when the draft IRP results are presented in a future IRP meeting. The impacts of the CCA on electric and gas load forecasts as CCA is implemented will continue to be refined in future IRP cycles as more of the impacts are known and measurable.

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			of electric heat pumps. However, to the best of our understanding, neither PSE's gas demand forecast, nor PSE's gas CPA, will capture the demand reduction when that customer electrified their space heating. As such, the reduction to the gas load from the customer's fuel conversion will not be identified. PSE will almost certainly need to amend its load forecasts to account for this action. We look forward to PSE fully addressing our concern in subsequent IRP meetings.	
7/22/2022	Deepa Sivarajan, Washington Clean Buildings Policy Manager, Climate Solutions	4	PSE should incorporate energy codes and standards into the gas and electric load forecasts. PSE stated during the meeting that new building codes and standards (C&S) are identified in the CPA and are later applied as a reduction to load. Our understanding is that once a C&S update has been picked up through the CPA, subsequent IRP cycles will incorporate that C&S standard into the baseline load forecast. The Washington State Energy Code requires progressively more stringent energy efficiency standards through the 2031 code, when new buildings are quired to achieve a reduction of at least 70%	Thank you for your comments. The forecast that was presented is a starting point and an input into the IRP analysis. The Conservation Potential Assessment (CPA) develops the codes and standards impacts on the demand as an output. The codes and standards loads will be reflected as the impact on the forecast once the draft IRP analysis is completed. These impacts will be presented when the draft IRP results are presented in a future IRP meeting.

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			annual net energy consumption compared to a 2006 baseline. 1 There is a step-cycle every few years in which C&S will continue to require additional efficiency. Commercial and residential energy codes are updated every three years, and the most recent commercial energy code requires that new buildings rely on heat pumps for space heating and at least 50% for water heating. The State Building Code Council is currently contemplating a similar heat pump requirement for the residential energy code. PSE has sufficient information now to begin incorporating current and future C&S changes into this IRP cycle's CPA, which will then be picked up in the baseline load forecast in subsequent IRPs and IRP updates.	
7/22/2022	Deepa Sivarajan, Washington Clean Buildings Policy Manager, Climate Solutions	5	PSE should not assume a static share of air conditioning end-use technology. On slide 30 of the Company's presentation, the table shows significant load growth attributable to air conditioning. This is due to an increase in cooling degree days driven by climate change, as can be seen in slide 38. When asked what end-use technologies PSE is assuming is driving this growth,	PSE assumes increasing air conditioning saturation in the forecast period in building its load forecast. The forecast before DSR is end-use technology agnostic: it is based on historical observed energy and peak demand relationships. The CPA, which determines the

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			PSE responded that their load forecast does not consider end-use technology. PSE's forecast assumes a static share of end-use technology throughout the planning horizon. PSE continued that this assumption means that the Company doesn't need to make an adjustment to their load forecast. PSE should not assume a static share of air conditioning end-use technology for the 20-year planning horizon, especially in light of the state building code requirements discussed above. The types of technologies customers are choosing to meet their heating needs is certainly changing, and that will have an impact on which end-use technologies customers use to meet their growing cooling needs. In the building heat sector, customers are rapidly installing air-source heat pumps2 due to its declining cost3 and its ability to provide air cooling. Furthermore, changes in Washington state building codes require the use of electric heating options like heat pumps. The types of end-use technology customers will adopt for AC loads are changing significantly relative to the current stock. Based on our understanding of the influence of a CPA	potential of DSR in the forecast period, uses frozen-efficiency assumptions for technologies, which is consistent with the Northwest Power and Conservation Council's Power Plan. The CPA includes heat pump options as measures that customers are expected to adopt over time. The final demand forecast after DSR, will reflect the impact of codes and standard and energy efficiency activities that incentivize the adoption of more efficient end-use technologies, such as heat pumps. This analysis will be shared with stakeholders later this fall.

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			on the opposite fuel's demand forecast, it does not appear that the increase in heat pump adoption to solve customer's heating and cooling needs will be reflected in the gas demand forecast.	
7/22/2022	Deepa Sivarajan, Washington Clean Buildings Policy Manager, Climate Solutions	6	The State Energy Strategy electrification scenario should have its own load forecast. In the State Energy Strategy developed in 2020, the state modeled various scenarios that would achieve Washington's statutory greenhouse gas requirements of 95% reductions by 2050, which are required in the implementation of the Climate Commitment Act (CCA). The analysis found that the most cost-effective scenario for achieving the required greenhouse gas reduction requirements is the electrification scenario. We strongly urge PSE to include the State Energy Strategy electrification scenario as a scenario in its gas and electric IRPs, as well as base the low-gas demand forecast assumption on the expected fuel demand in the electrification scenario. Likewise, PSE should develop a scenario and a load forecast that reflects the State energy Strategy electrification for its electric IRP update as well. Given the cost-	PSE will be performing an electrification scenario, which will use the CCA reductions as the goal. PSE developed this electrification scenario with an aggressive policy of end-of-life replacement of gas equipment with electric equipment. PSE's consultant developed a forecast for the electrification specific to PSE building stock. This scenario does not assume the replacement is made as a cost-effective measure but rather as mandated action due to policy, thus achieving a deeper state of electrification. While we are not certain of all the assumptions made in the WASES, as that data was not readily available in time for this study, we think our electrification scenario will represent the most aggressive replacement from gas to electric.

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			effectiveness of the State Energy Strategy electrification scenario and the requirements of the CCA, it is likely that actual gas and electric loads will closely resemble the loads in the electrification scenario.	The low demand will result from the electrification of the loads and so that will be an output of the analysis.
7/22/2022	Deepa Sivarajan, Washington Clean Buildings Policy Manager, Climate Solutions	7	Electric Vehicles Load Forecast On slide 54 of the presentation, PSE states its assumptions that only 37 percent EV adoption by 2050. When asked if that assessment includes Washington state's ban on internal combustion engines, Guidehouse, PSE's consultant who conducted the electric vehicle potential study, responded that they developed their curve prior to the state's ban on March 25, 2022.4 Guidehouse added that in other models the impacts of an ICE ban had a tremendous impact on their load forecast. PSE does not plan to file its IRP update until Q1 or Q2 2023, or a year after the law was passed by the legislature. This is more than enough time for PSE to incorporate this significant change to its electric demand forecast. Thank you for the opportunity to comment. We look forward to continuing to work with PSE throughout the 2023	The electric vehicle forecast includes estimated impacts from state policies effective as of the 2021 legislative session. The electric vehicle forecast was developed in late fall of 2021 and was an input into the updated IRP load forecast that was completed in early 2022. The load forecast is an input into the CPA. e The impact of the most recent legislation will be considered in the 2025 IRP.

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			Gas IRP and 2023 Electric IRP Update.	
7/12/2022	Joel Nightingale	8	When is the final DSR expected to be available?	The DSR potential results will be presented in September. The Electric DSR presentation is scheduled for September 13 and the Gas DSR presentation is scheduled for September 22. The cost effective DSR will be presented at the IRP draft results meeting later this fall.
7/12/2022	Don Marsh	9	I would like to express our disappointment not only with slide 17, but for what I feel is a very uninspired approach to resource planning. Having participated in these meetings for about 7 years now, I've come to see a flaw in the standard process, which is for PSE to predict what will happen with demand, and then much later identify possible responses and mitigations. This is like me saying I have small kids now, but they are going to grow and eat a lot more food. Someday I should think about how I'm going to respond to that. For us stakeholders, it is frustrating that we can't view this problem more holistically. Instead of just saying, look, EVs are going to significantly raise our peak demand, PSE should note that	Thank you for your comments. PSE has customarily shared its integrated resource planning work with stakeholders as it is being developed sequentially. For the next IRP, PSE is considering whether presenting the load forecast, prior to having the DSR potential results is meaningful to stakeholders, or if their time would be better spent examining the load forecast after DSR results have been developed and applied. PSE is in the planning stages for a virtual power plant and is seeking recovery for the investment in its General Rate Case (GRC). Similarly, PSE has proposed a Time Varying Rates pilot program

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			there is a special rate for EV owners in the upcoming Time Varying Rates program. With the right incentives, that will address most of that peak impact. Or instead of saying, wow, air conditioners are really going to strain the system, PSE could provide a graph showing the growth of rooftop and community solar, and say, this will probably be an integral part of the solution. I'm not saying we must see a detailed plan right now, but PSE could give us some indication of what you are thinking and what we should be focusing on for future meetings. In my own case, my family just had two Tesla Powerwall batteries installed in our garage. As things stand now, our investment of over $20,000 will only be useful for a few hours per year during power outages. We would like our investment to provide a daily benefit to our community and the environment by participating in a virtual power plant, like 25,000 customers of Pacific Gas and Electric are doing. Closer to home, Portland General Electric is also piloting a similar program. While PSE has mentioned its interest in virtual power plants many times, we never get any	in its GRC. Additionally, PSE's Clean Energy Implementation Plan (CEIP) provides insight on the plans and actions PSE intends to take over the next four years (2022-2025). Once PSE's CEIP is approved, PSE will be better positioned to focus on how it will be implementing its CEIP and planning for the next one.

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			specific plans or capacities or dates. I've spent seven years trying to get PSE to move forward just an inch, and I have so little to show for my efforts. I'm beginning to think that my time would be better spent elsewhere. Can PSE tell me anything today that can provide some hope for stakeholders and the public at large?	
7/12/2022	Don Marsh	10	Slide 32: Would like to differentiate electricity supplied by local resources (like rooftop solar) over remote resources that require investments in transmission and other infrastructure.	PSE does differentiate electricity supplied by local resources vs. remote resources by evaluating transmission line length (spur line) from the resource to the busbar and by adding transmission costs to the resources for each wheel (or balancing authority) that the transmission needs to pass through to get to PSE for remote resources. This is all outlined as part of the generic resources.
7/12/2022	Don Marsh	11	After my discussion with Stephanie Price, I'm not satisfied with her answer that EVs are driving the upward trend in demand starting in 2031-32. Look at slide 31. The post-DSR trend changes from slightly negative to robustly positive. Now look at slide 30. The EV wedge does not suddenly accelerate in the early 2030s. Therefore, the reversal of peak demand	Please see PSE's response to question 1.

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			is not due to a dramatic increase in EV demand at that time. I believe it is due to PSE's acceleration of optional efficiency, which leads to a bad forecast in every IRP I have participated in. Time to co	
7/12/2022	Kathi Scanlan	12	Has PSE looked at the difference between low and high forecast scenarios over the last few IRP cycles? For example, what is the range of the high/low forecasts over time? Thank you.	Because the 2023 Electric Progress Report is a progress report and not a full IRP, a high and low demand forecast will not be analyzed as scenarios; however, the P90 and P10 of the stochastic electric energy demand forecast runs versus the base forecast is around +/- 9% in 2030 and +/- 14% in 2045. For the 2021 IRP, the range for the electric high and low demand forecast versus base forecast was around +/- 10% in 2030 and +/- 15% in 2045. For the 2023 IRP the natural gas high and low energy demand forecast versus base forecast is around +/- 17% in 2030 and +/- 21% in 2045. For the 2021 IRP, the range for the natural gas high and low demand forecast versus base forecast was around +/- 22% in 2030 and +/- 27% in 2045.
7/12/2022	Brad	13	How do you incorporate compliance with	The CCA does have gas to electric

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	Cebulko. Climate Solutions		the climate commitment act? Given the state of gas and methane I imagine there is some interaction with the load forecast. Shouldn't it have some impact on your load forecast? If there is a feedback loop, that won't be seen today?	measures and these will have an impact on both the electric and gas demand forecasts. These impacts will be an output of the 2023 IRP analysis and will be presented at a future meeting where IRP draft results are presented.

Feedback Addressed from July 12 Electric and Gas Demand Forecast IRP Meeting

What PSE heard	What PSE did
Interest and concerns about the demand side resources in the IRP process. Some stakeholders expressed frustration that those elements were not included in the presentation.	PSE will consider how to improve the IRP process and the timing for presenting information to IRP stakeholders.
How does PSE incorporate compliance with the Climate Commitment Act within the Load Forecast? Given the state of gas and methane, is there some interaction with the load forecast?	PSE will analyze this after the portfolio analysis.
Stakeholders would like to provide input on conservation planning programs before they are implemented.	PSE develops these programs as part of the Biennial Conservation Plan that is filed with the UTC.
It is unclear if PSE is capturing heating trends for appliance use.	PSE will address this in the CPA.
Climate change: • Appreciation for including climate change and peak summer forecasts in load forecast • Caution against lowering peak load expectation in the winter due to the possibility of wide swings in the wintertime due to climate change • Weather variability takes out temperature swings and slides that show weather as variable are not weather-normalized	PSE is working to improve the climate change analysis. The load forecast reflects trends in normal peaks and resource adequacy will reflect variability.
Distribute the feedback document to participants by email instead of asking stakeholders to locate it on the IRP website.	PSE will update the location of the feedback form on the IRP website to make it more visible and link the feedback form in IRP emails.

Attendees (alphabetical by first name)

1. Aaron Tam – Attorney General
2. Ashton Michael Davis - CNGC
3. Aruna Ranaweera – Hecate Energy
4. Brad Cebulko - Strategen Consulting
5. Brian Duncan – Plus Power
6. Byron Harmon - UTC
7. Court Olson – Optimum Building
8. Don Marsh – Sierra Club
9. Evan Savage – Western Interstate Energy
10. Fred Huette – NWEC
11. Jake Ofgard – Western Interstate Energy
12. Jeffrey Larsen
13. Joel Nightingale – UTC
14. Kathi Scanlan – UTC
15. Lori Hermanson – Avista
16. Natalia Fioretti – Elemental Energy
17. Sashwat Roy – Renewable NW
18. Stephanie Chase – Attorney General
19. Vivek Balasubramaniam – DNV Energy Insights
20. Willard Westre – Union of Concerned Scientists

Puget Sound Energy Staff Observers (alphabetical by first name)

1. Alexandra Karpoff
2. Allison Jacobs
3. Bob Williams
4. Brett Rendina
5. Cindy Vu
6. Colin Crowley
7. Doug Hart
8. Elizabeth Hossner
9. Graham Marmion
10. Gurvinder Singh
11. Hannah Wahl
12. Jennifer Coulson
13. Jennifer Magat
14. Jesse Durst
15. Jessica Zahnow
16. Jisong Wu
17. Kara Durbin
18. Kelly Xu
19. Lorin Molander
20. Malcolm McCulloch
21. Meredith Mathis
22. Michelle Wildie
23. Nathan Critchfield
24. Nick Gemperle
25. Phillip Popoff
26. Ray Outlaw
27. Renchang Dai
28. Sara Leverette
29. Stephanie Price
30. Tyler Tobin
31. Wendy Gerlitz

Consultant Staff (alphabetical by first name)

1. Claire Moerder
2. Claire Wendle
3. Kajal Gaur
4. Robin Maslowski
5. Seth Baker
6. Sophie Glass
7. Will Henderson
8. Will Sierzchula