

Puget Sound Energy Resource Planning Advisory Group (RPAG) meeting

Meeting summary

Thursday, May 15, 2025 | 1:00 p.m. – 3:00 p.m.

Meeting purpose and topics

Below are the meeting topics of this Resource Planning Advisory Group (RPAG) meeting:

- Provide an overview of and discuss the electric modeling process and assumptions for the 2027 ISP
- Provide a high-level overview of E3's resource adequacy methodology for the 2027 Integrated System Plan (ISP)
- Receive feedback from RPAG members on electric modeling
- Adopt the updated RPAG charter in principle
- Provide an opportunity for public comment

Time	Agenda Item	Presenter
1:00 p.m. – 1:05 p.m. <i>5 min</i>	Introduction and agenda review <ul style="list-style-type: none">• Safety moment• Introductions• Agenda	Annie Kilburg Smith , Facilitator, Triangle Associates
1:05 p.m. – 1:15 p.m. <i>10 min</i>	Overview of electric modeling <ul style="list-style-type: none">• Electric supply in integrated system planning• Electric supply modeling process	Elizabeth Hossner , Manager, Resource Planning and Analysis, PSE
1:15 p.m. – 2:00 p.m. <i>45 min</i>	Resource adequacy methodology overview <ul style="list-style-type: none">• Overview of resource adequacy methodology Michaela Levine, E3• Developing the electric portfolio• Modeling workflow• Modeled resources	Michaela Levine , E3
2:00 p.m. – 2:15 p.m. <i>15 min</i>	Hydroelectric modeling update, resource alternatives, and alternative fuels <ul style="list-style-type: none">• Update to our hydroelectric modeling approach• Resource alternatives feedback and updates for the 2027 ISP• Resource alternatives by transmission zone	Elizabeth Hossner , Manager, Resource Planning and Analysis, PSE

Time	Agenda Item	Presenter
	<ul style="list-style-type: none"> Alternative fuels update and feedback 	
2:15 p.m. – 2:30 p.m. 15 min	Emerging resources and geothermal modeling <ul style="list-style-type: none"> Overview Risks and benefits 	Steve Schueneman , Manager, Development, Strategic Energy Initiatives, PSE
2:30 p.m. – 2:45 p.m. 15 min	Generic resource costs <ul style="list-style-type: none"> Generic resources Emerging resources Storage Thermal 	Kaitryn Olson , Associate Energy Resource Planning Analyst, PSE
2:45 p.m. – 2:50 p.m. 5 min	Charter adoption	Annie Kilburg Smith , Facilitator, Triangle Associates
2:50 p.m. – 3:00 p.m. 10 min	Next steps and public comment opportunity	Annie Kilburg Smith , Facilitator, Triangle Associates
3:00 p.m.	Adjourn	All

The full meeting materials, including the agenda, and presentation are available online under the March 25, 2025 meeting heading on the [ISP website](#).

Introduction and agenda review

Annie Kilburg Smith, facilitator, provided an overview of the agenda for the meeting and welcomed RPAG members. See [RPAG members in attendance](#) at the end of this document for a list of RPAG members who joined the meeting.

Overview of electric modeling

Annie introduced Elizabeth Hossner, Manager, Resource Planning and Analysis, PSE. Elizabeth provided an overview of the electric supply modeling process for the 2027 ISP. Her presentation included updates to planning process since 2021 and how PSE is addressing electric modeling feedback in the 2027 ISP.

RPAG members asked questions and provided the following feedback:

- RPAG member: Can you define resource correlations? Does this include batteries?
 - PSE Response: Yes, we want to tie loads with hydroelectric and wind generation to make sure that all resources are correlated together. This does not include batteries because they are not temperature dependent.

- RPAG member: If there are seven different sections in the Tetris block, are there seven different groups? How are the groups related to the assumptions?
 - PSE Response: Yes, these groups are different teams that present different information. All the groups are working with the same assumptions,

Resource adequacy methodology overview

Michaela Levine, Senior Managing Associate, E3, provided an overview of the scope of work E3 provides to PSE. Michaela noted that E3 forecasts resource adequacy (RA) and explained how their forecasting accounts for supply and demand variability. The overview included definitions for planning reserve margin (PRM), the total amount of capacity needed to satisfy the reliability target, and effective load carrying capacity (ELCC), the equivalent perfect capacity that a resource provides in meeting PSE's reliability target.

RPAG members asked questions and provided the following feedback:

- RPAG member: How does E3's forecasting interact with the Western Resource Adequacy Program (WRAP)? Does ELCC include thermal resources or just renewable resources? If it only includes renewables, what is the capacity accreditation for thermal resources?
 - PSE Response: E3 plans to create model ELCCs for both thermal and renewable resources. E3 also provides PSE forecast metrics for the WRAP because the WRAP itself does not provide a forecast of metrics. Several utilities in the Pacific Northwest convened and commissioned E3 to conduct a broad regional RA analysis.
- RPAG member: Will PSE use the WRAP PRM and ELCC metrics before the binding phase of the WRAP begins?
 - PSE Response: PSE anticipates using WRAP PRM and ELCC metrics, but it depends on what the metrics look like before the binding phase. Under the Clean Energy Transformation Act (CETA), PSE is required to have RA metrics. If PSE transitions over to the WRAP metrics, then those will become the RA metrics under CETA. If the WRAP, PMR, and ELCC reflect a lower resource need, then PSE would likely use these metrics before the binding phase.

E3 stated that no resource is perfectly reliable and shared their methods of reliability planning. ELCC forecasting helps identify complex dynamics from increasing penetrations of variable and energy limited resources.

RPAG members asked questions and provided the following feedback:

- RPAG member: Could you explain how ELCC forecasting will affect storage? Do these variables pose a problem or are there benefits?
 - PSE Response: The ELCC saturation curve for the peak summer net load will become flatter and broader. The cost-optimal amount of net storage would be addressed in a portfolio analysis and not during the RA modeling. The ELCC curves indicate that there is a diminishing capacity value for storage when you add additional storage quantities to the net load.
- RPAG member: Every different portfolio has different metrics for reliability and are driven by the types of resources. The ISP modeling of reliability to portfolio expansion appears to be a fixed margin. Is the margin truly fixed?
 - PSE Response: The PRM is not the only constraint in the portfolio expansion model. It's hard to judge that until PSE begins modeling. If it is a binding constraint in all the scenarios that PSE studies, then all the portfolios will have the same reliability metrics. If it is not a binding constraint, then the portfolios will have different reliability metrics. That is still to be determined.
 - PSE Response: There are many interactive effects that ELCCs do not take into consideration like variability in wind for example. We double check on the back end of modeling to make sure all the ELCCs we calculated did what they were supposed to do. We use RA modeling to check the preferred portfolios to achieve at least one in 10 loss of load event (LOLE) and compare RA metrics as well to help determine a preferred portfolio.
- RPAG member: Does PSE pick a preferred portfolio and then run the RA metrics, or does PSE run the RA metrics first and then choose a preferred portfolio?
 - PSE Response: PSE will develop several alternative portfolios. For an ISP, portfolios are broader than portfolios in an Integrated Resource Plan (IRP). There are different supply portfolio solutions, and build alternative portfolios based on the RA metrics. However, each portfolio has a variety of metrics that might differ from other portfolios.
- RPAG member: How does demand response (DR) realistically affect the model?
 - PSE Response: DR is treated as an existing resource. It has an ELCC value to contribute to load peaks and provides a total picture for the capacity.
- RPAG member: Are there generic DR resources that can be considered by the portfolio expansion model or is it a fixed set that is projected for 2030? Is there a cost curve for generic DR resources that the model can select alternatively to supply side resources?
 - PSE Response: During the RA analysis PSE will look at DR both five and ten years out. This analysis will look at new and growing programs that could happen by 2030. Forecasts will come from the Conservation Potential Assessment (CPA)

and DR assessment. These assessments will help meet peak resources and contribute to modelling. Regarding the cost, there is a cost for each program which PSE will consider.

- RPAG member: Is the 10% requirement from 1589 a binding constraint, or will it depend on economic feasibility?

PSE Response: PSE committed to providing a response in the subsequent feedback report.

Follow up: PSE will use the technical potential and commercial and technical feasibility to inform the demand response analysis in the ISP.

- RPAG member: What are the demand response and virtual power plant (VPP) ELCC estimates?
 - PSE Response: E3 has not modeled those yet and there are no ELCCs for DR resources yet.

Michaela continued to provide an overview of the portfolio expansion modeling workflow and its inputs and outputs.

- RPAG member: How does PSE model historical hourly generation from hydroelectric?
 - PSE Response: PSE is currently looking through historical and current hydroelectric data and how that might affect outcomes.
- RPAG member: Is there a cost assumption when modelling advanced nuclear and small modular reactors (SMR)? How are the cost of generic candidate resources incorporated into the portfolio model?
 - PSE Response: In the RA model there are no cost assumptions. The RA model shows how the generic candidate resources might contribute to load peaks. The RA modelling is one input into the portfolio model. There are other inputs that include resource costs. PSE looks to optimize the total portfolio cost and how PSE will meet peak requirements with RA and renewable requirements.
- RPAG member: What's the assumed in-service date for 100-hour storage?
 - PSE Response: There will be discussions about in-service dates later in this meeting.

Hydroelectric modeling update, resource alternatives, and alternative fuels

Elizabeth Hossner provided an overview of updates on hydroelectric modelling, resource alternatives and alternative fuels. The overview included information on PSE's approach for hydroelectric assumptions in the 2027 ISP. For previous IRPs, PSE used the 80-year historical hydroelectric dataset. PSE more recently incorporated climate change into the analysis per CETA rules.

RPAG members asked questions and made comments. PSE provided the following feedback:

- RPAG member: Why did PSE choose 10 years to use the 30-year historical generation data and then move to climate change data? How influential will climate patterns be over the next 10 years? Does PSE have another approach of building that climate change data?
 - PSE Response: PSE chose 10 years to capture current trends in recent years. As PSE heads towards 2030, we want to ensure that we're meeting CETA requirements and accounting for variability of hydroelectric outcomes in earlier years. There will be a weighted transition into using the climate change analysis data. The weighted average will start in 2037.
- RPAG member: Bonneville Power Administration (BPA) transitioned over to the climate change analysis data quickly and there were anomalies in their resource program. I'm glad that PSE is pacing its transition.
 - PSE Response: Thank you, we were concerned about sudden changes happening in later years which is why we came up with the idea of a transition. This is going to be used in resource adequacy so we can capture this variability for the planning margins.

Elizabeth Hossner presented on PSE's efforts of exploring electric resource alternatives. PSE requested feedback on resource alternatives and locations and how to handle uncertainty and costs around alternative fuels. The presentation included information about supply-side resource alternatives for the 2027 ISP.

RPAG members asked questions and made comments. PSE provided the following feedback:

- RPAG member: Are SMR resources included in these alternatives? Are there in-service dates for SMRs? How does nuclear waste storage get addressed and can new stations store waste?

- PSE Response: Yes, PSE has included SMRs as alternatives. As of now we don't have specific dates for commercial availability. For nuclear waste storage, there is no federal advice as of now, but the interim plan is to store nuclear waste close to stations. We will follow-up with more information on newly built stations and their ability to store waste.
- RPAG member: What are the in-service dates for 100-hour battery storage?
 - PSE response: There is really only one original equipment manufacturer (OEM) for the 100-hour battery storage, and that's Form Energy. We don't have a lot of specifics to share, but we expect full commercialization by the end of this decade.

Elizabeth presented a map showing resource alternatives by transmission zones and constraints within those zones. Resources on the map include wind, solar, energy storage, baseload and peakers.

- RPAG member: Why is there uncertainty about where batteries can appear on the map?
 - PSE Response: There isn't, batteries can often go in most places. PSE would like feedback on where resources could be distributed among the transmission zones.
- RPAG member: Why are there no transmission zones from California affecting alternative resource planning?
 - PSE Response: We will take this back to the Transmission team and follow-up. *Follow up: California isn't included as a transmission zone due to a few factors. California resources would require at least one additional wheel of transmission for delivery, which adds to the overall delivered cost of resources as compared to the Washington and Oregon zones. In addition, clean energy resources in southern and central Oregon have similar resource profiles to resources in northern and central California. Lastly, the amount of transmission to deliver resources from California would have the same limits as the Oregon transmission zones. As a result, the modeling of a California transmission zone would not increase the throughput of transmission from southern Oregon to PSE*
- RPAG member: What additional resources are needed to upgrade the long-haul transmission lanes in the different areas?
 - PSE Response: PSE is working with the transmission teams to model different options that include potential upgrades, potential constraints and other sensitivities.

- RPAG member: The RPAG would not be able to provide definitive or productive feedback or answers to energy storage locations. Energy storage is a complex modelling subject dependent on resource availability and resource characteristics and system synergy. Batteries are a fairly flexible resource, and PSE should conduct a thorough analysis on battery location rather than rely on the RPAG for an answer.
 - PSE response: The discussion around this is very helpful and will help us with building scenarios and locations.

Phillipp Popoff, PSE introduced Jason Kuzma, PSE, to provide an overview of CETA requirements, environmental attributes and the regional renewable portfolio standard with BPA's Residential Exchange. Under the Northwest Power Act, BPA is required to equitably share the benefits of the federal hydro system with all residential and small farm customers, not just publicly owned utilities. The current method for sharing benefits of the low cost federal hydro system with PSE's residential and small farm customers is based on a settlement agreement between the region's investor owned utilities and BPA from nearly 20 years ago that is set to expire in 2028. Unless that agreement is renegotiated, PSE will be able to essentially swap power with BPA for our residential and small farm customers. That is, PSE gives BPA our average system supply and BPA returns the same amount of energy, but that energy will have a greater ratio of non-emitting energy than PSE's supply. The practical effect of reverting to physical exchange of power is that it would increase the amount non-emitting energy in PSE's portfolio, meaning PSE would be able to swap higher cost incremental renewables for lower cost BPA power while pursuing CETA's 80% non-emitting energy target. All six affected investor-owned utilities sent a letter to BPA informing the agency of our intent to pursue an exchange of power when the current contract expires. PSE staff will estimate the impact on BPA's emission profile of all six investor-owned utilities exchanging power to examine how a physical exchange with BPA would impact PSE's energy supply resource plans and costs to customers. This plan will help on an energy basis but not help with net-capacity as it is just exchanging power.

- RPAG member: I'm unsure what the Residential Exchange Program has to do with resource planning? What does it have to do with ISP. It seems that PSE is only claiming attributes for compliance.
 - PSE Response: This is for transparency on how PSE is working to reach CETA goals and the requirements for the Clean Energy Action Plan (CEAP) and Clean Energy Implementation Plan (CEIP) statutes. It will affect how the physical exchange occurs with BPA and the need for non-emitting generation.

Elizabeth Hossner, PSE provided an overview of PSE's approach to alternative fuels, and the existing CETA-compliant fuel options. PSE has proposed to take an average of several CETA-compliant fuel options to create a generic fuel alternative for the ISP.

- RPAG member: Are CETA-compliant fuels non-emitting fuels? Why is methanol included in PSE's list of alternative fuels? If there is a sustainable aviation fuel (SAF), there will be an enormous demand.
 - PSE Response: Yes, CETA-compliant fuels are zero-carbon, non-emitting fuels. Methanol is not a CETA compliant fuel yet but it is on a similar pathway to other alternative fuels listed. The shipping industry is likely to pursue the green-methanol route since their fuel options are limited. PSE lists methanol as a potential option because it will be compatible with turbines in the future. SAF has a similar situation because it is compatible from a turbine technology perspective and the possibility of supply. There is a possibility of sustainable aviation fuel. It will depend on price points and development. SAF is likely to be expensive and may not be chosen, but it still remains an option if available in the market.

Emerging resources and geothermal modeling

Steve Schueneman, Manager, Development, Strategic Energy Initiatives, PSE, provided an overview of geothermal energy and enhanced geothermal systems (EGS). The overview included historical methods of harnessing geothermal energy and the potential for harnessing geothermal energy for energy production. Steve noted that while EGS is a promising clean energy source, it is very costly to explore and maintain, there are many unknowns due to lack of geological data, and public support is needed to support early adoption of the technology.

- RPAG member: How expensive is it to understand ideal conditions? Do you need state support and federal support?
 - PSE Response: It costs about ten to twenty million dollars to run the equipment. Federal support would be very helpful, and state support would be just as important.
- RPAG member: The US Department of Energy (DOE) is interested in geothermal but what is PSE's role in geothermal development? Is this just something that PSE is tracking, or are there plans to pursue geothermal? Is there potential negotiation for procurement that can be discussed with the Commission?
 - PSE response: PSE applied for a DOE grant in 2024 to study and model geothermal energy, but it wasn't geared for actual exploration. PSE's role in geothermal energy is more for articulating the need and understanding of how it can fit into a portfolio that will help meet PSE's 2045 goals. PSE also wants to help developers understand our energy system. For procurement of EGS, PSE plans on modelling scenarios based on commercial availability of EGS.

Generic resource costs

Kaitryn Olson, Associate Energy Resource Planning Analyst, PSE, provided an overview of PSE's generic resource costs and what the costs include. Draft costs include engineering, procurement and construction (EPC), and owner's costs. The drafts costs do not include ITCs, PTCs, interconnection costs and lease fees, but PSE will factor these in for the final costs for the generic resources. Kaitryn shared the capital costs for:

1. Emerging resources
2. Storage resources
3. Thermal resources
4. Renewable co-located resources

PSE proposed the following questions to RPAG members:

- How should we handle uncertainty around tariffs?
- How should we handle changes in policy surrounding investment tax credit (ITC) and production tax credits (PTC)?
- How should we handle uncertainty in emerging resource technology timing and costs?

RPAG members asked questions and provided the following feedback:

- RPAG member: What does the NREL ATB stand for?
 - PSE Response: National Renewable Energy Laboratory Annual Technology Baseline
- RPAG member: The cost for this kind of technology is up around the world and the cost for the skillset is in high demand. In the capital projects I've been involved in, I've observed a significant rise in material costs. I would caution on the side of being conservative with uncertainty percentages and costs. 20% and 50% seem low.
 - PSE Response: Thank you for your comment.
- RPAG member: The uncertainty and risk in the nuclear industry is typically several hundred percent, and costs are relative to the initial estimates.
 - PSE Response: Thank you for your comment.

Charter adoption

PSE decided to move charter updates and adoption to the June 24, 2025 RPAG meeting due to time constraints.

Next steps

PSE and the facilitator gave closing remarks and previewed upcoming activities.

- May 22, 2025: Feedback form from May 15, 2025 meeting closes
- June 18, 2025: RPAG electric vehicle forecast info session
- June 24, 2025: RPAG Meeting
- July 29, 2025: RPAG meeting
- August 2025: No RPAG meeting

Annie welcomed comments and questions from public attendees. Please visit PSE's [recording of the May 15 meeting](#) for full public comments. At the conclusion of the meeting, participants were invited to complete a post-meeting feedback poll to share their insights and help improve future sessions.

Public comment opportunity

All public comments and PSE's responses are located in the Feedback report for this meeting on PSE's [clean energy planning website](#).

Don Marsh, representing the Washington Clean Energy Coalition, provided public comment requesting changes to the public participation process. Don addressed RPAG members specifically regarding the RPAG charter, PSE's use of the International Association of Public Participation (IAP2) spectrum of public participation, and PSE's post-meeting feedback reports.

Attendees

Attendees are listed alphabetically by first name. These numbers do not include viewers on [PSE's YouTube channel](#).

RPAG members

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|------------------|----------------------|
| 1. Aliza Seelig | 9. Katie Chamberlain |
| 2. Dan Kirschner | 10. Lauren McCloy |

3. Dennis Suarez
4. Donald Williams
5. Ezra Hausman
6. Froylan Sifuentes
7. Jaimie McGovern
8. Lisa Schwartz

11. Megan Larkin
12. Sommer Moser
13. Stefan de Villiers
14. Quinn Weber

Presenters

- | | |
|---------------------------|---------------------------|
| 1. Elizabeth Hossner, PSE | 5. Steven Schueneman, PSE |
| 2. Michaela Levine, E3 | 6. Phillip Popoff, PSE |
| 3. Kaitryn Olson, PSE | |
| 4. Kara Durbin, PSE | |

Support staff

- | | |
|-------------------------------|--------------------------|
| 1. Aaron Burdick, E3 | 6. Jennifer Coulson, PSE |
| 2. Christopher Drobnicki, PSE | 7. Meredith Mathis, PSE |
| 3. Ray Outlaw, PSE | 8. Stephen Collins, PSE |
| 4. Kara Durbin, PSE | |
| 5. Jason Kuzma, PSE | |

Facilitation staff

- | | |
|---------------------------------------------|---------------------------------------------|
| 1. Annie Kilburg Smith, Triangle Associates | 3. Jessa Clark, Maul, Foster & Alongi (MFA) |
| 2. Ben Relampagos, Triangle Associates | |

Members of the public

1. Don Marsh
2. Jessica Shipley
3. Joel Cook