2021 IRP Webinar #6: Portfolio Sensitivities, CETA Assumptions, and Distributed Energy Resources

Analyze Alternatives and Portfolios
Electric & Gas Portfolio Model

August 11, 2020

Agenda

- Electric and gas portfolio sensitivities
- Clean Energy Transformation Act (CETA) assumptions
- Distributed energy resources (DER)
- Consultation update: electric price forecast

Safety Moment: Sun Safety

- Ultraviolet (UV) rays from the sun can damage your skin in as little as 15 minutes.
- When outdoors, use sunscreen with an **SPF of 15 or higher** on any exposed skin.
- Be sure to **reapply sunscreen after 2 hours**, after swimming, or after toweling off.
- Sunscreen usually only has a **shelf life of 3 years**.
- You can also reduce sun exposure by staying in the shade, wearing long pants, wearing long sleeves, and wearing a hat.
- **Sunglasses help protect your eyes** from UV rays, reducing the risk of cataracts and protecting the skin around your eyes.
- When hiking, you are exposed to more UV rays at **higher elevation**.
- You are still exposed to UV rays on cloudy or foggy days, so you should still wear sunscreen.

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Today's Speakers

Elizabeth Hossner
Manager Resource Planning & Analysis, PSE

Jens Nedrud
Manager System Planning, PSE

Therese Miranda-Blackney
Manager Distributed Energy Resources, PSE

Elaine Markham
Manager Grid Modernization Strategy and Enablement, PSE

Penny Mabie & Alison Peters
Co-facilitators, EnviroIssues

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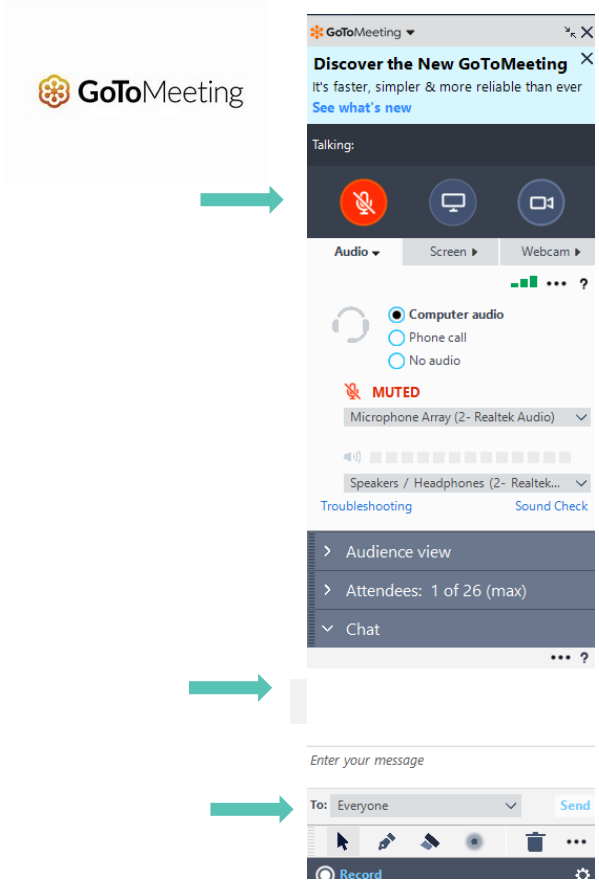
Welcome to the webinar and thank you for participating!



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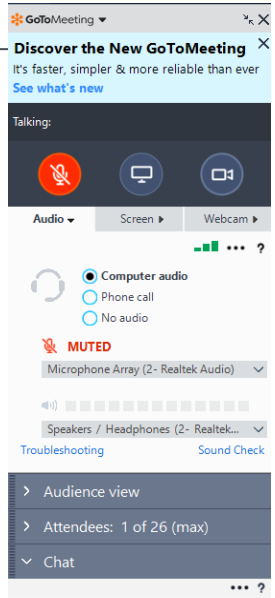
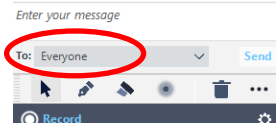
  - **In writing:** your question will be read
  - **Verbally:** type "Raise hand" and slide #, share with "Everyone"; please wait to be called on to ask your question
- Be considerate of others waiting to participate
- We will try to get to all questions



Raise hand, slide 33



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Scenarios and Sensitivities

Participation Objectives

- PSE will involve stakeholders in planning scenarios and portfolio sensitivities for the 2021 Electric and Gas IRP.

  IAP2 level of participation: INVOLVE

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Portfolio sensitivities overview

- The purpose of a scenario is to create a 20-year electric price forecast.
- The purpose of a portfolio sensitivity is to test how different generating resources, environmental regulations, market conditions, transmission assumptions and other variables change PSE's mix of generating resources to meet electric and gas load.
  - Sensitivities evaluate PSE's place in the market (defined by the 20-year electric price forecast).
- Portfolio sensitivity results are used to inform the forecast of resources to meet the peak capacity, energy and renewable need over the 24-year planning time horizon (2022-2045).
- All portfolio sensitivities will meet the Clean Energy Transformation Act:
  - By 2030: at least 80% of electric sales met by renewable/non-emitting resources
  - By 2045: 100% of electric sales met by renewable/non-emitting resources

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Portfolio sensitivities

- PSE will run a set of portfolios using different economic conditions, varying gas prices and demand.
- PSE will then select a reference portfolio to use as the basis to make input changes for each portfolio comparison.
- These changes may include:

Social cost of carbon/CO_2 price	Renewable generation
Demand forecast	Natural gas generation
Gas prices	Energy Storage
Conservation	Transmission constraints/build limits
Demand Response	Market conditions

- Each sensitivity will create a unique set of results to examine how the portfolio changes, such as: generating resource mix, portfolio cost, portfolio emissions, and others.

Key Definitions

- **Scenario** – A consistent set of data assumptions that defines a specific picture of the future; it looks at different economic factors that can change the electric price forecast
- **Sensitivity** - A set of data assumptions based on a reference scenario in which only one input is changed. Used to isolate the effect of a single variable.
- **Power Price** – The wholesale price of power, provided by the Resource Planning team's Electric Price Forecast.
- **Demand** – The demand for electric power and natural gas from PSE's customers.
- **Gas Price** – The price of natural gas (NG), which is used as a fuel in NG generation plants, provided by Wood Mackenzie.
- **CO_2 Price/Regulation** – The price of CO_2 in the model (if applicable), or any other regulation regarding greenhouse gas emissions.
- **RPS/Clean Energy Regulation** – Regulation that dictates the type of generation that must be used to produce electricity.
- **Transmission Build Limits** – Model assumptions about transmission capacity and availability.
- **Market conditions** – This market conditions looks at PSE's connection into the electric power markets

Stakeholder involvement

- PSE would like involvement from stakeholders to create the list of portfolio sensitivities and asks for stakeholders to suggest sensitivities and help to prioritize the analysis.

    1. Are there sensitivities that should be added and/or removed?
    2. Do you have detailed assumptions or criteria that can inform the sensitivities?

- PSE will make best efforts to complete all the requested analysis, however some analysis may take longer than others to complete and it is possible that not everything can be finished to meet the IRP filing date.
    - PSE will start modeling with the highest priority items.

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Stakeholder involvement

- The list of sensitivities is the current thinking and includes sensitivities identified so far.
- The list of sensitivities will be finalized after stakeholder involvement is incorporated.
- Multiple sensitivities will be modelled for most themes.
- Details are included in the spreadsheet and on following slides.

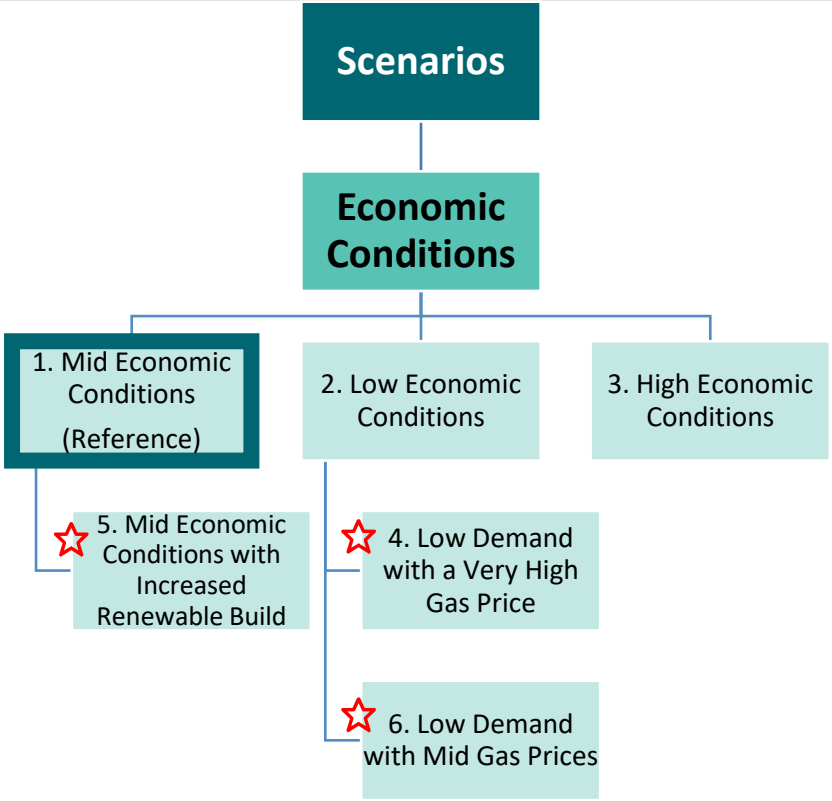
2021 IRP key issues

The following key issues are proposed for analysis:

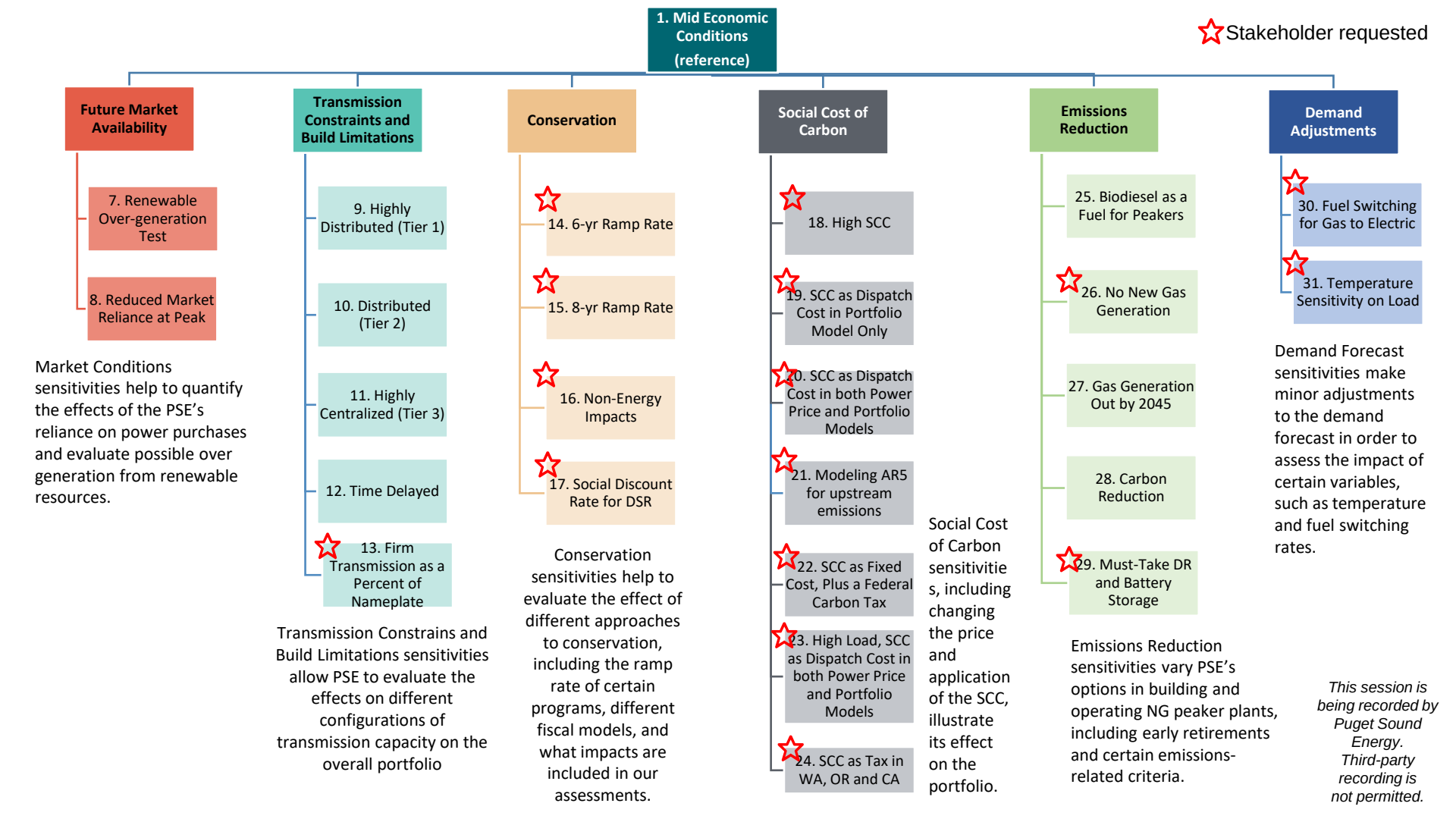
- Portfolio resources to meet CETA
- Social cost of carbon impact on portfolio modeling
- Conservation impacts from CETA
- Electric vehicle, fuel conversion and temperature impacts on demand forecast
- Early retirement of natural gas generation and switching to alternative fuel sources
- Transmission availability for meeting CETA
- Future market availability

Other issues may be proposed by stakeholders.

Portfolio sensitivities



☆Stakeholder requested


1. Mid Economic Conditions (reference)
Stakeholder requested
Future Market Availability
7. Renewable Over-generation Test
8. Reduced Market Reliance at Peak
Market Conditions sensitivities help to quantify the effects of the PSE's reliance on power purchases and evaluate possible over generation from renewable resources.
Transmission Constraints and Build Limitations
9. Highly Distributed (Tier 1)
10. Distributed (Tier 2)
11. Highly Centralized (Tier 3)
12. Time Delayed
13. Firm Transmission as a Percent of Nameplate
Transmission Constrains and Build Limitations sensitivities allow PSE to evaluate the effects on different configurations of transmission capacity on the overall portfolio
Conservation
14. 6-yr Ramp Rate
15. 8-yr Ramp Rate
16. Non-Energy Impacts
17. Social Discount Rate for DSR
Conservation sensitivities help to evaluate the effect of different approaches to conservation, including the ramp rate of certain programs, different fiscal models, and what impacts are included in our assessments.
Social Cost of Carbon
18. High SCC
19. SCC as Dispatch Cost in Portfolio Model Only
20. SCC as Dispatch Cost in both Power Price and Portfolio Models
21. Modeling AR5 for upstream emissions
22. SCC as Fixed Cost, Plus a Federal Carbon Tax
23. High Load, SCC as Dispatch Cost in both Power Price and Portfolio Models
24. SCC as Tax in WA, OR and CA
Social Cost of Carbon sensitivities, including changing the price and application of the SCC, illustrate its effect on the portfolio.
Emissions Reduction
25. Biodiesel as a Fuel for Peakers
26. No New Gas Generation
27. Gas Generation Out by 2045
28. Carbon Reduction
29. Must-Take DR and Battery Storage
Emissions Reduction sensitivities vary PSE's options in building and operating NG peaker plants, including early retirements and certain emissions-related criteria.
Demand Adjustments
30. Fuel Switching for Gas to Electric
31. Temperature Sensitivity on Load
Demand Forecast sensitivities make minor adjustments to the demand forecast in order to assess the impact of certain variables, such as temperature and fuel switching rates.
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Economic conditions sensitivities

Description	Power Price	Demand	Gas Price	CO_2 price/Regulation	RPS/Clean Energy Regulation
1. Mid economic conditions	Mid	Mid	Mid	2.5% SCC plus upstream natural gas GHG emissions	WA CETA – 80% renewable resources by 2030 and 100% by 2045
2. Low economic conditions	Low	Low	Low	2.5% SCC plus upstream natural gas GHG emissions	WA CETA – 80% renewable resources by 2030 and 100% by 2045
3. High economic conditions	High	High	High	2.5% SCC plus upstream natural gas GHG emissions	WA CETA – 80% renewable resources by 2030 and 100% by 2045

Note: all scenarios include unconstrained transmission (Tier 0), conservation and DR chosen economically, existing natural gas plants allowed to retired economically, and market purchases and sales available up to transmission limit.

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Economic conditions sensitivities continued

Scenario	Power Prices	Demand	Gas Price	CO_2 price/Regulation	RPS/Clean Energy Regulation
4. Low demand with very high gas price	Low demand + very high gas	Low	Very High	2.5% SCC plus upstream natural gas GHG emissions	WA CETA – 80% renewable resources by 2030 and 100% by 2045
5. Increased Renewable Builds	Mid + increased renewable builds	Mid	Mid	2.5% SCC plus upstream natural gas GHG emissions	WA CETA – 80% renewable resources by 2030 and 100% by 2045, 100% by 2045 in OR plus utility goals
6. Modified low growth	Mid + low demand	Low	Mid	2.5% SCC plus upstream natural gas GHG emissions	WA CETA – 80% renewable resources by 2030 and 100% by 2045

Note: all scenarios include unconstrained transmission (Tier 0), conservation and DR chosen economically, existing natural gas plants allowed to retired economically, and market purchases and sales available up to transmission limit.

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Future market availability sensitivities

- Market Conditions sensitivities help to quantify the effects of the PSE's reliance on power purchases and evaluate possible over generation from renewable resources.

- The Mid economic conditions is used as the baseline assumptions to make changes.

7. Renewable over generation

- This sensitivity tests for renewable over generation by modeling PSE in isolation

8. Declining market reliance

- This sensitivity reduces the availability of market purchases to meet peak capacity

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Distributed generation/transmission constraint sensitivities

- Transmission Constrains and Build Limitations sensitivities allow PSE to evaluate the effects on different configurations of transmission capacity on the overall portfolio

- The Mid economic conditions is used as the baseline assumptions to make changes.

9. Highly Distributed Generation – results in more resources in Western WA
- Tier 1 with increased customer and PSE owned solar PV in Western Washington

10. Distributed Generation – results in more resources in Western WA
- Tier 2 with increased customer and PSE owned solar PV in Western Washington

11. Highly Centralized Generation
- Tier 3 transmission constraint that includes new builds

12. Time delayed transmission constraint
- Time delayed – Tier 1 (2022 – 2025), Tier 2 (2025 – 2030), Tier 3 (2030 – 2035), Tier 0 beyond 2035

13. Firm transmission as a percent of nameplate
- Firm transmission acquired for % of nameplate of renewable resources

4. Conservation sensitivities

- Conservation sensitivities help to evaluate the effect of different approaches to conservation, including the ramp rate of certain programs, different fiscal models, and what impacts are included in our assessments.

- The Mid economic conditions is used as the baseline assumptions to make changes.

14. 6 Year Ramp Rate

- This sensitivity models a 6 year ramp rate for DSR

15. 8 Year Ramp Rate

- This sensitivity models an 8 year ramp rate for DSR

16. Non-Energy Impacts

- This sensitivity includes non-energy impacts

17. Social Discount Rate for DSR

- This sensitivity models a 2.5% social discount rate

Social cost of carbon sensitivities

- Social Cost of Carbon sensitivities, including changing the price and application of the SCC, illustrate its effect on the portfolio.

- The Mid economic conditions is used as the baseline assumptions to make changes.

18. High Social Cost of Carbon

- A higher SCC value that includes upstream emissions

19. SCC as a Dispatch Cost – Portfolio Model Only

- SCC is applied as a dispatch cost to the portfolio model

20. SCC as a Dispatch Cost – Portfolio and Electric Price Models

- SCC is applied as a dispatch cost to the portfolio and electric price models. An updated electric price scenario will be run for this sensitivity

21. Modeling AR5 for upstream emissions

- This sensitivity would model the AR5 report fo upstream emissions instead of the AR4

Social cost of carbon sensitivities continued

- Social Cost of Carbon (SCC) sensitivities, including changing the price and application of the SCC, illustrate its effect on the portfolio.
- The Mid economic conditions is used as the baseline assumptions to make changes.

22. Federal CO_2 Tax

- A federal CO_2 tax of $15/short ton of CO_2 along with the social cost of carbon

23. High Growth and SCC Dispatch Cost

- SCC is applied as a dispatch cost to the portfolio and electric price models. An updated electric price scenario will be run for this sensitivity
- Note: This sensitivity uses the high economic growth and the reference.

24. SCC as a tax in WA, OR, CA

- This sensitivity uses SCC as a CO_2 tax in WA, OR, and CA. An updated electric price scenario will be run for this sensitivity
- Note: This sensitivity can also use the CA carbon price to model a west coast cap & trade. Given that the Mid-C is modeled as one pacific northwest zone, this sensitivity would need to include Idaho and Montana, otherwise there will be leakage into the other states.

6. Emissions reduction resource assumptions sensitivities

- Emissions Reduction sensitivities vary PSE's options in building and operating NG peaker plants, including early retirements and certain emissions-related criteria.

- The Mid economic conditions is used as the baseline assumptions to make changes.

25. Biodiesel as a fuel for peaker plants

- This sensitivity models biodiesel as an option for peaker natural gas plants

26. No new natural gas generation

- This sensitivity models PSE becoming 100% renewable by 2030

27. Natural gas generation out by 2045

- This sensitivity models all natural gas plants retiring by 2045

28. Carbon Reduction

- This sensitivity models a time limitation on any new natural gas builds to limit CO_2 emissions

29. Demand Response and batteries prioritized

- This sensitivity forces the model to maximize demand response and batteries before new natural gas plants are built

7. Demand adjustment sensitivities

- Demand Forecast sensitivities make minor adjustments to the demand forecast in order to assess the impact of certain variables, such as temperature and fuel switching rates.

- The Mid economic conditions is used as the baseline assumptions to make changes.

30. Gas to Electric Conversion

- Demand forecast that includes the electrification of the gas sector

31. Temperature Sensitivity

- Temperature sensitivity demand forecast (increased summer peak)

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Stakeholder involvement

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5-minute Break

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CETA: 2030-2045

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Participation Objectives

- PSE will consult stakeholders on assumptions to use for the alternative compliance as part of the Clean Energy Transformation (Act CETA) for the 2021 Electric IRP.
- PSE will consult with stakeholders about the best way to meet the 20% carbon-neutral method outlined by CETA.

IAP2 level of participation: CONSULT

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CETA Targets

"With our wealth of carbon-free hydropower, Washington has some of the cleanest electricity in the United States. But electricity remains a large source of emissions in our state. We are at a critical juncture for transforming our electricity system. **It is the policy of the state to eliminate coal-fired electricity, transition the state's electricity supply to one hundred percent carbon-neutral by 2030, and one hundred percent carbon-free by 2045.** In implementing this chapter, the state must prioritize the maximization of family wage job creation, seek to ensure that all customers are benefiting from the transition to a clean energy economy, and provide safeguards to ensure that the achievement of this policy does not impair the reliability of the electricity system or impose unreasonable costs on utility customers."

- CETA Section 1, Subsection 2

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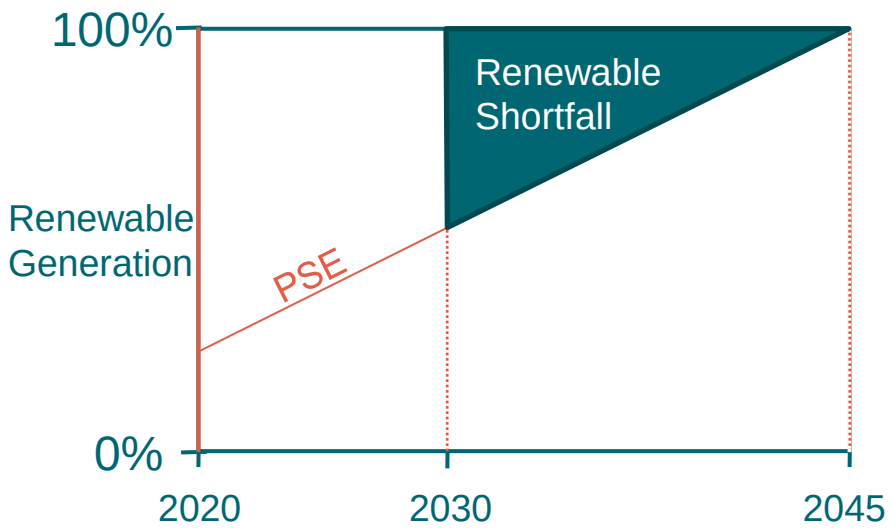
Carbon Neutral by 2030, with 80% Renewable Generation

- CETA states that all utilities must be carbon neutral by 2030, and that 80% generation must be renewable.
- CETA provides flexibility with the remaining 20% between the years 2030 and 2045.
- PSE must determine how to best meet the carbon neutral goal until the utility can achieve 100% renewable generation.



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Meeting CETA between 2030 and 2045

(b) Through December 31, 2044, an **electric utility may satisfy up to twenty percent of its compliance obligation** under (a) of this subsection **with an alternative compliance** option consistent with this section. An alternative compliance option may include any combination of the following:

(i) **Making an alternative compliance payment** under section 9(2) of this act;

(ii) **Using unbundled renewable energy credits**, provided that there is no double counting of any nonpower attributes associated with renewable energy credits within Washington or programs in other jurisdictions, as follows:

(A) Unbundled renewable energy credits produced from eligible renewable resources, as defined under RCW 19.285.030, which may be used by the electric utility for compliance with RCW 19.285.040 and this section as provided under RCW 19.285.040(2)(e); and

(B) Unbundled renewable energy credits, other than those included in (b)(ii)(A) of this subsection, that represent electricity generated within the compliance period; p. 11 E2SSB 5116.PL

(iii) **Investing in energy transformation projects**, including additional conservation and efficiency resources beyond what is otherwise required under this section, provided the projects meet the requirements of subsection (2) of this section and are not credited as resources used to meet the standard under (a) of this subsection; or

(iv) **Using electricity from an energy recovery facility using municipal solid waste as the principal fuel source**, where the facility was constructed prior to 1992, and the facility is operated in compliance with federal laws and regulations and meets state air quality standards. An electric utility may only use electricity from such an energy recovery facility if the department and the department of ecology determine that electricity generation at the facility provides a net reduction in greenhouse gas emissions compared to any other available waste management best practice. The determination must be based on a life-cycle analysis comparing the energy recovery facility to other technologies available in the jurisdiction in which the facility is located for the waste management best practices of waste reduction, recycling, composting, and minimizing the use of a landfill.

Options for Meeting the Next 20%: Alternative Compliance Payments

- The alternative compliance payment is a base fine of $100 for each MWh of electricity that is not produced by a renewable or non-emitting resource.
  - Coal-fired resources receive a fine of $150/MWh
  - Gas-fired peakers receive a fine of $84/MWh
  - Gas-fired combined-cycle power plants receive a fine of $60/MWh

- These fines are adjusted to inflation every 2 years.

Options for Meeting the Next 20%: Unbundled RECs

- Unbundled Renewable Energy Credits (RECs) are tradeable certificates issued by the EPA that are attached to a single MWh of renewable generation.
- RECs are available nationally, but must correspond to an “eligible period” of generation.
    - For example, PSE could not purchase RECs from 2029 to meet the 2030 CETA requirements.
- “Unbundled” RECs mean that they are sold separately from the electricity that they are tied to.
- What is the price of unbundled RECs?

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Options for Meeting the Next 20%: Energy Transformation Projects

- Utilities may also invest in “Energy Transformation Projects” to achieve the “Carbon Neutral” status outlined in CETA

- Energy transformation projects reduce emissions from sectors that are not specifically related to energy production. These reductions can be used to offset emissions from CO_2-generating resources.

- Potential projects include things like:
  - Electrification of the transportation sector (e.g. public transportation, electric vehicles)
  - Investments in hydrogen as a fuel for transportation
  - Distributed Energy resource programs
  - Efficiency and conservation efforts
  - Agricultural emission reduction

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Stakeholder feedback on how PSE should be meeting the 20%

- PSE is seeking feedback from stakeholders if there is any prioritization of the options for the 20% alternative compliance to reach carbon neutral target by 2030 in the 2021 IRP.

- PSE will also analyze a sensitivity to reach 100% renewable resources by 2030 (see Sensitivity 26 No new gas generation)

DER Integration between Delivery System Planning (DSP) and Integrated Resource Planning (IRP)

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Participation Objectives

- PSE will inform stakeholders on how distributed energy resources are incorporated into the 2021 IRP

IAP2 level of participation: INFORM

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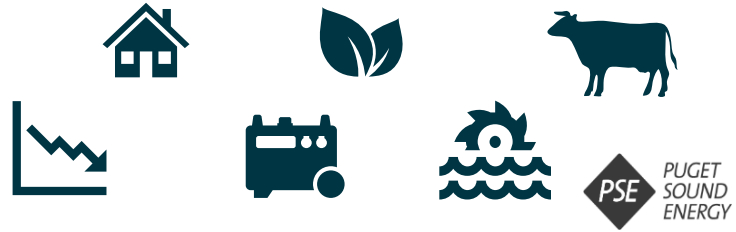
Agenda

- Distributed Energy Resource (DER) evolution
- Delivery System Planning (DSP) and IRP integration
- DER pilots
- Grid modernization – DER enablement
- DSP Non-wire alternative evaluations
  - Bainbridge example
- DER forecast

Distributed Energy Resources play an important role in PSE's customer future

- Experiencing tremendous change across industry
- Distributed Energy Resources (DERs) solve a resource need
- Non-Wired Alternatives (NWAs) solve a system deficiency and potentially a resource need
- Both are important and can be distribution and/or transmission connected depending upon size / location; either in front or behind the meter
- Non-emitting / renewable
- Sets of technologies used together (such as microgrid) or alone (such as PV)

"Distributed Energy Resources (DERs) and Non-Wire Alternatives (NWAs) are a set of technologies including PV cells, battery storage, fuel cell, wind, thermal, hydro, biogas, cogeneration, compressed air, flywheel, combustion generators, demand response (DR), and energy efficiency"
NY Reform the Energy Vision (REV)



How does it all fit together?

Load Forecasting

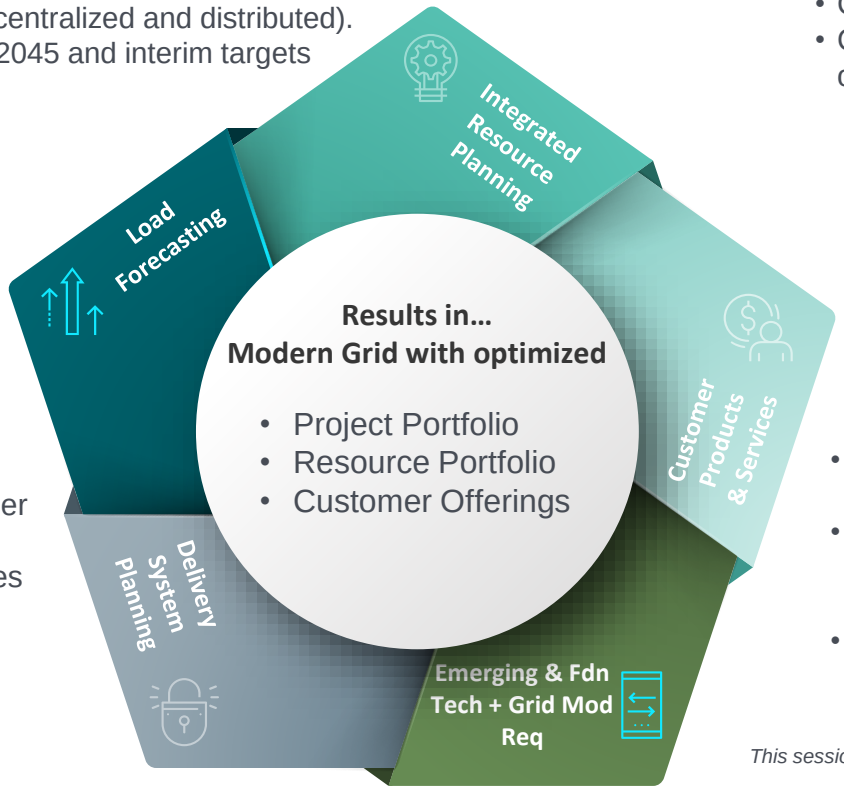
- Electricity demand
- System-wide
- Locational
  - End use

Integrated Resource Planning

- Resource portfolio enabling CETA requirements (DER centralized and distributed).
- 2030, 2045 and interim targets

Delivery System Planning

- Infrastructure solutions that:
  - Enable resource portfolio (distributed and centralized)
  - Maintain reliability, resiliency, capacity and power quality
  - Promote customer / stakeholder engagement
  - Consider Non-Wire Alternatives (NWAs)



Customer Products & Services

- Customer desires for clean energy
- Customer product and service offerings to:
  - Mitigate upward rate pressure from grid/resource investments
  - Support customer engagement in CETA goals

Emerging & Foundational Technologies + Grid Modernization Requirements

- Smart / flexible capabilities to delivery system
- Systems such as:
  - AMI
  - ADMS
- Pilot technologies such as:
  - Microgrids
  - Storage

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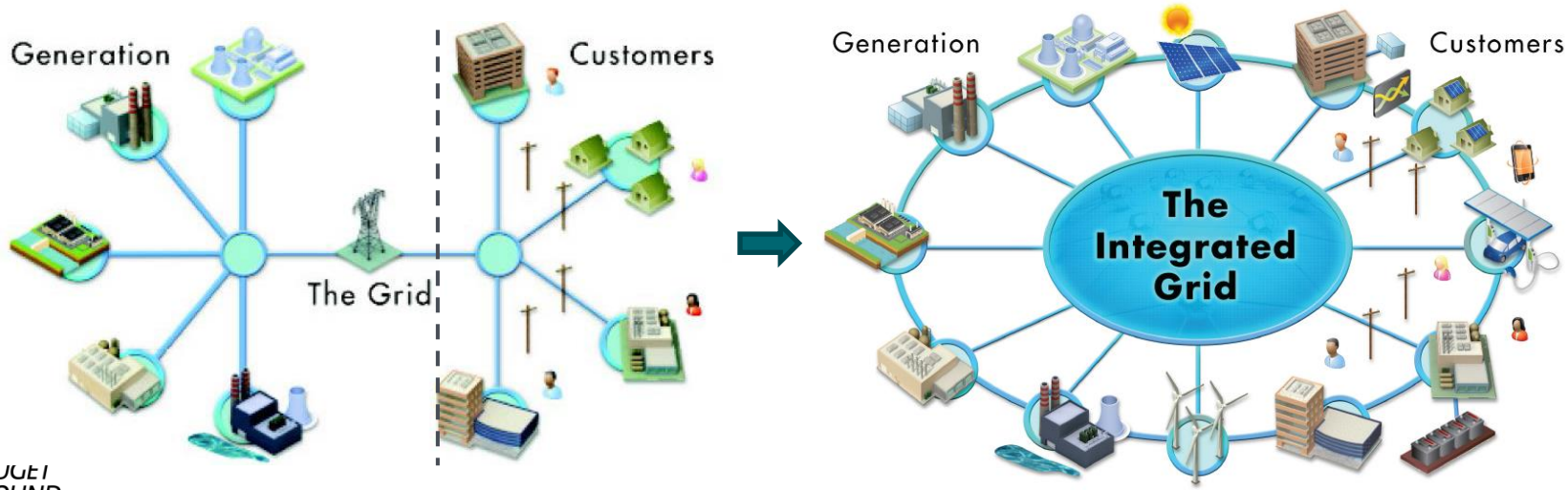
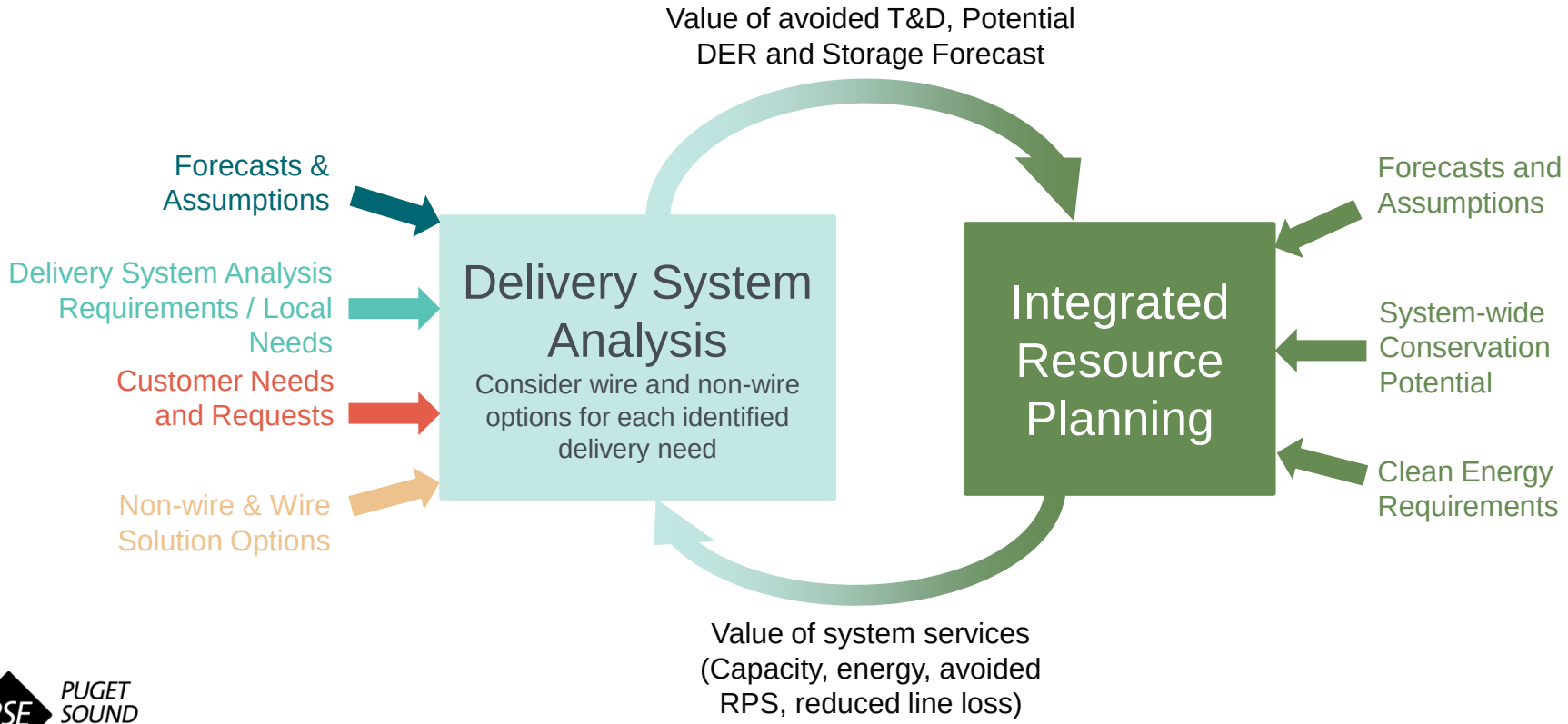
PSE's IRP and DSP linked closely

- Integrated Resource Planning (IRP) optimizes resources which deliver power to grid.
- Delivery System Planning (DSP) ensures that electricity gets to our customers



Existing grid design – push power to customers
EPRI - 2014

DSP & IRP evolving integration to support DERs



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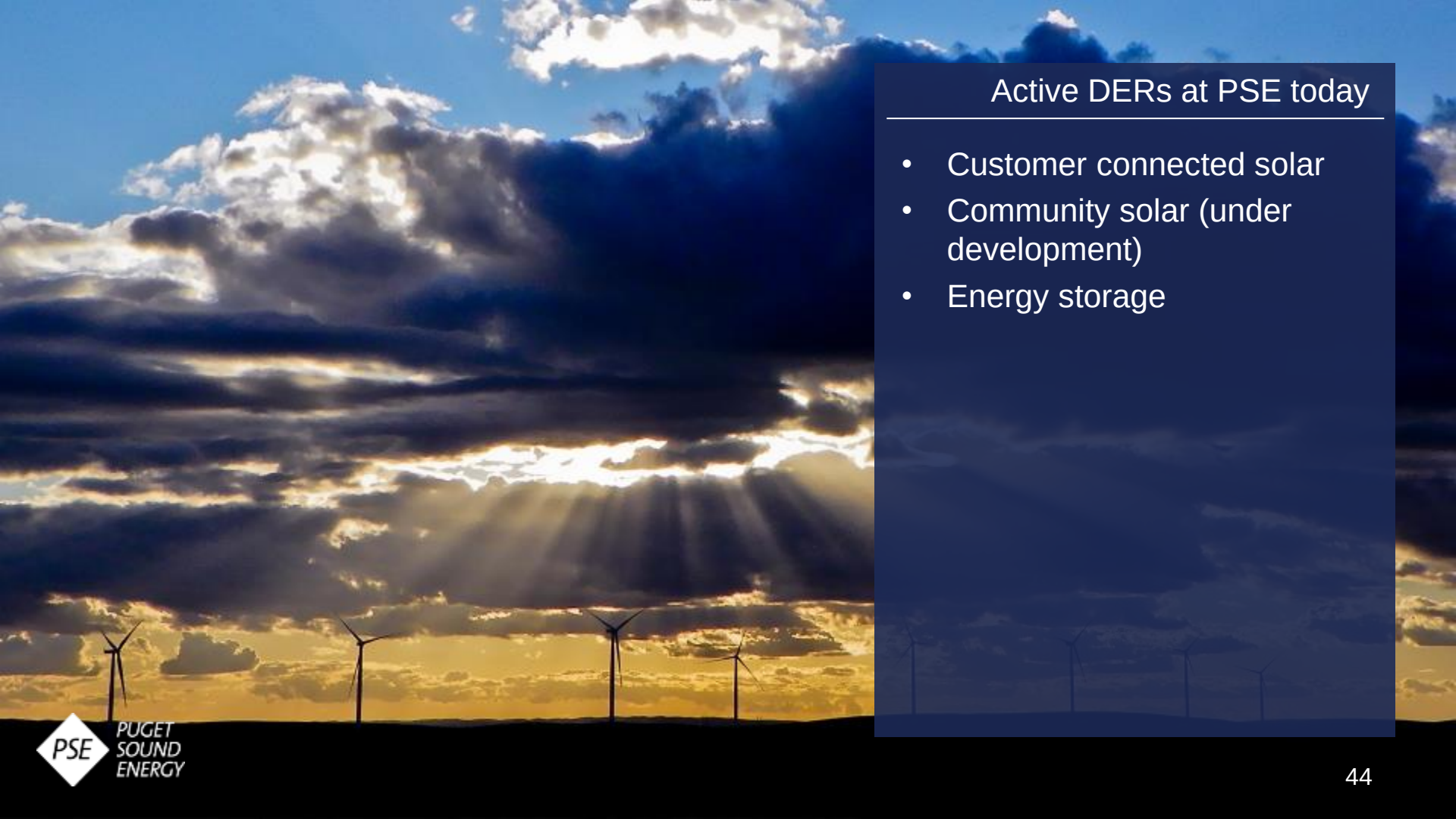

Active DERs at PSE today

- Customer connected solar
- Community solar (under development)
- Energy storage

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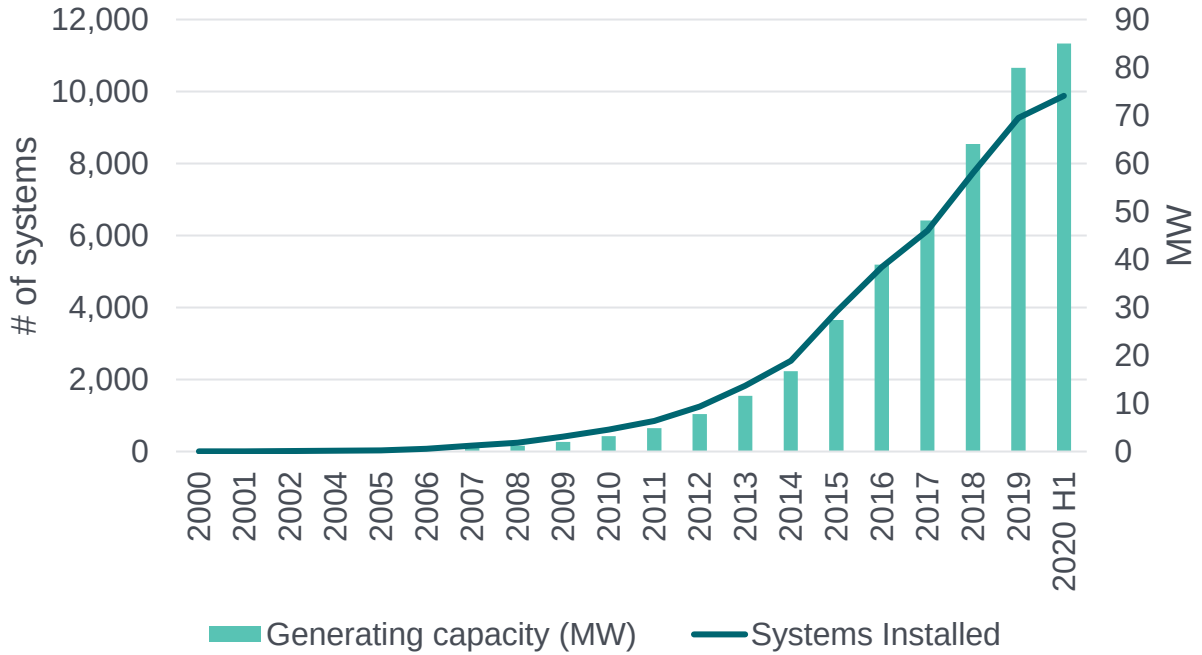
PSE's solar net metering program continues to grow



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Community solar overview

Community solar refers to local solar projects wherein multiple subscribers voluntarily pay a small amount each month and receive credit on their electric bills energy for produced by their share of the project.

Community solar programs can **expand access** to renewable energy to a broader set of customers such as renters, those with shaded roofs, and those who choose not to install a residential system on their home for financial or other reasons.

PRELIMINARY PRODUCT DESIGN

- New, local solar capacity in PSE's electric service territory
- Participants select specific projects to participate in
- Monthly subscription model
- Customers can purchase multiple shares
- Customers sign year-long commitment
- 8-year program length
- Portion of discounted subscriptions dedicated for low-income customers
- Available to residential and commercial customers

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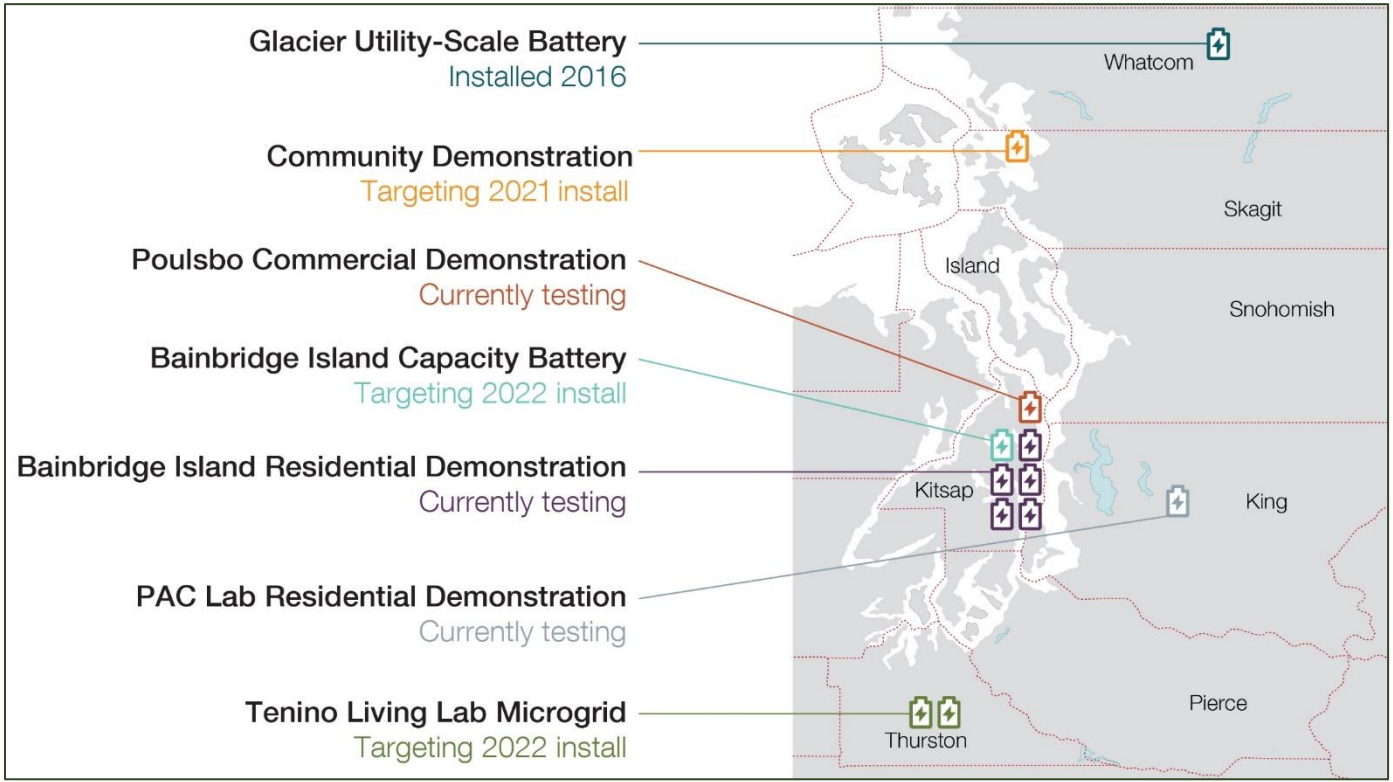
PSE's portfolio of energy storage



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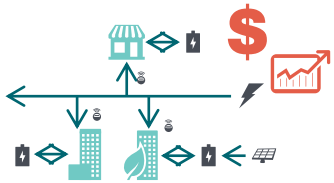
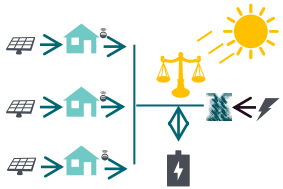
Customer-sited energy storage demos

	Project	Primary Use Case	Battery Deployment and Project Scale	On the Grid
1	**Residential Project: Bainbridge Island**	Backup power during grid outage	• Behind-the-Meter (6-units) • Consumer-scale (6kW/15.5kWh) • Proprietary software platform for operation	
2	**Commercial Project: Poulsbo**	Demand (kW) management	• Behind-the-Meter (1-unit) • C&I Building-scale (30kW/183kWh) • Integrated communication and controls	
3	**Community Project: Samish Island**	Balance solar PV backfeed to the grid	• Front-of-Meter (1-unit) • Distribution-scale (~75kW/160kWh) • Controls and grid integration for microgrid	

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Current PSE battery storage projects

Bainbridge Island
Residential Demonstration

Bainbridge Island
Residential Demonstration

Mobile Battery Trailer

Glacier utility-scale battery

Poulsbo Commercial Demonstration

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5-minute Break

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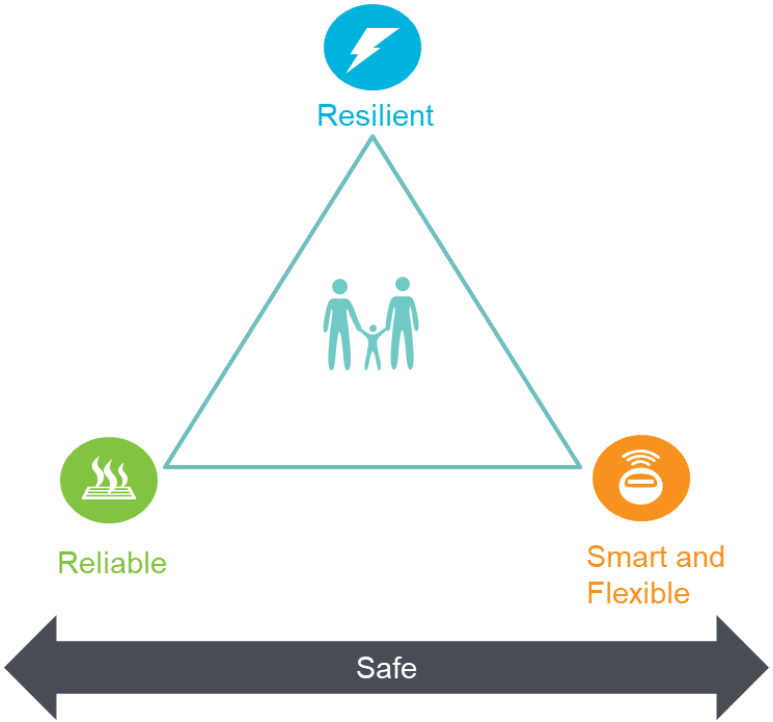
PSE's Grid modernization vision

To meet PSE customer expectations, PSE needs a grid that is

- **Safe** for the public and for those who work around it. Above all, safety continues to be the top priority.
- **Reliable**, with fewer and shorter power outages. When there is an outage, restoration and communication go hand-in-hand until the power is back.
- **Resilient** so that our region recovers quickly from weather extremes and other emergencies.
- **Smart**, utilizing automation and technology to save energy and improve customer satisfaction
- **Flexible**, enabling customers to control their energy on the basis of cost, carbon, or other preferences



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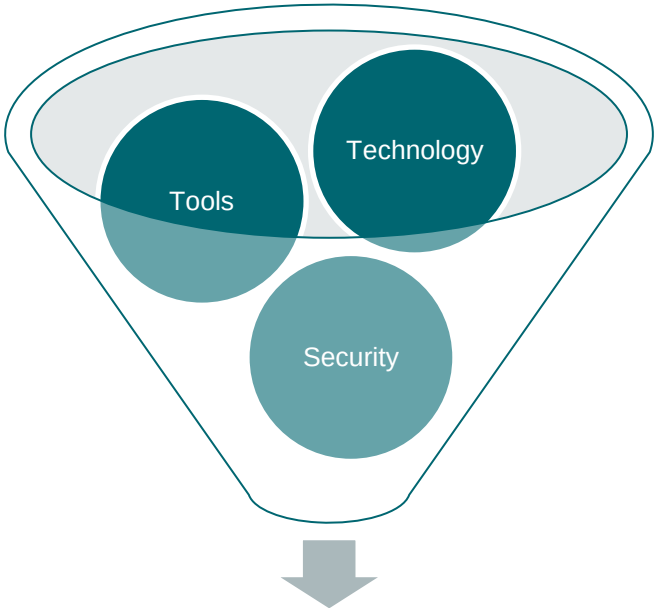
PSE invests to support DER enablement



DER Enablement

Technology provides enhanced visibility, insight and control – key attributes of a system with more DERs and bi-directional power flow.

Tools support optimal planning and operations, so DERs are sited and operated to minimize costs and maximize benefits.

Security means developing and utilizing standards for DER projects to support a safe, resilient, *and distributed* system.

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Technology investments

Advanced Metering Infrastructure (AMI)

- Replaces aging meter technology and provides greater visibility and granularity of usage and operational data
- Enables Customer Programs and Service, Grid Management (ADMS), Planning Tools

Advanced Distribution Management System (ADMS)

- Software platform that coordinates programs impacting our distribution system, allowing us to monitor, manage, and optimize control of everything in real time.
- Enables Distributed Energy Resource Management System (DERMS)

Substation SCADA (Supervisory Control and Data Acquisition)

- Enhances telecommunications infrastructure to remotely monitor and control our substation equipment in real time and transmit key information
- Enables ADMS and DERMS, Predictive Analytics and Maintenance

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Tools investments

Geospatial Load Forecasting

In addition to the system and county level forecasts, circuit-level load and DER forecasting will allow PSE to make more precise capital investments to support DER integration. This will result in higher confidence that system improvements are targeted to the highest need areas.

PSE plans to implement Geospatial Load Forecasting in 2021.

Hosting Capacity Analysis

HCA tells us how many DERs can be interconnected at a specific location on the grid without adversely impacting power quality or reliability under existing control and protection systems, and without infrastructure upgrades.

PSE is currently testing hosting capacity analysis tools to develop requirements in anticipation of circuit-level forecasting availability.

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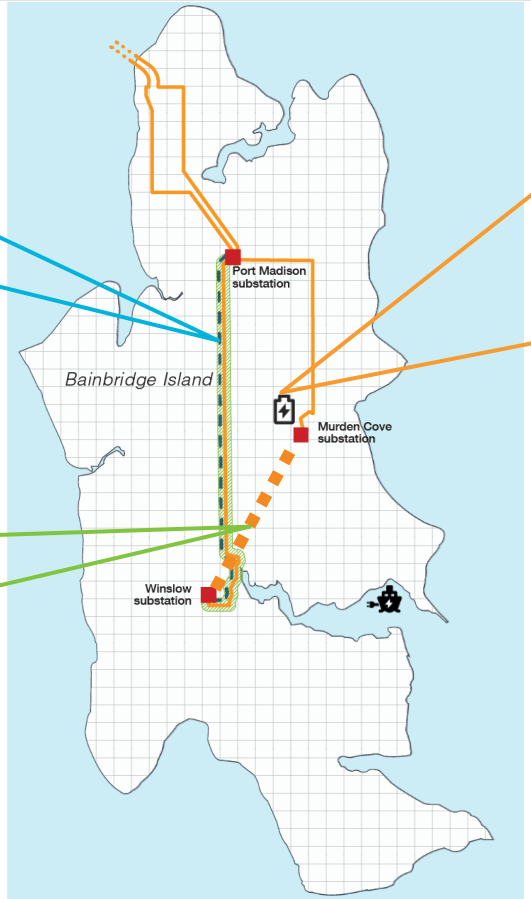
Non-wire Alternative Analysis – Bainbridge Island

Resiliency

Rebuild aging Winslow Tap line

Reliability

Build “missing link” transmission line



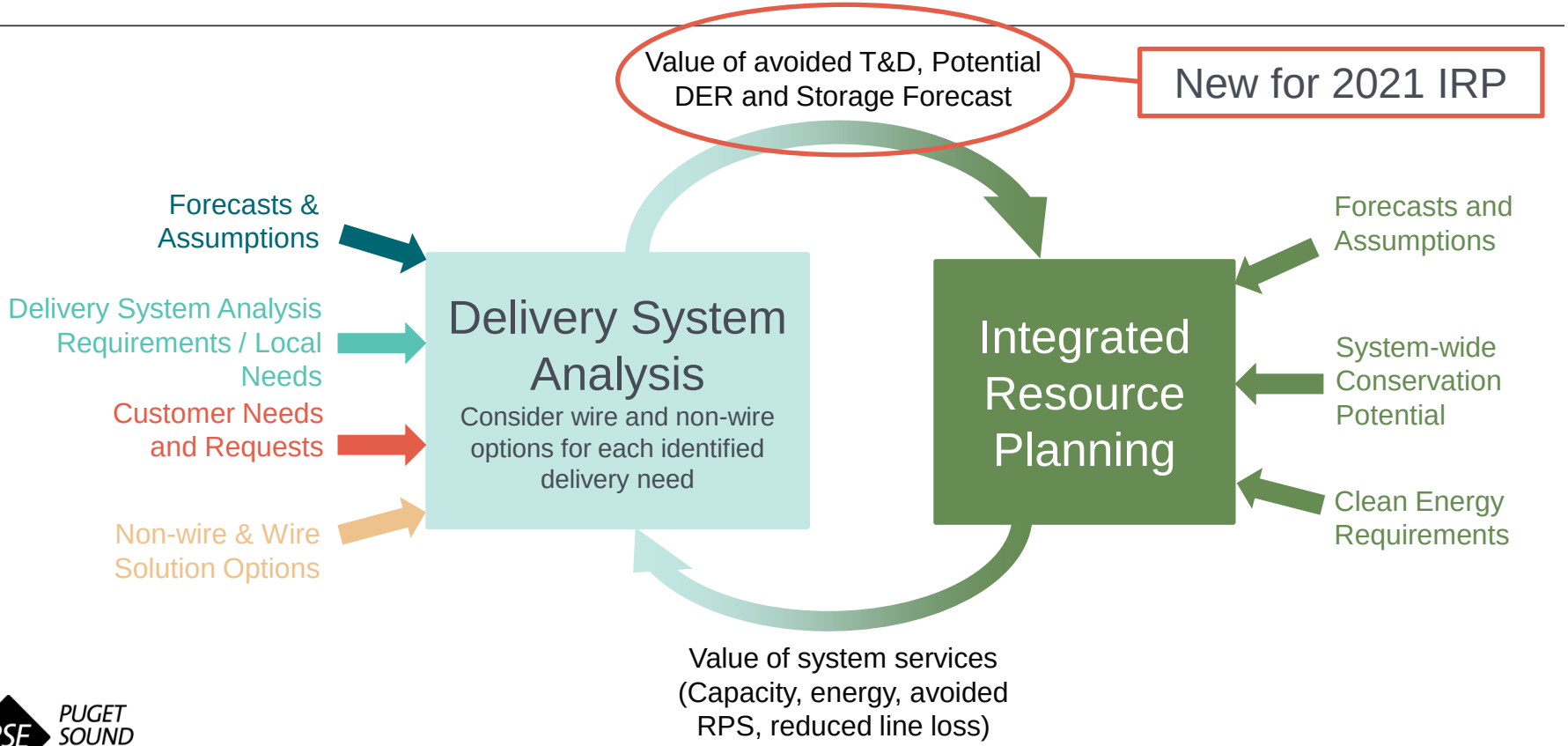
Needs addressed:

- Reliability
- Aging Infrastructure
- Capacity

Smart, flexible Battery adds capacity and improves system flexibility

Smart, flexible conservation and demand response tools

DSP & IRP evolving integration to support DERs



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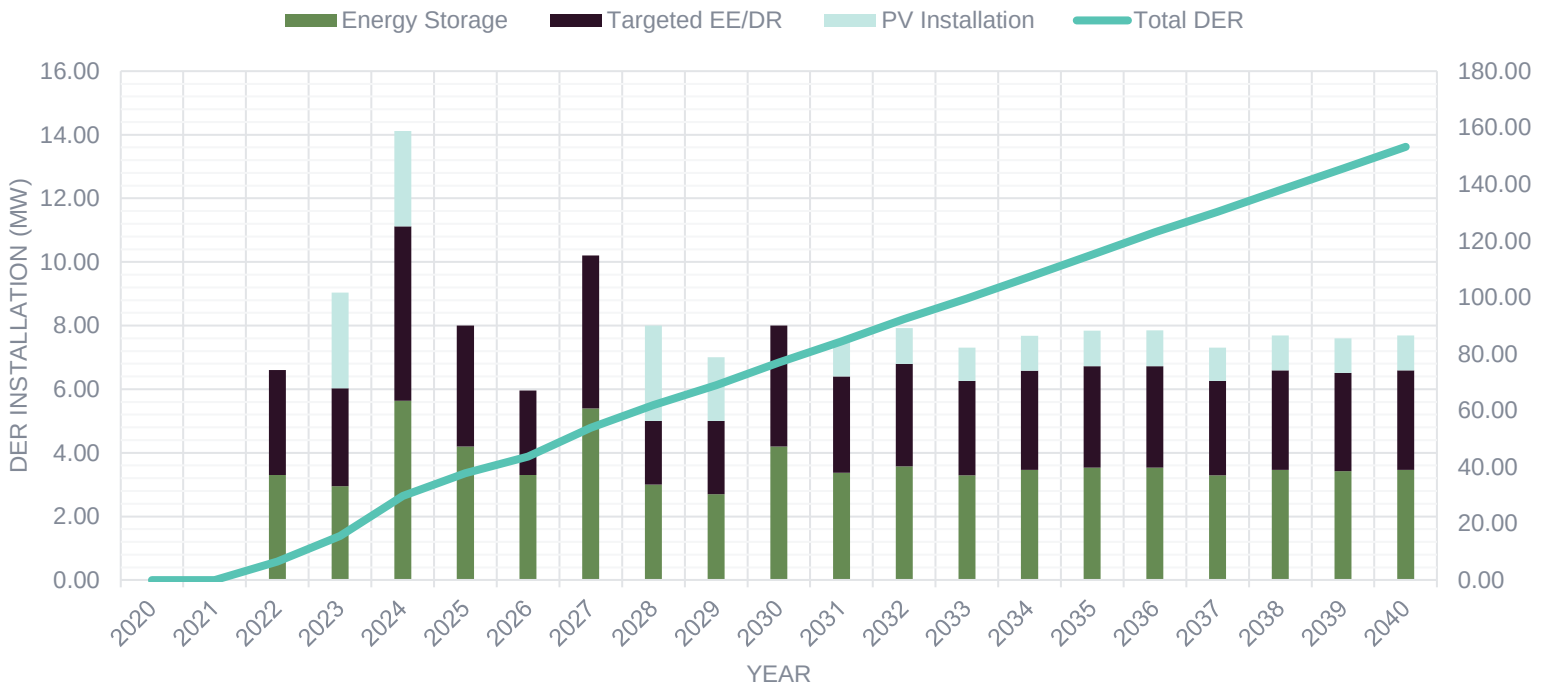
DER forecast to address DSP T&D non-wire alternatives



DERs in the IRP

	Behind the Meter Load reduction and / or shaping	Front of the Meter Provide energy and / or capacity
Solar	• Accounted for in CPA • Include sensitivity to cost	• Modeled as a resource type • Some must-take due to summer-peak DSP NWA
Batteries	• Not currently forecasted • Accessibility to PSE depends on program design	• Modeled as a resource type (25 MW 4 hr storage) • Some must-take due to DSP NWA solutions
Demand Response	• Accounted for in CPA • Some must-take due to DSP NWA solutions	• N/A
Energy Efficiency	• Accounted for in CPA • Some must-take due to DSP NWA solutions	• Distribution efficiency accounted for in CPA
Combined Heat & Power (CHP)	• Accounted for in CPA	• N/A

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CPA: Conservation Potential Assessment

Consultation update: electric price forecast

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Stakeholder feedback included in 2021 IRP electric price forecast

On June 10, 2020 PSE presented the draft electric price forecast and incorporated stakeholder feedback regarding the electric price forecast

1. Regional demand forecast

   PSE received feedback from James Adcock, Kathi Scanlan, WUTC Staff, and Joni Bosh and Fred Heutte, NWEC, concerning PSE's use of the Northwest Power and Conservation Council's (the Council) 7th Power Plan regional demand forecast.

   - PSE contacted the Council and included the demand forecast from the 2019 Policy Update to the 2018 Wholesale Electricity Forecast

2. Washington renewable need

   PSE received feedback from Vlad Gutman-Britten, Climate Solutions, and James Adcock regarding the starting point for the ramp used for Washington state Clean Energy Transformation Act (CETA) requirements.

   - PSE updated the Washington renewable need for the updated demand forecast and started the ramp in 2022.

3. Natural gas price forecast

   PSE received feedback from Kathi Scanlan, Washington Utilities and Transportation Commission (WUTC) Staff, requesting the use of an updated gas price forecast to reflect the socioeconomic changes of the COVID-19 pandemic.

   - PSE updated to the most recent natural gas price forecast.

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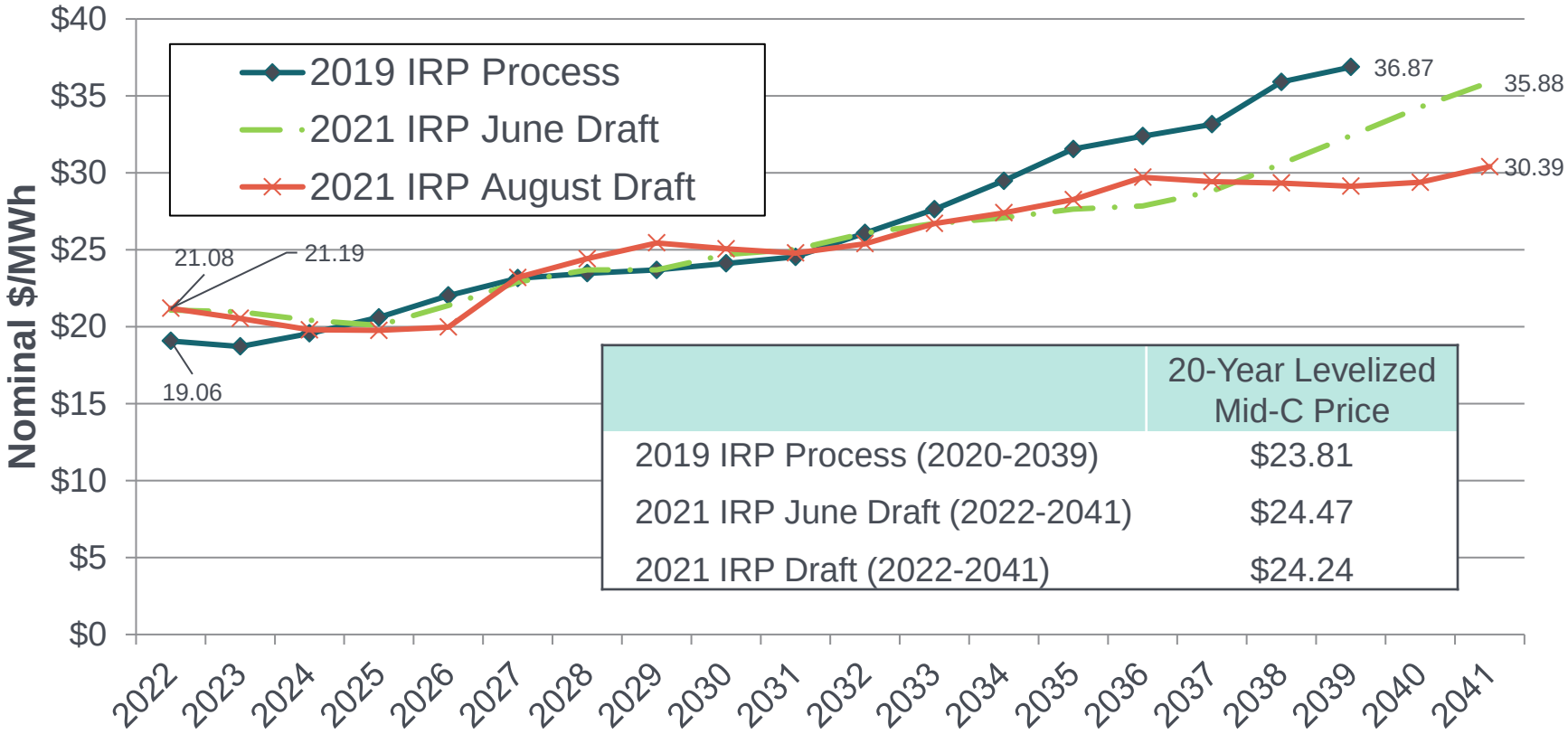
2021 IRP electric price August update



	20-Year Levelized Mid-C Price
2019 IRP Process (2020-2039)	$23.81
2021 IRP June Draft (2022-2041)	$24.47
2021 IRP Draft (2022-2041)	$24.24

Question and Answer

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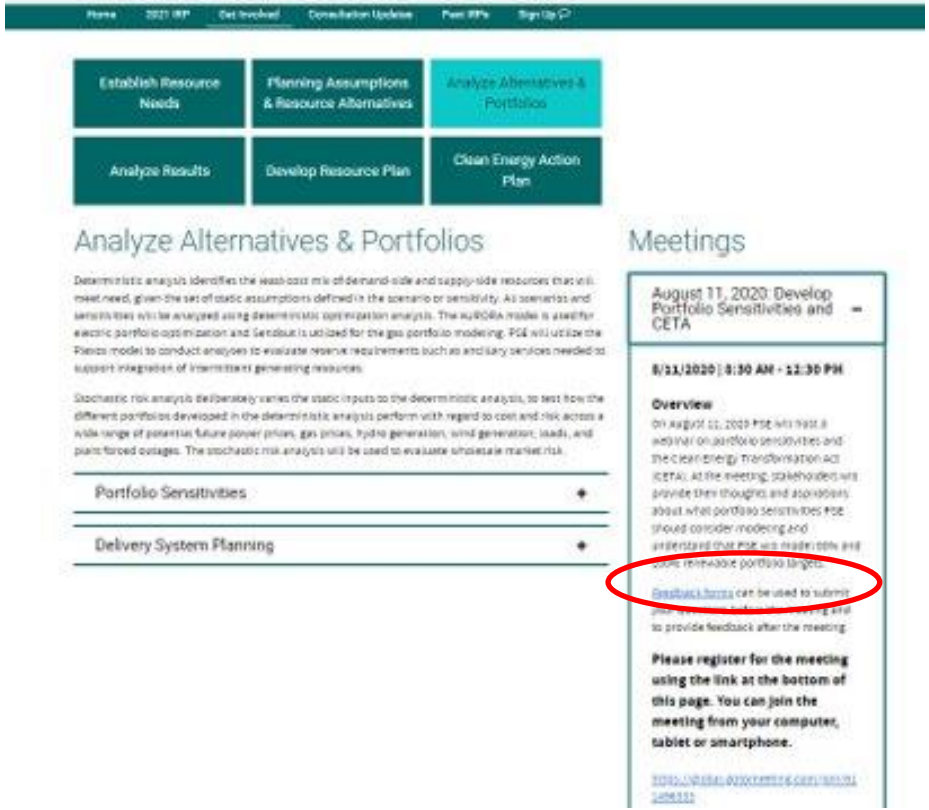
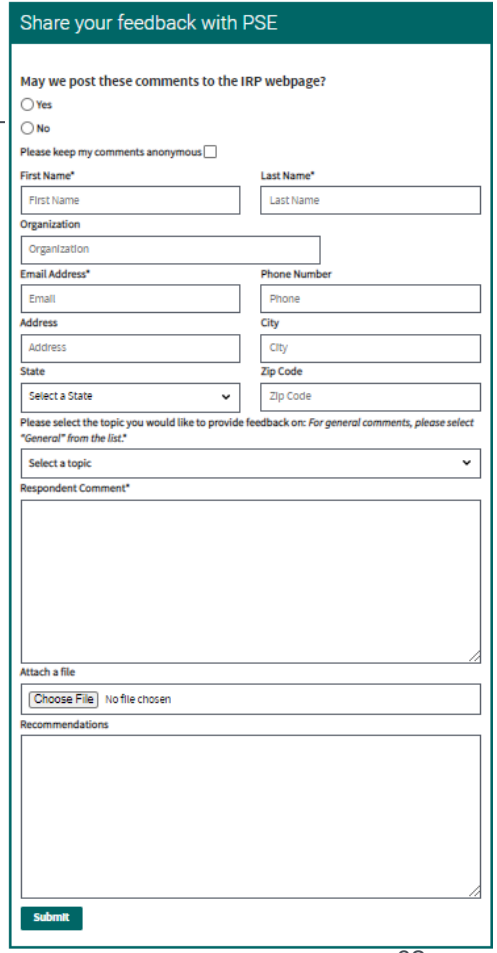
Feedback Form





Feedback Form

- An important way to share your input
- Available on the website 24/7
- Comments, questions and data can be submitted throughout the year, but timely feedback supports the technical process
- Please submit your Feedback Form within a week of the meeting topic

Feedback Form → **Feedback Report** → **Consultation Update**

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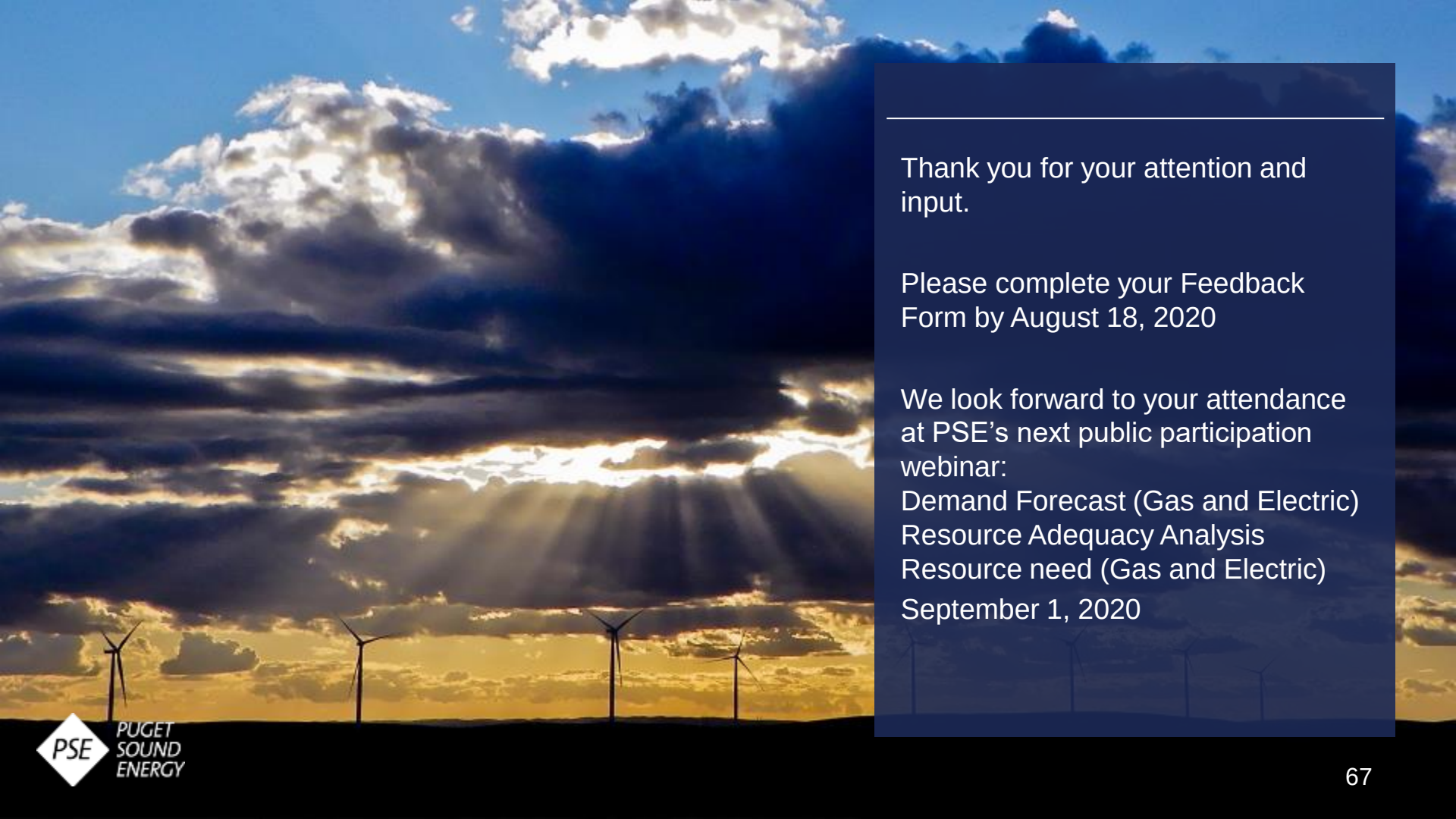
Next steps

- Submit Feedback Form to PSE by **August 18, 2020**
- A recording and the chat from today's webinar will be posted to the website **tomorrow**
- PSE will compile all the feedback in the Feedback Report and post all the questions by **August 25, 2020**
- The Consultation Update will be shared on **September 1**

Details of upcoming meetings can be found at pse.com/irp

Date	Topic
September 1, 1:00 – 5:00 pm	Demand forecast (electric & gas) Resource adequacy Resource need: peak capacity, energy & renewable energy need
October 20, 1:30 – 4:30 pm	Portfolio sensitivities draft results Flexibility analysis
November 4, 1:00 – 4:30 pm	Clean Energy Action Plan 10-year Distribution & Transmission Plan
December 9, 1:00 – 4:30 pm	Portfolio draft results Stochastic analysis Wholesale market risk



Thank you for your attention and input.

Please complete your Feedback Form by August 18, 2020

We look forward to your attendance at PSE's next public participation webinar:
Demand Forecast (Gas and Electric)
Resource Adequacy Analysis
Resource need (Gas and Electric)
September 1, 2020

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