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# 2021 IRP Webinar #2: Draft Electric Price Forecast

Planning Assumptions & Resource Alternatives  
Electric Portfolio Model

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June 10, 2020

# Agenda

2

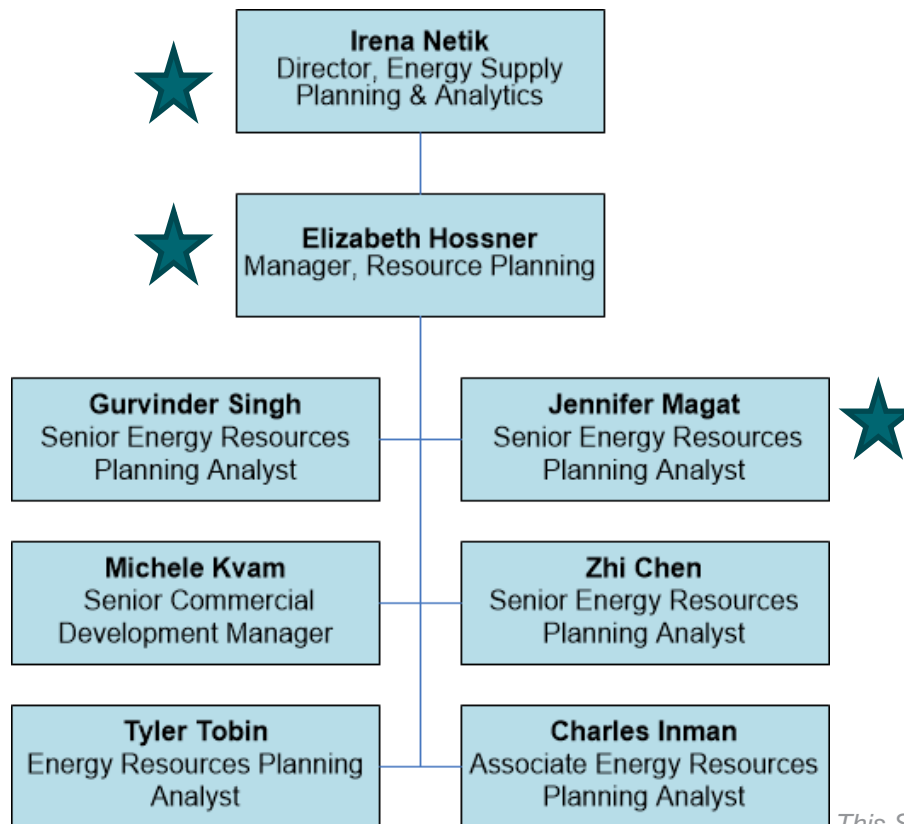


- Safety moment
- How is the electric price forecast used?
- Modeling overview
- Review of 2017 IRP and 2019 IRP Progress Report electric price forecasts
- Results of draft 2021 IRP electric price forecast
- Clean energy regulation assumptions
- 2021 IRP electric price scenarios



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Speakers

# Public participation in the 2021 IRP

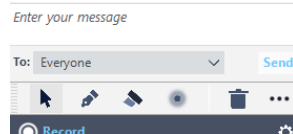
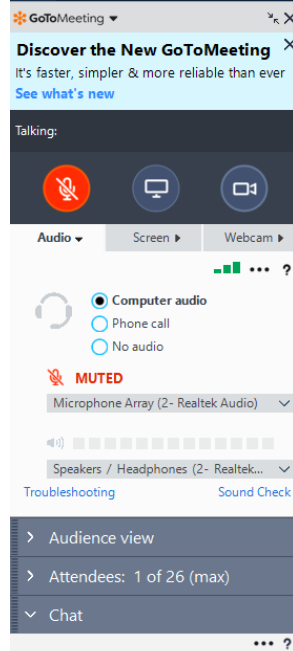
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5



# Welcome to the webinar and thank you for participating!

6



Virtual webinar

link: <https://global.gotomeeting.com/join/993123797>

Access Code: 993-123-797

Call-in telephone number: [+1 \(224\) 501-3412](tel:+12245013412)



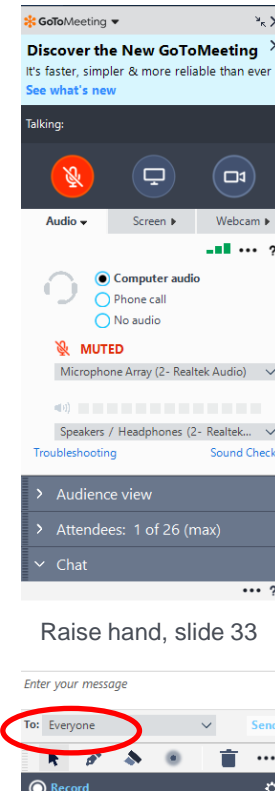
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# How to participate using Go2Meeting

7

## Presentation Do's

- Mute your mic during the presentation
- Ask clarifying questions using the Chat window
- Share your questions or comments with "Everyone"
- During question time, reference Slide # and type "Raise hand"
- Wait to be called on to ask your question



Raise hand, slide 33

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# 2021 IRP modeling process

8

The 2021 IRP will follow a 6-step process for analysis:

1. Establish peak capacity, energy and renewable energy need
2. Determine planning assumptions and identify supply-side and demand-side resource alternatives
3. Analyze scenarios and sensitivities using deterministic and stochastic risk analysis
4. Analyze results
5. Develop resource plan
6. Develop 10-year Clean Energy Action Plan





# 2021 IRP process timeline

9



Meeting dates are available on [pse.com/irp](https://pse.com/irp) and will be updated throughout the process. This is a tentative timeline subject to revision.

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How is the electric price  
forecast used?

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# How is the electric price forecast used?

11

- IRP
  - The electric price forecast is used as the cost of wholesale market purchases and for economic dispatch of power plants in both the Plexos flexibility model and the AURORA portfolio model.
  - It is used to determine the value of the resource against the market.
- Analysis to support resource acquisitions
  - The acquisition analysis uses the same models as the IRP an the electric price forecast is used in the manner as the IRP.
  - The acquisition analysis also includes CETA implementation and RPS incremental cost calculation evaluation.
- Avoided costs for Energy Efficiency Services (EES) measure evaluation
  - The electric price forecast is used to evaluate cost effective energy efficiency measures.
- Schedule 91 & 92 for PURPA resources - Public Utility Regulatory Policies Act (**PURPA**, Pub. L. 95–617, 92 Stat. 3117, enacted November 9, 1978)
  - Schedule 91 are the tariff rates for small renewables resources <5 MW
  - Schedule 92 are the avoided cost rates for large renewable resources 5-80 MW
- Other analysis as needed for the company

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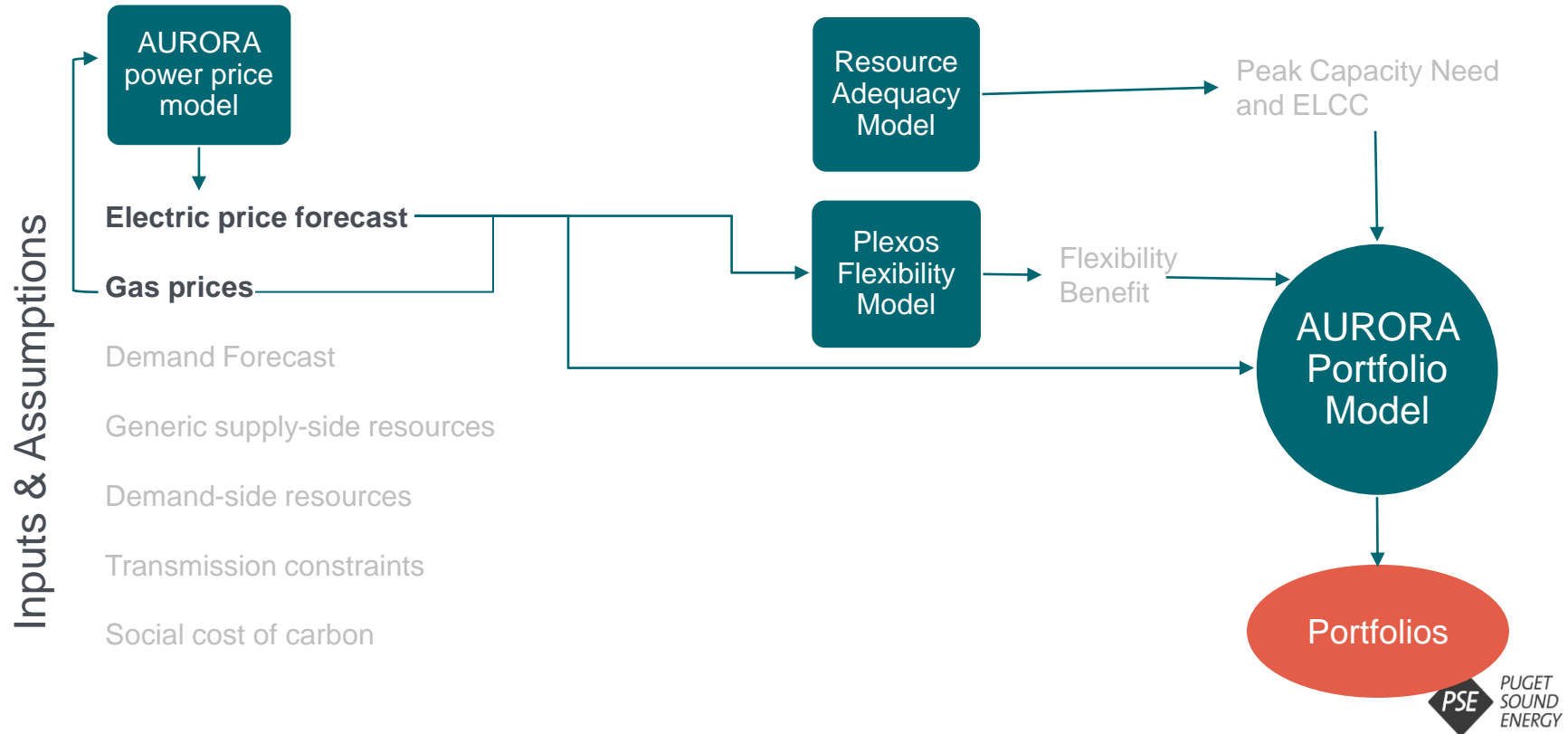
# Modeling overview

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# Electric IRP Models

13



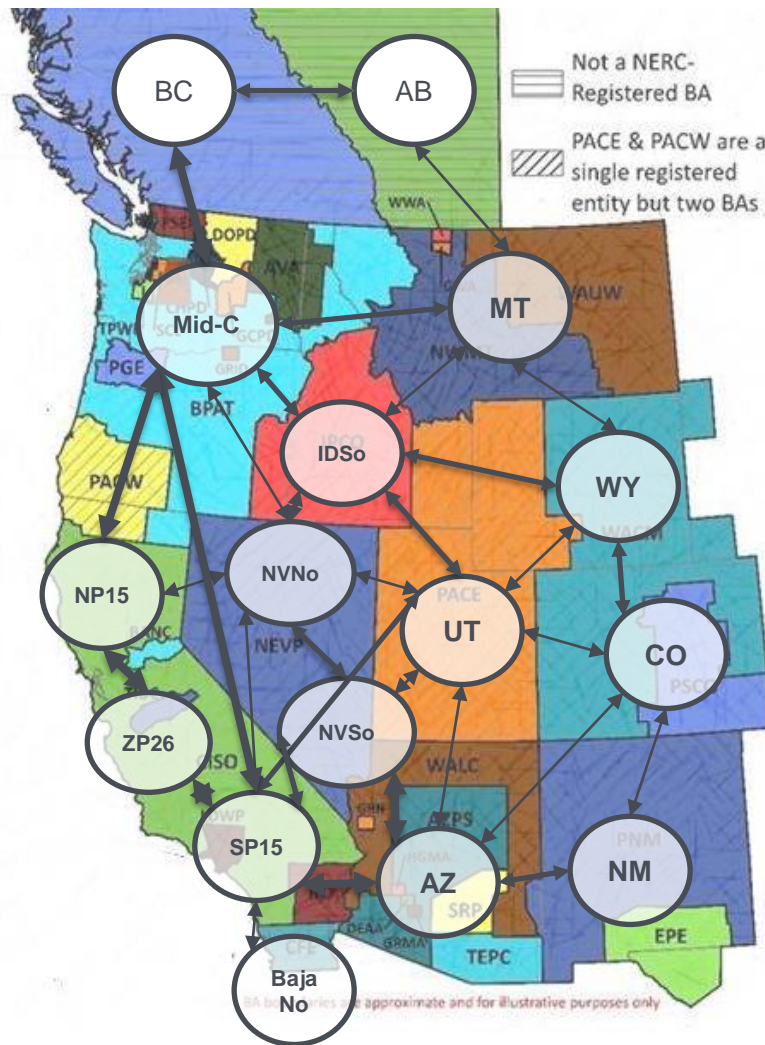
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# How does PSE create power prices?

14

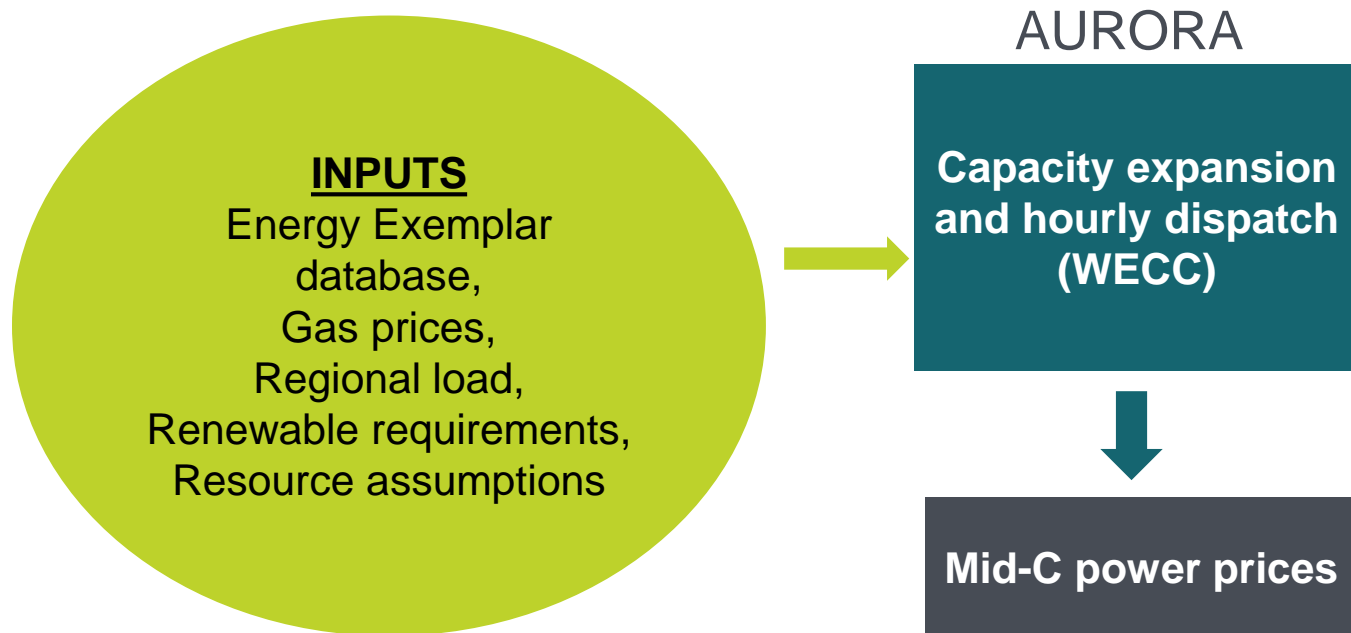
- PSE uses a software model called AURORA.
  - Software for forecasting wholesale power market prices, long term capacity expansion, portfolio analysis and risk analysis
  - AURORA is a fundamentals-based model that employs a multi-area, transmission-constrained dispatch logic to simulate real market conditions
- PSE started using AURORA in 1999 for power costs then in 2003 for IRP and acquisitions.
- AURORA users include
  - Utilities, including investor-owned utilities (IOUs), publics, co-ops and municipalities
  - State public utility commissions, inter-state and federal agencies, system operators and other regional planning authorities
  - Traders, independent power producers (IPPs), developers and financial institutions
  - Consultants, universities and national labs





## AURORA system diagram for WECC

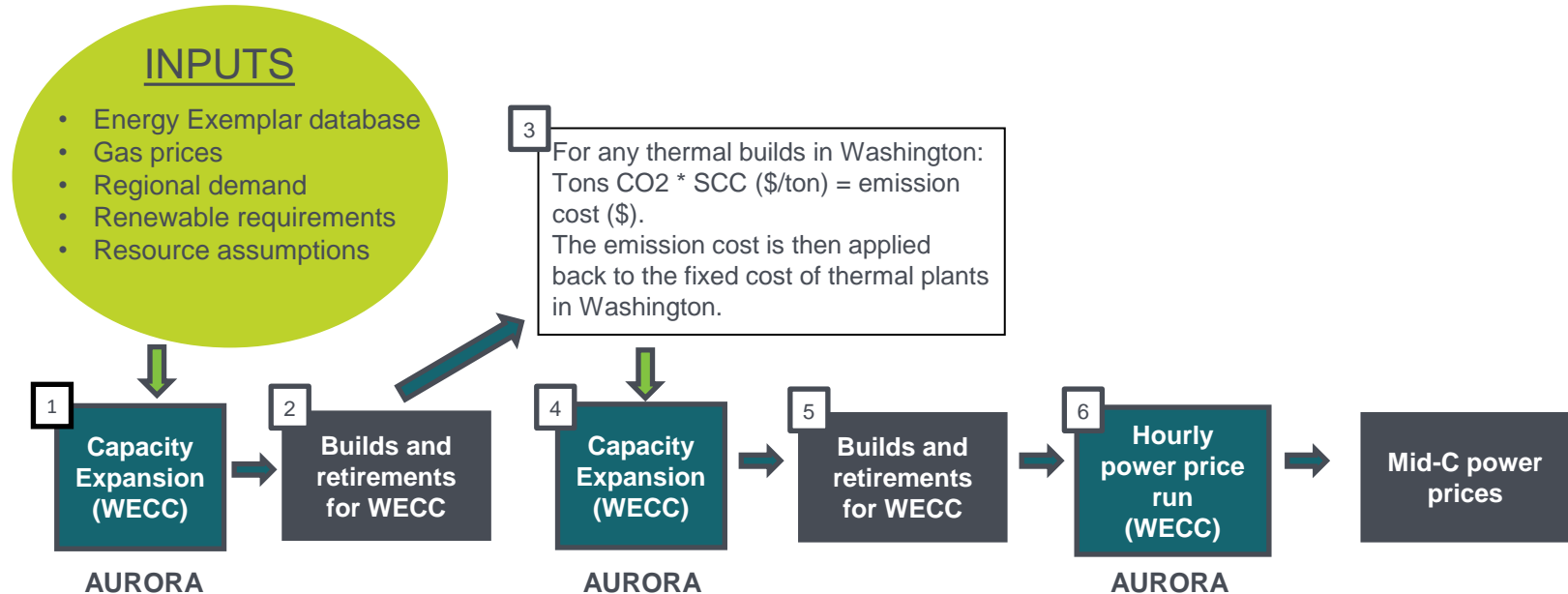
The WECC system diagram provides an object view of each zone definition system being modeled. A system diagram has been created for all delivered zone definition systems.





# The social cost of carbon (SCC) is reflected as a planning adder in the electric price forecast

17



## Notes:

1. This methodology is for the electric price forecast. The methodology for the portfolio model will be discussed at the July 21 webinar.
2. In the electric price model, no new thermal plants are built in Washington State.

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# Review of 2017 IRP and 2019 IRP Progress Report electric price forecasts

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# Changes in assumptions for electric price forecast from 2017 IRP to 2019 IRP Progress Report

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19

- Lower regional load from the 7<sup>th</sup> Power Plan
- Lower gas prices using the Wood Mackenzie prices released in Spring 2018
- Adaptation of regional clean energy policies
  - Nevada renewable requirement increased from 25% to 50% by 2030 and 100% by 2050
  - New Mexico increased from 20% RPS to 100% zero carbon by 2045
  - California SB 100, renewable requirement increased from 50% RPS to 60% renewable resources by 2030 and 100% by 2045
  - Washington SB 5116 Clean Energy Transformation Act, increased from 15% renewable requirement to 80% renewable resources by 2030 and 100% by 2045



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# 2019 IRP Progress Report clean energy policy assumption for electric price forecast

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With stakeholder input, the 2019 IRP Progress Report electric price forecast assumed a renewable need of 22.9 million MWh in 2030, approximately 8,700 MW nameplate capacity of new renewable resources added in Washington state.

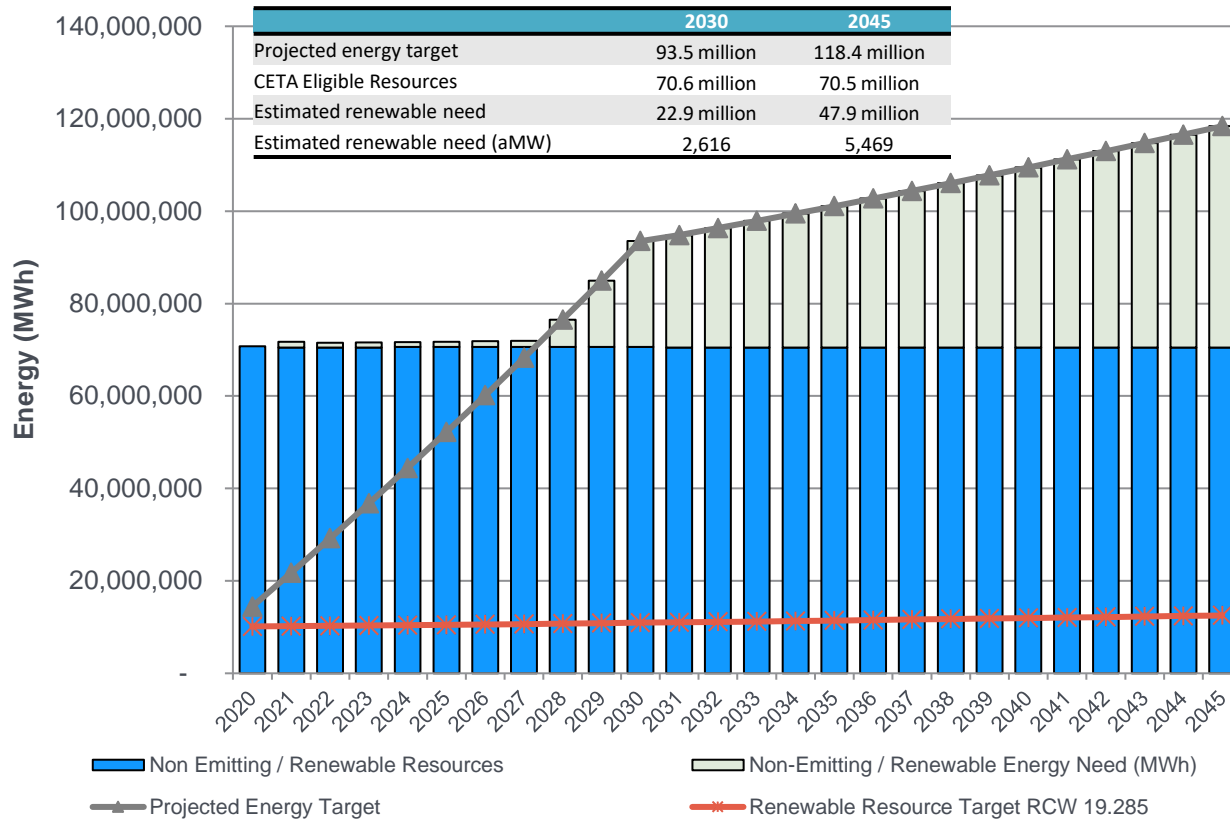
The renewable need assumption was based on the following:

- The utilities, that are currently more than 80% hydro, will reach 100% by 2030
- The utilities, that are less than 80% hydro, will reach 80% by 2030
- Applying the above assumptions to the 2018 Washington Department of Commerce fuel mix report provides:
  - 52% of sales in Washington by utilities will reach 100% by 2030
  - 48% of sales in Washington by utilities will reach 80% by 2030
  - This comes to an additional 22.9 million MWh (approx. 8,700 MW nameplate) of new renewable resources added in Washington State.



# Renewable energy needed in Washington to support Clean Energy Transformation Act

21



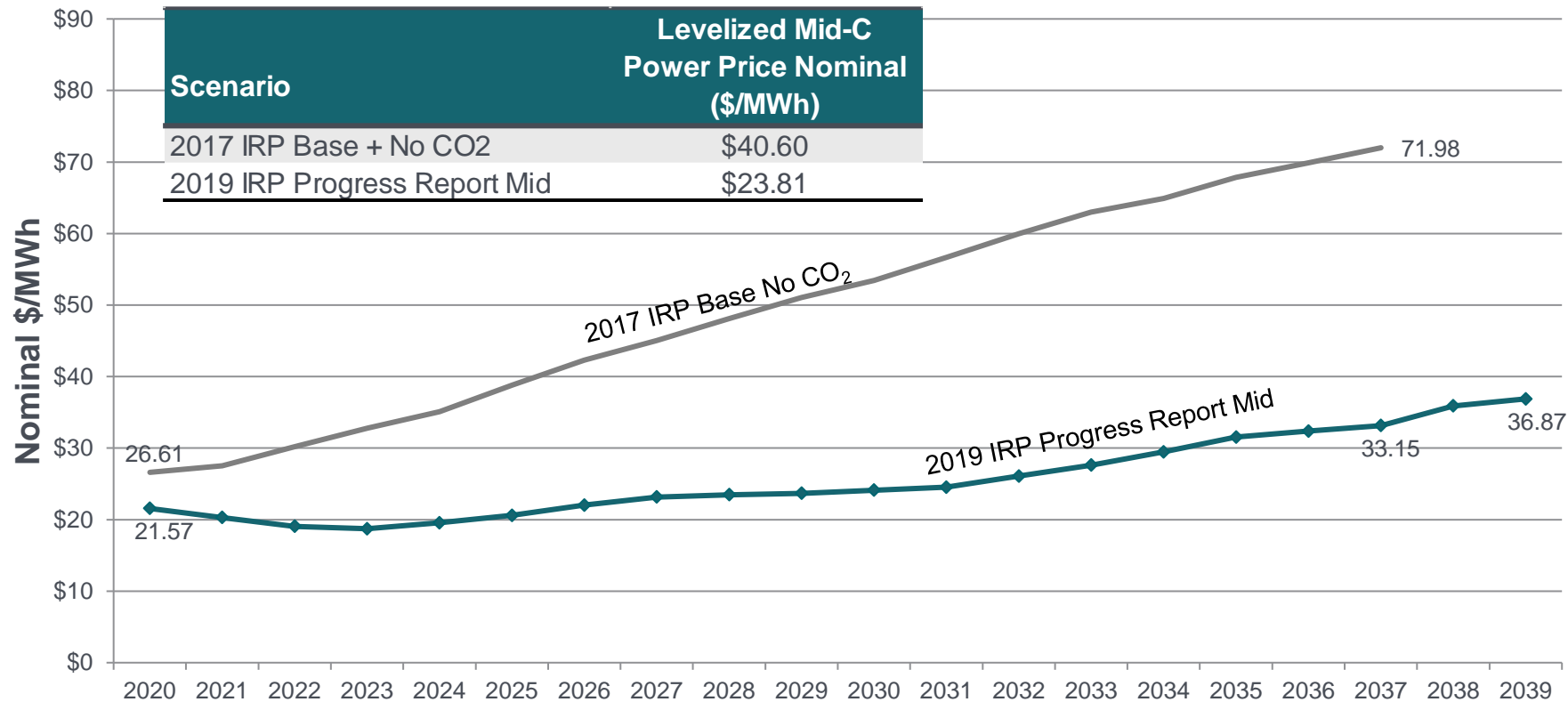
Renewable need for 2020 – 2028 is based on RCW 19.285. Starting in 2029, the incremental renewable need is higher to meet the requirement of 80% of sales under SB 5116 in 2030.

Non-emitting resources such as hydro and nuclear are eligible to meet the requirement. Washington State Electric Utilities Fuel Mix Report from 2000 – 2017 show the average hydro as 6,619 aMW and nuclear as 480 aMW. A total of 7,098 aMW will be used as a proxy annual contribution from hydro and nuclear when determining the incremental renewable need for Washington under SB 5116.



# 2017 IRP vs 2019 IRP Progress Report Mid-C electric price forecast

22



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# Results of draft 2021 IRP electric price forecast

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What didn't change?	What changed?
<ul style="list-style-type: none"><li>• North American Database v2018 in Aurora</li><li>• Regional Demand from the 7<sup>th</sup> Power Plan</li><li>• Clean energy policies adopted in the 2019 IRP process:<ul style="list-style-type: none"><li>Arizona decision 69127</li><li>California SB100</li><li>Nevada SB358</li><li>New Mexico SB489</li><li>Montana SB164</li><li>Oregon SB1547</li><li>Utah SB202</li><li>Washington SB5116</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Implemented the latest available Aurora Version 13.4</li><li>• Updated generating resource additions and retirements using S&amp;P Global Data</li><li>• Updated new regional renewable resources needs<ul style="list-style-type: none"><li>Colorado: 100% clean energy sources by 2050 for utilities serving 500,000 or more customers</li><li>Reflected changes in need due to new renewable resources in construction phase</li></ul></li><li>• Included updated gas price forecast from Wood Mackenzie</li></ul>

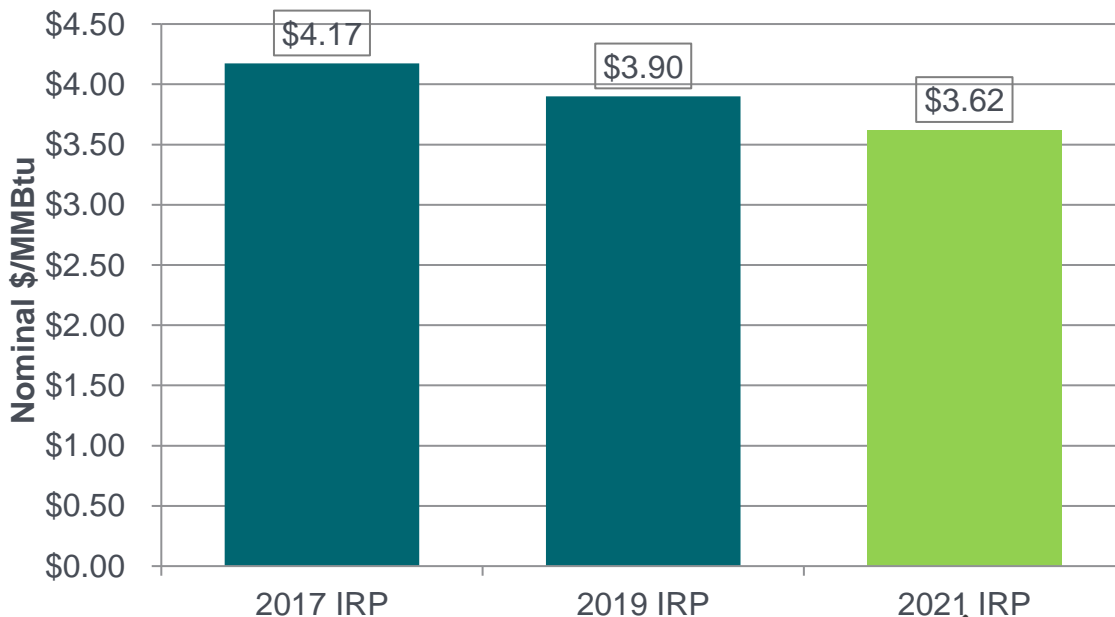


# 2021 IRP gas price forecast is lower than the 2019 IRP

25

**MID GAS PRICES.** From 2022-2025, this IRP uses the three-month average of forward marks for the period ending Jan 31, 2020. Forward marks reflect the price of gas being purchased at a given point in time for future delivery. Beyond 2025, this IRP uses Wood Mackenzie long-run, fundamentals-based gas price forecasts that were published in Fall 2019.

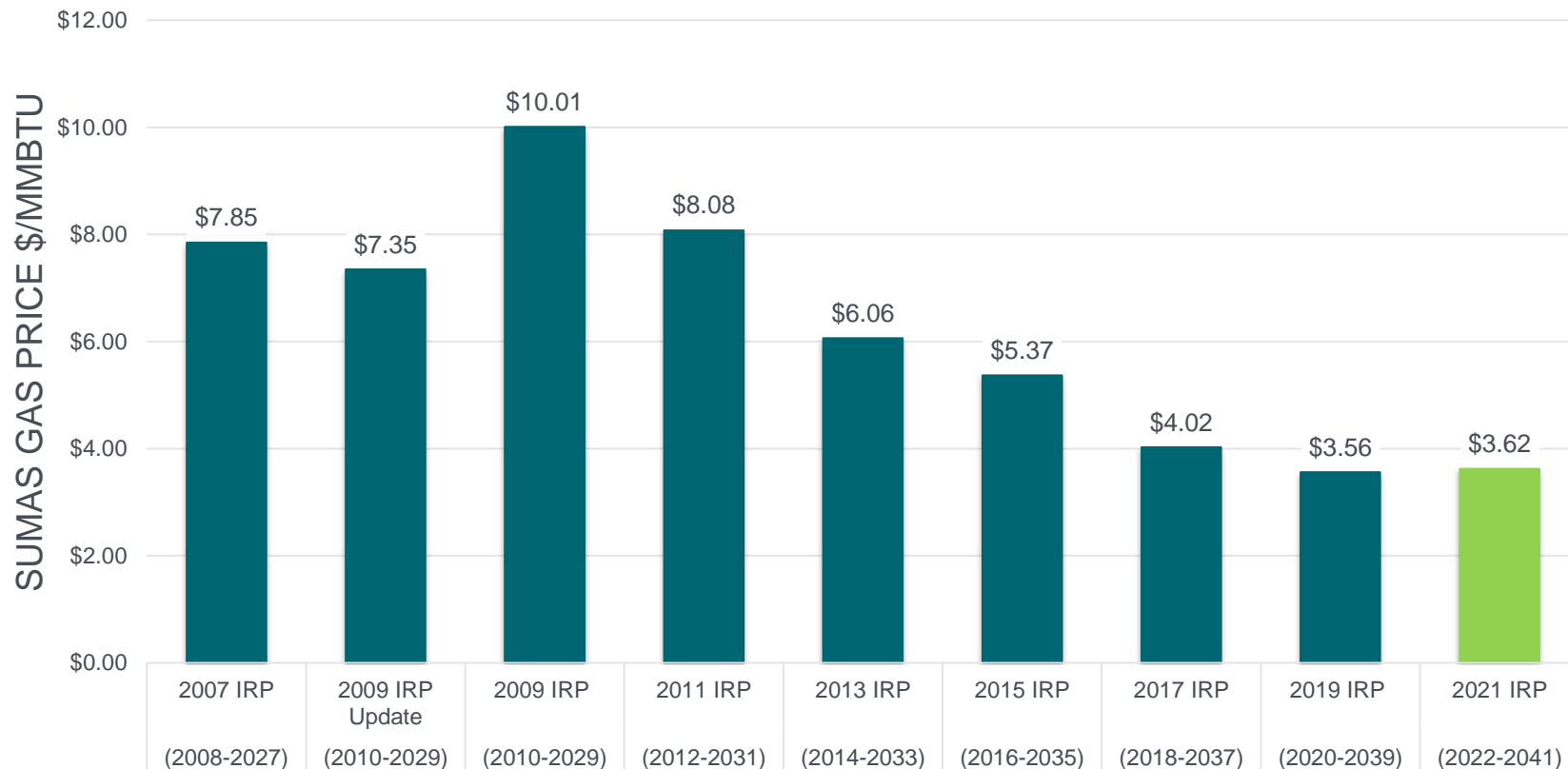
**Levelized Price Comparison 2022 to 2041  
- Natural Gas \$/MMBtu**



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# Comparison of gas price forecasts

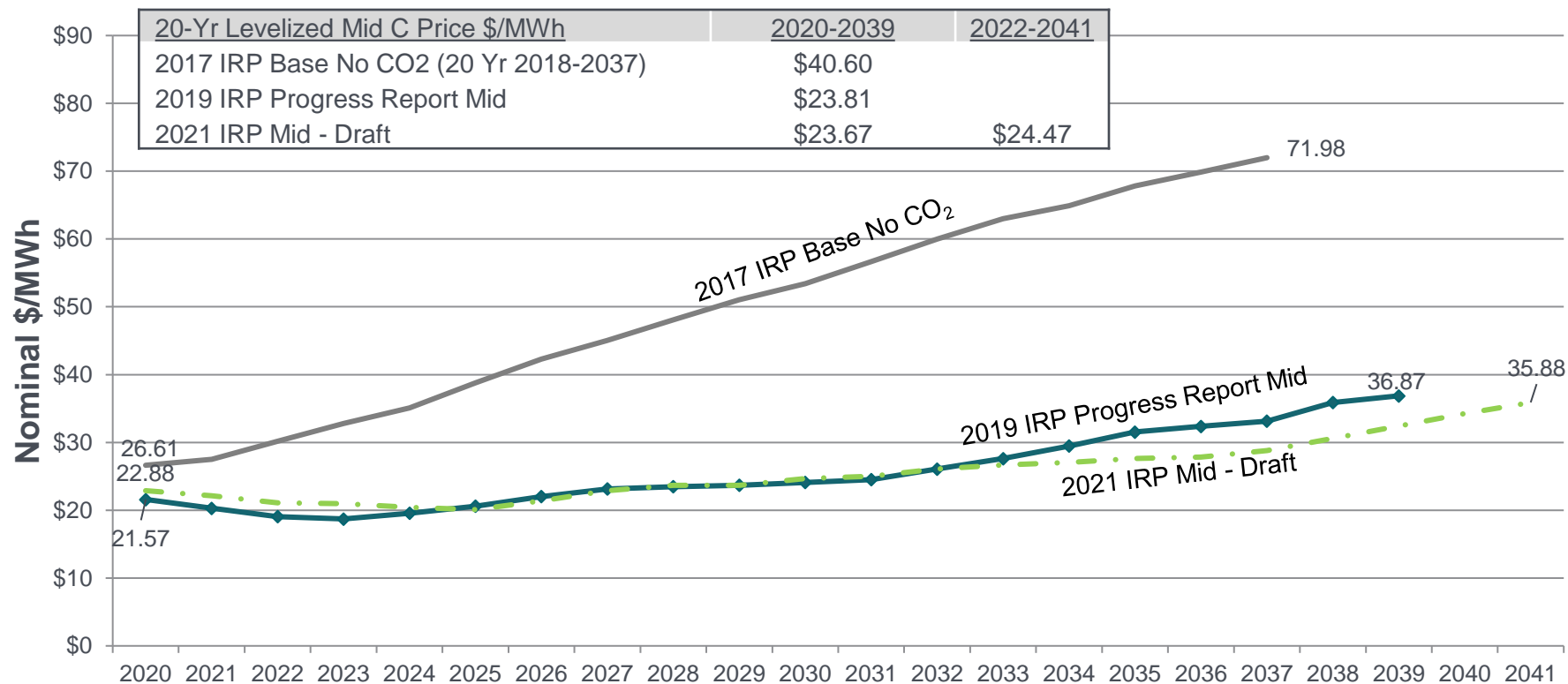
26



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# 2021 IRP electric price update

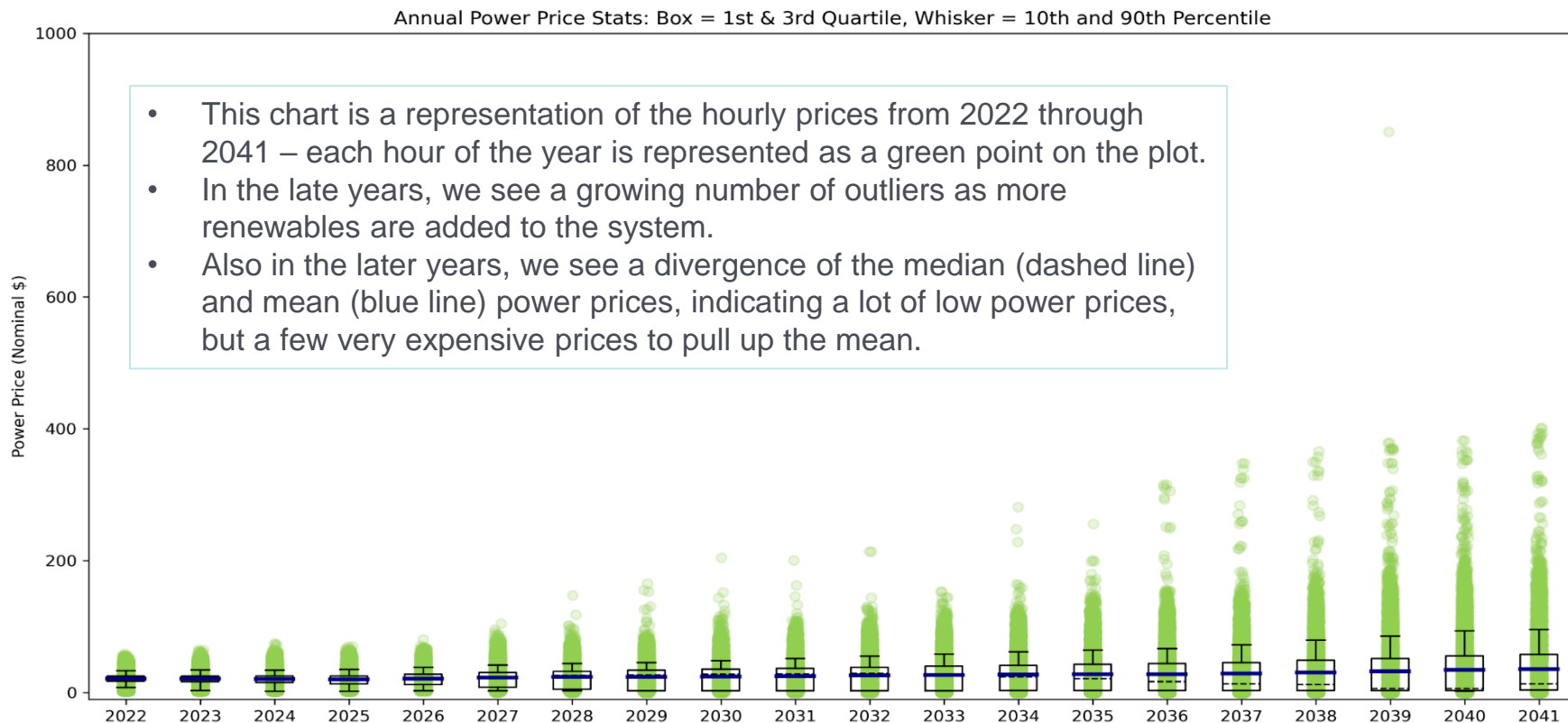
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# 2021 IRP electric prices show increased variability over time

28

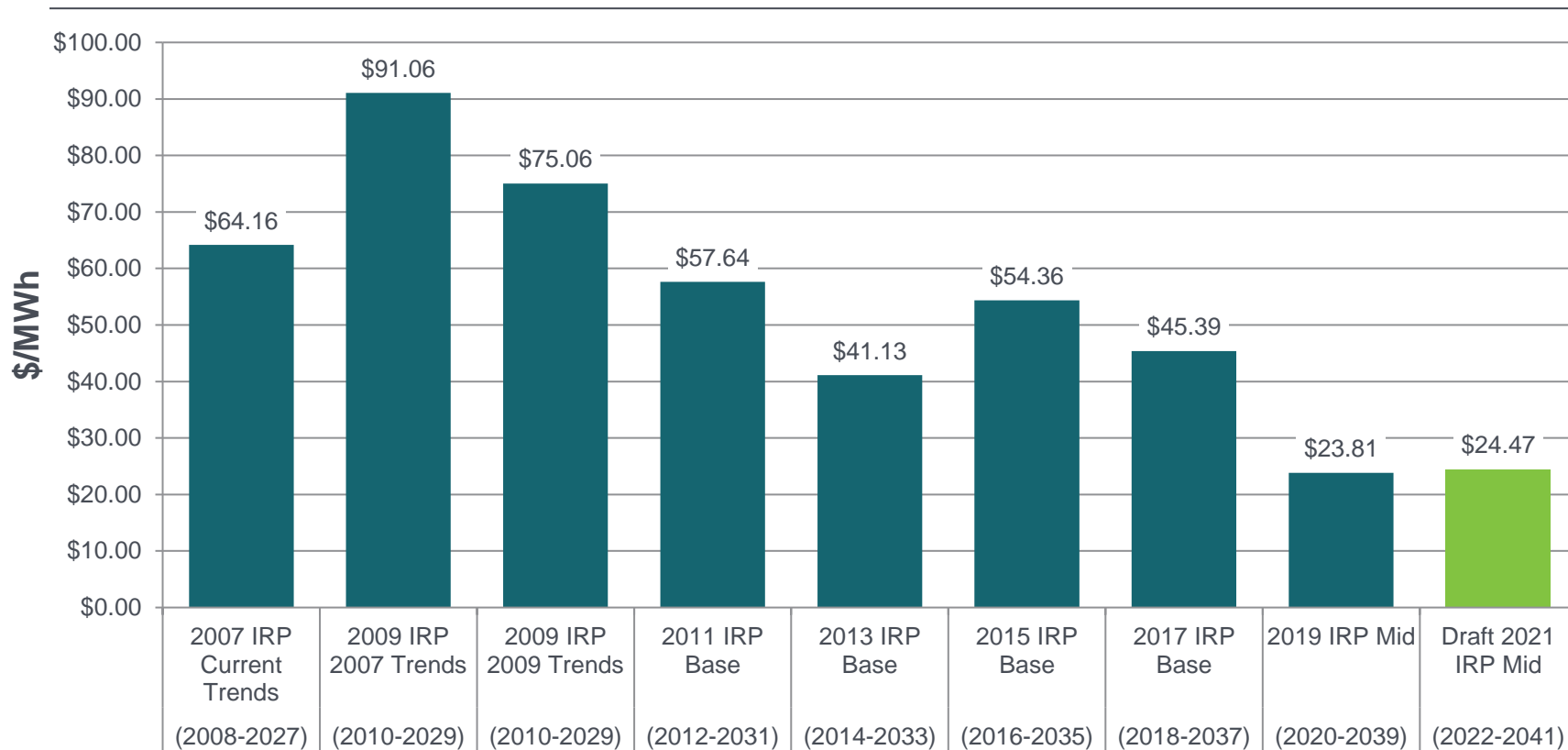


\* Solid blue line: average power price; Dashed blue line: median power price

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# Comparison of electric price forecasts

29



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# 5-minute break



## Participation Objective

- ⚡ Stakeholders share input on incorporating clean energy policies in baseline assumptions to inform the electric price forecast
- ⚡ Stakeholders share input on alternative electric price scenarios that vary demand, gas prices, or clean energy implementation

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## Clean energy regulation assumptions

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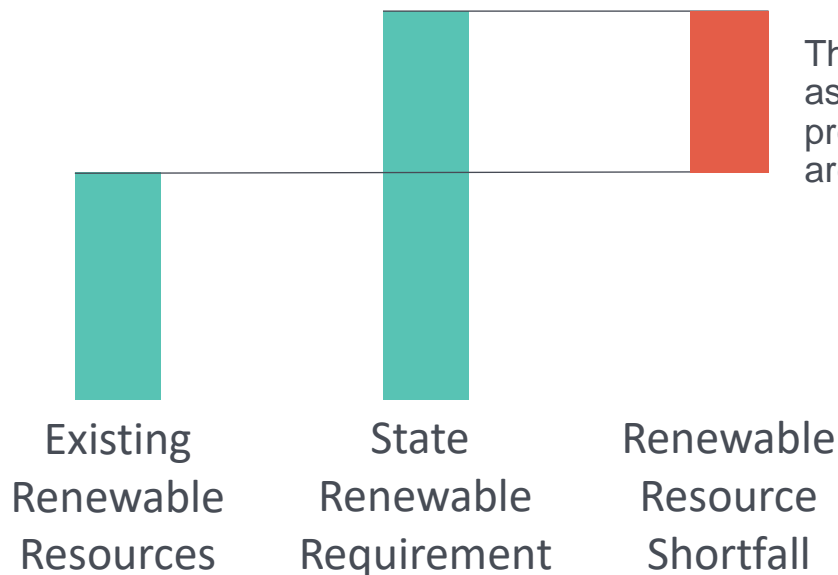




# How PSE models clean energy regulation assumptions

33

- For each state, we must determine what amount of renewable resources must be built in order to meet renewable energy requirements in that state.
- By comparing the existing resource pool to the forecasted resource need, we determine how many renewable energy resources need to be added.



The resulting deficit of renewable resources is used as a constraint in the capacity expansion modeling process to ensure that enough renewable resources are built.

# Clean energy regulation assumptions for electric prices

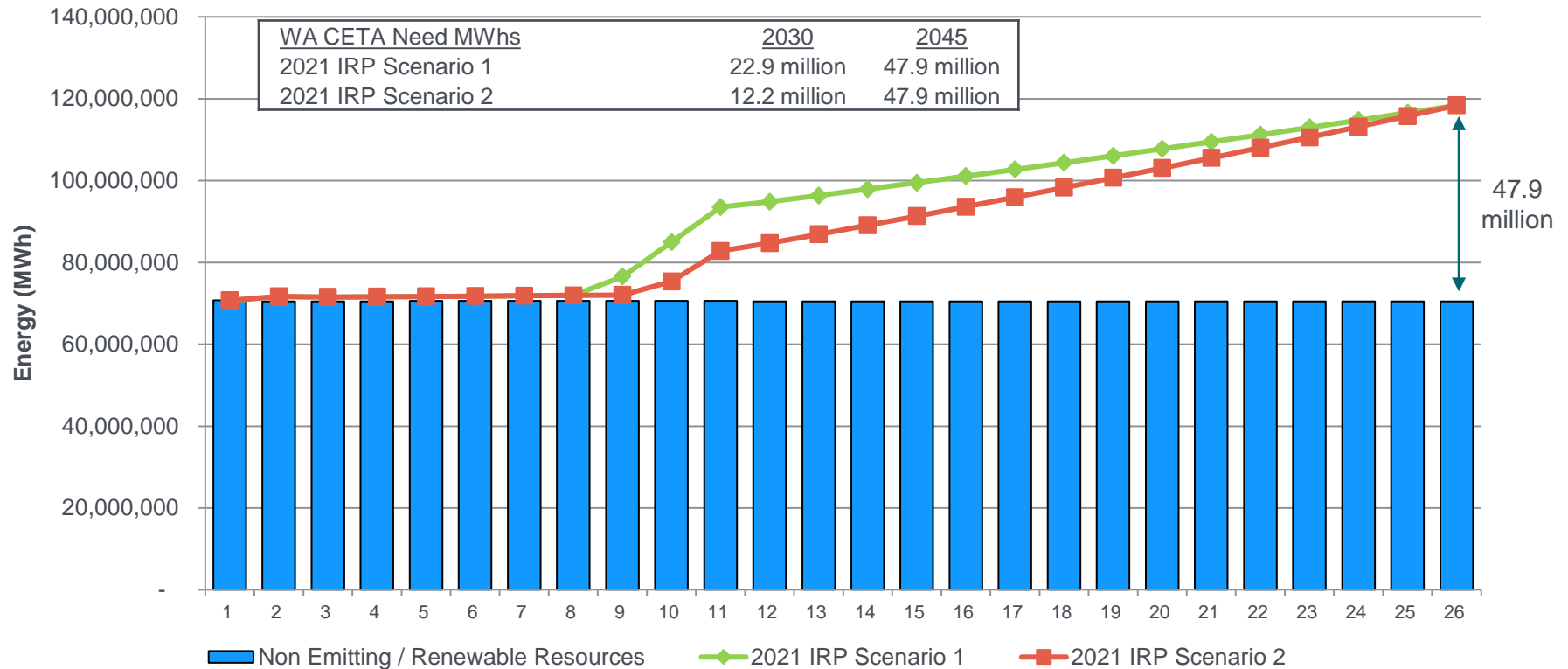
34

- With stakeholder input, the 2019 IRP Progress Report electric price forecast assumed that 90% of electric sales in Washington will be met by renewable resources by 2030.
  - This is a total of 22.9 Million MWh (approx. 8,700 MW) of new renewable resources added in Washington State by 2030.
- California SB100 requires 60% renewable or carbon free resources by 2030 and a *goal* to get to 100% by 2045.
  - The 2019 IRP assumed that California would reach the 100% goal with all renewable resources, but the law allows for other non-renewable carbon free resources.

	Washington	California
Clean Energy Implementation Scenario 1	22.9 million MWh by 2030 47.9 million MWh by 2045	103.1 million MWh by 2030 261.7 million MWh by 2045
Clean Energy Implementation Scenario 2	12.2 million MWh by 2030 47.9 million MWh by 2045	103.1 million MWh by 2030 195.8 million MWh by 2045

# Washington CETA renewable need

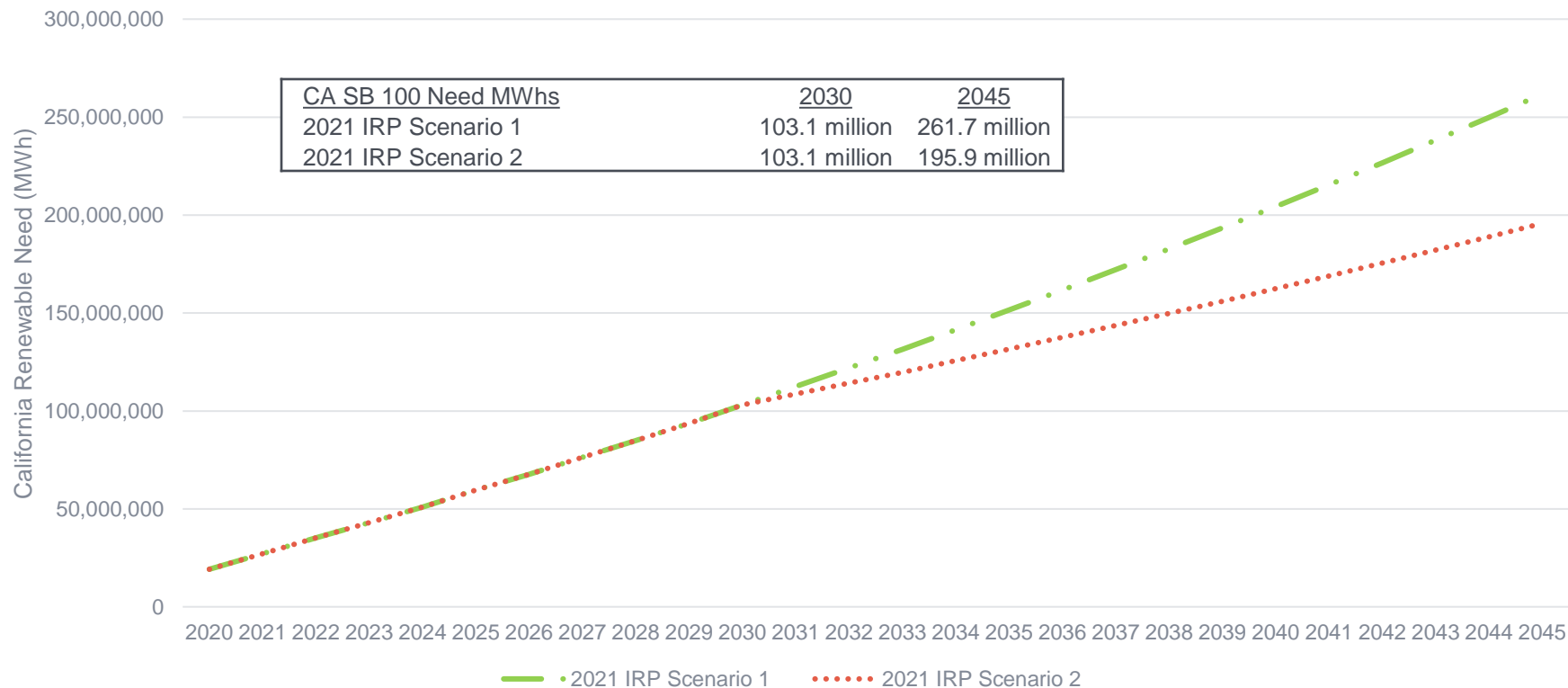
35



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# California SB 100 renewable need

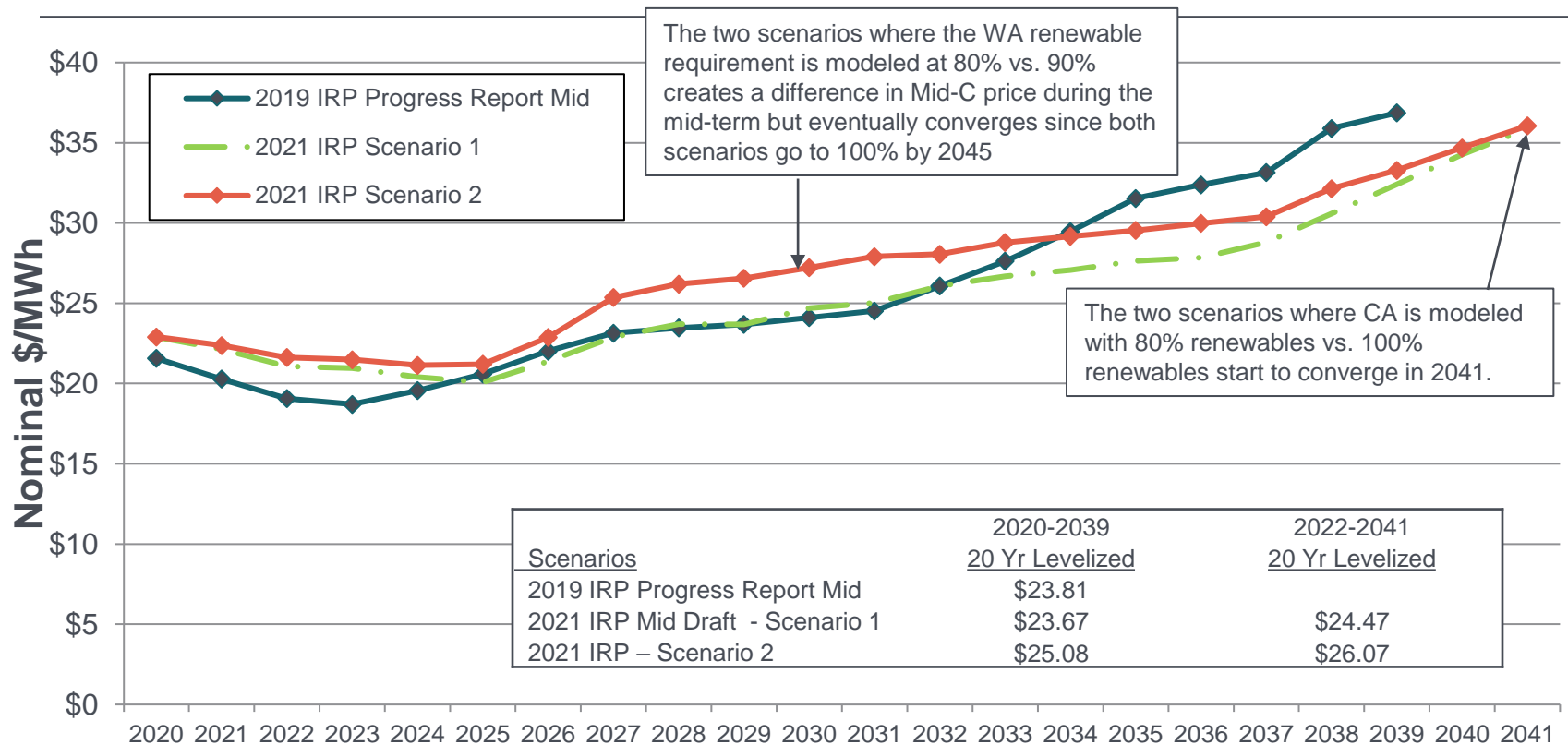
36



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# Clean Energy regulation sensitivities

37



PSE is looking for feedback on which clean energy implementation scenario to use for the electric price forecast

- Should we use the higher renewable resource shortfall in 2030 of 22.9 million MWh or the lower 12.1 million MWh for Washington?
  - Note: the MWh need is based on the mid demand forecast and will adjust with the low and high demand forecast.
- This assumption can be modeled as
  1. The same RPS/clean energy regulation assumption that will be used in all the electric price scenarios modeled, or
  2. Varied by electric price scenario

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## 2021 IRP electric price scenarios

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# What is an electric price scenario?

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Electric price scenarios are different sets of assumptions that create future electric market conditions.

- Gas prices, carbon regulation and regional loads create different wholesale electric prices, which affect the relative value of different resources.
- Wholesale electric price forecasts are developed using the AURORA model.
- This analysis models all major generators in the interconnected Western U.S., along with loads.



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# Electric price scenarios vs. portfolio sensitivities

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41

The purpose of a scenario is to create a 20-year electric price forecast.

The purpose of the sensitivity is to test different resources in PSE's portfolio.

Scenarios are about the market; sensitivities are about PSE's place in the market.

# 2021 IRP draft scenarios for electric price analysis

42

Scenario	Demand	Gas Price	CO <sub>2</sub> price/Regulation	RPS/Clean Energy Regulation
1. Mid	Mid	Mid	<b>CO<sub>2</sub> price:</b> CA AB32, and BC <b>CO<sub>2</sub> Regulation:</b> Social Cost of Carbon and upstream natural gas GHG in WA	WA CETA plus all other state regulations in the WECC
2. Low	Low	Low	<b>CO<sub>2</sub> price:</b> CA AB32, and BC <b>CO<sub>2</sub> Regulation:</b> Social Cost of Carbon and upstream natural gas GHG in WA	WA CETA plus all other state regulations in the WECC
3. High	High	High	<b>CO<sub>2</sub> price:</b> CA AB32, and BC <b>CO<sub>2</sub> Regulation:</b> Social Cost of Carbon and upstream natural gas GHG in WA	WA CETA plus all other state regulations in the WECC
4. No CETA	Mid	Mid	<b>CO<sub>2</sub> price:</b> CA AB32, and BC	WA 15% RPS plus all other state regulations in the WECC

PSE is looking for feedback on other electric price scenarios that vary

- Demand,
- Gas prices, or
- Clean energy implementation

Scenario	Demand	Gas Price	CO <sub>2</sub> price/Regulation	RPS/Clean Energy Regulation
5. Stakeholder scenario	?	?	<b>CO<sub>2</sub> price:</b> CA AB32, and BC <b>CO<sub>2</sub> Regulation:</b> Social Cost of Carbon and upstream natural gas GHG in WA	?

# 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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Share your feedback with PSE

May we post these comments to the IRP webpage?

☐ Yes  
☐ No

Please keep my comments anonymous ☐

First Name\*  Last Name\*

Organization

Email Address\*  Phone Number

Address  City

State  Zip Code

Select a State  Zip Code

Please select the topic you would like to provide feedback on: For general comments, please select "General" from the list.\*

Select a topic

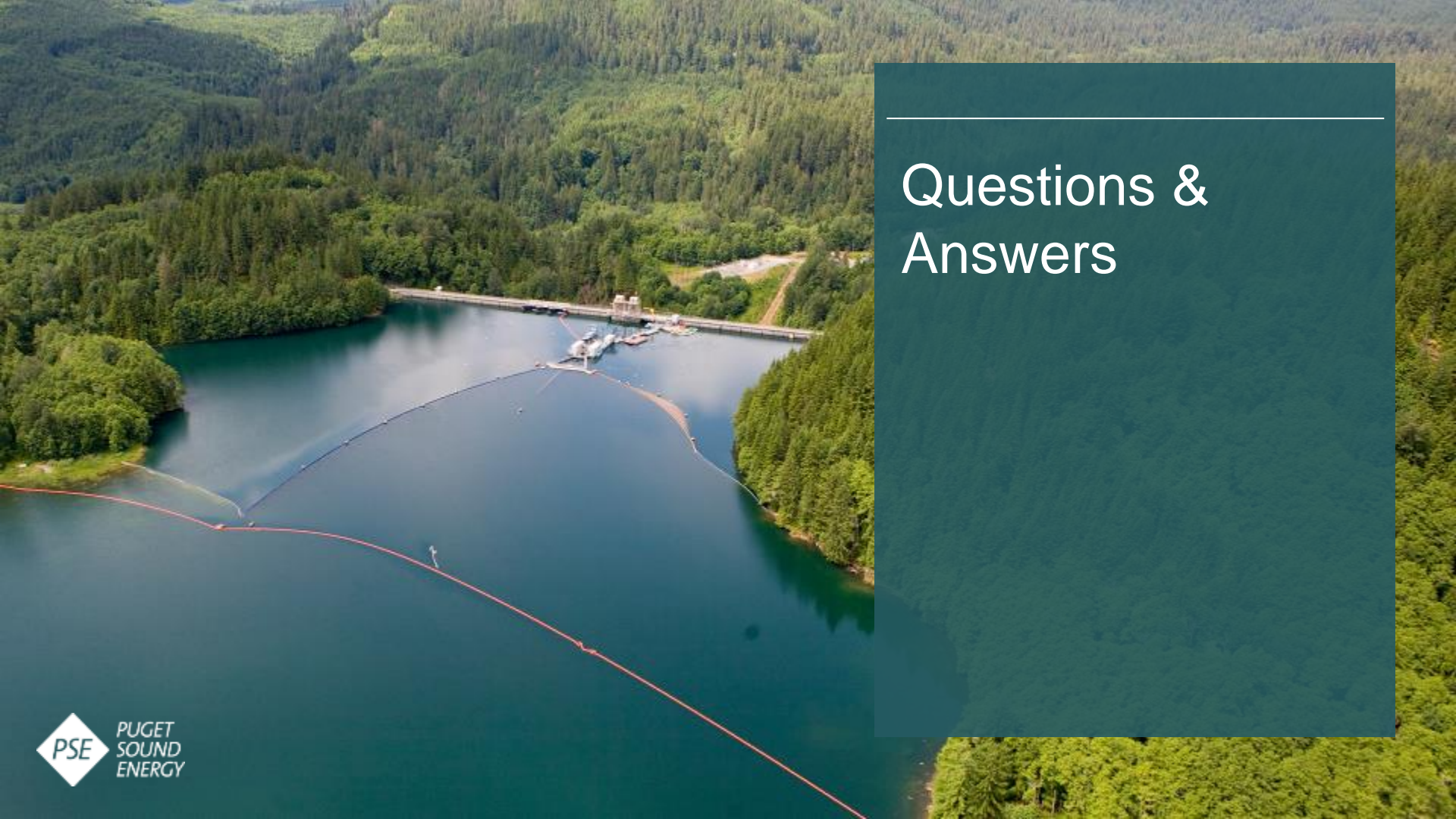
Respondent Comment\*

Attach a file

Choose File no file chosen

Recommendations

Submit



# Questions & Answers

# Next steps

46

- Submit Feedback Form to PSE by **June 17, 2020**
- A recording and the chat from today's webinar will be posted to the website **tomorrow**
- The Feedback Report from the Generic Resource Assumptions webinar will also be posted **tomorrow**.
- PSE will compile all the feedback in the Feedback Report and post all the questions by **June 24**
- By **July 1**, PSE will make a decision on what costs to use. The documentation for the decision made will be released in a Consultation Update that will be posted to the website



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# Upcoming meetings

47


- Stakeholders can register for upcoming meetings on the [website](#)
- Agendas and meeting materials will be posted one week prior to each meeting
- Meetings will be added as the IRP technical work progresses

Date	Topic
June 30, 1:30 pm – 3:30 pm	Transmission Constraints
July 14, 1:30 pm – 4:30 pm	Demand Side Resources
July 21, 1:30 pm – 4:30 pm	Social Cost of Carbon
August 11, 9:30 am – 12:30 pm	Develop Portfolio Sensitivities



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Thank you for your attention  
and input.

Please complete  
your Feedback Form by June  
17, 2020

We look forward to your  
attendance at PSE's next  
public participation webinar:  
Transmission Constraints  
June 30, 2020

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