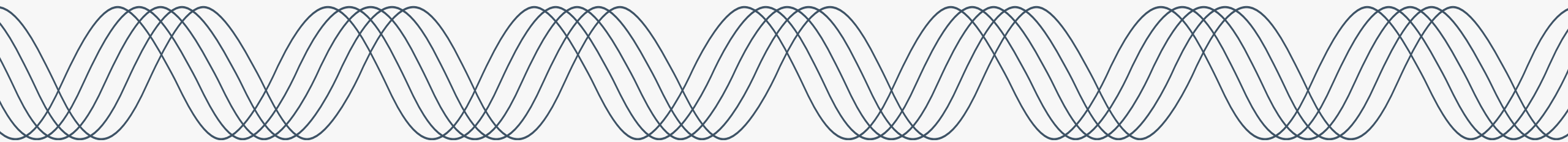




PGE CEP & IRP Roundtable 24-6

October 2nd 2024



October 2nd, 2024 – Agenda

9:00 – 9:05	Welcome Meeting Logistics
9:05 – 9:35	RFP Proxy
9:35 – 10:10	DER Update
10:10 – 10:30	Transmission Step 1: Existing Capacity
10:30 – 11:05	Transmission Step 2: Future Capacity
11:05 – 11:25	Modified Price Forecast
11:25 – 11:30	Closing Remarks Next Steps

Meeting Details



Electronic version of presentation

<https://portlandgeneral.com/about/who-we-are/resource-planning/combined-cep-and-irp/combined-cep-irp-public-meetings>



Zoom meeting details

- Join Zoom Meeting
<https://us06web.zoom.us/j/9291862450?pwd=xVXQl4jljt7FdetDzWD0G35FFvayF8.1&omn=84372774388>
- Meeting ID: 929 186 2459
- Passcode: 108198



Participation

- Please rename yourself indicating the organization you represent if applicable.
- Use the raise the hand feature to let us know you have a question
- Unmute with microphone icon or *6

Meeting Logistics



Focus on Learning & Understanding

- There will be no chat feature during the meeting to streamline taking feedback
- Team members will take clarifying questions during the presentation, substantive questions will be saved for the end (time permitting)
- Attendees are encouraged to 'raise' their hand to ask questions

Follow Up

If we don't have time to cover all questions, we will rely on the CEP/IRP feedback form



RFP Proxy

Rob Campbell, PGE

Purpose of RFP Proxy

The RFP (Request for Proposal) proxy is a placeholder in PGE's modeled baseline portfolio for resources that are expected to be acquired through the ongoing RFP.

Because negotiations for project acquisition are ongoing, the actual resources that will become part of PGE's portfolio are unknown.

Based on the resources on the RFP final shortlist, the RFP proxy is an informed estimate about the quantity of resources that will be acquired.

The RFP proxy represents the energy and capacity benefits contributed to PGE's portfolio by the expected resources so they can be accounted for in calculation of energy and capacity needs.

Proxy resources in the RFP proxy are replaced by the characteristics of actual projects when certainty of acquisition is achieved.

RFP Proxy in the 2023 CEP/IRP



Initial Modeling

- Proxy wind 400 MW
- Proxy solar/hybrid 400 MW

Filed CEP/IRP

- Clearwater wind 311 MW
- Proxy solar 410 MW
- Proxy 4hr battery 400 MW

CEP/IRP Addendum

- Clearwater wind 311 MW
- Seaside battery 200 MW
- Troutdale battery 75 MW
- Evergreen battery 200 MW

The RFP proxy was updated throughout the 2023 CEP/IRP process, replacing the proxy with details about the actual projects as new information became available.

The evolution in resource mix of the RFP proxy in the 2023 CEP/IRP illustrates the uncertainty inherent in commercial negotiations for resource acquisition.

Updating of the RFP proxy can lead to changes in estimates of energy need and resource ELCCs, the calculation of which are dependent on resource mix.

RFP Proxy in the IRP Update

The 2023 RFP final shortlist contains four projects:

- 250 MW solar & 250 MW battery
- 41 MW solar
- 400 MW battery
- 125 MW solar and 125 MW battery

To represent the energy and capacity provided by the projects on the final shortlist, the current RFP proxy consists of:

- Proxy solar/battery hybrid 375 MW
- Proxy standalone solar 41 MW
- Proxy standalone battery 400 MW

Resources in the RFP proxy will be replaced with details about actual projects as contracts are signed.

If commercial negotiations proceed quickly, we may replace the whole RFP proxy with actual projects in our models for the IRP Update.

However, if necessary, based on timing of execution, some or all projects will be represented by the RFP proxy in modeling.



DER Update

Seth Wiggins, PGE

Fred Schaefer, Cadeo

PGE's 2023 CEP/IRP uses two forecasts of Distributed Energy Resources (DERs)

Both come from PGE's Distribution System Planning team

1. Cost-effective DERs: Quantities of DERs that are projected to be added (and that PGE should plan for)
 - *Given the current economics, what will customers procure?*
2. Additional DERs: Quantities of DERs that could be acquired (that PGE should evaluate)
 - *Given the current economics of supply-side resources included in portfolio modeling would it make sense for PGE to procure more?*

The 2023 CEP/IRP used DER forecasts from 2022 DSP II (created in March 2022) and were updated for the 2023 CEP/IRP Addendum (created June 2023)

Today Cadeo will describe their updated forecast.



Updates for August 2024 Forecast

2024 Q3 Forecast Vintage Updates



Current DER "stock" from PGE Systems of Record

- Solar PV and Storage
- Transport Electrification (TE): DMV data mapped to PGE service points

Adoption Curves

- TE: expected impacts of Advanced Clean Cars II and Advanced Clean Truck mandates, known fleet electrification plans
- Building Electrification (BE): expected impact of Inflation Reduction Act legislation
- Solar PV: incorporate available federal and local policy support, future panel price trends

Hourly Load Impact

- BE: Residential 8760 shapes from ResStock 2024.2 Release

Program Costs

- Refreshed selected PGE customer program costs

Avoided Costs

- Generation and distribution capacity from UM 1893
- Flexibility capacity are from 2023 IRP (using average of values for years 2026-2030)



DER Forecasting Approach

AdopDER is our DER Forecasting Software

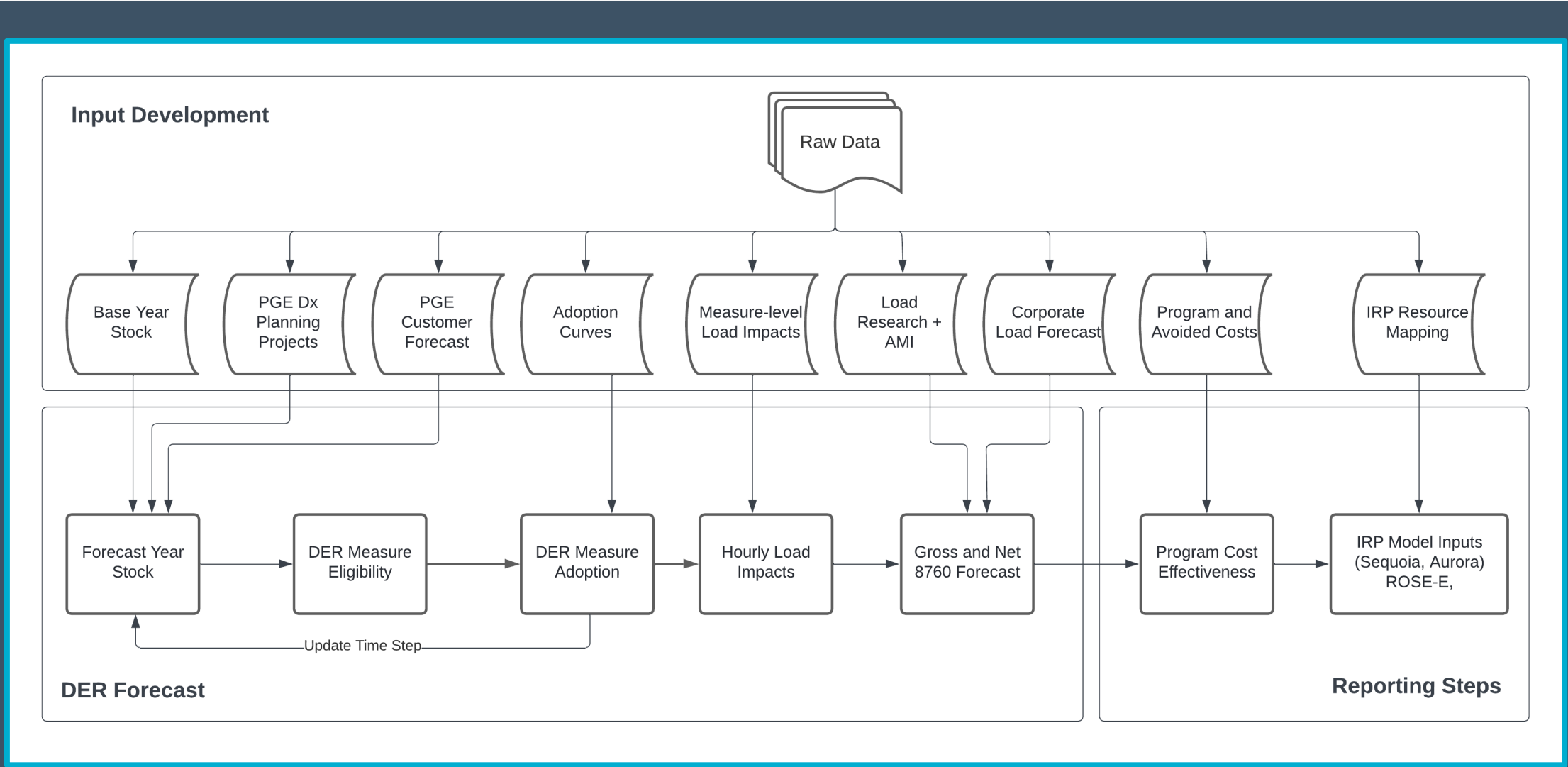
Consistent forecasting process from 2021 to present

- Distribution Resource Planning group owns process at PGE
- Service-territory DER potential estimate
- Feeder-level load forecast, net of DER adoption (2022)
- Service-point level load forecast for Dx Planning (2024)

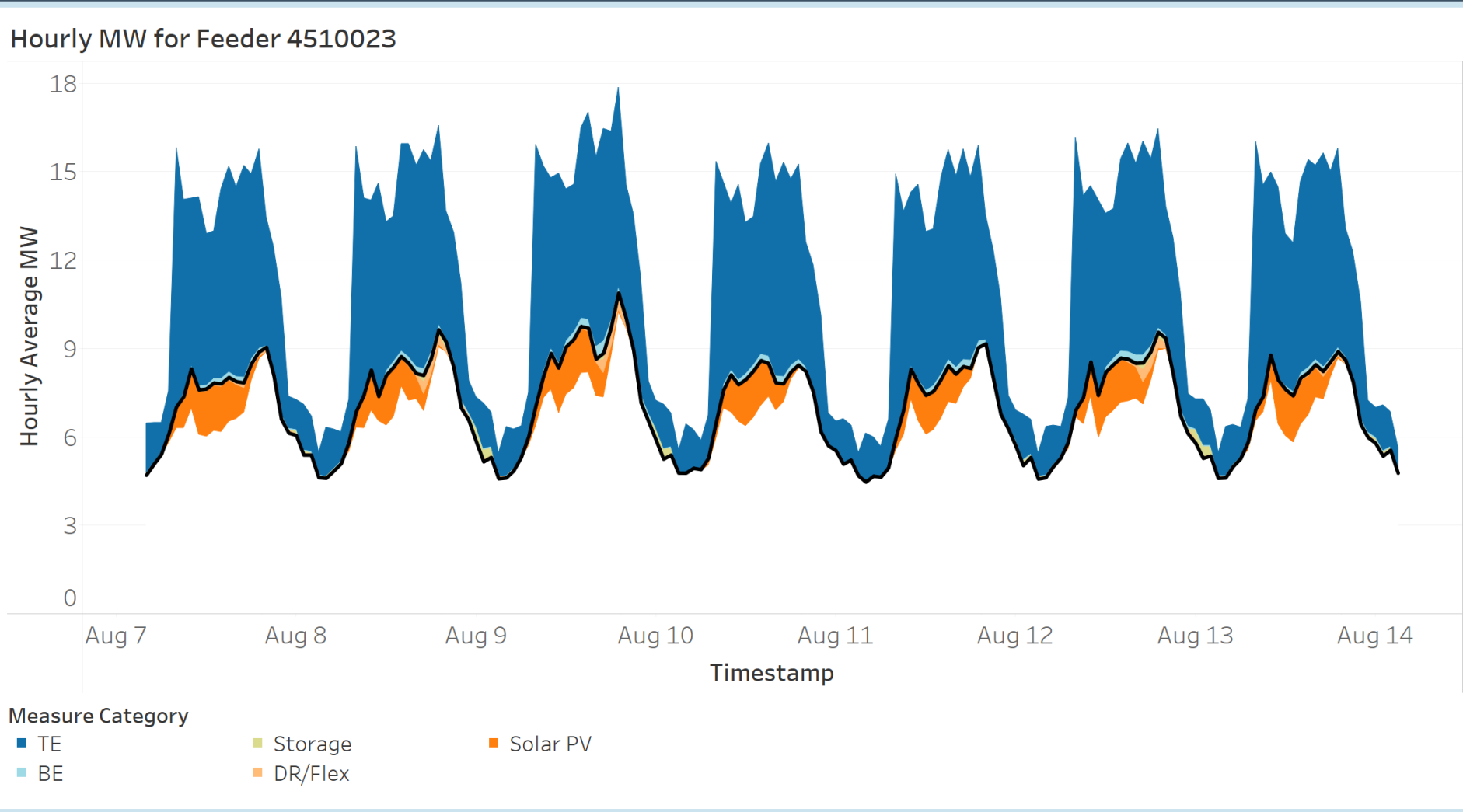
Broad definition of DERs:

BTM Solar PV	Building Electrification	DLC
BTM Storage	Electric Vehicles	Time-of-Use
Microgrids	EVSE	Curtailement

AdopDER Forecasting Framework



Illustrative 8760 Forecast from AdopDER



We consider multiple forecast scenarios, each with many assumptions

Reference Case

- “Most likely” outcome.
- Based on known policies, adoption trends, and/or moderate technology costs.

Low Adoption

- A lower bound alternative scenario.
- Based on less aggressive policies, adoption trends, and/or higher technology costs.

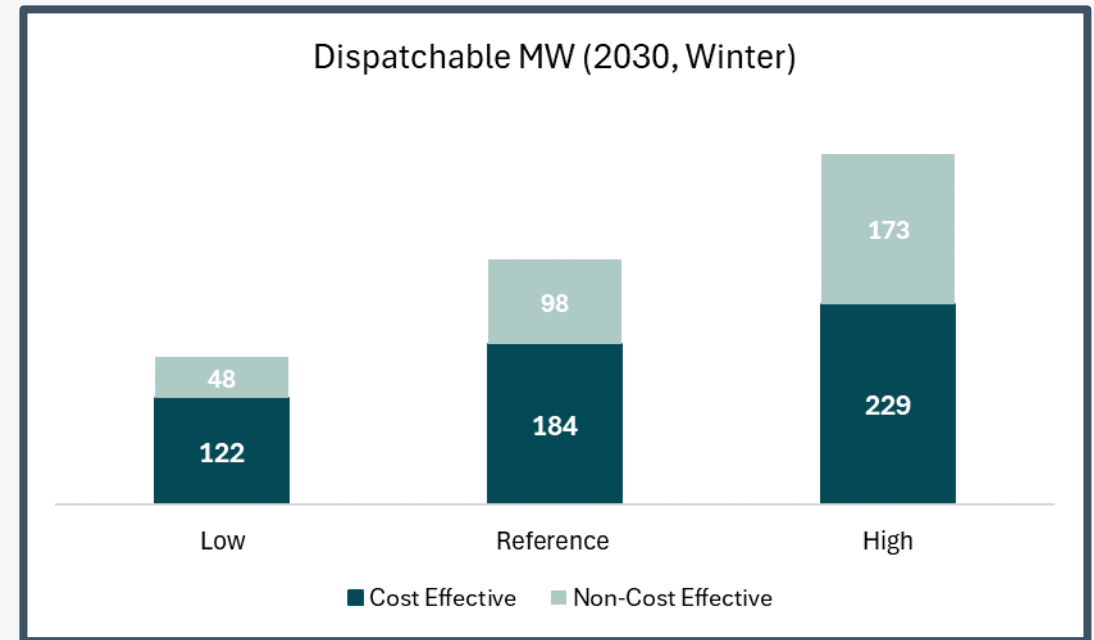
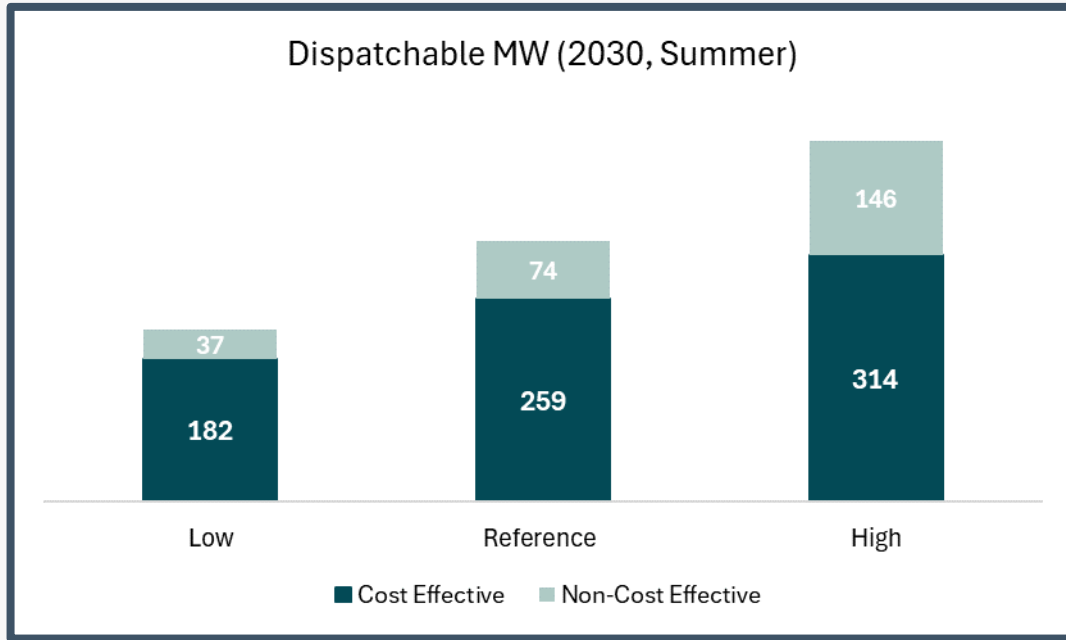
High Adoption

- An upper bound alternative scenario.
- Based on more aggressive policies, adoption trends, and/or lower technology costs.



High-level Forecast Results

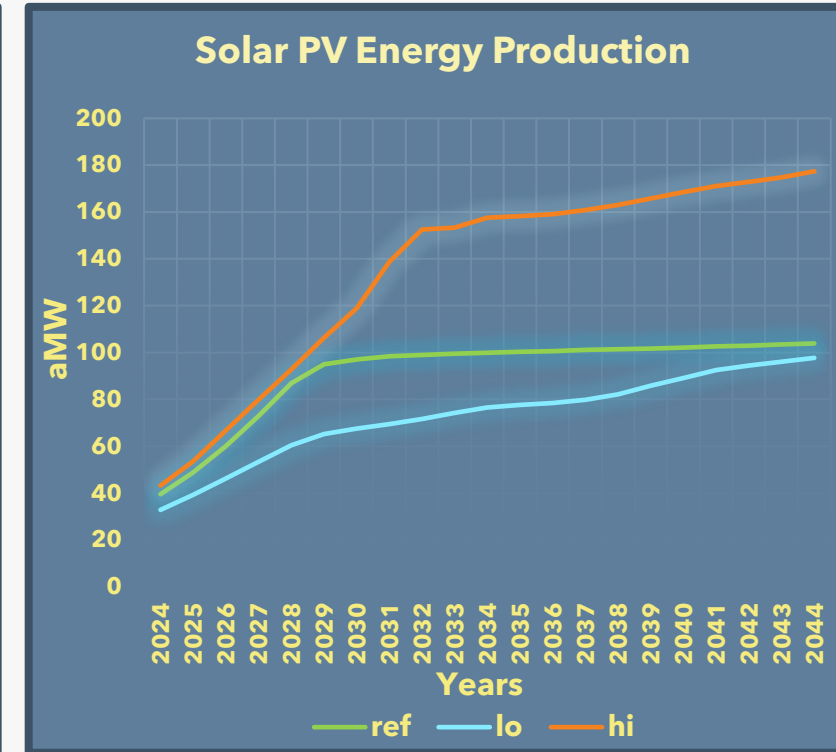
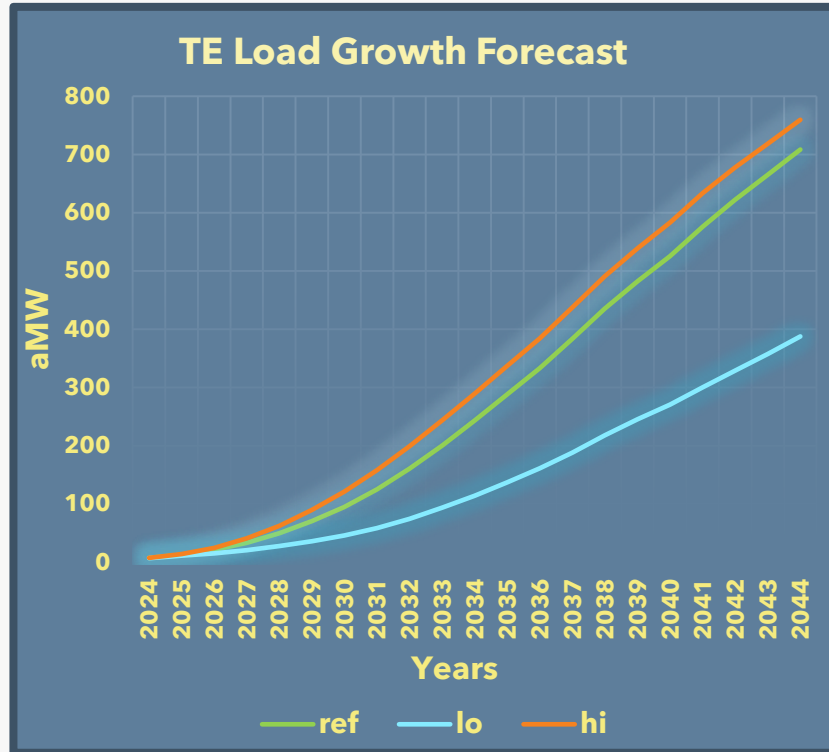
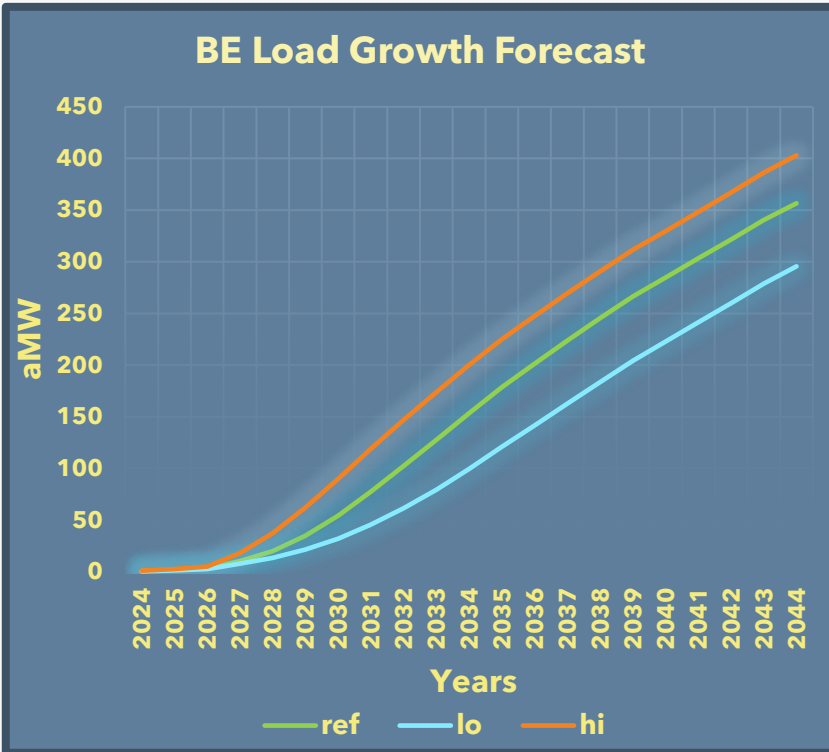
Dispatchable MW by Scenario



Includes current and possible PGE customer programs: curtailment, DLC (Thermostat, WH, and EVSE), flexible loads, utility-controlled storage, building electrification

DLC: Direct Load Control
WH: Water Heater
EVSE: Electric Vehicle Supply Equipment

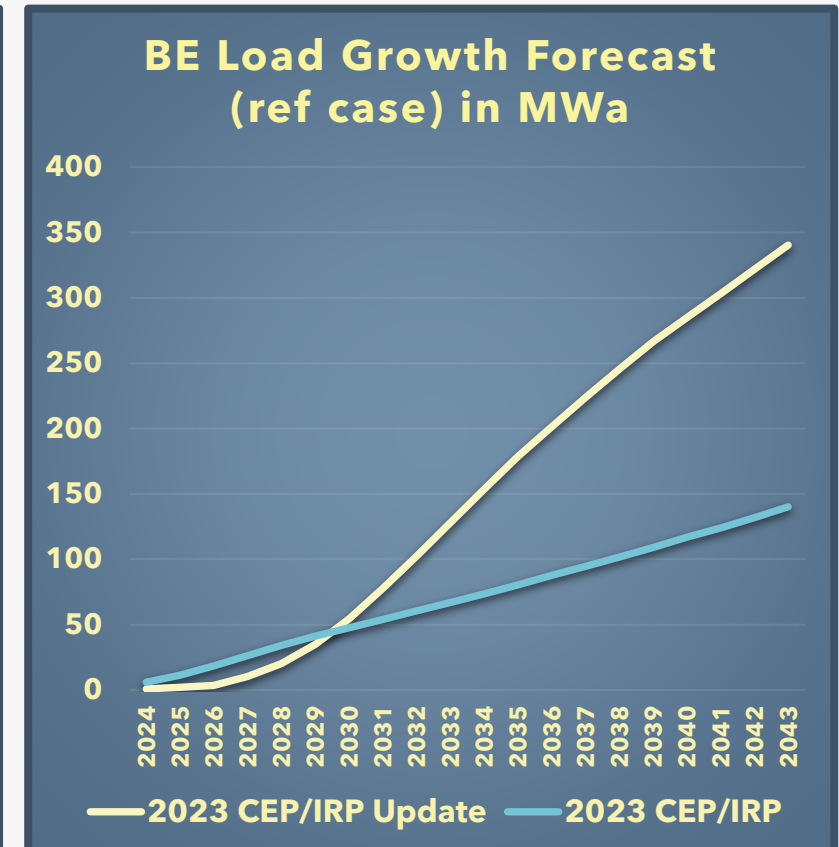
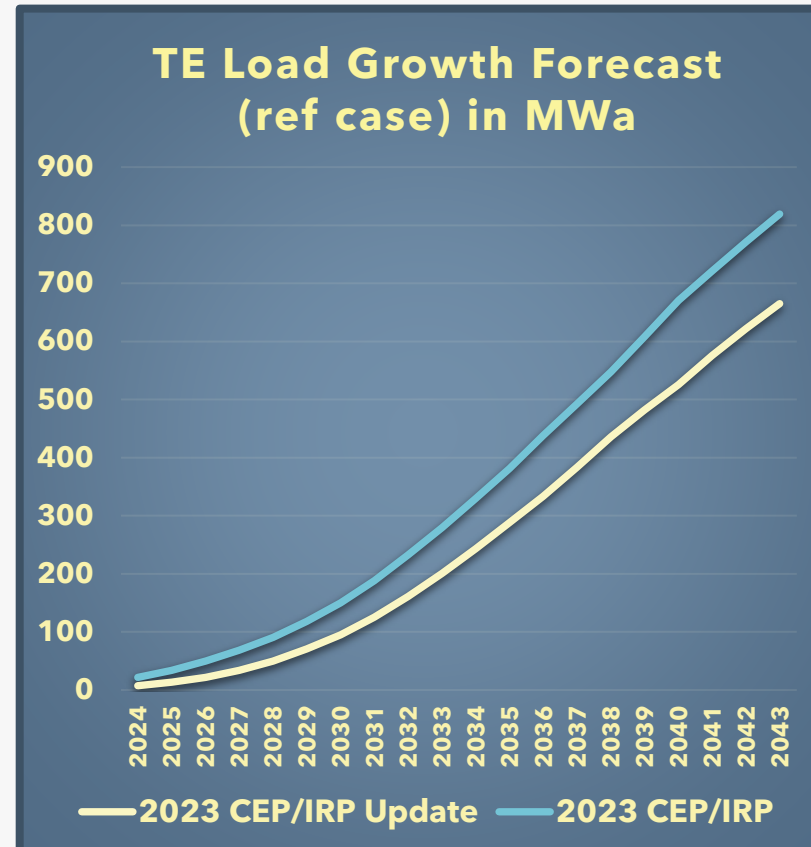
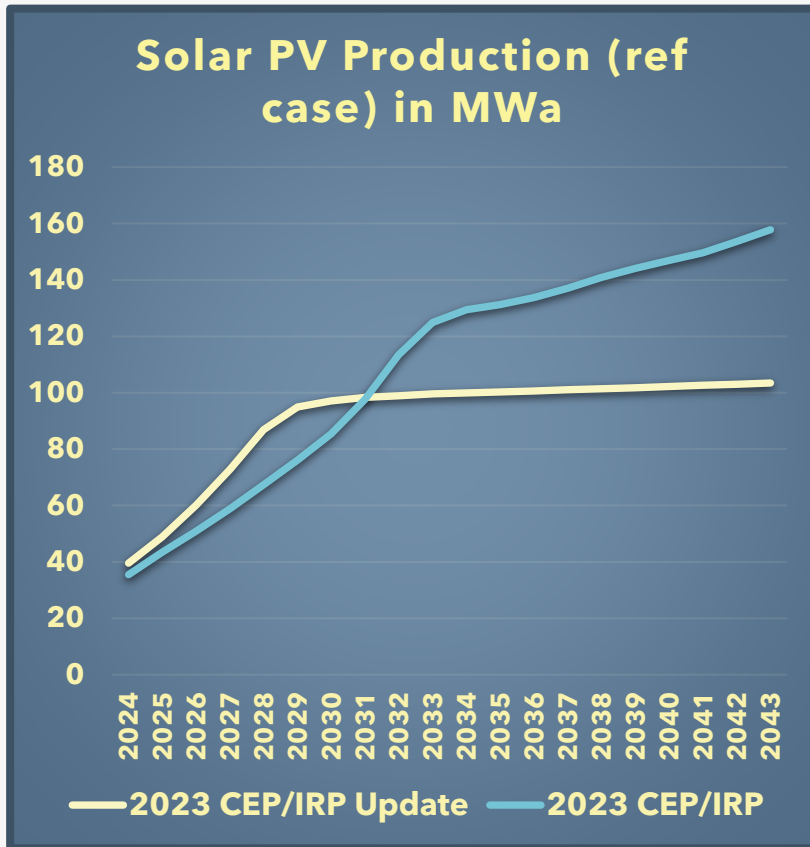
Annual Load Impacts by Scenario



These annual load impacts modify the annual load forecast that IRP models use.

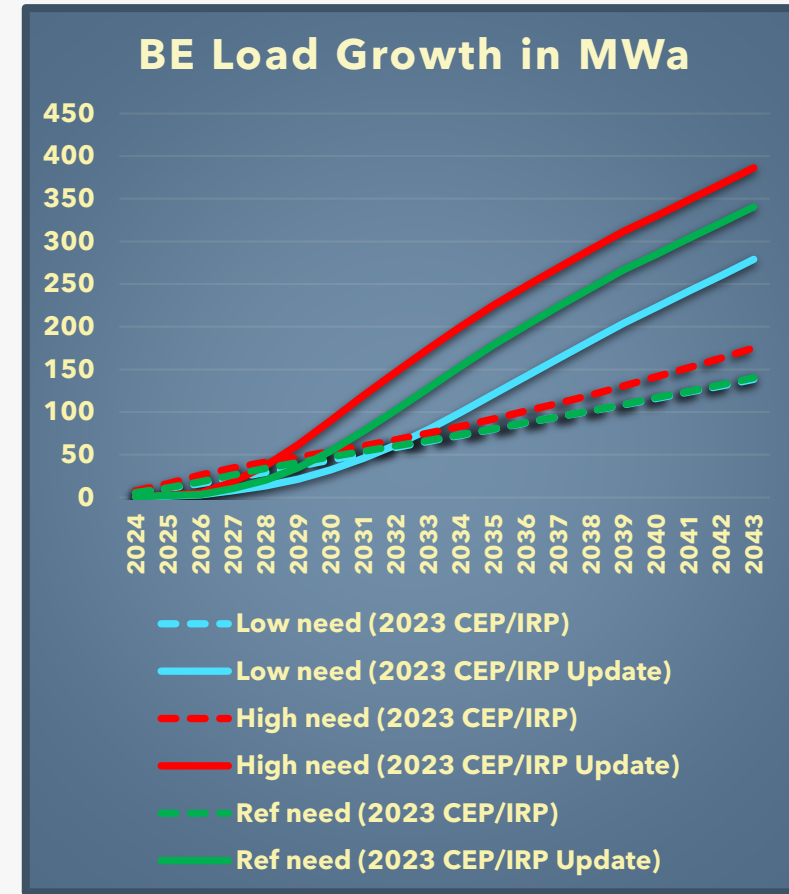
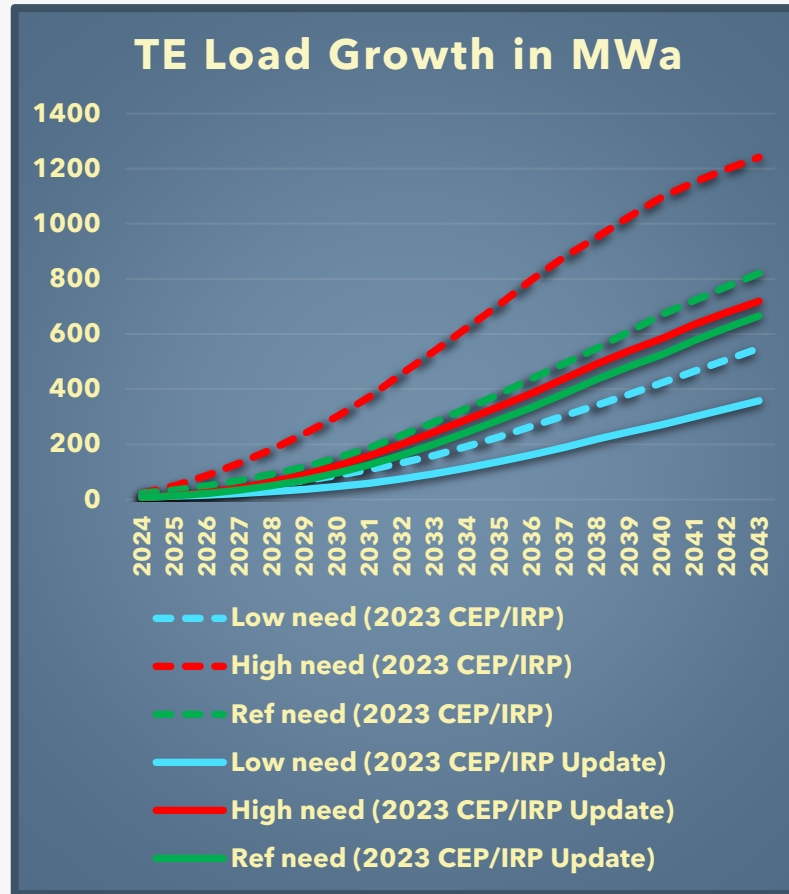
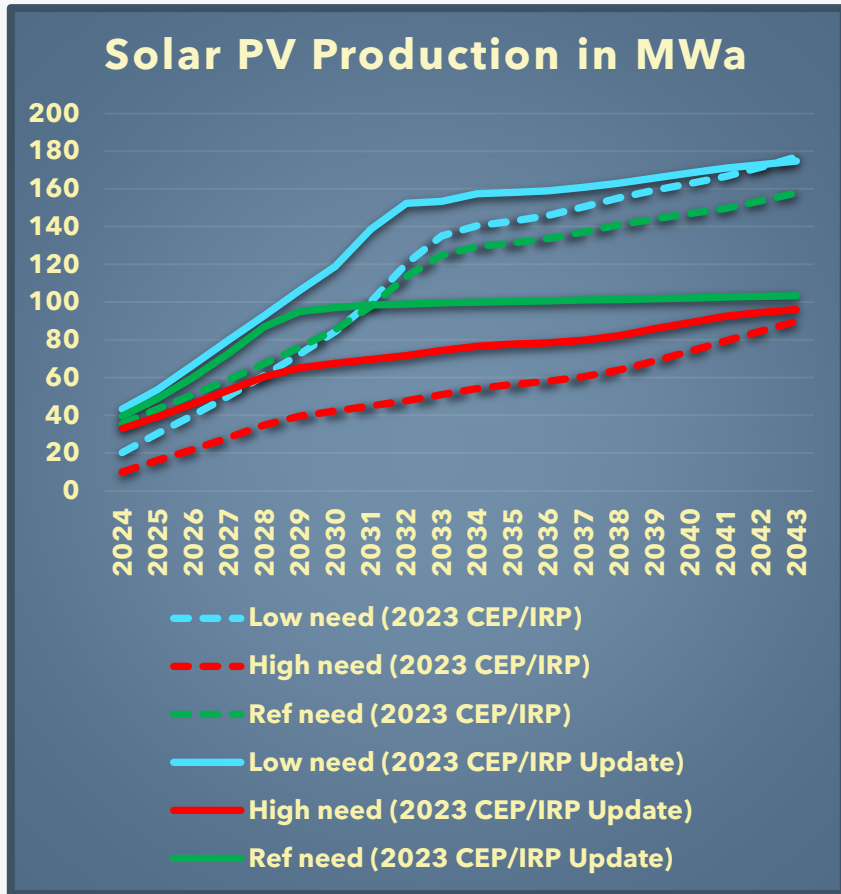
BE: Building Electrification
TE: Transportation Electrification

Comparison of 'ref' Forecasts Between 2023 CEP/IRP and 2023 CEP/IRP Update



BE: building electrification
TE: transportation electrification

Comparison of Forecasts Between 2023 CEP/IRP and 2023 CEP/IRP Update



BE: building electrification
TE: transportation electrification

A decorative pattern of white, overlapping sine waves runs horizontally across the top of the dark blue background.

Transmission | Step 1 : Existing Capacity

Laura Green, PGE

Seth Wiggins, PGE

2023 CEP/IRP Update Transmission Modeling

PGE's geography necessitates an analysis with three components:

1. A characterization of the existing transmission system

- How much transmission capacity is available to PGE today?

2. A characterization of the future transmission system

- How much transmission capacity will be available to PGE when expected upgrades are made?

3. A description of actions PGE can take to increase transmission capacity (September 2024 Roundtable)

- What can PGE do to bring more transmission capacity?

2023 CEP/IRP Update Transmission Modeling



PGE's geography necessitated an analysis requiring three components:

A characterization of the existing transmission system [Discussed here]

- How much transmission capacity is available to PGE today?

In the 2023 CEP/IRP, PGE extrapolated from Transmission Service Requests (TSRs) in BPA's previous four TSR Study and Expansion Process (TSEPs) to estimate this transmission capacity in each resource zone

We are following that method and presenting updated results here

Table 129 from the 2023 CEP/IRP:

Resource Zone	LTF	CF	Total
Christmas Valley	490	510	1000
Gorge	190	388	578
McMinnville	10	0	10
Montana	0	0	0
Offshore	0	80	80
SE Washington	0	150	150
Total	690	1128	1818

July Roundtable:



IRP Zone	Long Term Firm	Conditional Firm	Total
Christmas Valley	3	*	
Gorge	875	*	
McMinnville	80	*	
Montana	250	*	
Offshore	80	*	
Southeast Washington	0	*	
Wasco	76	*	
Total	1394	1360	2754

*NewPoint TSRs are under study and masked. Therefore, IRP Zones are not available

Updated Existing Transmission Forecast



IRP Zone	Long Term Firm	Conditional Firm	Total
Christmas Valley	3 201	* 466	667
Gorge	875 55	* 129	184
McMinnville	80 45	* 105	150
Montana	250 96	* 224	320
Offshore	80 201	* 467	668
Southeast Washington	0 31	* 73	104
Wasco	76 124	* 289	413
Total	1394 753	1360 1753	2754 2506

*NewPoint TSRs are under study and masked. Therefore, IRP Zones are not available

Methodological Change for Existing Transmission Forecast

July Methodology

- Queried TSRs in OASIS with a status of Received, Study and Confirm.
- Request type: Originals and Redirects.
- Start date: 8/20/2022 (close of the 2023 Cluster Study window) - 8/15/2024 close of the 2025 Cluster Study window.
- LTF PTP TSRs in a study status and requesting NewPoint with a POD of BPAT.PGE (resource sink zone information not available)

Update Methodology

- Analyzed BPA's LTF queue data from 2016-2023.
- 2016-2023 LTF Queue: Used the 2019-2023 Cluster Study data¹ to determine resource zones (POR/POD) and MW amounts.
- 2019-2023 TSEPs/EG: Used Evolving Grid 2019-2023 Cluster Study data to determine LTF and CF amounts. CF 70% awarded; LTF 30% awarded.

LTF: long term firm
CF: conditional firm
OASIS: open access same time information system
POD: point of delivery
PTP: point to point
TSR: transmission service request

¹From BPA's Evolving Grid Presentation, May 16, 2024

A decorative wave pattern consisting of multiple overlapping white lines on a dark blue background, spanning the width of the slide.

Transmission | Step 2: Future Capacity

Laura Green, PGE

Seth Wiggins, PGE

2023 CEP/IRP Update Transmission Modeling

PGE's geography necessitates an analysis with three components:

1. A characterization of the existing transmission system

- How much transmission capacity is available to PGE today?

2. A characterization of the future transmission system

- How much transmission capacity will be available to PGE when expected upgrades are made?

3. A description of actions PGE can take to increase transmission capacity

- What can PGE do to bring more transmission capacity?

2023 CEP/IRP Update Transmission Modeling



PGE's geography necessitated an analysis requiring three components:

A characterization of the future transmission system

- How much transmission capacity will be available to PGE when expected upgrades are made?

In the 2023 CEP/IRP, once transmission capacity inventories were exhausted ROSE-E only had access to transmission expansion options (e.g., NV WY, SOA resources)

This assumed that no additional transmission capacity would become available

No Comparable Input in 2023 CEP/IRP

Forecasted Impact of Evolving Grid

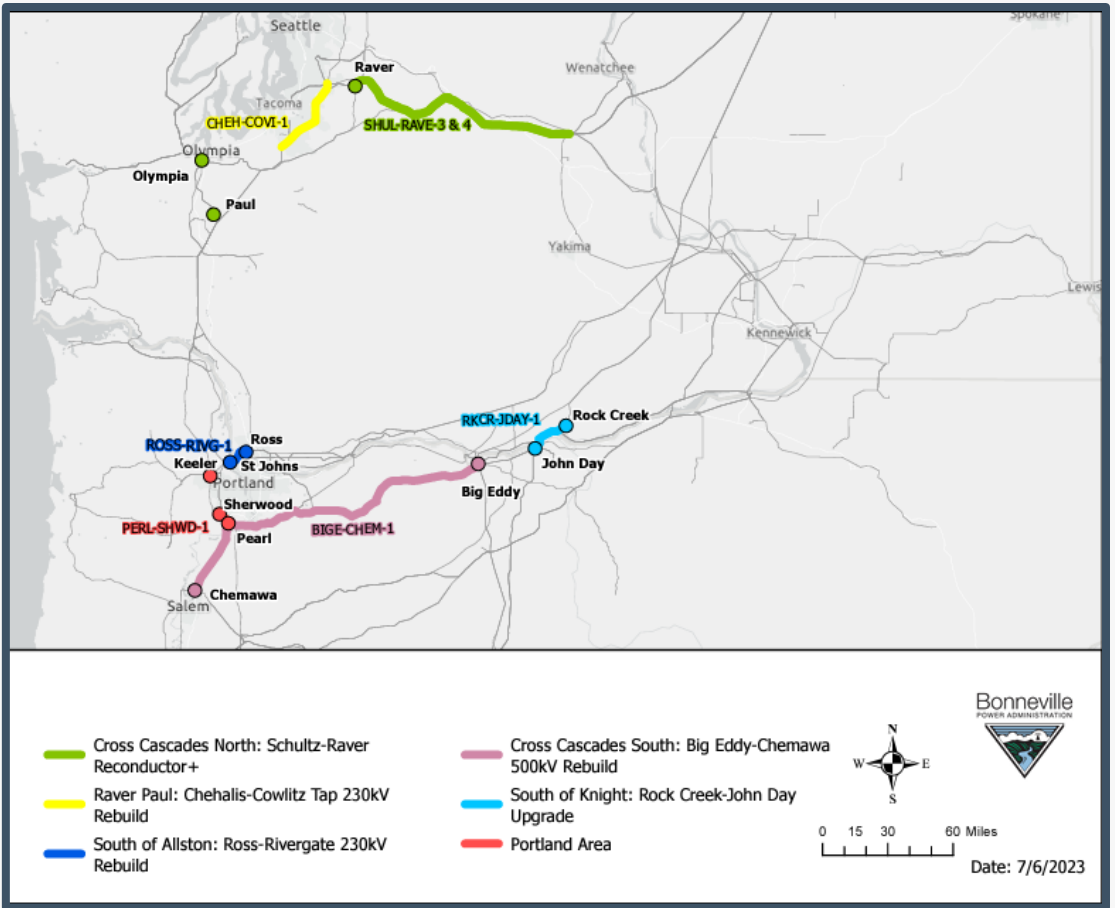
In July 2023, BPA announced their intent to construct a collection of transmission infrastructure referred to as BPA's 'Evolving Grid' projects. Together these projects were forecasted to cost over \$2 Billion.

BPA has hosted three workshops regarding these infrastructure plans and the next update is anticipated in Q4 2024.

PGE's 2023 CEP/IRP Update will assume that these projects announced by BPA are successfully constructed and allocated as network assets due to their status as 'Regionally Needed Projects.'

The current list of projects include:

- Schultz-Raver Reconductor
- Bid Eddy-Chemawa 500kV Rebuild
- Covington-Chehalis 230kV Rebuild
- Ross-Rivergate 230kV Rebuild
- Rock Creek-John Day
- Pearl-Sherwood-McLoughlin



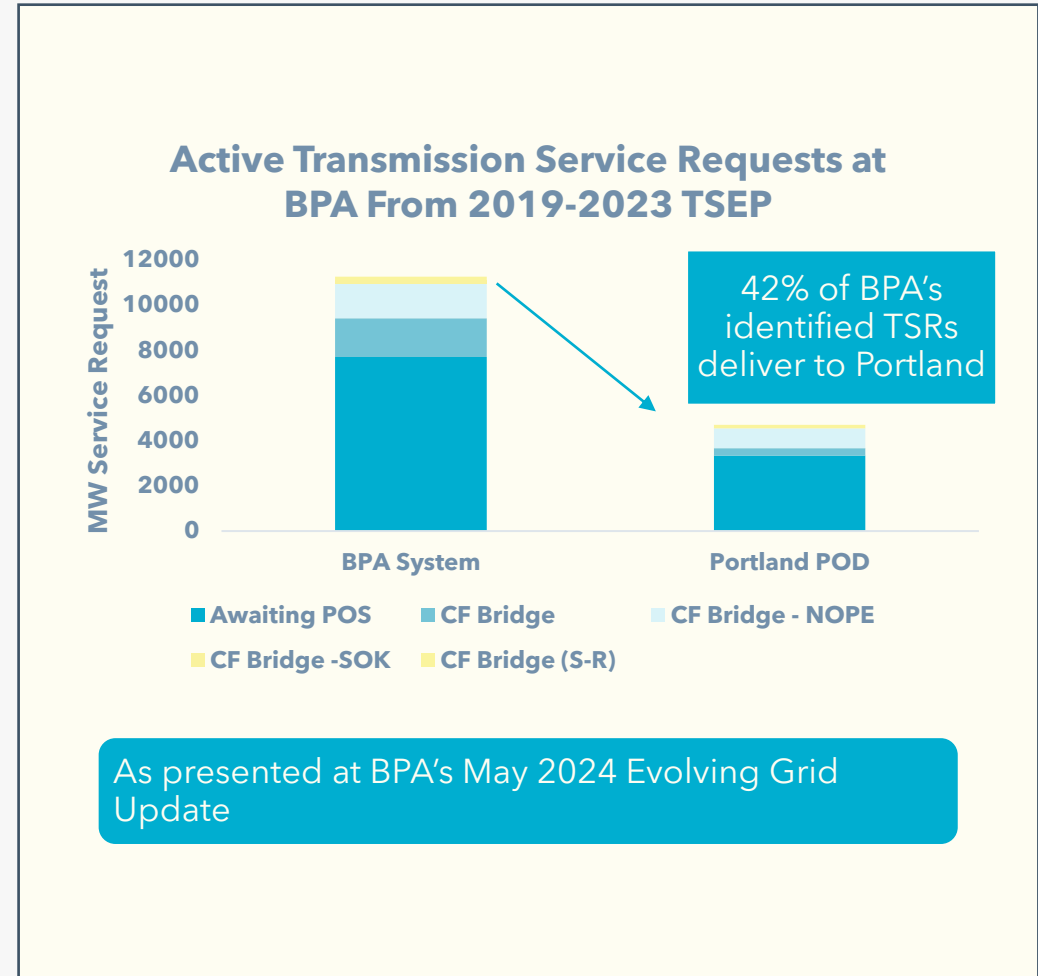
Forecasted Impact of Evolving Grid Cont.

In April 2023, BPA communicated that upon completion of all Evolving Grid projects, 4260 MW of additional transmission service will be enabled.

Using publicly available information, PGE estimates that 42% (1779 MW) of that enabled service will allow for firm transmission service delivered to the Portland area.

Projects are currently forecasted to be complete in 2032. Upon completion, 1753 MW conditional firm bridge transmission will convert to long term firm service. An additional 26 MW of long-term firm transmission service is forecasted by PGE to be marketed upon completion of identified Evolving Grid Projects.

PGE will monitor ongoing Evolving Grid updates to consider incorporating updated information.



Incremental Transmission Service as of Jan 2033



Incremental Transmission Service as of Jan 2033			
IRP Zone	Long Term Firm	Conditional Firm	Total
Christmas Valley	7		7
Gorge	2		2
McMinnville	2		2
Montana	3		3
Offshore	7		7
Southeast Washington	1		1
Wasco	4		4
Total	26		26

Conditional-firm upgrades



IRP Zone	Conditional Firm in 2025
Christmas Valley	466
Gorge	129
McMinnville	105
Montana	224
Offshore	467
Southeast Washington	73
Wasco	289
Total	1753



IRP Zone	Long Term Firm in 2033
Christmas Valley	466
Gorge	129
McMinnville	105
Montana	224
Offshore	467
Southeast Washington	73
Wasco	289
Total	1753

Total 2033 Transmission Capacity



IRP Zone	Identified Transmission Service As of Jan 2033		
	Long Term Firm	Conditional Firm	Total
Christmas Valley	674	-	674
Gorge	186	-	186
McMinnville	152	-	152
Montana	323	-	323
Offshore	675	-	675
Southeast Washington	105	-	105
Wasco	417	-	417
Total	2532	-	2532

A decorative wave pattern consisting of multiple overlapping, light-colored sine waves spans the top of the dark blue header area.

Updated Price Forecasts

New Methodology for 2023 CEP/IRP Update

Chris White, PGE

2023 CEP/IRP Price Forecast

PGE benefitted from extensive discussions on our electricity price forecasts with stakeholders in several CEP/IRP Roundtables¹. These discussions identified the following risk drivers to be considered in the IRP forecasts:

- **Gas prices** and hydro conditions
- Cost of compliance with potential carbon policy/policies
- Uncertainty in net load
- Scarcity of committed dispatchable resources

***Updated between 2023 CEP/IRP and 2023 CEP/IRP Update**

****Unchanged between 2023 CEP/IRP and 2023 CEP/IRP Update**

1 February 2021, May 2021, November 2021, April 2022

2023 CEP/IRP Price Forecast

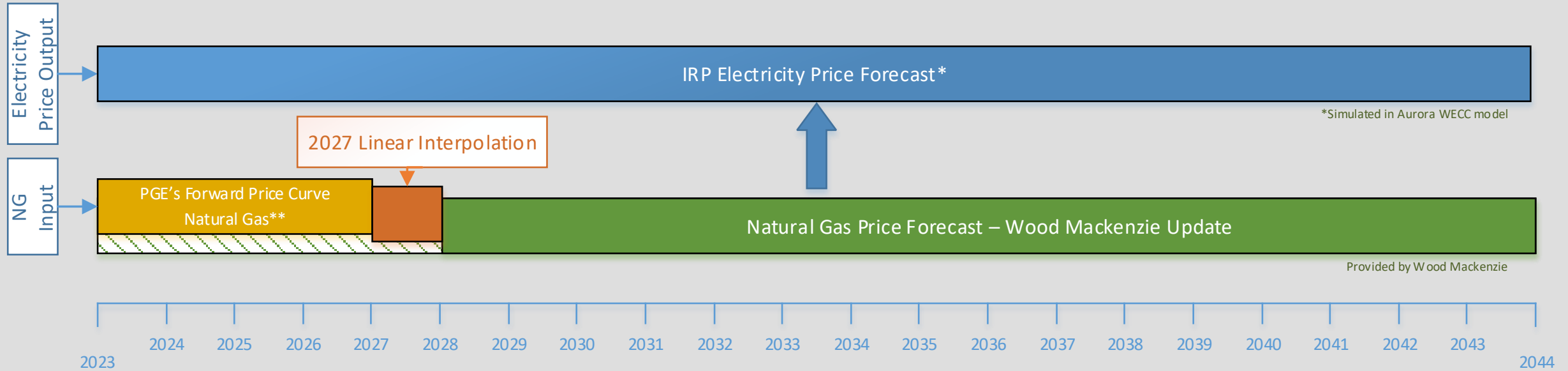
PGE relies on the expertise of a power research consultancy, Wood Mackenzie (WM):

- To project the Western Electricity Coordinating Council (WECC) resource buildout and development, and its impact on electricity prices.
- To incorporate WM's natural gas price forecasts into its long-term **electricity price** forecasts.

2023 CEP/IRP: Uses WM's long-term reference gas price forecast from **June 2022**

2023 CEP/IRP Update: Uses WM's long-term reference gas price forecast from **December 2023**

2023 CEP/IRP Price Forecast



*Simulated in Aurora WECC model

Provided by Wood Mackenzie

**Generated Internally

2023 CEP/IRP UPDATED Price Forecast



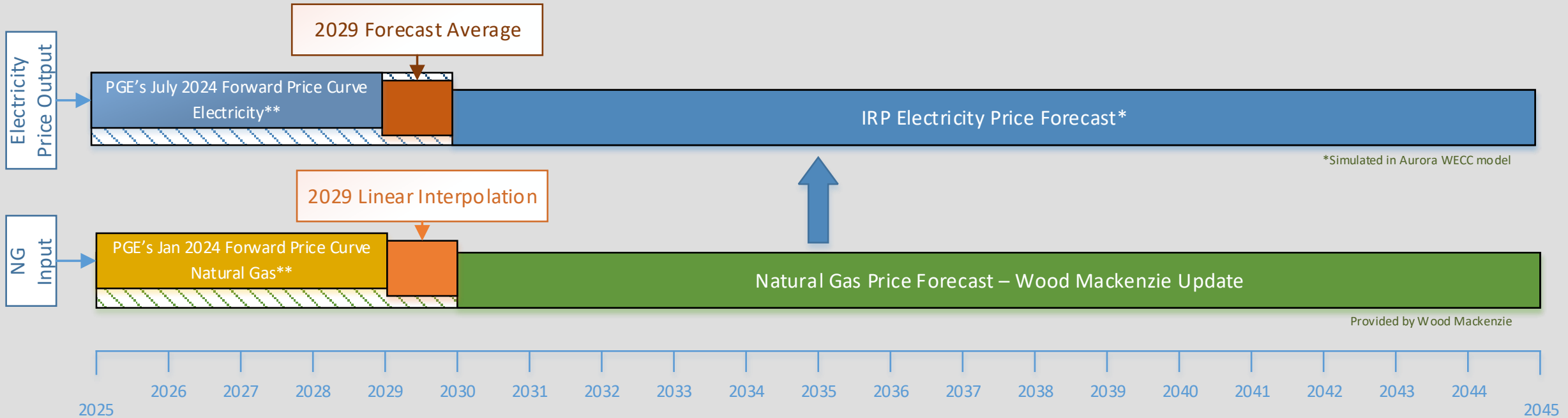
Change in Methodology for 2023 CEP/IRP Update:

To align with the Staff's recommendation in the UM 1893 docket, PGE will be incorporating the July 31, 2024 Snapshot of the Electric Forward Price Curve (FPC) as estimated by the PGE's Power Cost Forecasting Group using the Lydia Model to create hourly granularity.

For reference case electricity prices:

- There is no change to the methodology for how the WECC simulated price forecast is created.
- 2025-2028 prices reflect PGE's Electric FPC.
- 2029 prices are an average of PGE's Electric FPC and WECC simulated price forecast.
- 2030-2045 prices are WECC simulated price forecast.

2023 CEP/IRP UPDATED Price Forecast

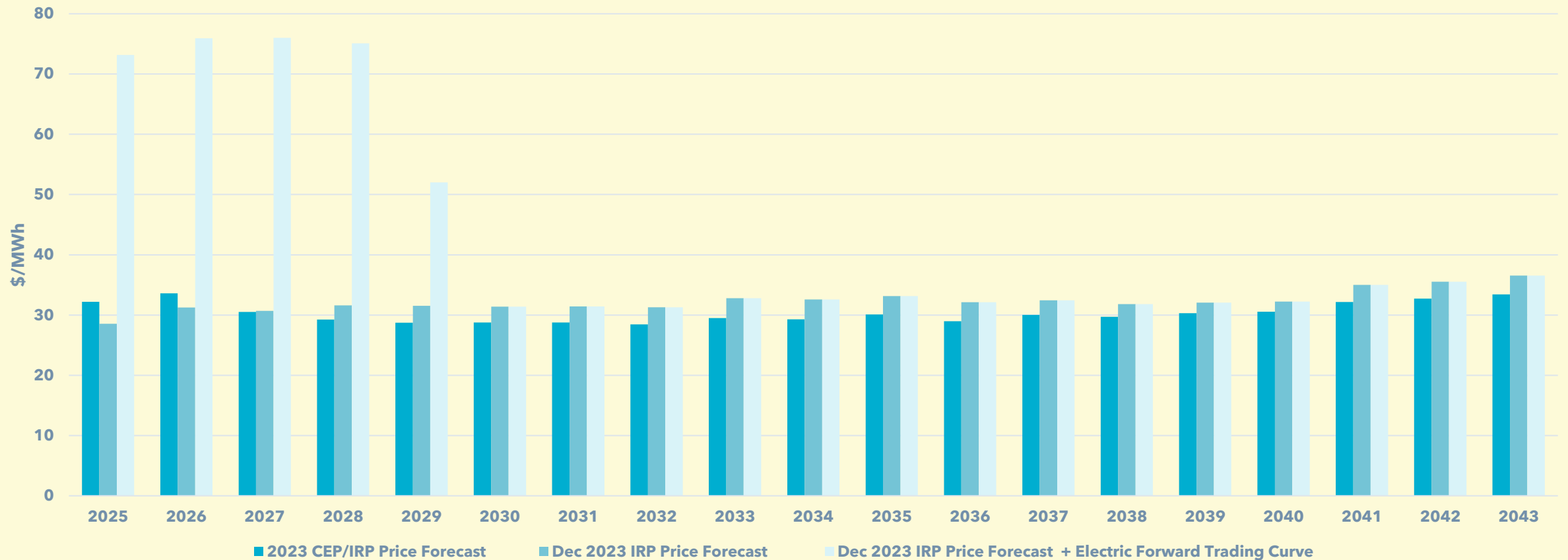


**Generated Internally

2023 CEP/IRP UPDATED Price Forecast



IRP Price Forecast (2025 - 2043)



2023 CEP/IRP UPDATED Price Forecast



The methodological change in the IRP Price Forecast results in higher average prices between 2025-2029. We expect that these higher prices will lead to changes in the following variables for the 2023 CEP/IRP Update:

- Energy values
- Frequency of Variable Energy Resource (VER) curtailment
- Timing and quantity of thermal generation
- Thermal generation allocated to serve PGE load

Questions



A photograph of an electric vehicle charging station with several cars plugged in, set against a dark blue background.

NEXT STEPS

A recording from today's webinar will be available on our [website](#) in one week

Upcoming Roundtable: November 6th

Distribution System Workshop: October 24th

Thank you

Contact us at
IRP.CEP@PGN.COM

An

Oreanon
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Oregon

kind of energy

ACRONYMS

ARIMA: autoregressive integrated moving average

ART: annual revenue-requirement tool

ATC available transfer capability

BE: Building Electrification

BPA: Bonneville Power Administration

C&I: commercial and industrial

CBI: community benefit indicators

CBIAG: community benefits and impacts advisory group

CBRE: community based renewable energy

CDD: cooling degree day

CEC: California energy commission

CEP: clean energy plan

CF conditional firm

DC: direct current

DER: distributed energy resource

DR: demand response

DSP: distribution system plan

EE: energy efficiency

ELCC: effective load carrying capacity

EJ: environmental justice

ETO: energy trust of Oregon

EUI: energy use intensity

GHG: greenhouse gas

HB2021: House Bill 2021

HDD: heating degree day

HVDC: high-voltage direct current

HRCO: heat rate call option

IE: independent evaluator

IOU: investor-owned utilities

ITE: information technology equipment

ITC: investment tax credit

kW: kilowatt

LOLH: loss of load hours

LT/ST: long term/ short term

LTF long-term firm

MW: megawatt

MWa: mega watt average

NAICS: North American industry classification system

NCE: non-cost effective

NG: natural gas

NPVRR: net present value revenue requirement

OASIS Open Access Same Time Information System

ODOE: Oregon department of energy

PPA: power purchase agreement

PSH: pumped storage hydro

PUC: public utility commission

PURPA: Public Utility Regulatory Policies Act

PV: photovoltaic

REC: renewable energy credit

RLRR: low carbon price future

ROSE-E: resource option strategy engine

RPS: renewable portfolio standard

RRRR: reference case price future

RTO: regional transmission organization

SoA: South of Allston

TE: Transportation Electrification

T&D: transmission and distribution

TSR: transmission service request

TSEP: TSR study and expansion process

Tx: transmission

UPC: usage per customer

UPS: uninterruptible power supply

VER: variable energy resources

VPP: virtual power plant

WECC: western electricity coordinating council