



Integrated Resource Planning

ROUNDTABLE 22-11

DECEMBER 2022

PGE

MEETING PARTICIAPTION

Electronic version of presentation

https://www.portlandgeneral.com/our-company/energy-strategy/resource-planning/integrated-resource-planning/irp-public-meetings

Zoom Meeting

- Please click the meeting link sent to your email or here:
- Join Zoom Meeting https://us06web.zoom.us/j/84391255924?pwd=RDQ2VFpUZERVSEcraU5CZWw3VDhQZz09
- Meeting ID: 843 9125 5924
  Passcode: 108198

PARTICIPATION

During the presentation

All attendees will be muted; to unmute yourself via computer, click on the microphone that appears on the screen when you move your mouse

To unmute yourself over the phone, **press *6**

If you call in using your phone in addition to joining via the online link, please make sure to **mute your computer audio**

Raise your hand icon to let us know you have a question

AGENDA

8:30 – 8:45	Welcome, Introductions, Operating Agreement, Meeting Logistics
8:45 – 9:45	Emissions Forecasting Part II
9:45 – 10:15	Community Benefit Indicators Update
10:15 – 10:30	Price Futures Update
10:30 – 10:45	Transmission Part IV
10:45 – 11:15	Portfolio Scoring Metrics
11:15 – 12:15	Draft Portfolio Results

Public Process Intent

Understand future long-term resource needs, analysis of the expected costs and associated risks of the alternatives to meet those needs, and the action plan to select the best portfolio of resources to meet those needs for customers.

The courageous conversations framework
By Glenn Singleton and Curtis Linton

MEETING LOGISTICS

Sharing space through facilitation

Focus on learning and understanding

- Attendees will be asked to "raise hand" to ask questions during the presentation
- Clarifying questions will be answered throughout the presentation, more detailed questions may be held to the end of the topic

Q&A

- The meeting facilitator will take questions in the order that hands are raised
- Time will be dedicated at the end of each presentation to address questions and comments

Follow Up

If we don't have time to cover all questions, we will take questions via the PGE feedback form or at another roundtable meeting

OPERATING AGREEMENTS

- Establishing norms with our partners is foundational to **building trust and ensuring a productive dialogue and engagement**

- Creating a **respectful and inclusive space**, starts with establishing **common agreements**

Share the Airtime

Expect and Accept Non-closure

Be Constructive

Listen to Seek Understanding, Not to Respond

Challenge Ideas and Not People

The courageous conversations framework

EMISSIONS FORECASTING PART II

TOMÁS MORRISSEY

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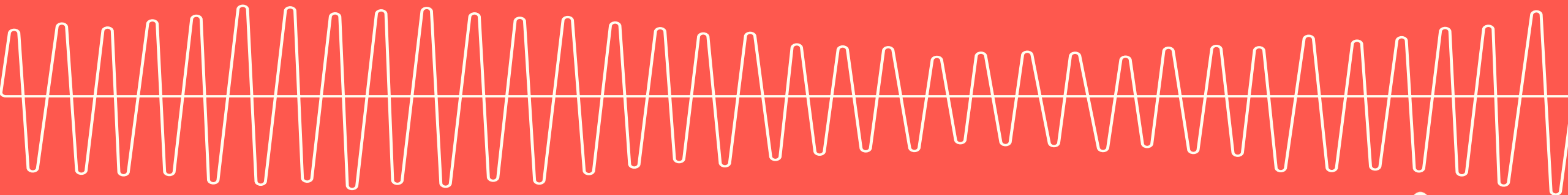


Presentation Topics

1. Review November's emissions presentation with a focus on the Greenhouse Gas (GHG) Emissions Model

2. Review PGE thermal units and historical usage

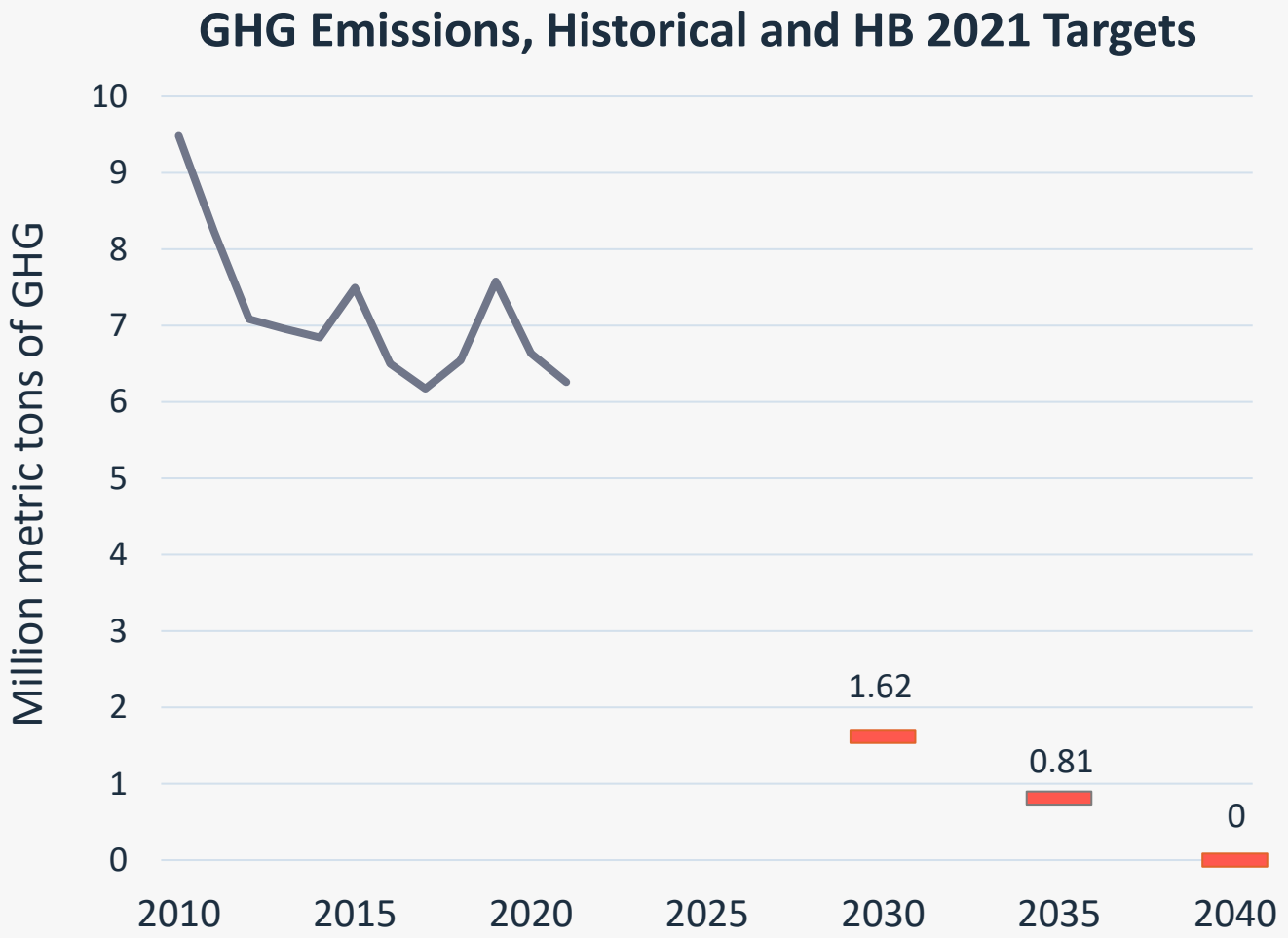
3. Discuss thermal units in the 2023 IRP with a focus on
   a) Reliability
   b) Wholesale revenue impact on net variable power costs
   c) The changing Western Interconnection
   d) Carbon emissions and the Western Interconnection

4. PGE total thermal unit modeling projections

HB 2021 GHG Targets

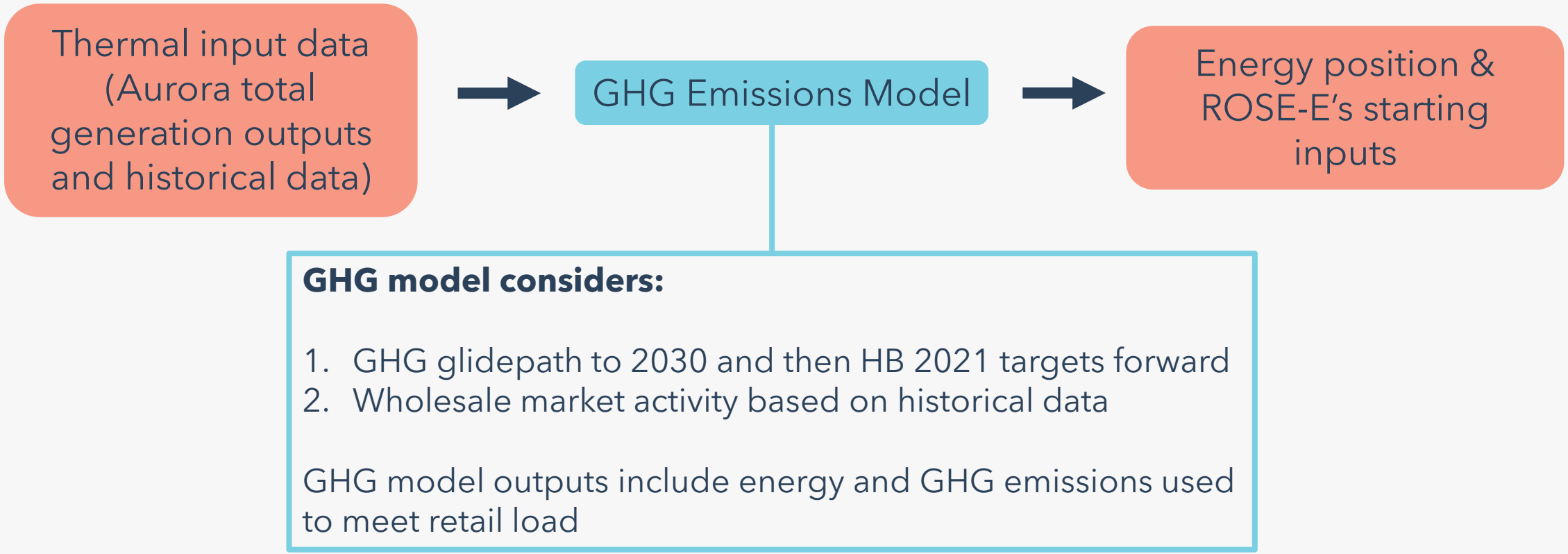
For energy serving retail load, PGE must reduce its GHG emissions 80% below the baseline by 2030, 90% below by 2035, and be GHG free by 2040*

PGE will continue to report emissions associated with retail load to the Oregon DEQ

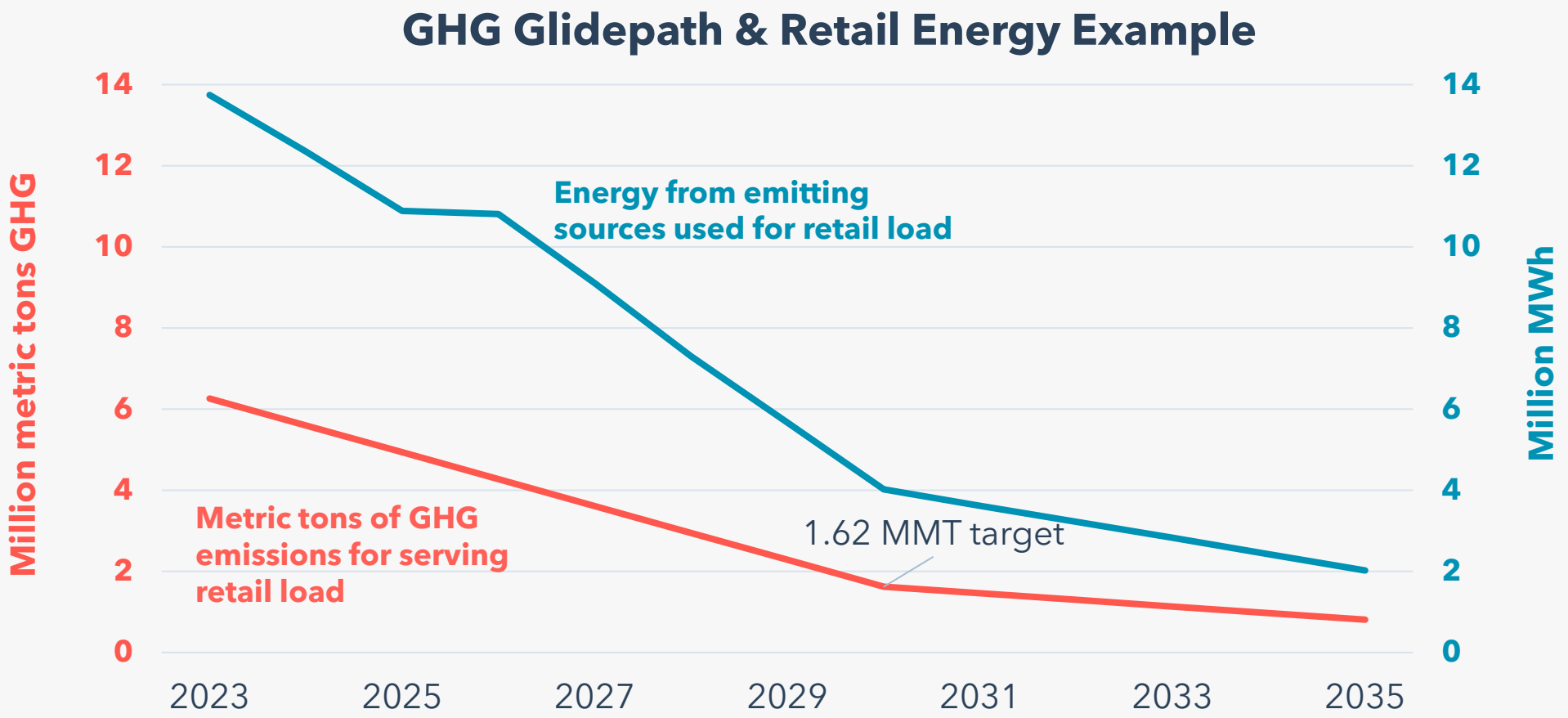


The baseline period is the average annual GHG emissions associated with serving retail load for the years 2010, 2011, and 2012

GHG Emissions/Energy Position Modeling



Sample GHG Emissions Model Output



Wholesale Market Sales

PGE buys and sells power on the wholesale market. The GHG emissions model accounts for retail and wholesale sales.

A few key points on wholesale sales:

a. Emissions associated with wholesale market sales are not subject to the GHG emission reduction targets set by HB 2021

b. Wholesale market sales do not impact the need for GHG free resources to meet HB 2021 targets for retail sales

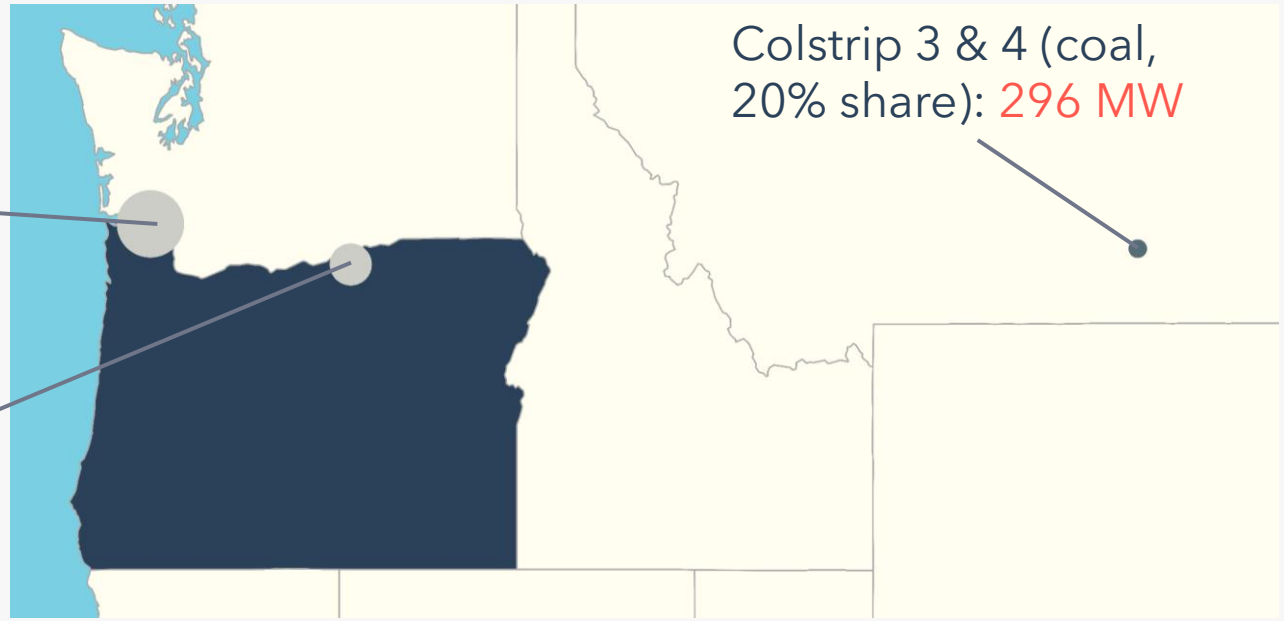
c. Net power costs will likely change due to wholesale market activity

d. Many wholesale market transactions occur with counterparties in carbon regulated markets (like California and Washington)

PGE Owned Thermal Plants & Nameplate

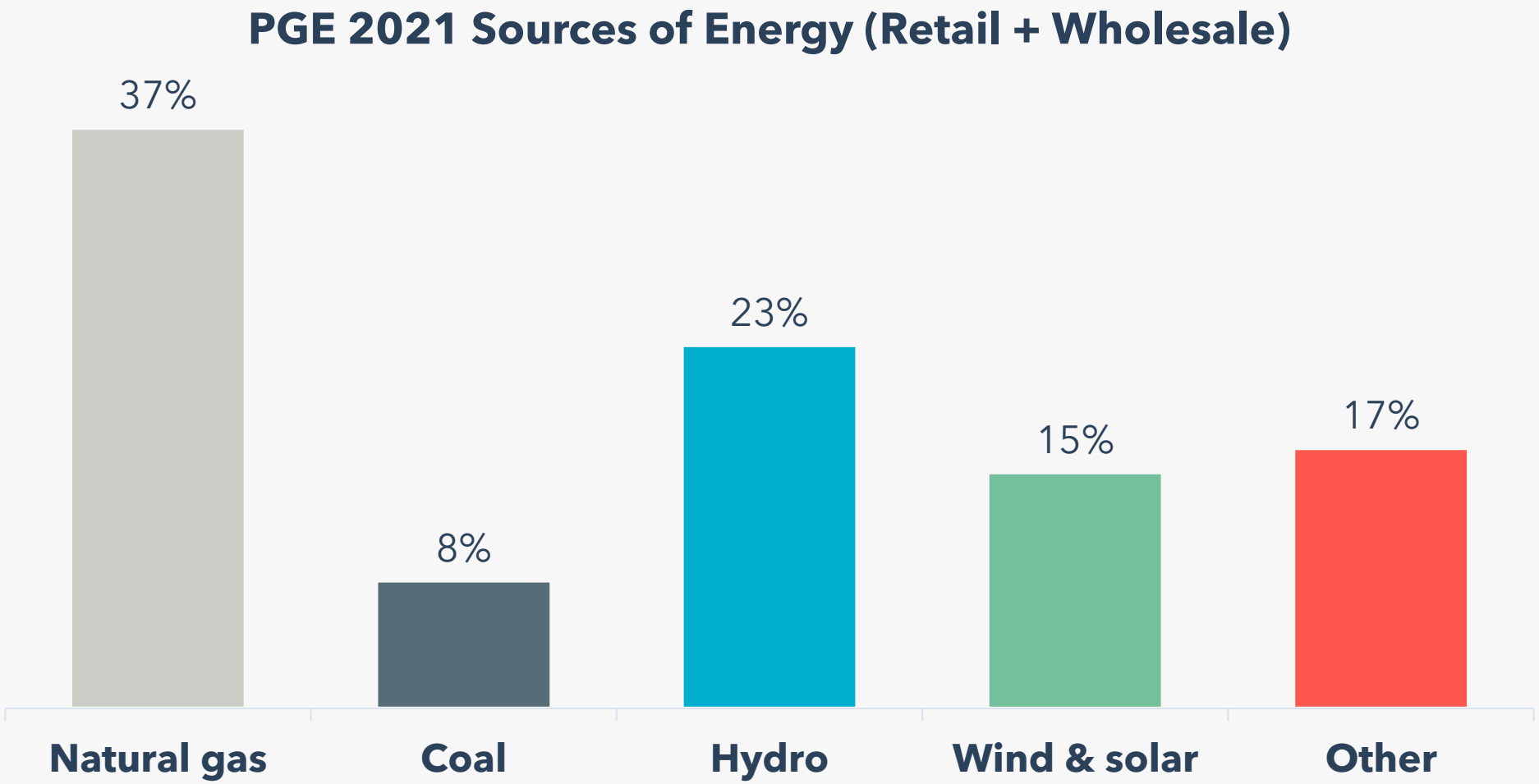
Beaver (gas): 510 MW
Port Westward 1 (gas): 411 MW
Port Westward 2 (gas): 225 MW

Carty (gas): 438 MW
Coyote (gas): 258 MW



From Form 10-K, hydro values include power purchased from BPA. Other includes waste, wood, landfill gas, and unspecified sources.

2021 Total Generation & Purchases



Thermal Plants in 2023 IRP

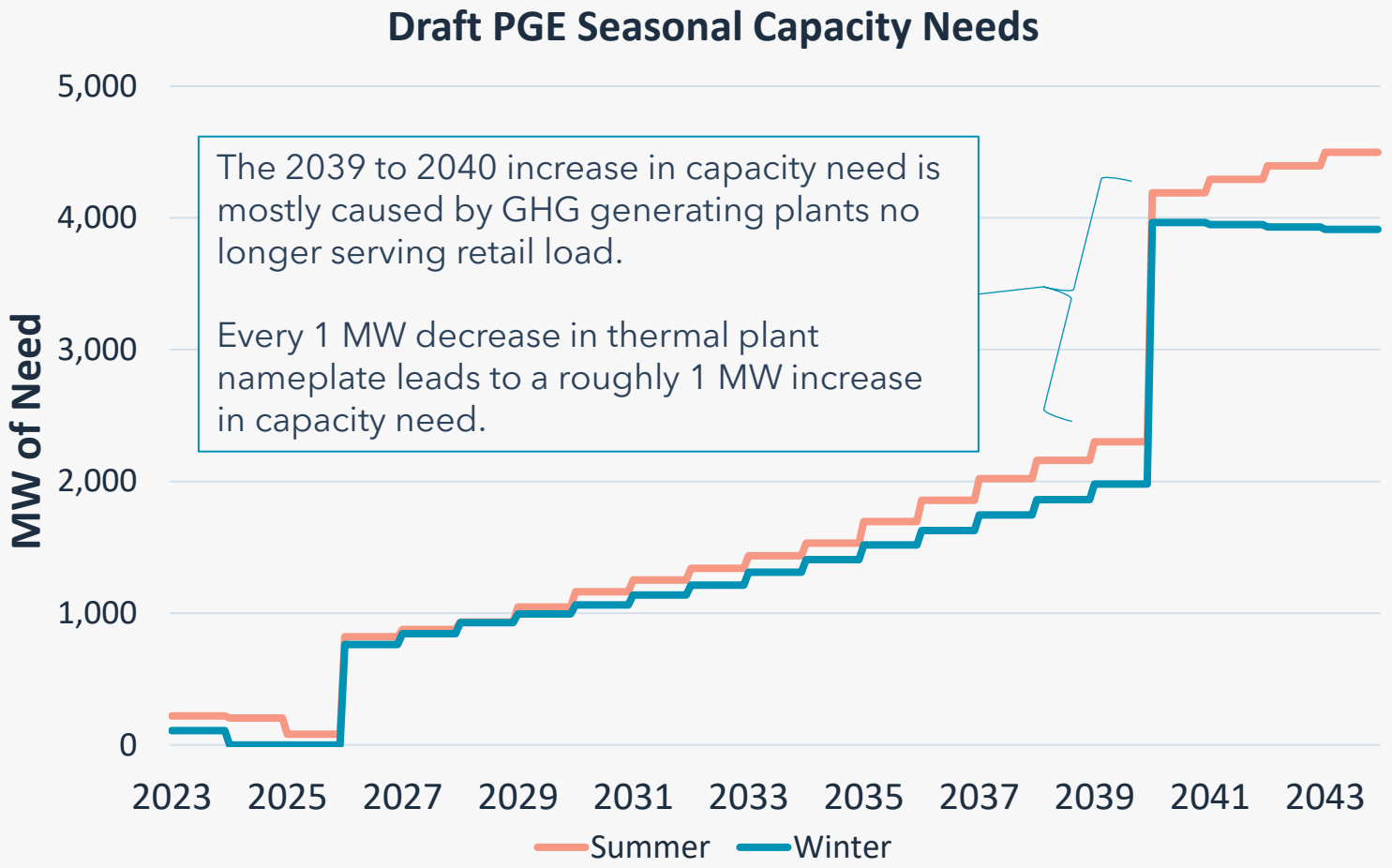
For modeling, we assume all plants run on economic dispatch. When power prices are higher than our thermal plant's variable costs, it signifies that both PGE and the greater West need power from those plants (and at this point most, if not all, low marginal cost variable energy resources are already in use).

Additionally:

1. Both PGE & the West rely on thermal plants for resource adequacy
2. Wholesale revenues can decrease net variable power costs
3. Electric power sales across the West are increasingly carbon regulated either by total tonnage (like in Oregon) and/or via carbon pricing
4. Altering gas plant dispatch would likely have no impact or slightly increase Western Interconnection GHG emissions

Reference Case Reliability & Thermal Units

Draft 2023 IRP reference case capacity needs. The graph shows how much perfect capacity is needed to meet the IRP adequacy target before any supply side resources are added. Reference levels of DERs are included.



Western Reliability & Imports

A recent (November 2022) WECC report found that

"when the ability to import power is removed, the DRI (demand risk indicator) increases drastically for all subregions over the next ten years."

(WECC defines the demand risk indicator as the number of hours at risk for an outage)

They also noted that

"In the NWPP-NE, NWPP-NW, and NWPP-Central subregions, the DRI (without imports) is two to three times higher than in Scenario 2, where there were no new resources. This suggests that, for these subregions, a lack of import ability is more impactful than a lack of new resources."

Full study is available online:
https://www.wecc.org/Reliability/2022%20Western%20Assessment%20of%20Resource%20Adequacy.pdf

NVPC & Wholesale Market Activities

PGE wholesale revenues vary by year (and market conditions)

In 2021 wholesale revenues were $255 million, up from $162 million in 2020 (*PGE Form 10-K*)

Wholesale revenues provide a reduction in net variable power costs (NVPC).

The table below shows how NVPC changed from 2020 to 2021.
Note the reduction in power costs from the increase in wholesale revenues (PGE Form 10-K).

The following items contributed to the increase in Actual NVPC for the year ended December 31, 2021 compared to the year ended December 31, 2020 (in millions):

Year ended December 31, 2020	$	546
Purchased power and fuel expense		143
Wholesale revenues		(93)
PCAM Deferral		(29)
Year ended December 31, 2021		567
Change in NVPC	$	21

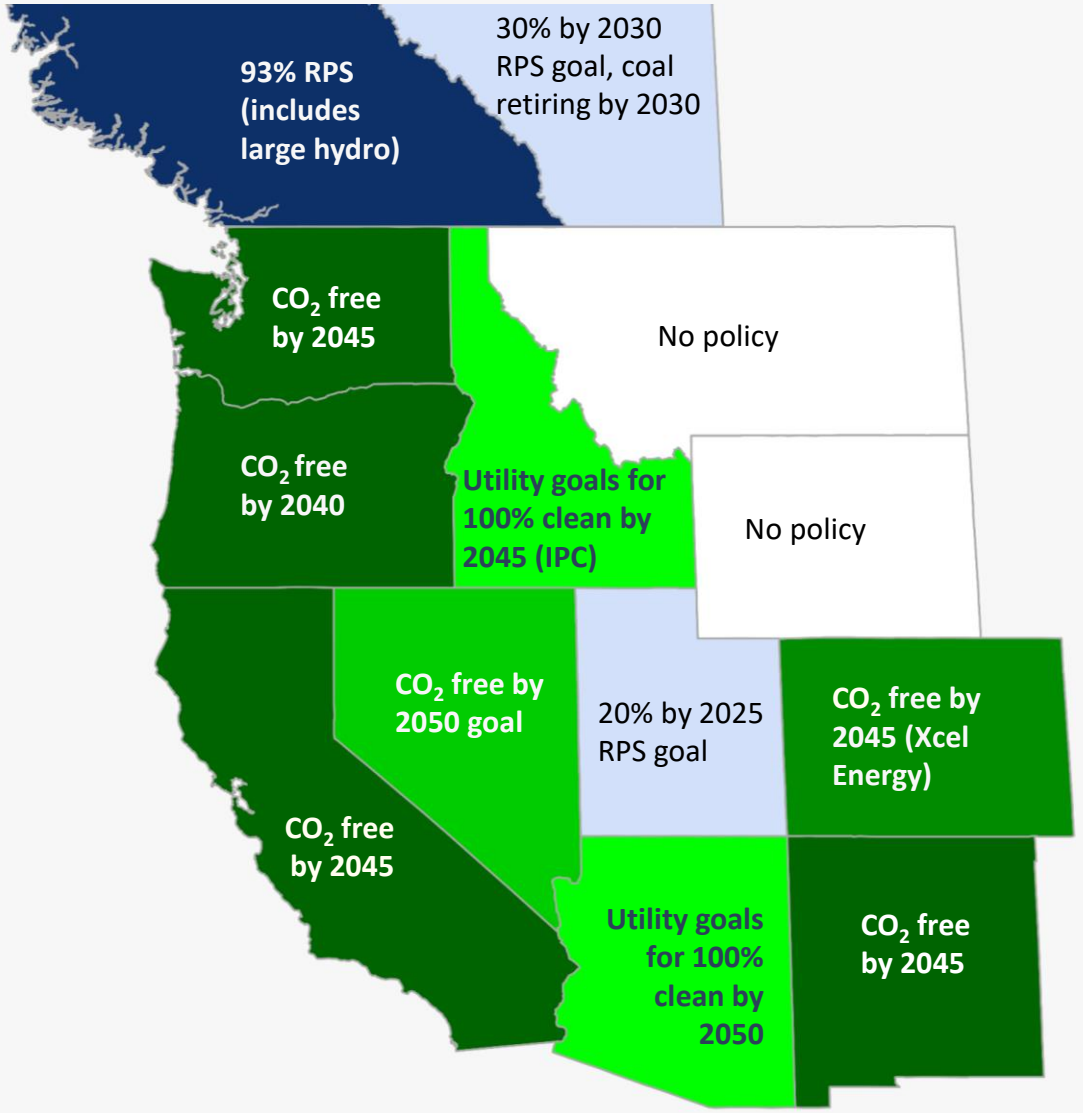
Goals listed on the map may exclude smaller electricity providers

A Changing West

Decarbonization efforts throughout the West will lead to unprecedented generation and transmission development.

These policies, as well as carbon pricing, are captured in the Aurora model that is used to calculate power prices and unit dispatch.

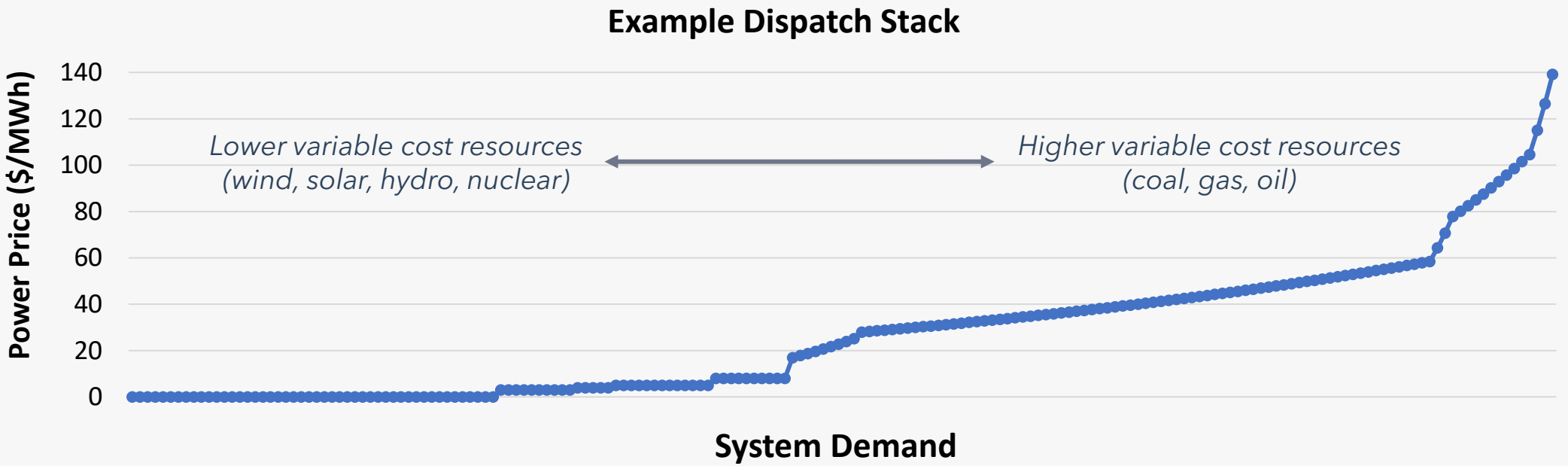
From 2022 to 2045 Aurora (using the Wood Mackenzie database) adds roughly 180,000 MW of solar, 70,000 MW of wind, and 70,000 MW of storage, among other resource actions, across the West.



Power Plant Dispatch 101

On a day-ahead basis most power plants decide if they will dispatch the next day, depending on fuel prices and power prices. This occurs across the West every day.

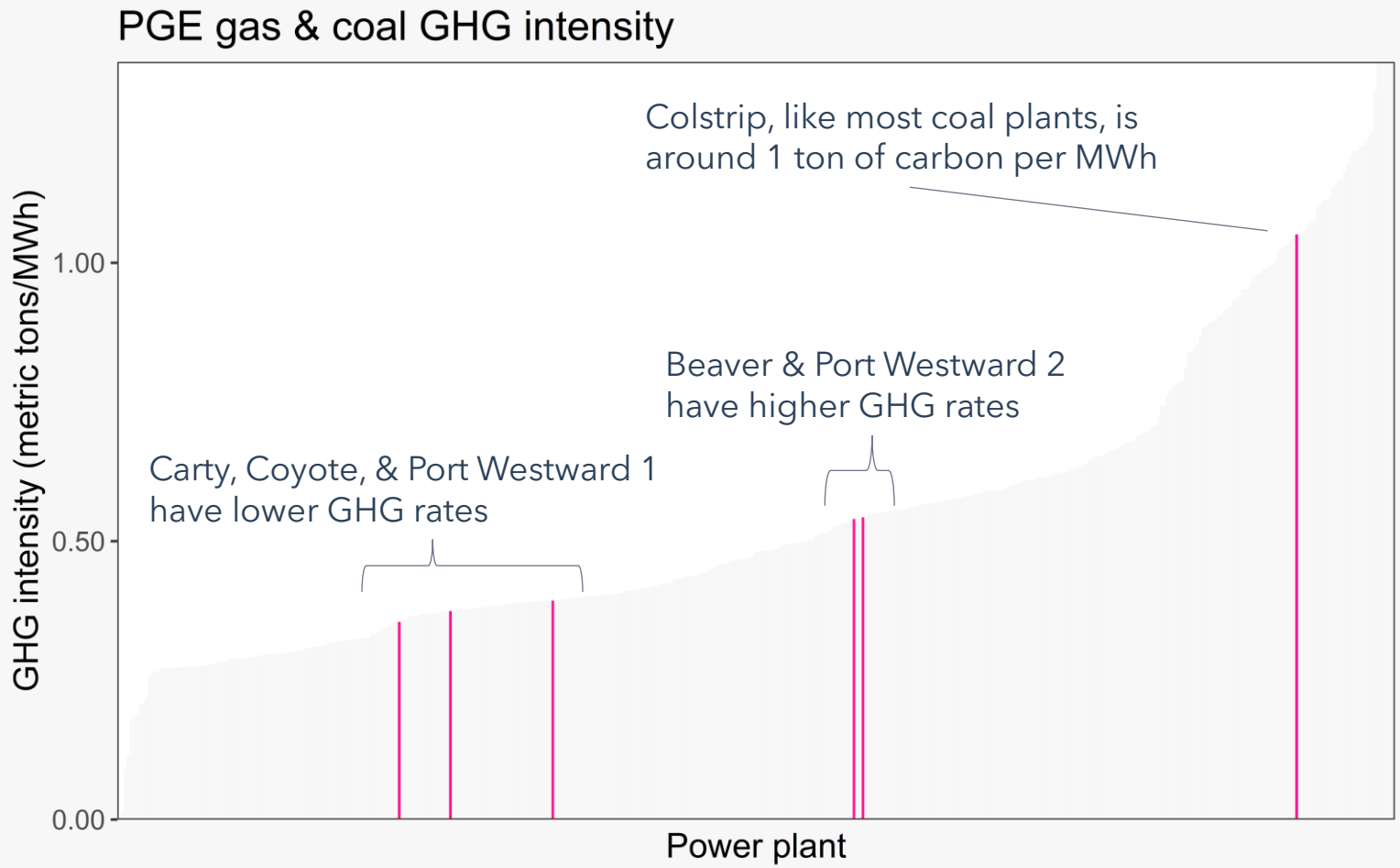
Today, natural gas power plants are often on the margin of dispatch (they dispatch after lower variable cost resources, like renewables, are already running).



PGE Gas & Coal Plant GHG Intensity

PGE owns six thermal plants of varying carbon intensity.

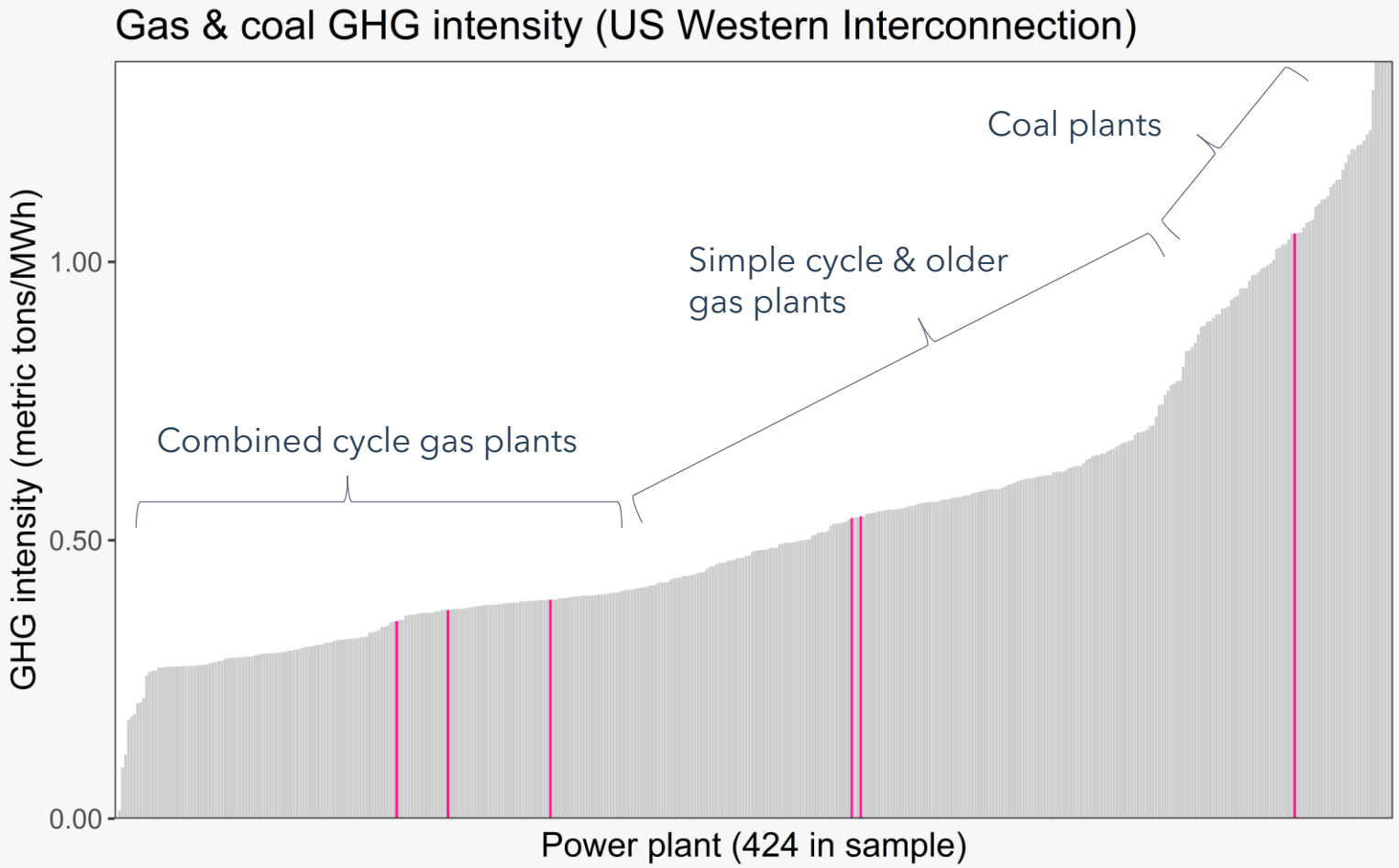
The plants operate in order of economic efficiency. Colstrip may dispatch before the gas plants, depending on fuel prices.



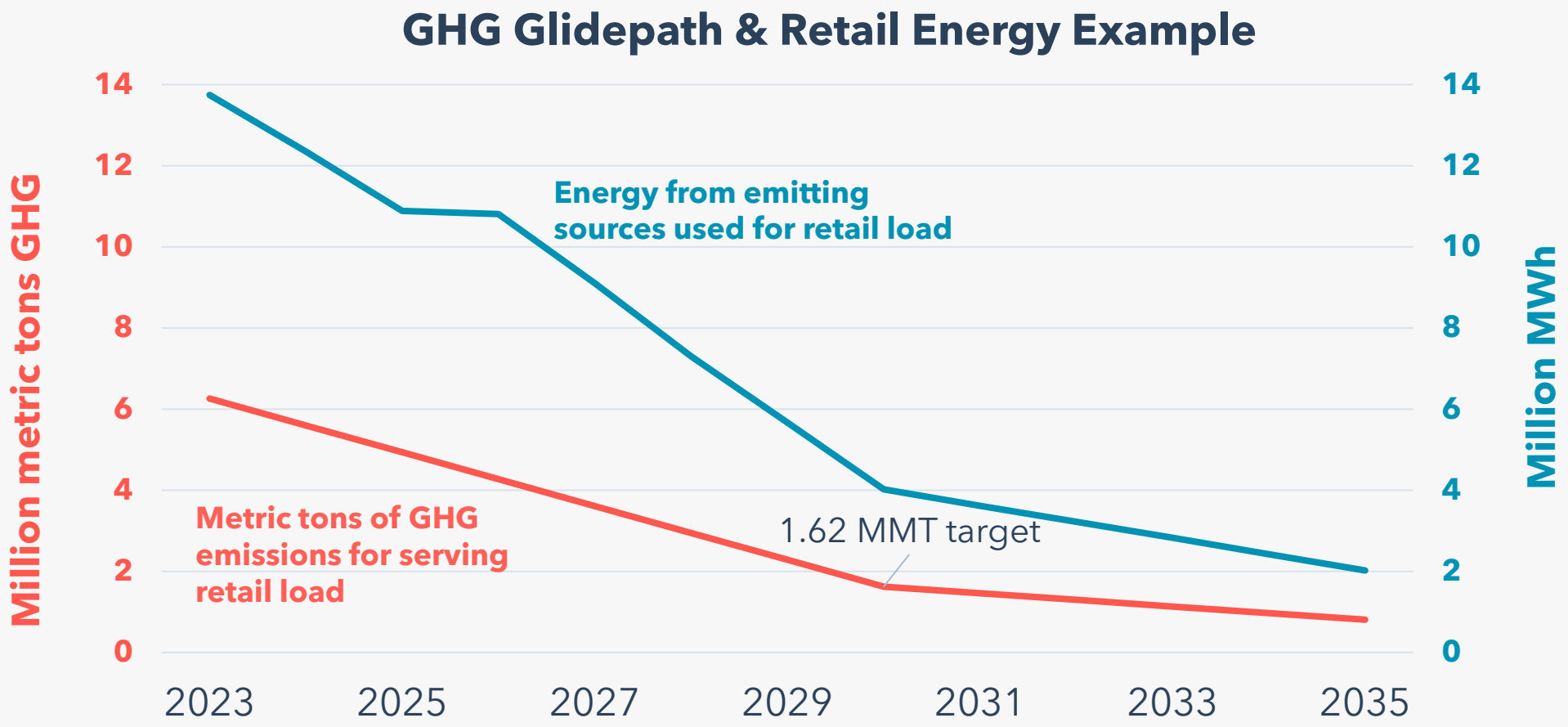
Western US Gas & Coal Plant GHG Intensity

There are hundreds of gas & coal plants in the West. Economic dispatch of our plants creates a more efficient system, all other factors equal.

Data from EPA E-Grid (2020) & ODEQ, natural gas & coal plants only. Plants without an emissions rate excluded. Emissions rates capped around 1.5 tons/MWh for scale. Plants with unusually low rates are often combined heat/power. Graph shows GHG intensity, not heat rate / dispatch order.

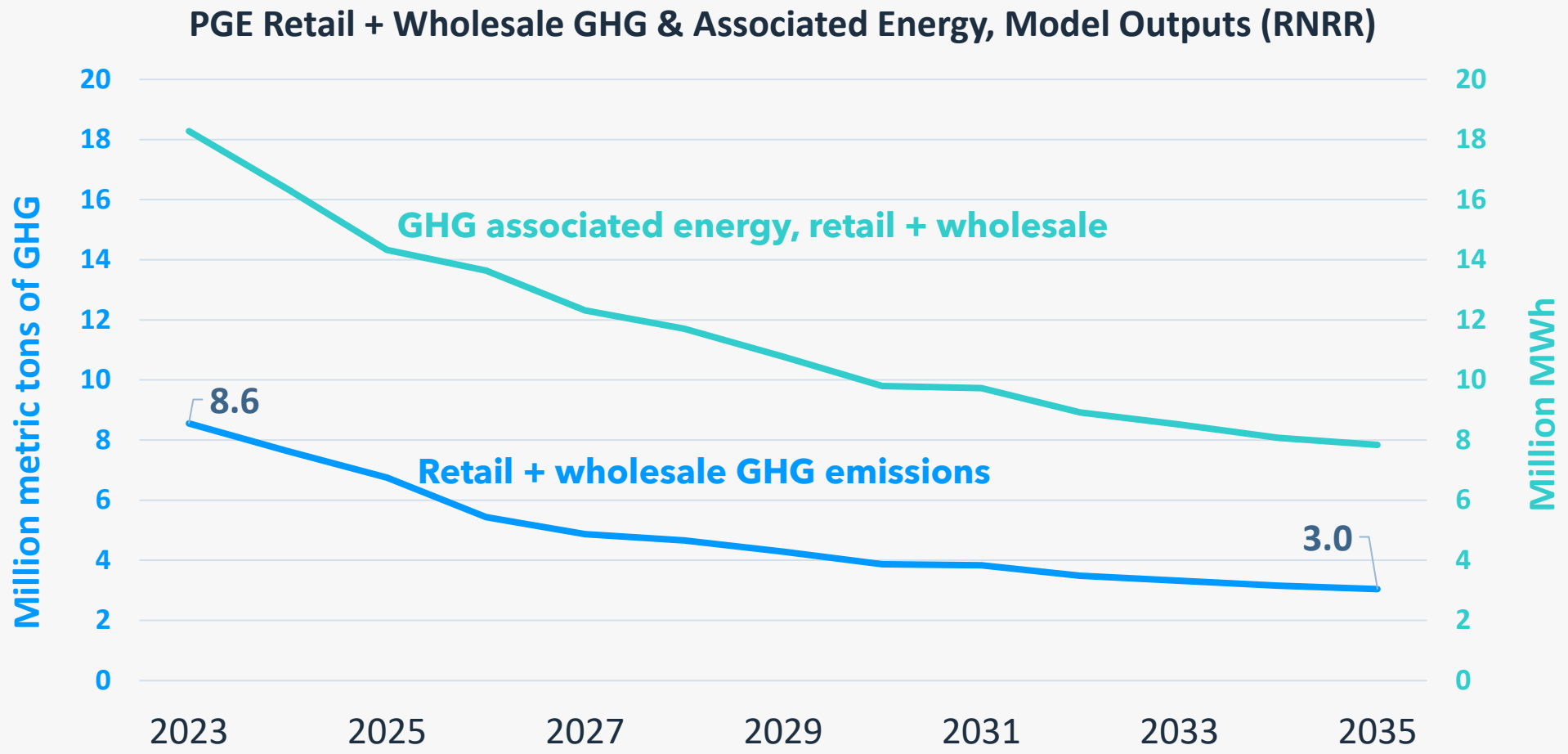


Sample GHG Emissions Model Output



From emissions model, GHG values include power purchased from BPA

Modeled Retail + Wholesale IRP GHG generation



QUESTIONS/ DISCUSSION

COMMUNITY BENEFIT INDICATORS (CBI) UPDATE

NIHIT SHAH

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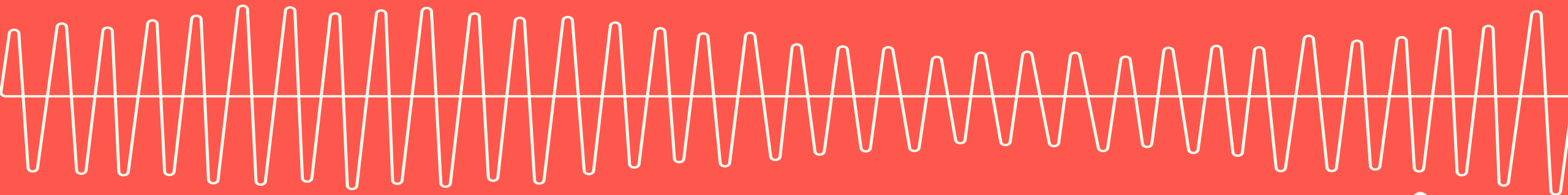


Defining the Community Benefit Indicators for the Clean Energy Resource Plan (CEP/IRP)

Resource CBIs (rCBI) $/MW value assigned to each Community Based Renewable Energy

Similar to the "Conservation Favored"[1] policy of the 1980 NW Power Act, PGE proposes a "CBRE favored" policy in the IRP/CEP to ***include 10% of the Community Based Renewable Energy's fixed cost as an rCBI benefit***

Portfolio CBIs (pCBI) Scoring metrics that direct portfolio analysis

Community Benefits: Reflecting all portfolio benefits associated with the CBRE additions

Informational CBIs (iCBI) Data that supports community investment (*does not change results within portfolio analysis*)

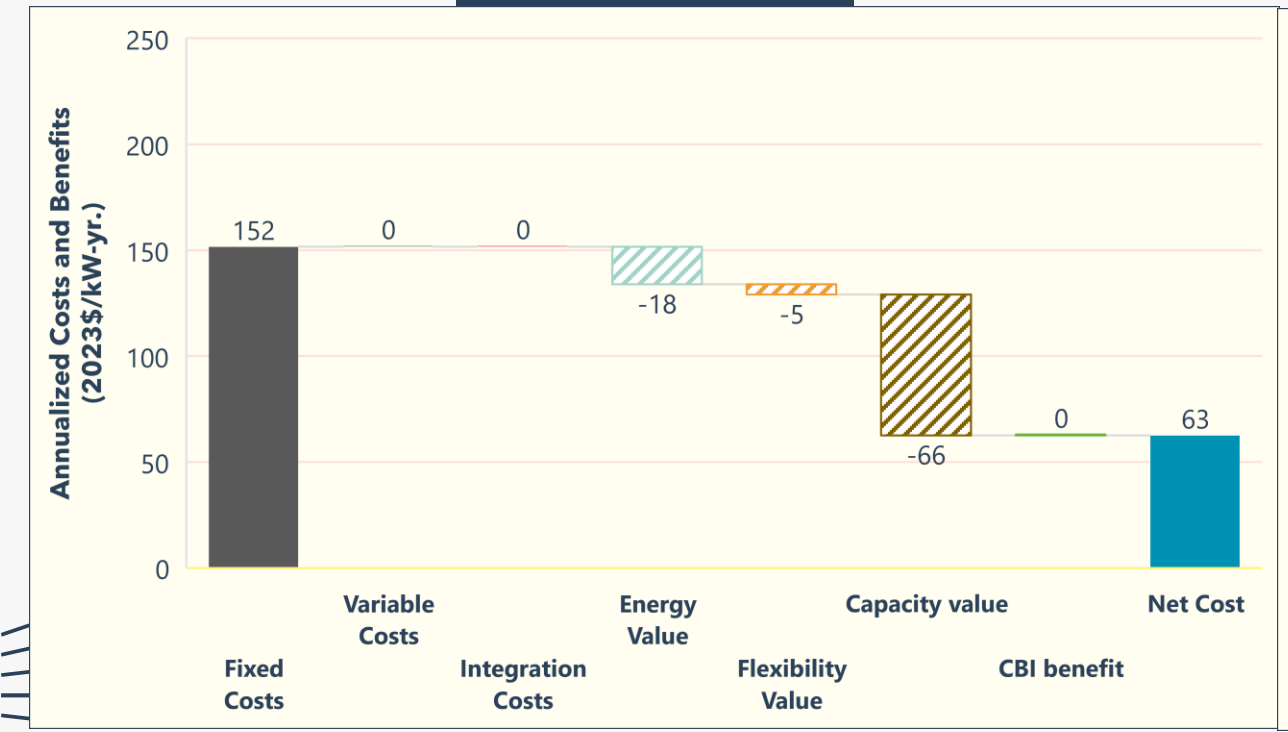
[1] Page 81 of The NW Power Act details "Conversation favored", available online: https://www.nwcouncil.org/media/filer_public/9c/3e/9c3eaa2f-57be-44e4-92b4-14319f2ae3c3/poweract.pdf#page=4

How is the rCBI Applied?

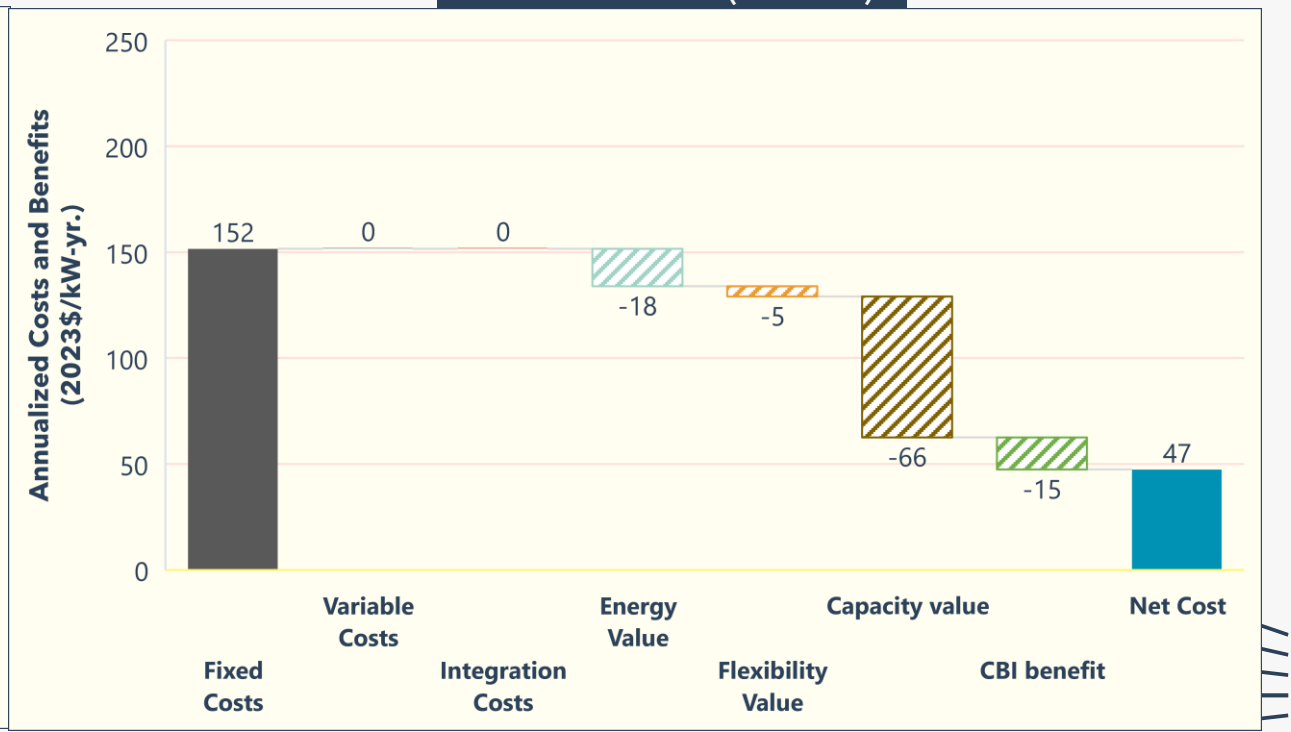
Illustrative Example

- When selecting resources to meet capacity, energy, or flexibility needs, ROSE-E will choose the resource with the lowest net cost
- rCBIs decrease the net cost of the CBRE making it more competitive during resource selection

Resource A



Resource B (CBRE)



QUESTIONS/ DISCUSSION

PRICE FUTURES UPDATE

RAINBOW WONG

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Price Future Selection for Portfolio Analysis

In July 22-6 IRP Roundtable, the IRP team presented 39 price futures to be included in portfolio analysis

- 27 combinations of gas prices, carbon goals/policy, and hydro conditions with default WECC buildout
- 3 futures capture uncertainty and scarcity due to intermittency of generation
- 1 future references gas and hydro conditions but has no additional carbon adder in WECC, RNRR
- 8 futures that align to the ROSE-E modelling requirements of low, reference, high hydro conditions

Price Futures Selection

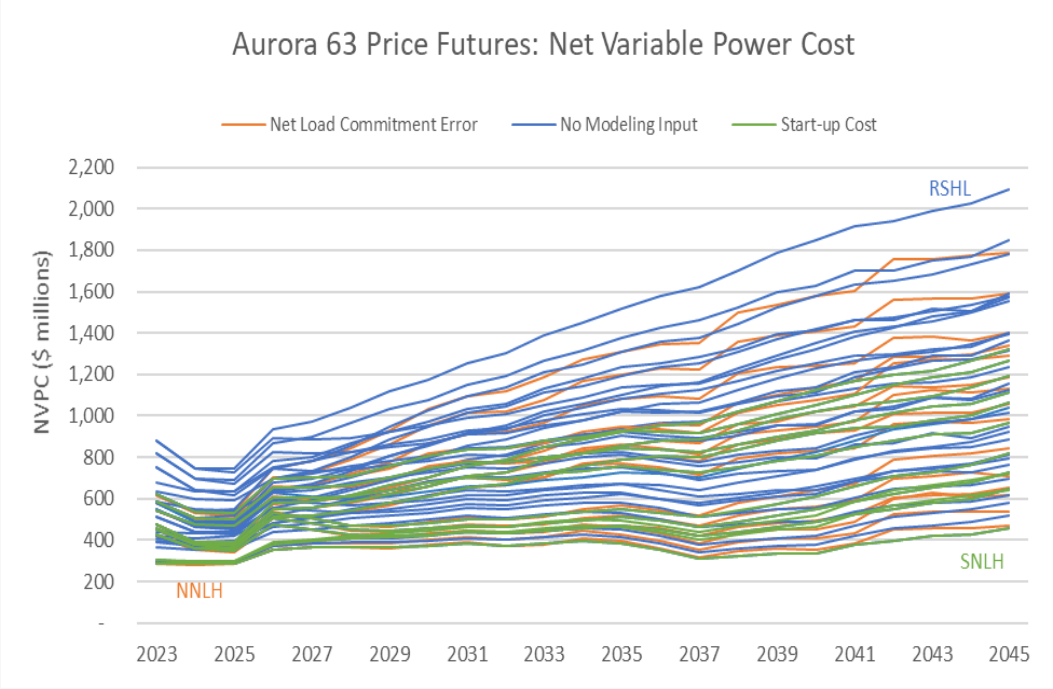
The IRP team has since created 24 additional price futures that do not include carbon adder in the Western Electricity Coordinating Council (WECC) (xNxx). From examining the Net Variable Power Cost (NVPC) and Market Purchases of the full set of 63 price futures, IRP refined the selection of price futures to optimize for scenario variety and model processing time. The selected **42** price futures are categorized as such:

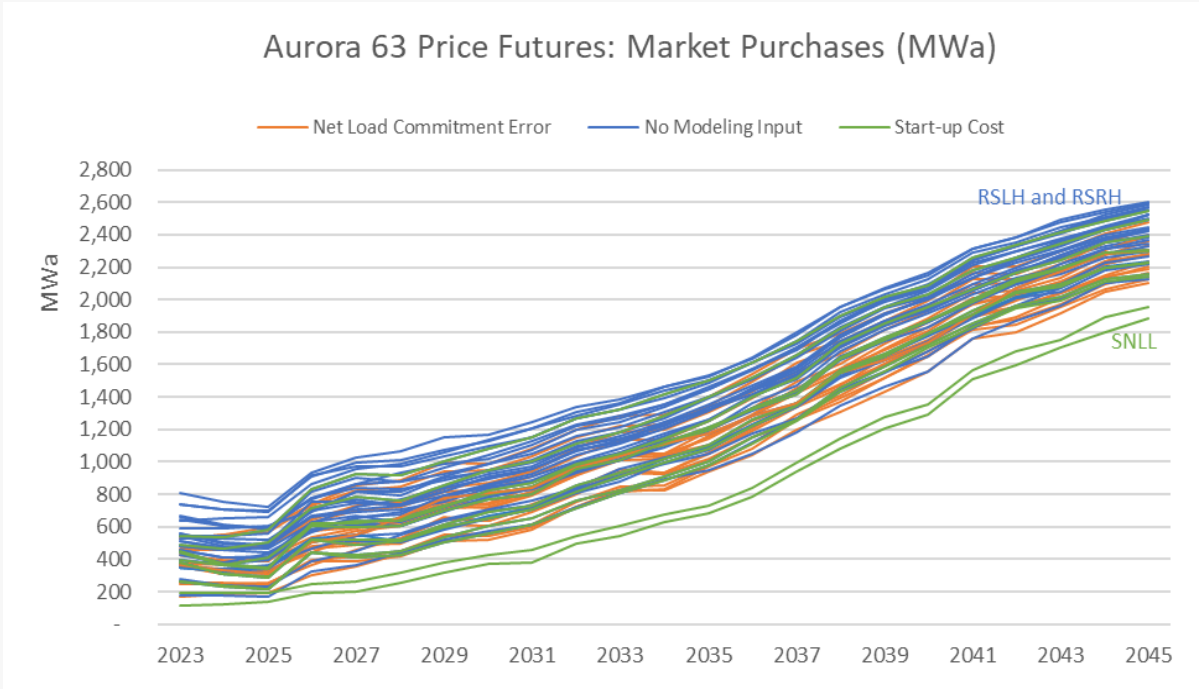
- 18 combinations of gas prices, carbon goals/policy, and hydro conditions with default WECC buildout
- 9 combinations of gas prices, social cost, and hydro conditions with default WECC buildout
- 9 combinations of gas prices, no additional carbon adder in WECC, and hydro conditions with default WECC buildout
- 2 price futures with start-up cost added to prices, SNLH and SNLL, to capture the low end of NVPC and Market Purchases, respectively
- 1 price future with net load commitment error, NNLH, to capture the low end of NVPC
- 3 price futures of different hydro conditions to accompany SNLH, SNLL, and NNLH for modeling purposes. They are NNLR, NNLL, and SNLR.

42 Price Futures Selected for Portfolio Analysis

63 Price Futures were created in the simulation software, Aurora

To capture the full range of **scenarios**, we've selected all of the price futures with no modeling input (Rxxx), NNLH, **NNLL, NNLR,** SNLH, **SNLR,** and SNLL as the graphs below show that these price futures have the lowest NVPC and Market Purchases





QUESTIONS/ DISCUSSION

TRANSMISSION PART IV

LAUREN KERR

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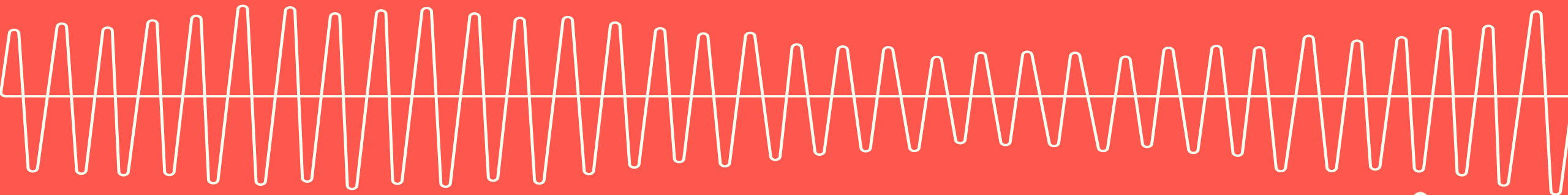


Previous transmission development meetings

September 28, 2022 - Transmission Part I (video, ppt)
October 26, 2022 - Transmission Part II (video, ppt)
November 16, 2022 - Transmission Part III (video, ppt)

TRANSMISSION IN 2023 IRP

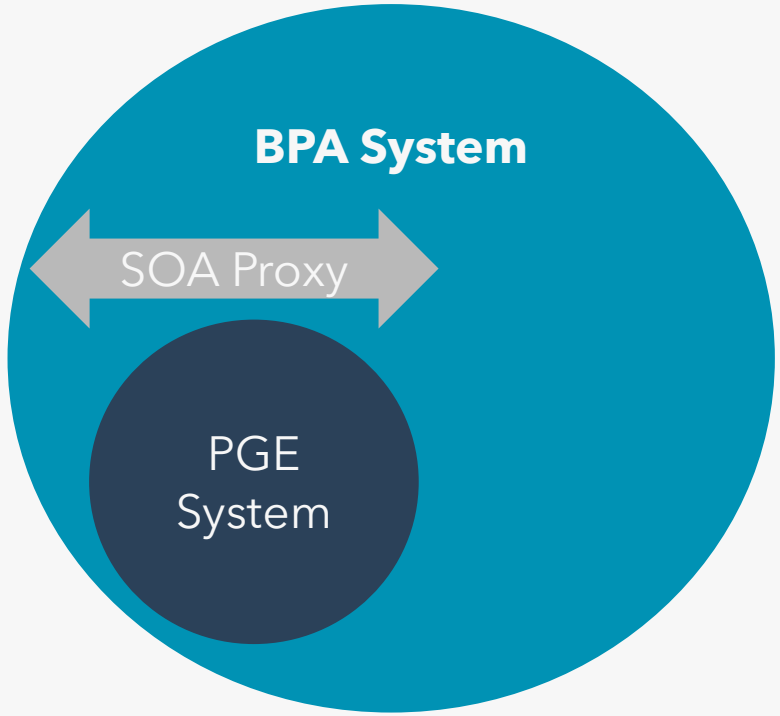
1 PGE proxy transmission modeling

- Quick review of proxy options and methodology
- Discussion of costs and benefits

Key finding: Bonneville Power Administration (BPA) long-term inventory is limited, and upgrades are likely a decade away; the IRP needs to determine the transmission volumes needed to ensure reliable portfolios as we decarbonize.

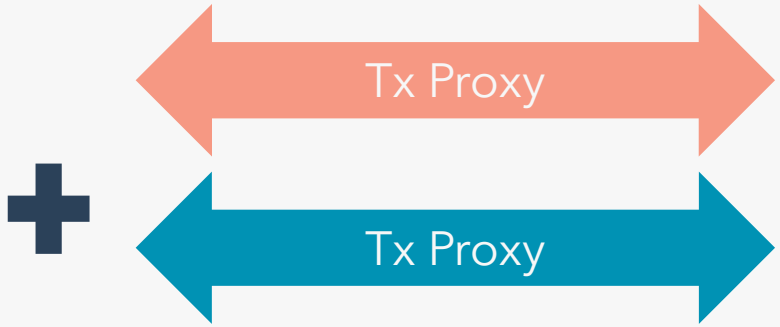
Proxy Modeling Provides Directional Value

Historically, the IRP has modeled proxy generation adds flowing across the BPA system. **Since BPA has historically planned for sufficient Tx, no off-system incremental transmission planning occurred in past IRPs.**



As BPA constraint now limits the amount of long-term Tx, the model needs additional options to solve for reliability.

An option is for the model to expand BPA availability through an assumed South of Allston (SOA) proxy.



Another option to select proxy Tx to supplement BPA once BPA availability is exhausted. **We expect both BPA and supplemental proxy options to be selected in the 2023 IRP to establish a reliable portfolio.**

Proxy selection does not specify a specific project or path, but rather shows that there is value in acquiring sufficient Tx to run the system reliably while meeting decarbonization targets.

While it seems intuitive that meeting decarbonization targets reliably is imperative, we need to know how much Tx outside of BPA's projects is needed to make that happen.

Proxy Tx modeling is performed in addition to Tx planning requirements outlined in our OATT.

Review of Proxy Projects Available for Model Selection

Our capacity expansion model (ROSE-E) will assume the availability of additional transmission capacity expansion options after 2026:

Path	Resource	Energy and capacity assumption
Generic proxy transmission (Tx Proxy)	Desert SW solar (DSW) Wyoming wind (WY) Dispatchable capacity	Model can select to "build" a Tx path to access resource profiles based on climate zones in the WECC. Tx resource assumed to be able to access Desert Southwest solar via Mead or Fourcorners, Wyoming wind, Idaho market, dispatchable capacity, or a combination of resource options. Tx cost, resource and capacity cost, energy and capacity benefits will each be evaluated by ROSE-E
South of Allston Expansion (SOA)	IRP proxy resource	Assumes the ability to increase transfer capacity on PGE's share of South of Allston via upgrade available in 2027. Would unlock additional capacity for resources that leverage BPA rights to get to PGE's system.

Modeling Tx Needs

Tx expansion options allow access to energy (MWa) and capacity (MW) necessary to meet PGE's forecasted needs

Can model solve based on ~1800 MW of available BPA long-term rights (firm and CF)?

If Tx is insufficient to solve

SOA Proxy benefits come from expanded access to the IRP proxy resources in 2027, capped at 400 MW

If Tx is insufficient to solve

Tx Proxy benefits come from access to additional proxy resources and capacity. Model selects optimal number of MW and locations.

ROSE-E selects the least-cost set of resources to meet energy and capacity needs from amongst the Tx expansion options

Summary of Tx Costs and Benefits in ROSE-E

Regional Hub	Real Levelized Cost of Tx[1]	Benefit per MW of Tx	Available Size & Timing	Associated VER Energy Value
Wyoming	$20.46/kW-month	0.44 MWa from Wind 1 MW ELCC	Default: Unconstrained in 2031 WY Tx Portfolio: 400 MW in 2026, then unconstrained	WY Wind: $28.80/MWh
Mead (Desert Southwest)	$23.04/kW-month	0.32 MWa from Solar 1 MW ELCC	Default: Unconstrained in 2031 DSW Tx Portfolio: 400 MW in 2026, then unconstrained	NV Solar: $25.60/MWh
South of Allston Upgrade	TBD	From OR/WA/MT Proxy Renewables	400 MW in 2027	From OR/WA/MT Proxy Resources

[1] Saadi, Fadl H, et al. "Relative Costs of Transporting Electrical Chemical Energy." *Energy & Environmental Science*, *Energy & Environmental Science*, no. 3, 29 Jan. 2018, pp. 469-475.

QUESTIONS/ DISCUSSION

PORTFOLIO SCORING METRICS

NIHIT SHAH

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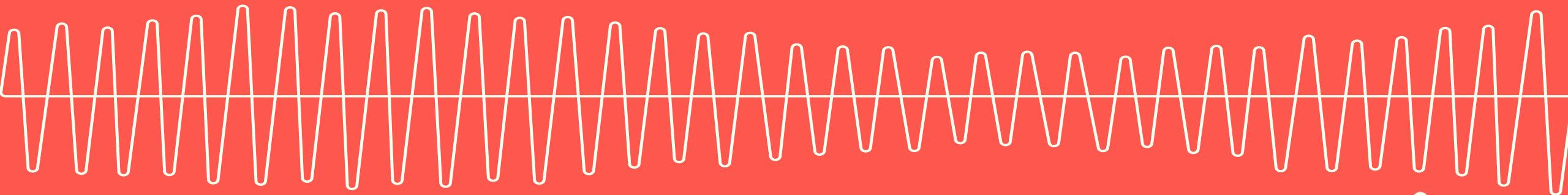
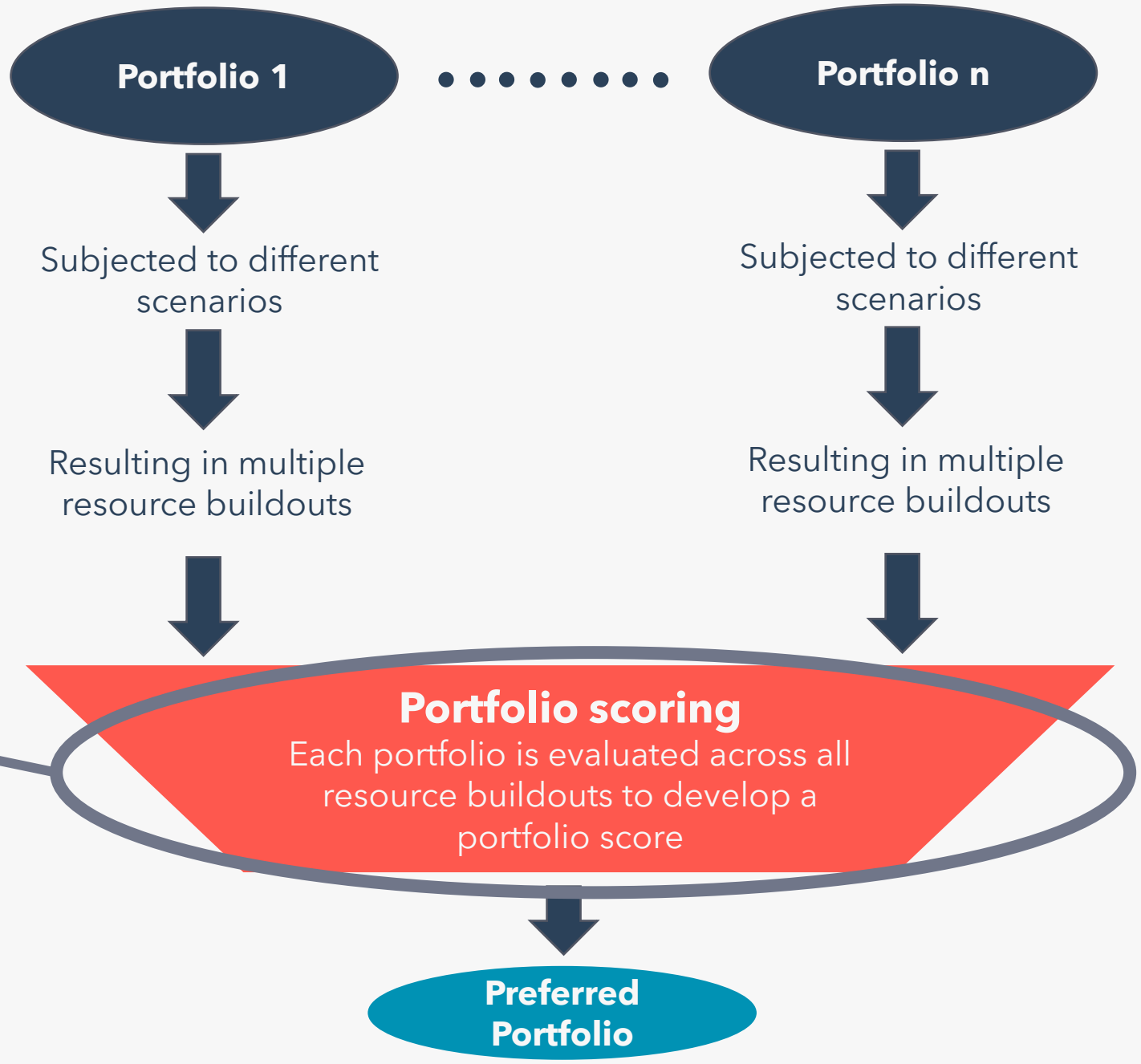


From a Portfolio to the Preferred Portfolio

In November, we presented an overview of how we develop the preferred portfolio

Today's focus is on the metrics that influence Portfolio Scoring



Portfolio Scoring Metrics

Traditional Metrics

- Cost
- Variability
- Severity

Portfolio Community Benefit Indicator (pCBI)

Community Benefits

Portfolio Scoring Metrics
Definitions (1/2)

Cost

Net present value of revenue requirement (NPVRR) through the planning horizon (2043)

Accounts for all IRP costs and benefits including rCBIs, fixed costs, variable costs, capacity value, etc.

Variability

Semi-deviation of NPVRR

Semi-deviation is a measure of the dispersion of the NPVRR across all futures from the reference case that are more expensive

Portfolio Scoring Metrics
Definitions (2/2)

Severity — TailVAR90 of NPVRR

An average value of the worst 10% of NPVRRs across all futures

Community Benefit — Reflecting all portfolio benefits associated with the CBRE additions

Calculated on a per MW basis

QUESTIONS/ DISCUSSION

DRAFT PORTFOLIO RESULTS

ROB CAMPBELL

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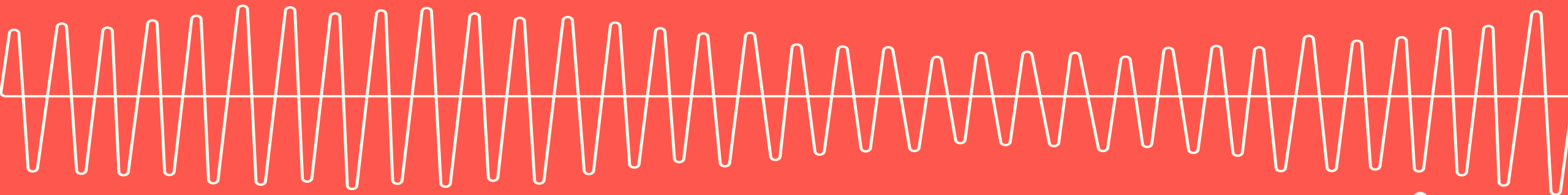


Presentation Topics

1. Review November's portfolio presentation
2. Review data vintages, energy and capacity need, and key assumptions
3. Draft Portfolio results

Review of the November Roundtable Slides

Portfolio Analysis – Definitions

Portfolio: A fixed set of resource decisions set in all scenarios. The model (ROSE-E) creates resource buildouts around those choices in each scenario.

Scenarios: Refer to elements that are varied within portfolio analysis resulting in multiple resource buildouts. Some of the predefined scenarios are - need, technology cost, price, hydro

Resource buildout: Least cost set of incremental resource additions given a set of specific input conditions such as a portfolio and scenario

Sensitivities: Sensitivities test the robustness or provide additional information on the preferred portfolio by forcing changes resource constraints or other inputs

Draft Portfolio Design Principles

Portfolios are designed to meet a set of constraints

Capacity needs

- Capacity additions are future-specific and can meet different capacity needs in different futures

Energy position

- No minimum energy need constraint
- HB2021 requirements – GHG glide path

Portfolio constraints

Examples:

- A different GHG glide path
- Different levels of CBREs
- Oregon only resources

Other policy constraints

- Cannot be long over 100MWa
- Renewable Portfolio Standards

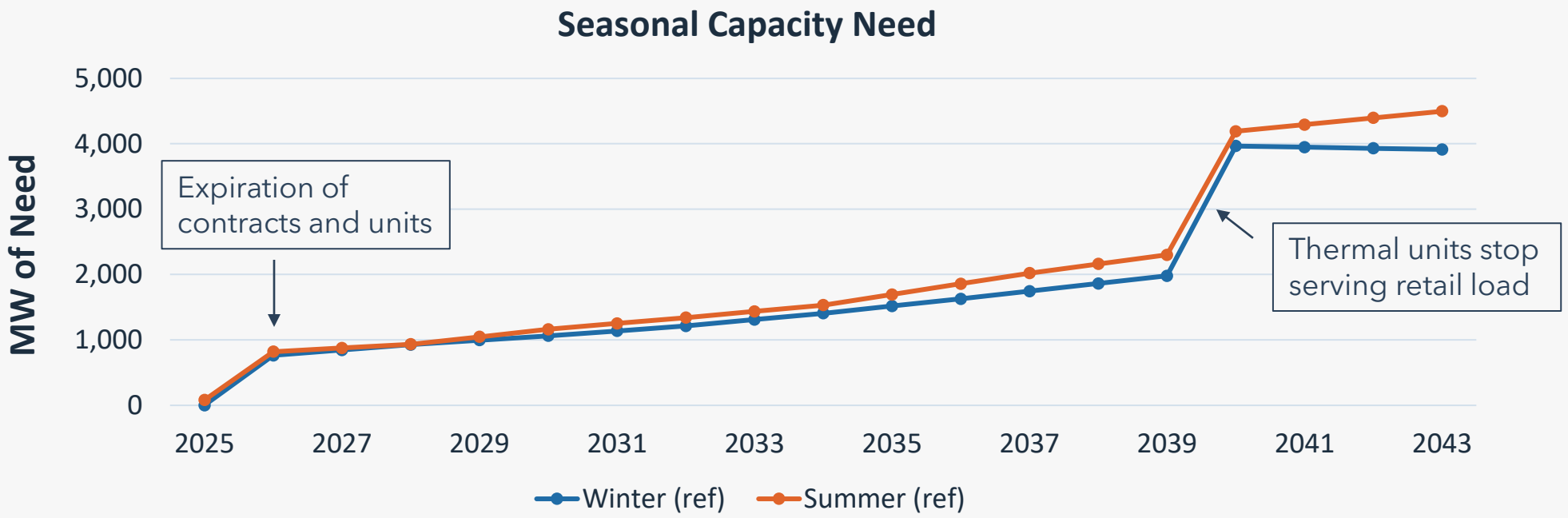
Review of the Energy & Capacity Needs

Portfolio Analyses Use the Following Data

Input Data	Data Vintage & Roundtable
Capacity need and energy position	Covered in following two slides
Load Forecast	Draft analysis incorporates March 2022 load forecast shared in Roundtable 22-3 on April 14th
DER inputs	Draft analysis incorporates DER outputs from 2022 DSP and Energy Trust's forecast shared in Roundtable 22-6 on July 21st and Roundtable 22-10 on November 16th
Market Capacity Study	Incorporates recommendations from Market Capacity Study shared in Roundtable 22-6 on July 21st and updated on Roundtable 22-9 on October 26th
Flexibility analysis results	Final variable energy resource (VER) integration costs and flexibility value for dispatchable resources, shared in Roundtable 22-9 on October 26th
Cost and performance data	Incorporates cost and performance data for Reference, Low, and High Technology Cost Futures including Inflation Reduction Act tax credits
Outcome of 2021 RFP	Draft analysis incorporates Clearwater Wind Project and proxy resources to represent the outcome of the 2021 RFP

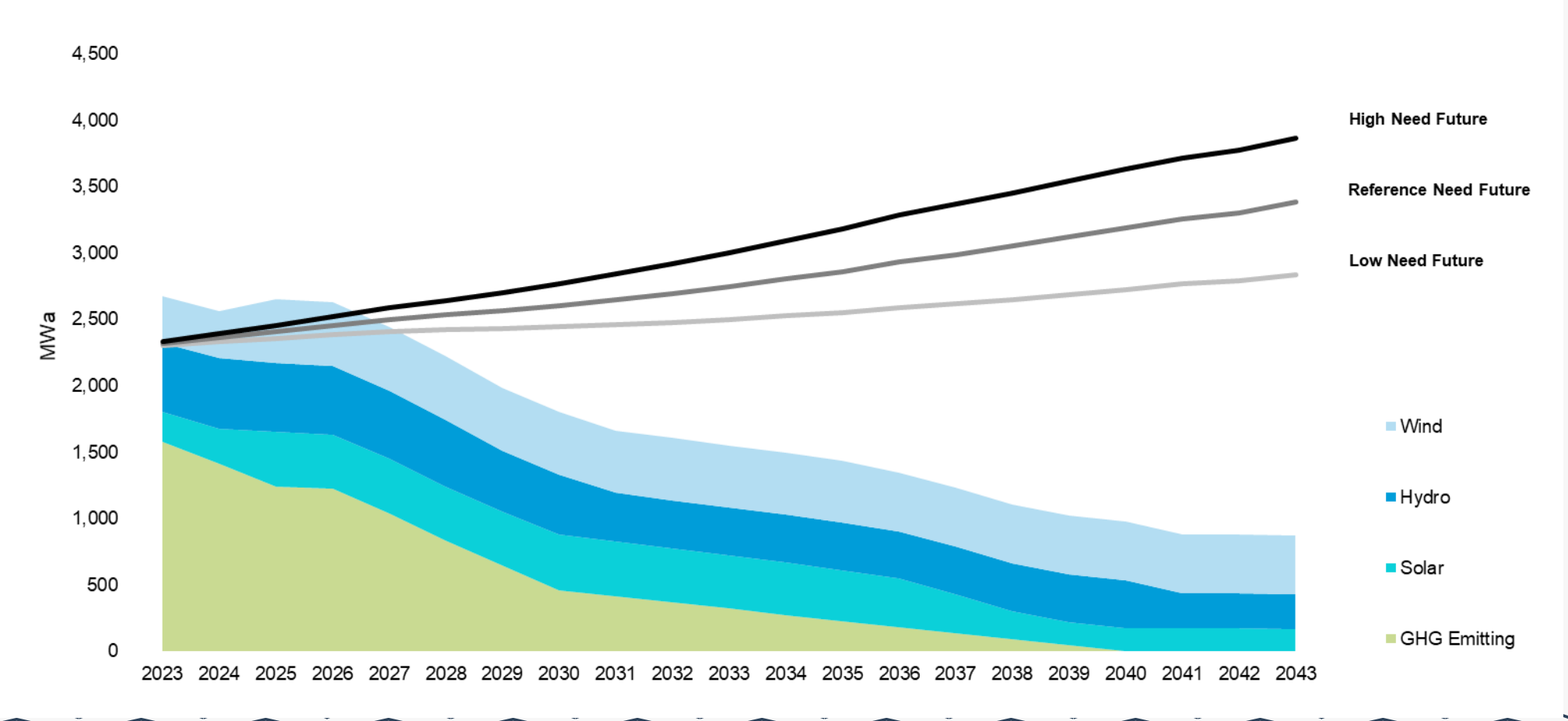
Draft Capacity Needs

Draft analysis indicates capacity needs 820MW in summer and 762MW in winter in 2026 growing to 1162MW in summer and 1062MW in winter driven primarily by contract expiration and secondarily by load growth



Draft Energy Position

Draft analysis indicates energy position grows to 781MWa by 2030 in the RNRR Case assuming a linear decline in GHG emissions from 2023 to 2030 to meet the 80% reduction goal by 2030.



Key Assumptions in Portfolio Analysis

Parameter	Base Assumption (unless modified by portfolio design)
Emissions	Linear decline in emissions associated with retail load from 2024 to 2030, meeting 80% GHG reduction of retail sales Linear decline in emission from associated with retail load from 2031 to 2035 and from 2036 to 2040
First year for in-service	Opportunities for incremental resource actions are available starting in 2026
Transmission availability	South of Allston transmission is available in 2027 Transmission expansion to Wyoming and Desert Southwest is only available after all other transmission is exhausted
Contract expiration	200 MW of contract extension through 2030
Community Based Renewable Energy resources (CBREs)	Assume 100% of available CBRE additions

2023 IRP – Portfolio construction (1/3)

Customer

Portfolios that include a defined set of customer actions

- **CBRE – optimize:** Allow ROSE-E to optimize selection of CBRE
- **CBRE – microgrid:** Must select 100% of microgrid potential and does not select any other CBREs
- **CBRE - 75%:** Must select 75% of the total CBRE potential annually
- **30MWa NCE EE&DERs**: Must select 30MWa of additional EE annually over the action plan window
- **No NCE EE&DERs:** Assume no non-cost-effective DERs are available
- **CBRE – zero:** Assume no CBREs are available

Targeted Policy

Limit portfolio options to meet a targeted policy direction

- **Oregon resources**: Only allow Oregon sited resources
- **Physical RPS**: Enforce physical RPS compliance constraint

2023 IRP – Portfolio construction (2/3)

Emerging technology

Require adoption of a specific emerging or a long lead time technology

- **Hydrogen -1**: Assume natural gas plants will use hydrogen blended fuel
- **Hydrogen -2**: Assume 100MW of 100% hydrogen-based power plants in 2028 as must take
- **Offshore wind**: Assume 500MW of offshore wind in 2032 as must take
- **Pumped hydro**: Assume 333MW of pumped hydro storage (PSH) in 2028 as must take
- **Long Duration Storage**: Assume 139MW of 24 hr. battery in 2028 as must take

Transmission

Explore portfolios with a set of defined transmission actions

- **Unconstrained Tx**: Assume no transmission constraints
- **SOA upgrade**: Assumes upgrades to PGE-transmission at South of Alston in 2027 as a given
- **DSW Tx**: Assume early adoption of new transmission – Desert Southwest – 400MW by 2026
- **WY Tx**: Assume early adoption of new transmission – Wyoming – 400MW by 2026
- **RTO**: Test the impact of a regional RA program – 5% decrease in capacity need starting in 2030
- ***Tx Risk:*** *Delay Tx upgrades and Tx expansion availability to 2032 <NEW ADDITION>*

2023 IRP – Portfolio construction (3/3)

Optimized

Optimized within ROSE-E for cost given base constraints

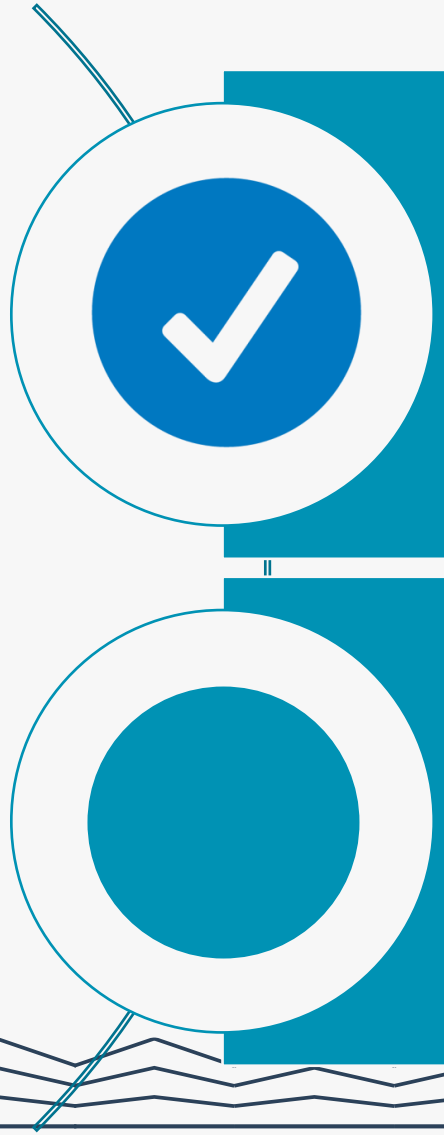
- **Min Avg ST cost**: Minimizing short-term costs through 2030
- **Min Avg LT cost**: Minimizing long-term costs throughout the planning horizon
- **Min Ref ST cost**: Minimizing reference case short-term NPVRR through 2030

Accelerated decarbonization

Introduce constraints that accelerate decarbonization

- **GHG 1**: Achieving each carbon target 2 years ahead of schedule - 80% by 2028, 90% by 2033 and 100% by 2038
- **GHG 2**: Achieving 100% carbon reduction by 2035
- **GHG 3**: Meeting 2030 targets by front loading emission reduction (each year must provide half the reduction of the previous year)
- **GHG 4**: Meeting 2030 targets by rear loading emission reduction (each year must provide twice the reduction of the previous year)

Draft Portfolios



Included Today:

- All (6) Customer Portfolios
- 4 of 5 Emerging Technology Portfolios
- All (6) Transmission Portfolios

Not Included Today:

- 1 Emerging Technology Portfolio
- All (4) Accelerated Decarbonization
- 2 Targeted Policy Portfolios
- 3 Optimized Portfolios

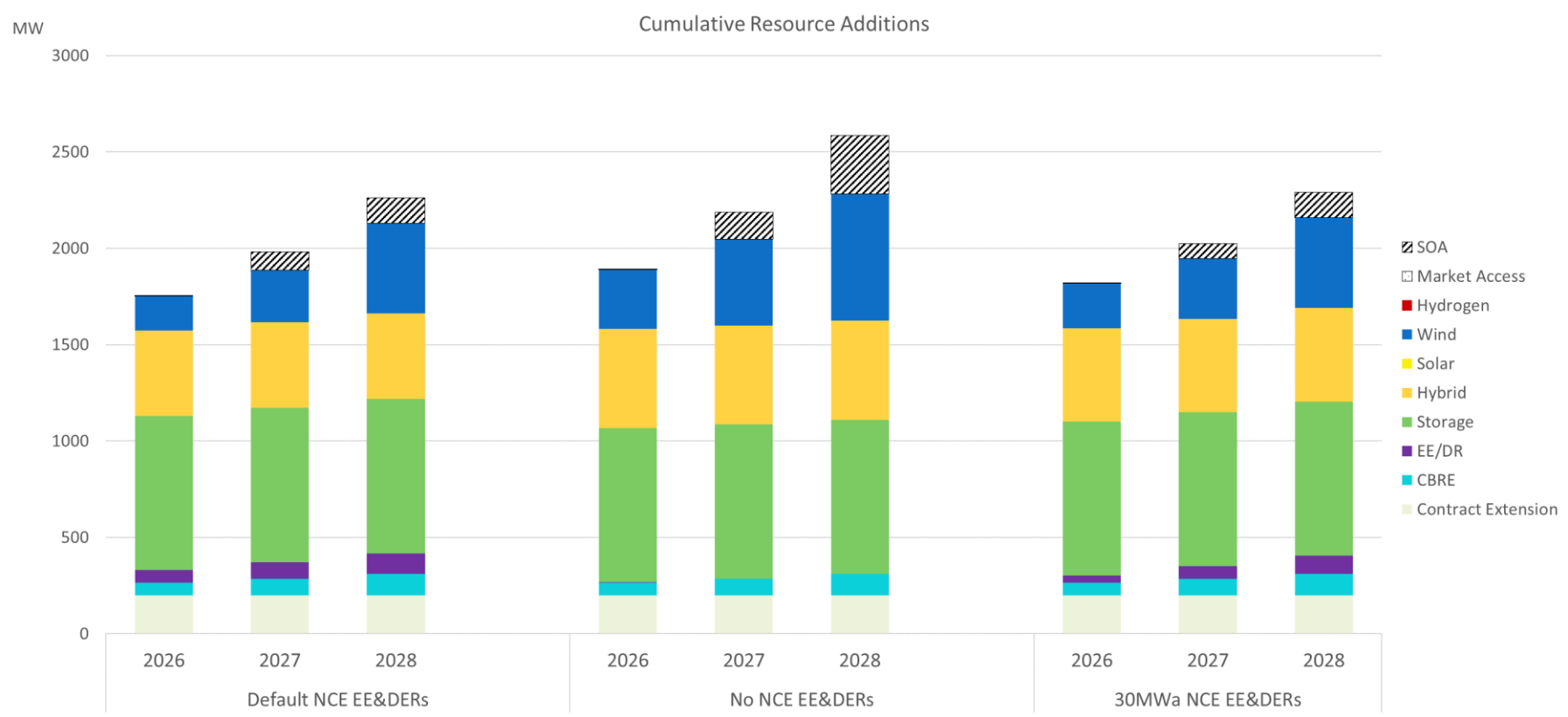
Draft Portfolio Results

Customer Portfolios

Non-Cost-Effective EE & DER Portfolios

Tests portfolios with varying actions across non-cost-effective EE and DR

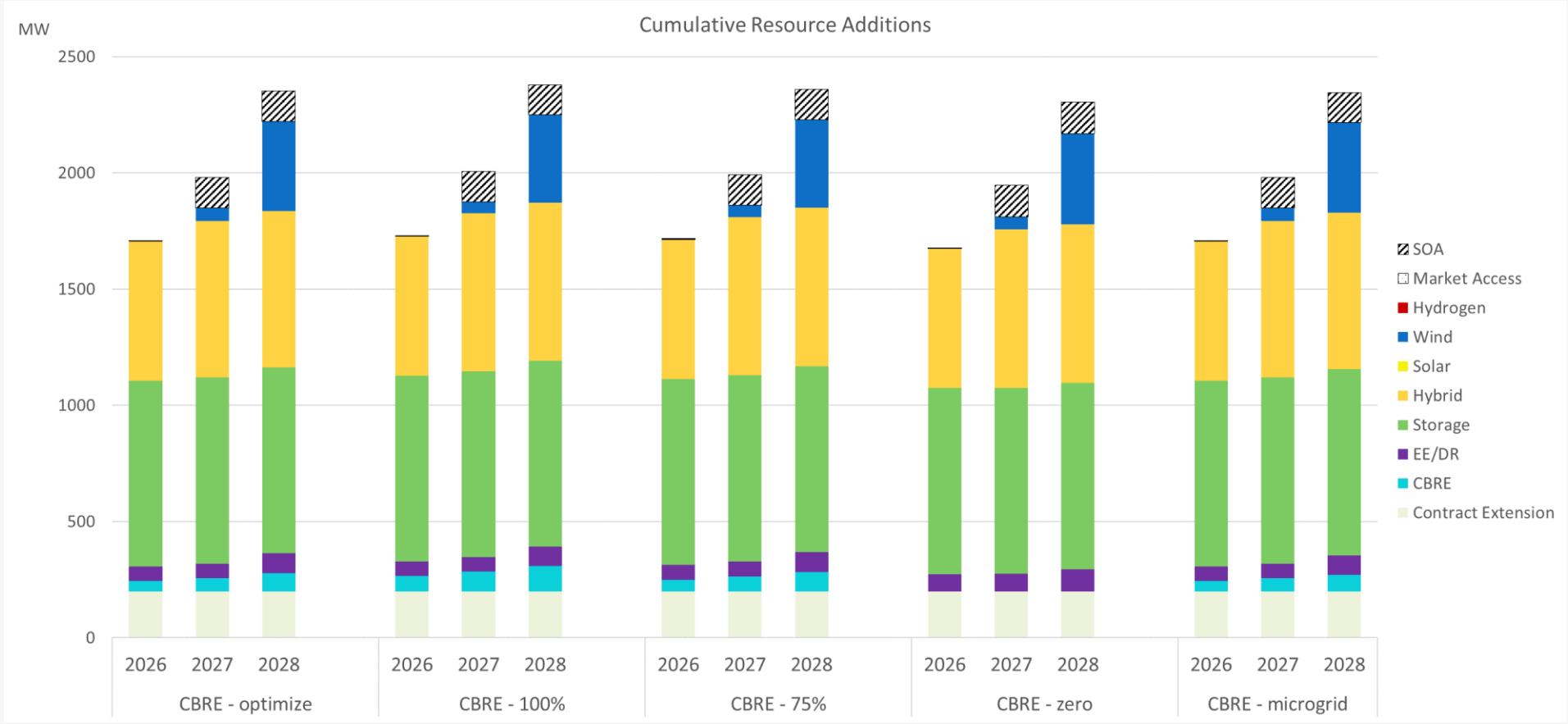
Cost-effective EE and DR from Energy Trust and the 2022 DSP are included in the need futures as presented in the July Roundtable



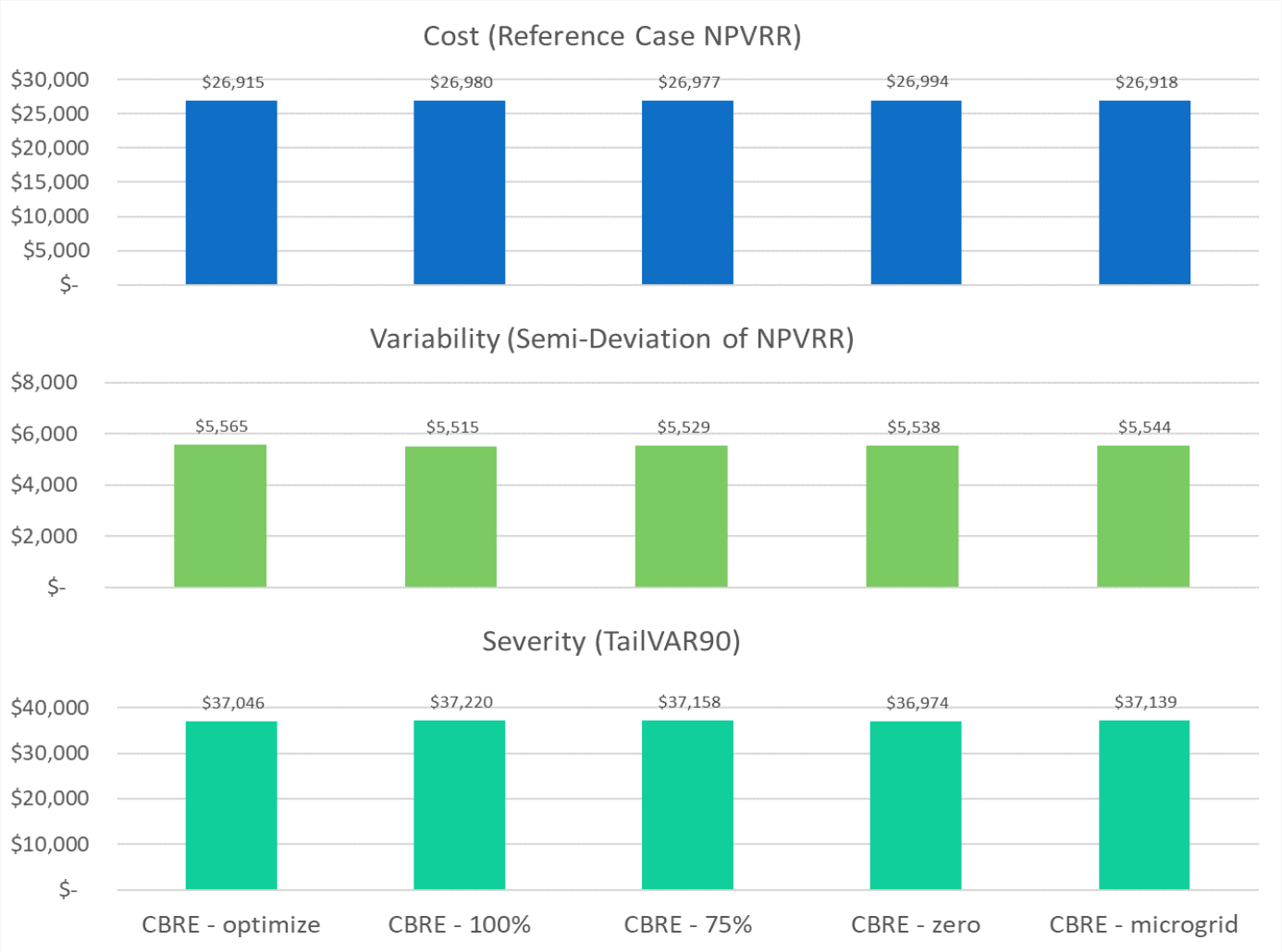
Non-Cost-Effective EE & DER Draft Scoring

CBRE Resource Additions

Tests portfolios with varying actions across CBREs



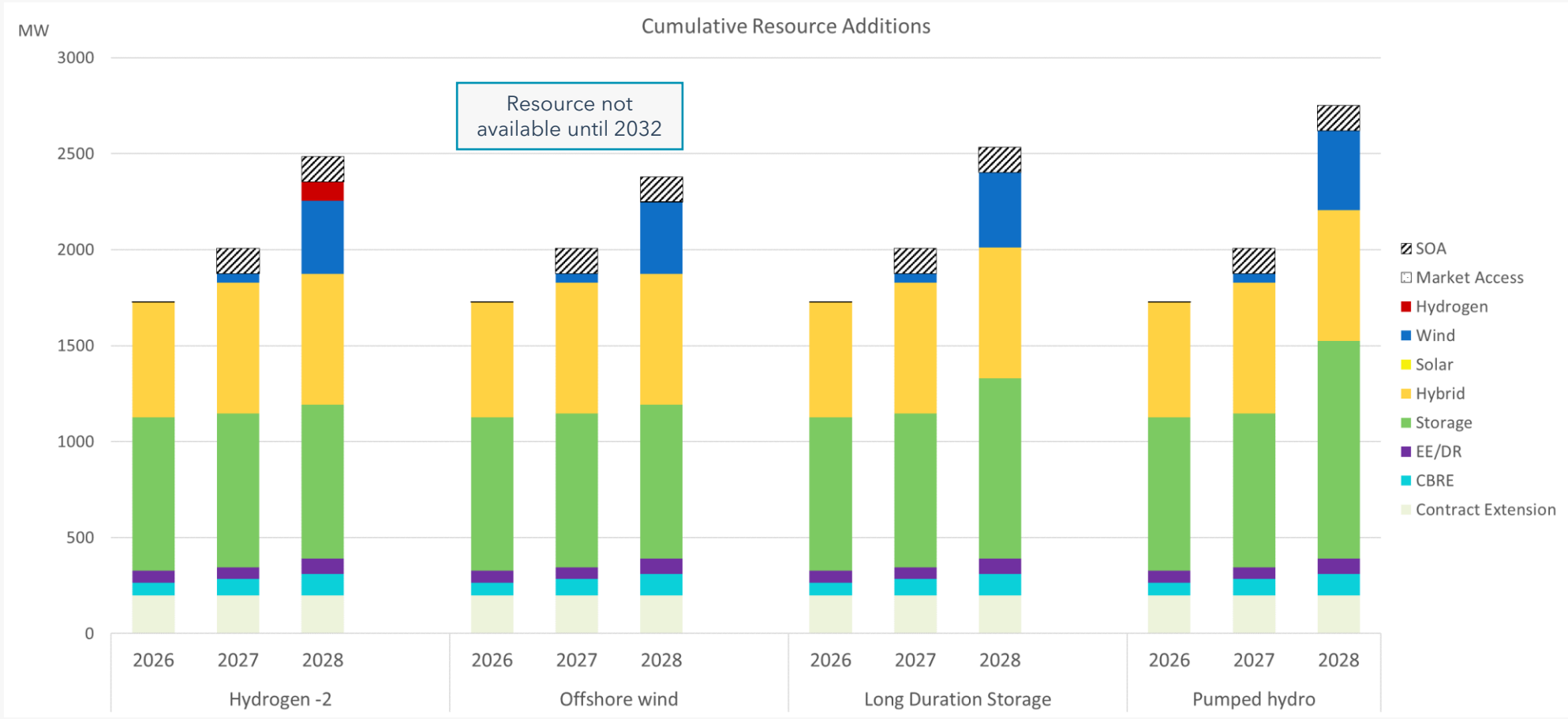
CBRE Scoring Metrics



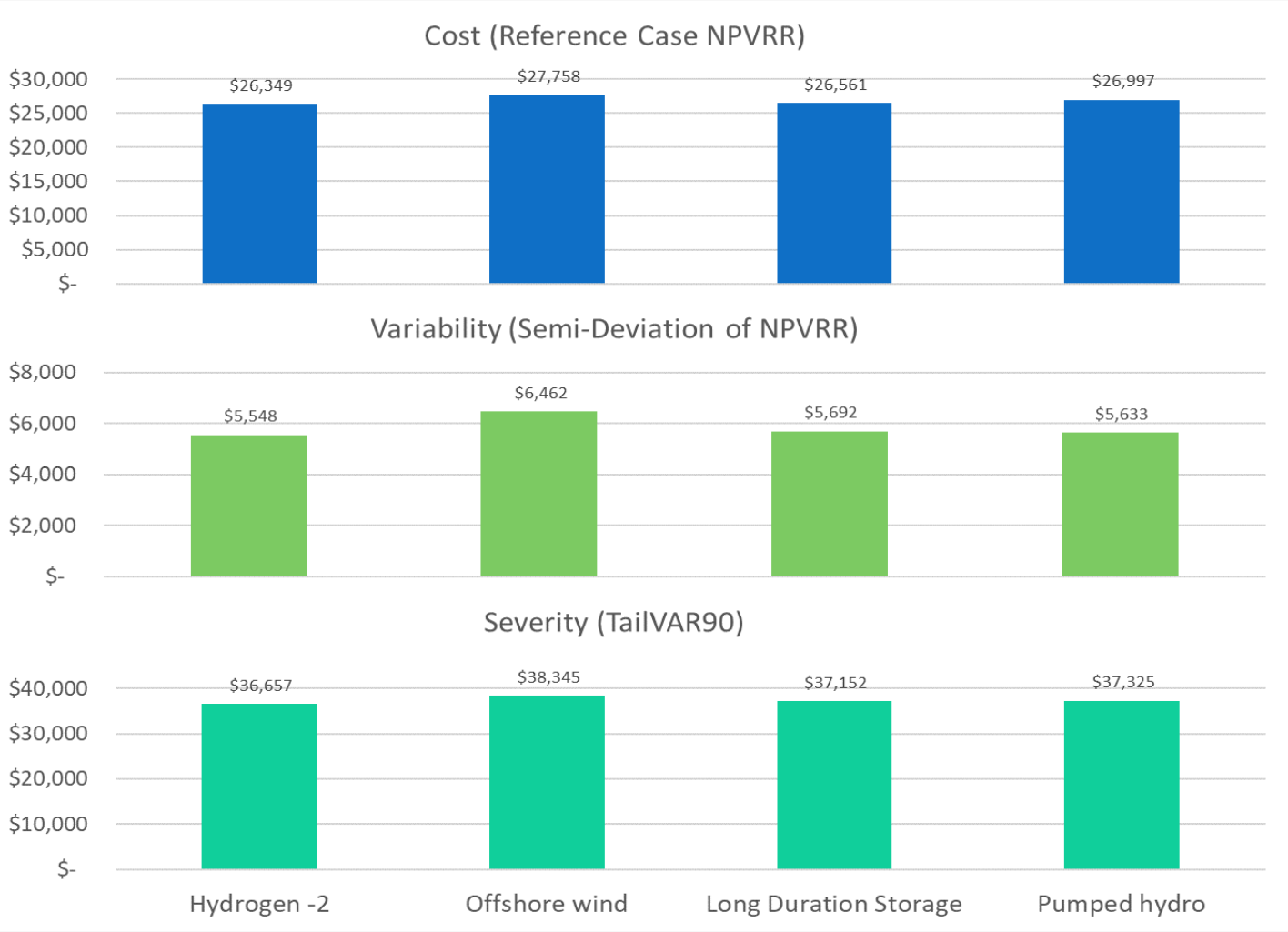
Emerging Technology Portfolios

Emerging Technology Portfolios

Testing portfolios with different emerging technologies and their associated MW availability estimate



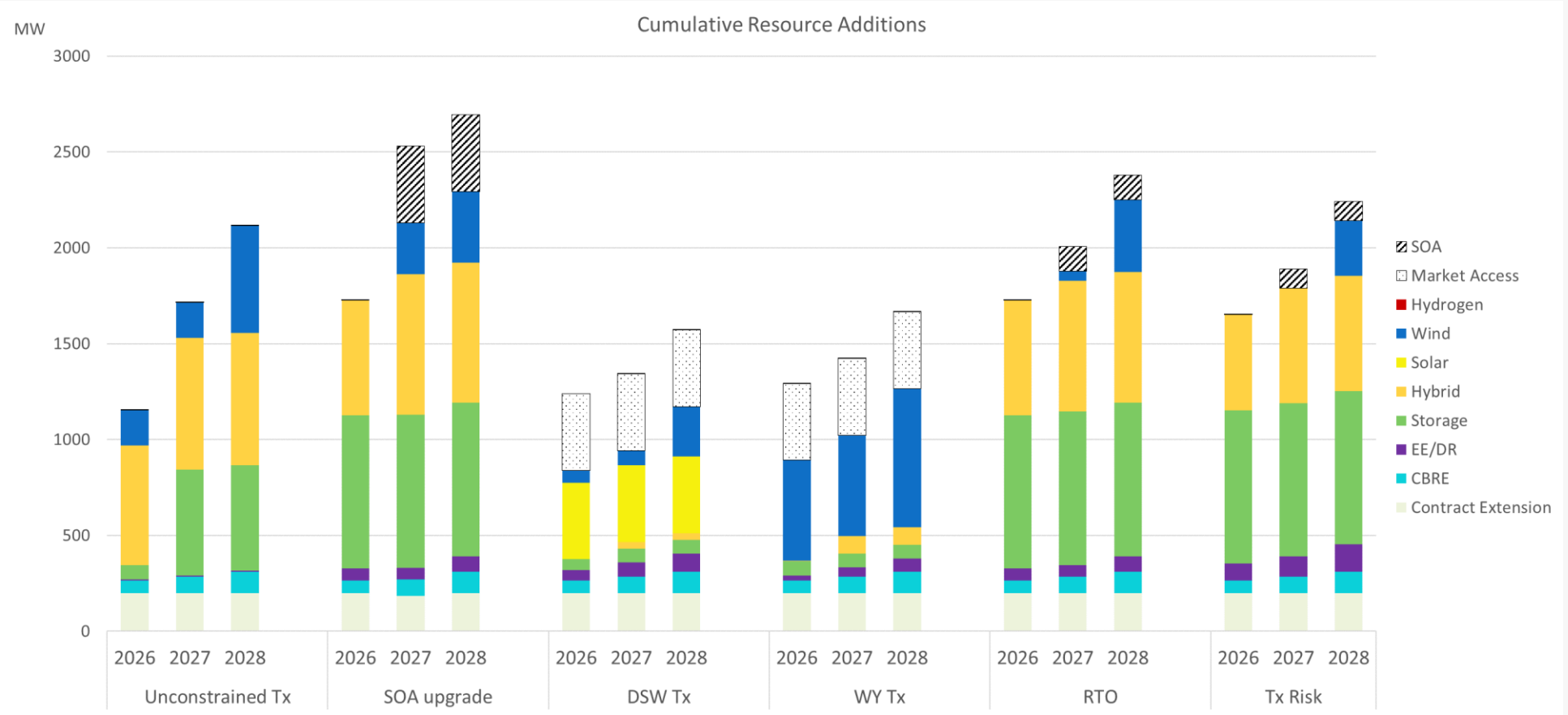
Emerging Technology Scoring Metrics



Transmission Portfolios

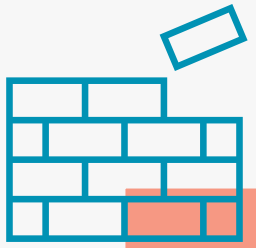
Transmission Portfolios

Evaluating different transmission conditions and constraints



Transmission Portfolios Scoring Metrics

Next Steps



Develop

- Targeted Policy Portfolios
- Optimized Portfolios
- Remaining Emerging Tech and

Update

Assumptions & constraints as applicable

QUESTIONS/ DISCUSSION

NEXT STEPS

A recording from today's webinar will be available in one week

Upcoming Roundtables:

- January 26
- February 23
- March TBD

THANK YOU

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IRP@PGN.COM

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kind of energy

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Acronyms

BPA = Bonneville Power Administration
CBRE = community based renewable energy
CCCT = combined cycle combustion turbine
COB = Columbia Gorge
DER = distributed energy resources
DEQ = department of environmental quality
DR = demand response
DRI = demand risk indicator
DSP = distribution system planning
EE = energy efficiency
EPA = environmental protection agency
GHG = greenhouse gas
HB 2021 = house bill 2021
iCBI = informational community benefit indicator
IRP = integrated resource plan
MW = mega watt; MWh = mega watt hour; MWa = megawatt average
NCE = non-cost effective
NPVRR = net present value revenue requirement
NVPC = net variable power costs
NWPP = northwest power pool
pCBI = portfolio community benefit indicator
rCBI = resource community benefit indicator
RFP = request for proposal
ROSE-E = optimal capacity expansion model used by PGE
RPS – renewable portfolio standard
SCCT = single cycle combustion turbine
Tx = Transmission
VER = variable energy resources
WECC = western energy coordinating council