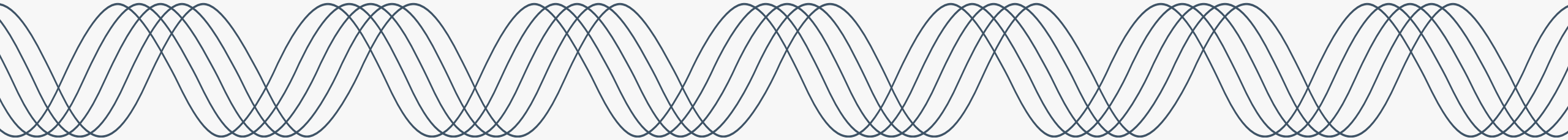
PGE CEP & IRP Roundtable 24-5

September 4th 2024



September 4th, 2024 – Agenda

9:00 – 9:05	Welcome | Meeting Logistics
9:05 – 10:15	Transmission Options
10:15 – 10:50	ETO: Updated Energy Efficiency Forecast
10:50 – 11:55	Cadeo: CBI Study
11:55 – 12:00	Closing Remarks | Next Steps

Meeting Details

1

Electronic version of presentation

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

2

Zoom meeting details

- Join Zoom Meeting https://us06web.zoom.us/j/9291862450?pwd=xVXQI4jljt7FdetDzWD0G35FFvayF8.1&omn=84372774388
- Meeting ID: 929 186 2459
- Passcode: 108198

3

Participation

- 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

Transmission Options

Seth Wiggins, PGE

PGE's Three Concentric Circles:

1. PGE's System

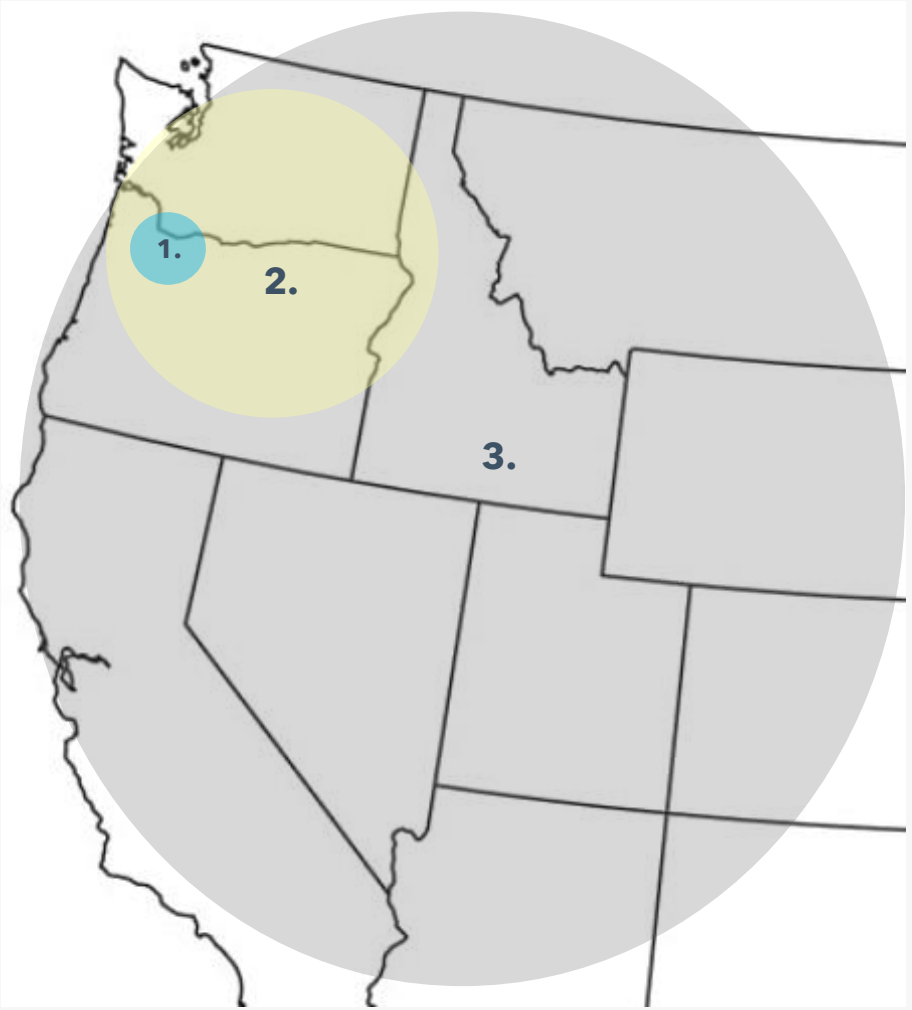
Essential for last-mile transmission to serve load from assets on and off our system

2. BPA & PGE Interface

Incremental capacity to bring power from our region via BPA's system, which encapsulates our service area, to get the power into PGE's area

3. Regional, Interregional Projects

Expand access to least cost intermittent resources, such as wind in Wyoming and sun in the desert Southwest



PGE's Three Concentric Circles in 2023 CEP/IRP:

Concentric Circle	Location	Description	In 2023 CEP/IRP
#1	PGE's System	Essential for last-mile transmission to serve load from assets on and off our system	*Chapter 9 - Transmission:* Qualitative description of PGE activity and list of current projects
#2	BPA & PGE Interface	Incremental capacity to bring power from our region via BPA's system, which encapsulates our service area, to get the power into PGE's area	*Chapter 11 - Portfolio Analysis:* SoA proxy transmission resource *Chapter 12 - Action Plan:* Continued study of SoA and Bethel-Round Butte options
#3	Regional, Interregional Projects	Expand access to least cost intermittent resources, such as wind in Wyoming and sun in the desert Southwest	*Chapter 11 -Portfolio Analysis:* WY Wind and NV Solar proxy resources

2023 CEP/IRP 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 for network load service

What can PGE do to bring more transmission capacity?

2023 CEP/IRP Transmission Modeling

PGE's geography necessitates an analysis with three components:

1. A characterization of the existing transmission system [Discussed at the July roundtable]

How much transmission capacity is available to PGE today?

2. A characterization of the future transmission system [Future roundtable]

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

3. A description of actions PGE can take in increase transmission capacity for network load service [Discussed today]

What can PGE do to bring more transmission capacity?

2023 CEP/IRP Transmission Modeling

3. A description of actions PGE can take in increase transmission capacity for network load service [Discussed today]

As discussed in the July roundtable, PGE has limited access to off-system resources based on the estimated available transmission capacity from each region

When there is insufficient transmission by resource zone, capacity expansion modeling has options of adding new transmission capacity for network load service – those options are discussed today

Table 129. Transmission ATC by Resource Zone

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

Note this table (from the 2023 CEP/IRP is being updated – see July roundtable for more detail

ATC Available transfer capability
LTF Long-term firm
CF Conditional firm

2023 CEP/IRP Transmission Limitations

3. A description of actions PGE can take in increase transmission capacity [Discussed today]

Portfolio analysis in the 2023 CEP/IRP had two methods of adding more resources once forecasted quantities of existing transmission were exhausted:

Additional generation resources	Increasing transmission inventory
• Wyoming wind and Nevada solar resource provided generation with geographically diverse profiles • An additional 'market access' benefit was added to each to reflect increased market availability	• Selecting the proxy 'South of Allston' proxy enabled an additional 400 MW of PNW resources • No additional market benefit

2023 CEP/IRP Transmission Limitations

3. A description of actions PGE can take in increase transmission capacity
[Discussed today]

PUC direction was clear on 2023 CEP/IRP approach:

*…to support acknowledgment, **we require a more complete analysis** of the need and **evaluation of the full range of available transmission solutions** than was provided here, including non-wires alternatives when appropriate. PGE will need to present a risk informed, cost-benefit analysis of all available transmission solutions for the 2030 time frame, including factors such as the associated timeline and cost risks, anticipated rate impacts, and the presence of longer-term or broader regional benefits. **We require PGE to complete this shorter-term analysis** of solutions to constraints that affect all resource delivery to PGE's load **by the time it files its next IRP/CEP Update**.*

– Order No. 24-096, emphasis added

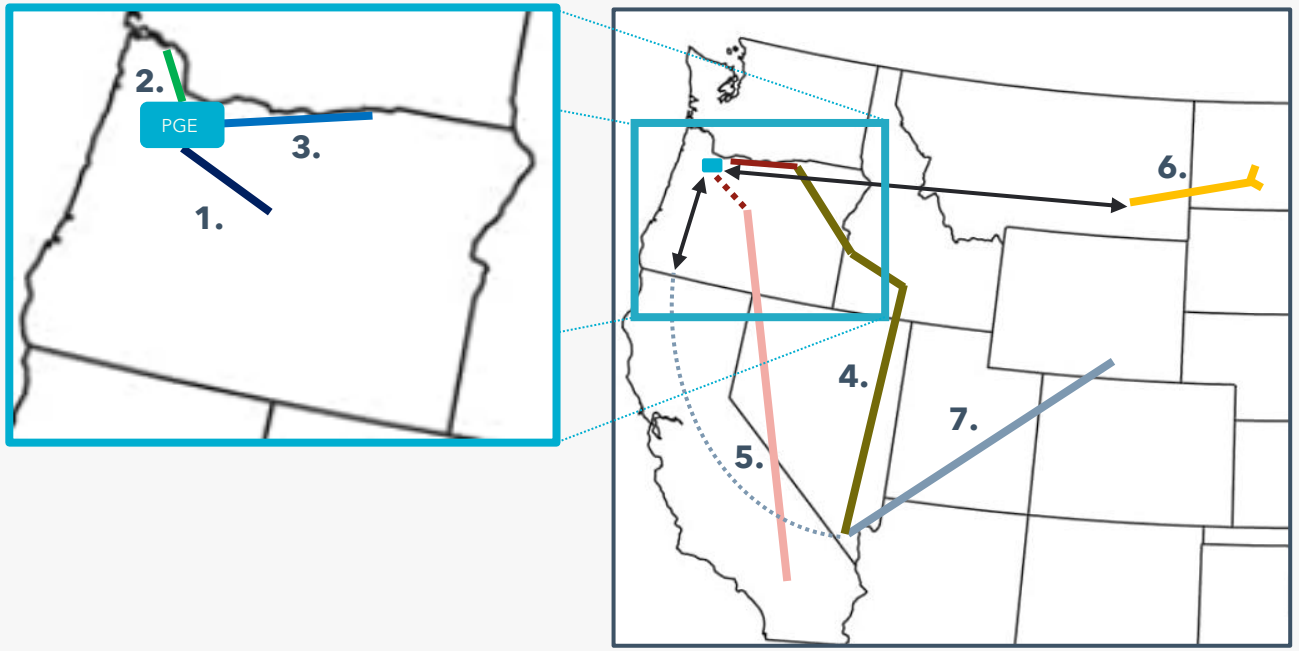
2023 CEP/IRP Update Approach

To fulfil this PUC direction for the CEP/IRP Update, PGE has compiled what it sees as a comprehensive list of transmission actions available to PGE. Only a subset of the modeling assumptions about those options will be discussed today:

Topic	Question to answer	Covered today?
Transmission option requirements	*What must happen for PGE to receive power from this option?*	Yes
Transmission option commercial operation date (COD)	*When will the transmission be available to PGE?*	Yes
Generation resources	*What generation benefits would the transmission enable?*	Yes
Market access	*Will there be any additional benefits beyond that generation?*	Covered in a future roundtable
Transmission costs	*What are the forecasted costs associated with the option?*	Covered in a future roundtable

2023 CEP/IRP Update Transmission Options

1.	Bethel-Round Butte
2.	Trojan-Harborton
3.	Cascade Renewable Transmission Project
4.	SWIP N + Gateway West 8 + B2H
5.	Western Bounty
6.	North Plains Connector
7.	TransWest Express



Transmission pathways and the differences in both color and patterns will be described for each individual option in the following seven slides

1. Bethel–Round Butte

The Bethel-Round Butte reconductoring would increase the capacity on the existing line

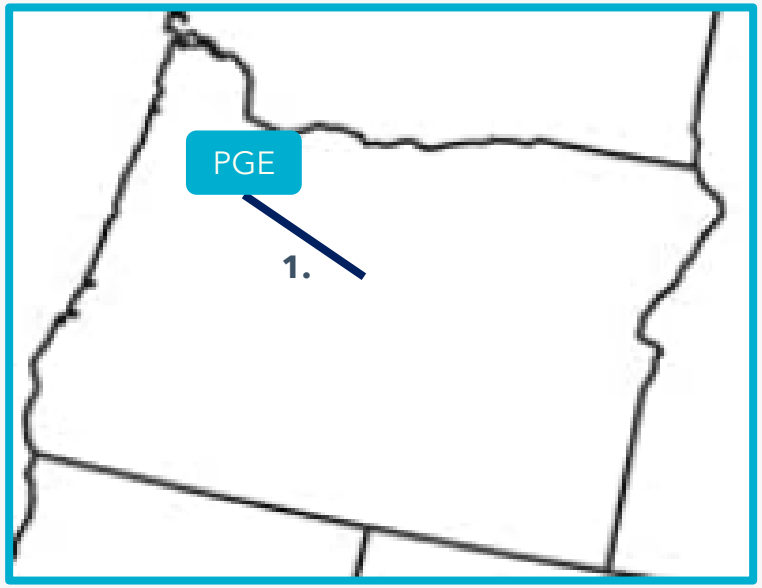
The line is 98 miles, running from the Bethel substation (near Salem) to the Round-Butte substation

The projected commercial operation date (COD) is **2032**, and will not require any other transmission expansion for PGE to access these benefits

Rebuilding the line from 230 kV to 500 kV will increase capacity

- This could support an increase of **2,385-4,770 MW** increase in 'BPA' resources (off-system resources in the PNW region), depending on specification and subsequent path rating processes

This option provides market access to the California-Oregon border *[the associated benefits will be discussed in a future roundtable]*



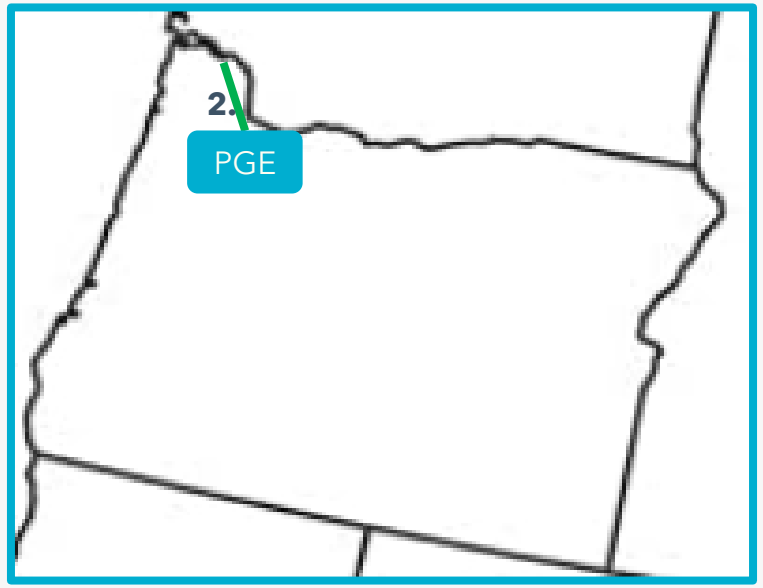
2. Trojan-Harborton

Approximately 34 miles long, running between PGE's Trojan and Harborton substations, paralleling two existing lines in service since the 1970s

PGE currently owns the additional unused ROW necessary for the project and has since the 1970s

The projected commercial operation date (COD) is **2032** and will not require any other transmission expansion for PGE to access these benefits.

This transmission project will enable **800 MW** from BPA's generation resources, subject to cooperative study and agreement with other South of Allston path owners, BPA and PacifiCorp.



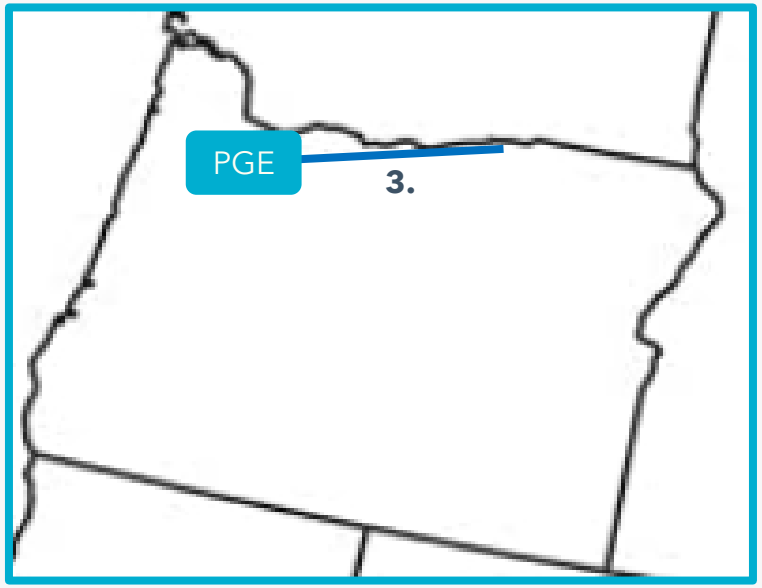
3. Cascade Renewable Transmission Project

This project involves an electric transmission cable bundle, buried entirely underground and underwater, along with two converter stations located next to existing substations.

This travels approximately 100 miles, primarily beneath the Columbia River, from the Big Eddy substation to the Harborton substation

The projected commercial operation date (COD) is **2032** and will require additional BPA and PGE transmission expansion for PGE to access these benefits

This is modeled to enable the transfer of **1,100 MW** of 'BPA' resources (off-system resources in the PNW region)



PGE is not currently participating in this project, but involvement may be possible if selected as part of PGE's preferred portfolio.

4. SWIP N + Gateway West 8 + B2H

PGE does not have a stake in these projects today. This option entails PGE purchasing access on five transmission lines leading to the desert southwest:

1. Boardman to Hemingway (B2H)
2. Gateway West segment E8
3. Southwest Intertie Project (SWIP) - North
4. One Nevada Transmission Line (ON Line)
5. Desert Link

This is achievable by **2027** (line COD). However, this option would require additional access across BPA's system, which is plausibly expected by **2032** (IRP COD).

Up to **600 MW** of **Nevada solar** is modeled to be enabled through this option

- Additionally, this would provide access to the **Mead** market hub *[the associated benefits will be discussed in a future roundtable]*

PGE is not currently participating in this project, but involvement may be possible if selected as part of PGE's preferred portfolio.

5. Western Bounty

The Western Bounty Transmission System is a proposed 3000 MW HVDC line that could connect southern California to the Grizzly substation

- The projected commercial operation date (COD) is **2033**

Up to **3000 MW** of **Nevada solar** is modeled to be enabled through this option

- This option would provide access to the **SP-15** market hub *[the associated benefits will be discussed in a future roundtable]*

Additional BPA upgrades would be required for this option to reach PGE

PGE is not currently participating in this project, but involvement may be possible if selected as part of PGE's preferred portfolio.

6. North Plains Connector

This project is a 412-mile HVDC transmission line to be constructed with endpoints near Bismarck, North Dakota and Colstrip, Montana.*

PGE currently has 270 MW of rights from Colstrip to PGE

- If nothing changes between now and 2032, only a combined 270 MW NPC will be available for model selection
- However, the company has submitted TSRs for an additional 720 MW across both BPA's and NorthWestern's systems

Up to **3000 MW** of **North Dakota wind** is modeled to be enabled through this option, subject to the constraints mentioned above

- Additionally, this option would provide access to the **MISO Resource Zone 1** market *[the associated benefits will be discussed in a future roundtable]*

This is option's COD is expected by **2032.**

*More details on this option found in June Roundtable

7. TransWest Express Transmission Project

This project is a two-part line that connects near Sinclair, WY and near Boulder City, NV:

- Near Sinclair, WY to near Delta, UT: 3000 MW DC
- Near Delta, UT to near Boulder City, NV: 1500 MW AC

This option is being structured as a gen-tie through CAISO, which PGE can access using its rights at the California-Oregon Border (COB) trading hub

- This line could add up to approximately 3,000 MW of transmission access, however PGE's COB rights limit access to **600 MW** of **Wyoming Wind**
- No other market access benefits assumed

The anticipated COD for this option is **2027**, and would not require any additional transmission expansion

PGE is not currently participating in this project, but involvement may be possible if selected as part of PGE's preferred portfolio.

2023 CEP/IRP Update Transmission Expansion Options

Resource	Transmission Line	Region	State	Option COD	Expected Required BPA Transmission Upgrades	Available to PGE (greater of last two columns)	Enabled MW	Generation Resource(s)	Market Access
1.	Bethel-Round Butte	PNW	Oregon	2032	n/a	2032	Up to 4,770	BPA*	COB
2.	Trojan-Harborton	PNW	Oregon	2032	n/a	2032	800	BPA*	n/a
3.	Cascade Renewable Tx	PNW	Oregon	2032	2032	2032	1100	BPA*	n/a
4.	SWIP N + Gateway West 8 + B2H	Southwest	Nevada	2027	2032	2032	600	Nevada Solar	Mead
5.	Western Bounty	Southwest	California	2033	2032	2033	3000	Nevada Solar	SP-15
6.	North Plains Connector	Rockies	North Dakota	2032	2032	2032	3000	North Dakota Wind	MISO Zone 1
7.	TransWest Express	Rockies	Wyoming	2027	n/a	2027	600	Wyoming Wind	n/a

** 'BPA' generation resources denote regional off-system resources generally considered in PGE's IRP (e.g., Gorge wind, Christmas Valley Solar, etc.)*

2023 CEP/IRP Update Portfolio Analysis

Portfolio analysis involves the process of identifying the set of incremental resource additions that represents the best combination of cost, risk, emission reductions and community benefits

- As in the 2023 CEP/IRP Update, portfolio analysis will *quantitatively estimate portfolio cost and risk*
- The evaluation of emission reductions and community benefits will be mostly qualitative

PGE will incorporate these transmission options into portfolio analysis

- The model will use all applicable assumptions about the costs and benefits of each transmission option
- ROSE-E (our capacity expansion model) will search for the least-cost set of resource options while meeting energy, capacity, emission reductions and other system needs

All transmission options selected in portfolio analysis will be for network load service

2023 CEP/IRP Update Transmission Study

PGE has engaged two consultants to conduct parts of its transmission study for the CEP/IRP Update

EnergyGPS:

Currently working to estimate market access of the applicable transmission options

- *What resource adequacy benefits can be achieved by accessing different markets?*
- *What is a reasonable estimate of the market depth and market liquidity in areas such as SP-15, MISO Zone 1, and Mead.*

Energy Strategies:

Currently working to evaluate the viability of the specific paths identified

- *Is this list of transmission expansion options comprehensive?*
- *Are there any other transmission options that PGE should be considering?*
- *Are the pathways identified (both in size and COD) viable for PGE?*

Remaining Transmission Modeling Questions

Area of Transmission Modeling	Initial Roundtable presentation	Question to Answer
1. A characterization of the existing transmission system	July 11th	*How should we allocate estimates of total conditional firm available to specific resource zones?*
2. A characterization of the future transmission system	Future roundtable	*How should we plan for upgrades to BPA's system?*
3. A description of actions PGE can take to increase transmission capacity	September 4th	*How should we model the costs associated with these options?*
		What are the market access benefits associated with these options?
		What is the generation profile of the North Dakota resource?

Updated Energy Efficiency Forecast

Seth Wiggins, PGE
Kyle Morrill, ETO

PGE's IRP uses two forecasts of energy efficiency (EE)

Both come from Energy Trust of Oregon (ETO)

1. Cost-effective EE: Quantities of EE that will be acquired (and that PGE should plan for)
   - *Given the current avoided costs (from UM 1893), what EE will ETO be able to procure?*
2. Additional EE: Quantities of additional EE 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 EE forecasts from May 2022. Today ETO will describe their updated forecast.

Energy Efficiency Resource Assessment

PGE 2025 IRP

September 4, 2024

Energy Trust of Oregon

Agenda

- Resource Assessment Model Overview
- Draft PGE 2025 Resource Assessment Results and Deployment Forecast

About us

Independent nonprofit

Serving 2.4 million customers of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas and Avista

Providing access to affordable energy

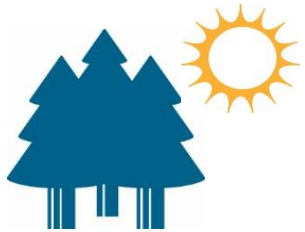
Generating homegrown, renewable power

Building a stronger Oregon and SW Washington

Clean and affordable energy since 2002

From Energy Trust's investment of $2.8 billion in utility customer funds:

825,000 sites transformed into energy efficient, healthy, comfortable and productive homes and businesses



30,000 clean energy systems generating renewable power from the sun, wind, water, geothermal heat and biopower

$13.5 billion in savings over time on participant utility bills from their energy-efficiency and solar investments

42.9 million metric tons of carbon dioxide emissions kept out of our air, equal to removing 11.2 million cars from our roads for a year

Energy Trust Resource Assessment Model Overview

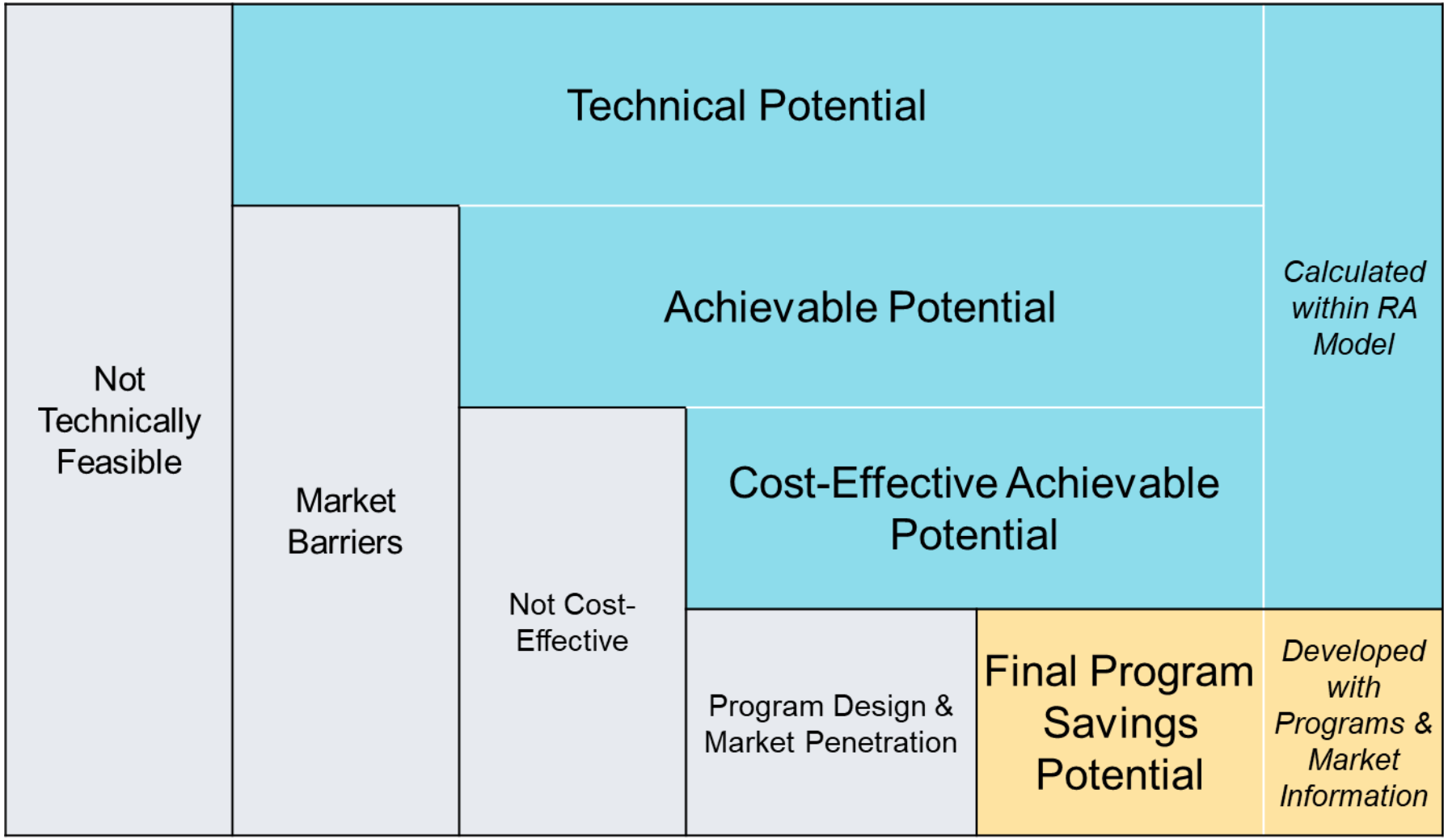
RA Model Background

- Estimate of 20-year energy efficiency potential
- “Bottom-up” modeling approach
  - Measure level inputs are scaled to utility level
- Measure inputs
  - Baseline and efficient equipment
  - Measure savings
  - Incremental cost
  - Market data
- Utility inputs
  - Load and customer count/building stock forecast
  - Customer stock demographics
  - Avoided costs

Modeling Updates

- Measure updates
  - Measure savings, incremental cost
  - New measures
  - Emerging technologies
- 2022 Residential Building Stock Assessment (NEEA)
  - Total measure density, technical suitability and baseline initial saturation
  - Heating fuel, water heating fuel splits

Forecasted Potential Types



Cost-Effectiveness Screen

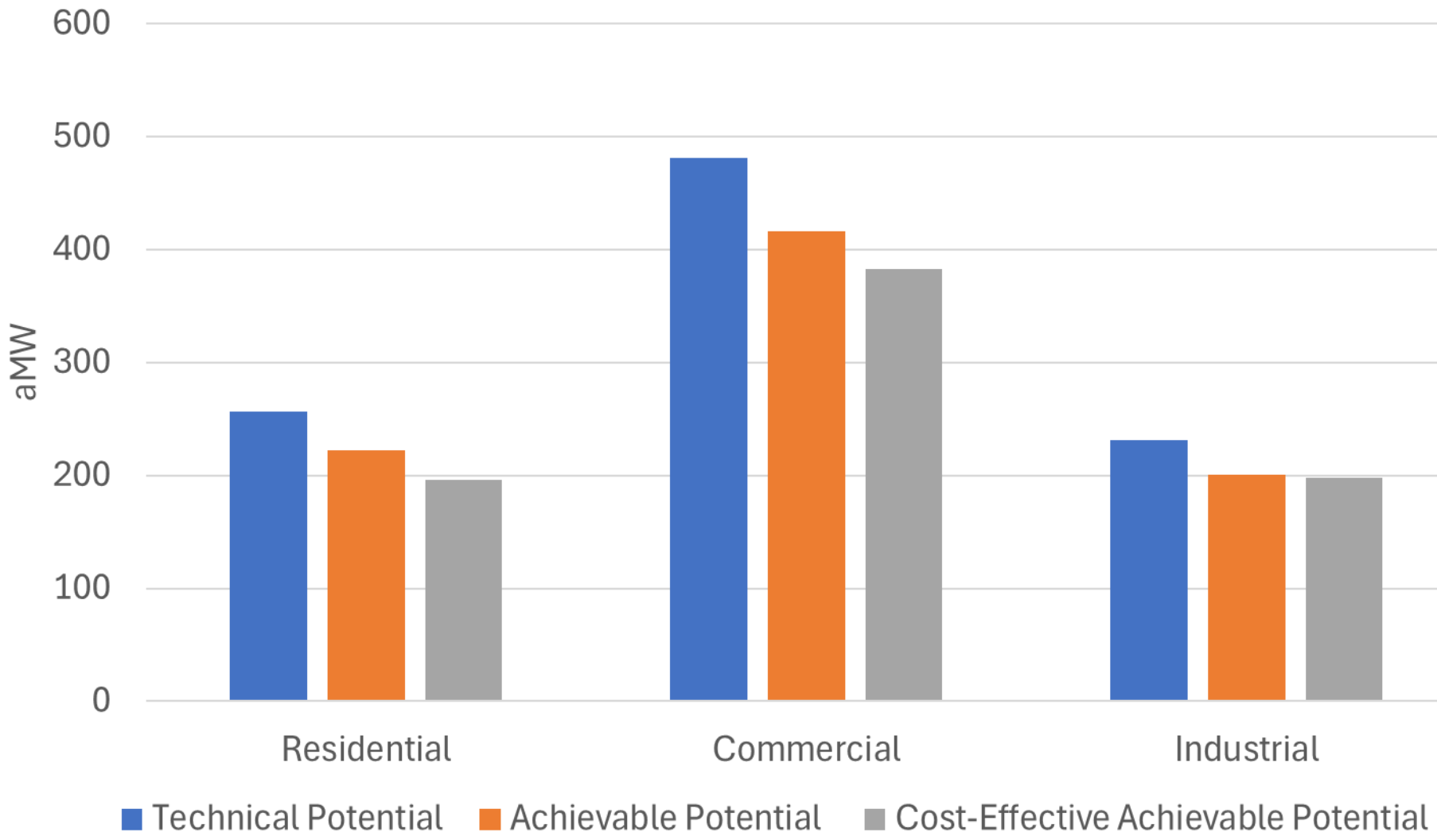
- RA model utilizes the Total Resource Cost (TRC) test to screen measures for cost-effectiveness

$$TRC = \frac{Measure\ Benefits}{Total\ Measure\ Cost}$$

- Measure benefits
  - NPV avoided costs per first-year kWh
  - Quantifiable non-energy benefits
- Measure costs
  - The customer cost of installing an efficiency measure (full cost for retrofits, incremental over baseline cost for replacement)
- Cost-Effectiveness Override
  - Measures under an OPUC exception

Draft Resource Assessment Results
PGE 2025 CEP/IRP Update

Draft Cumulative Potential by Sector and Type



Draft Cumulative Potential by End Use

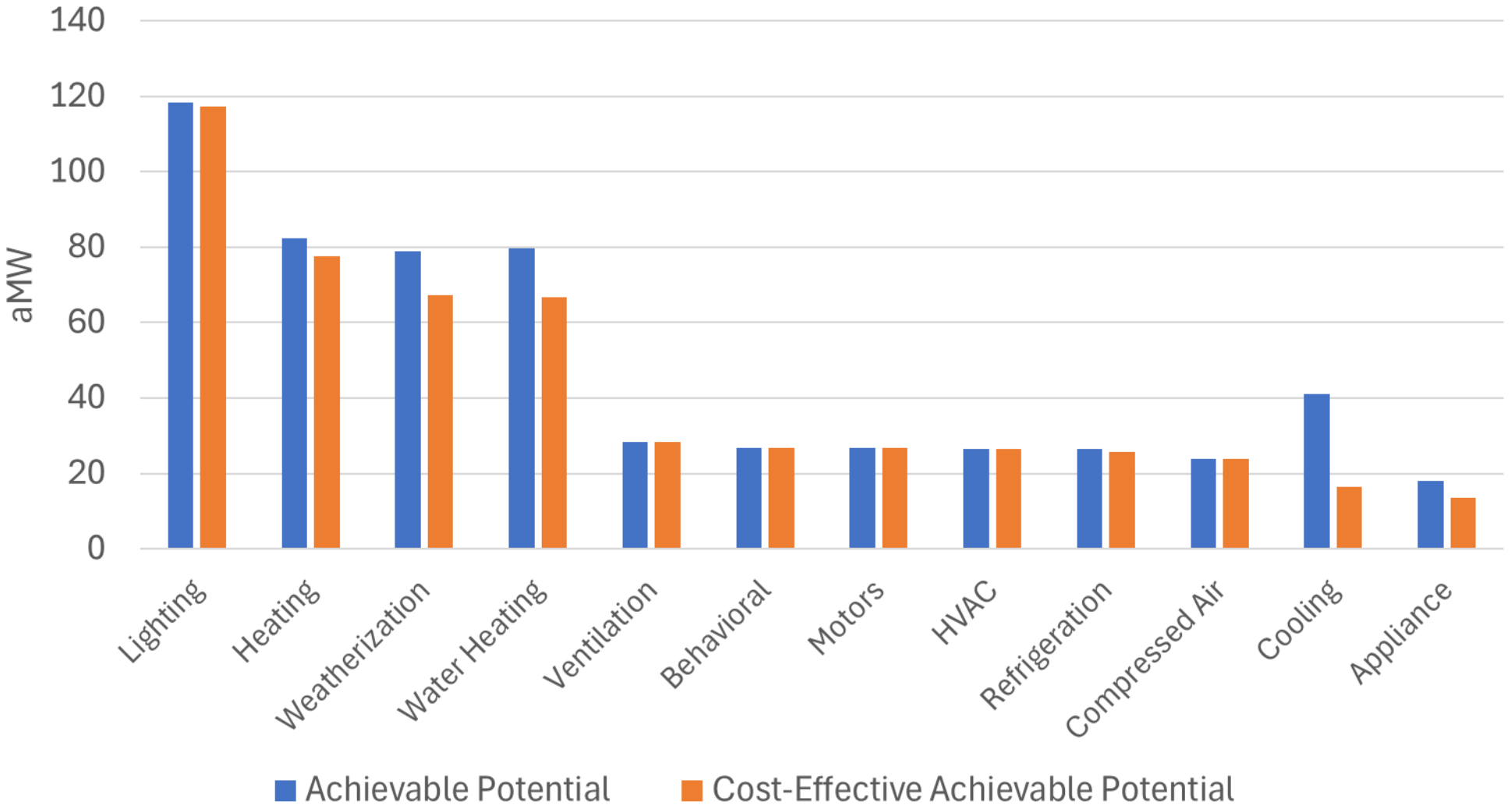


Chart includes major end uses only and does not add up to total potential.

Draft Results and Deployment

20-Year Energy Efficiency Potential (aMW) - PGE

Sector	Technical Potential	Achievable Potential	Cost-Effective Achievable Potential	Draft Savings Projection
Residential	256	222	196	156
Commercial	481	416	383	271
Industrial	231	201	198	195
Total	**969**	**839**	**777**	**622**

2023 Total	*712*	*630*	*509*	*527*
% change	*36%*	*33%*	*53%*	*18%*

Draft PGE Deployment, Cost-Effective Achievable Potential

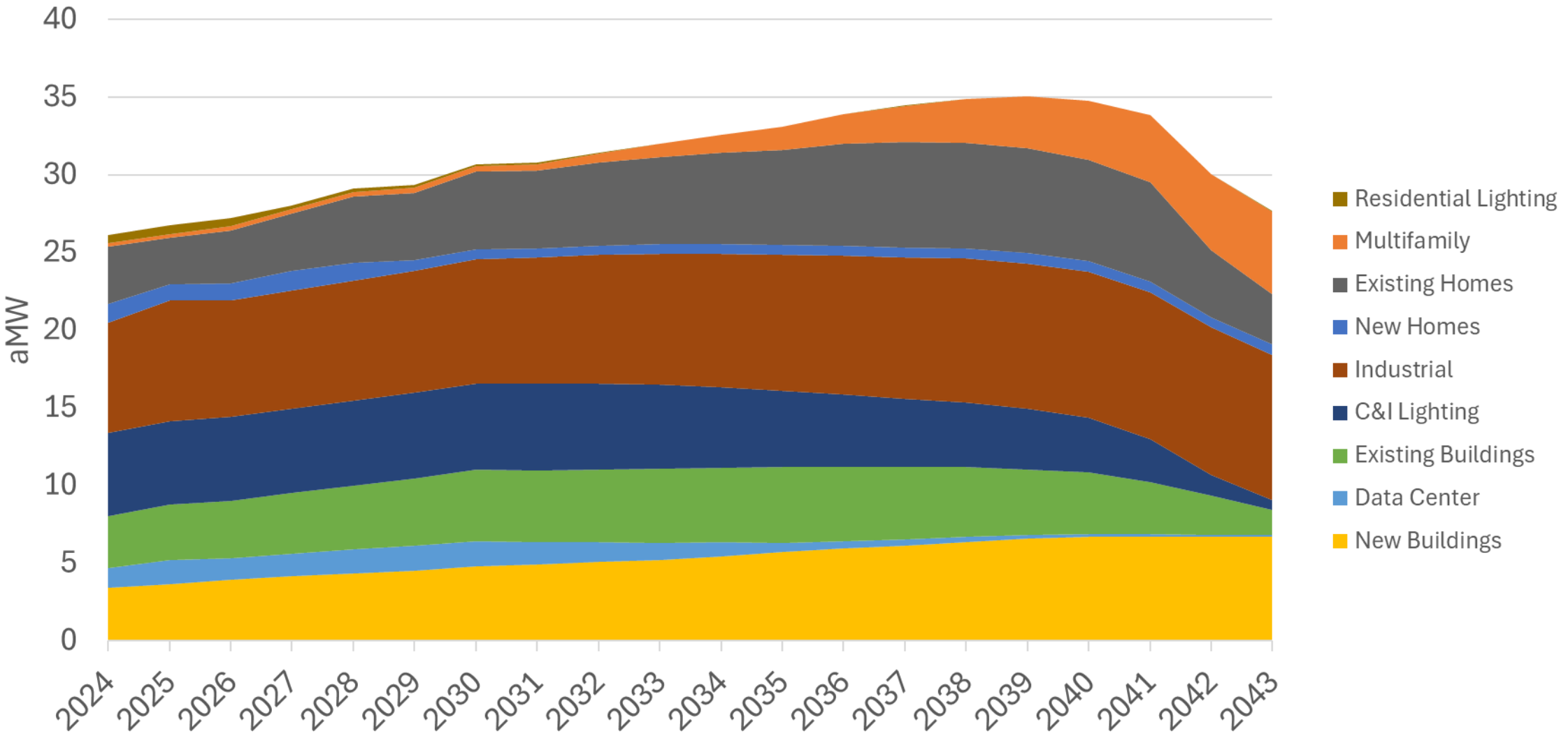
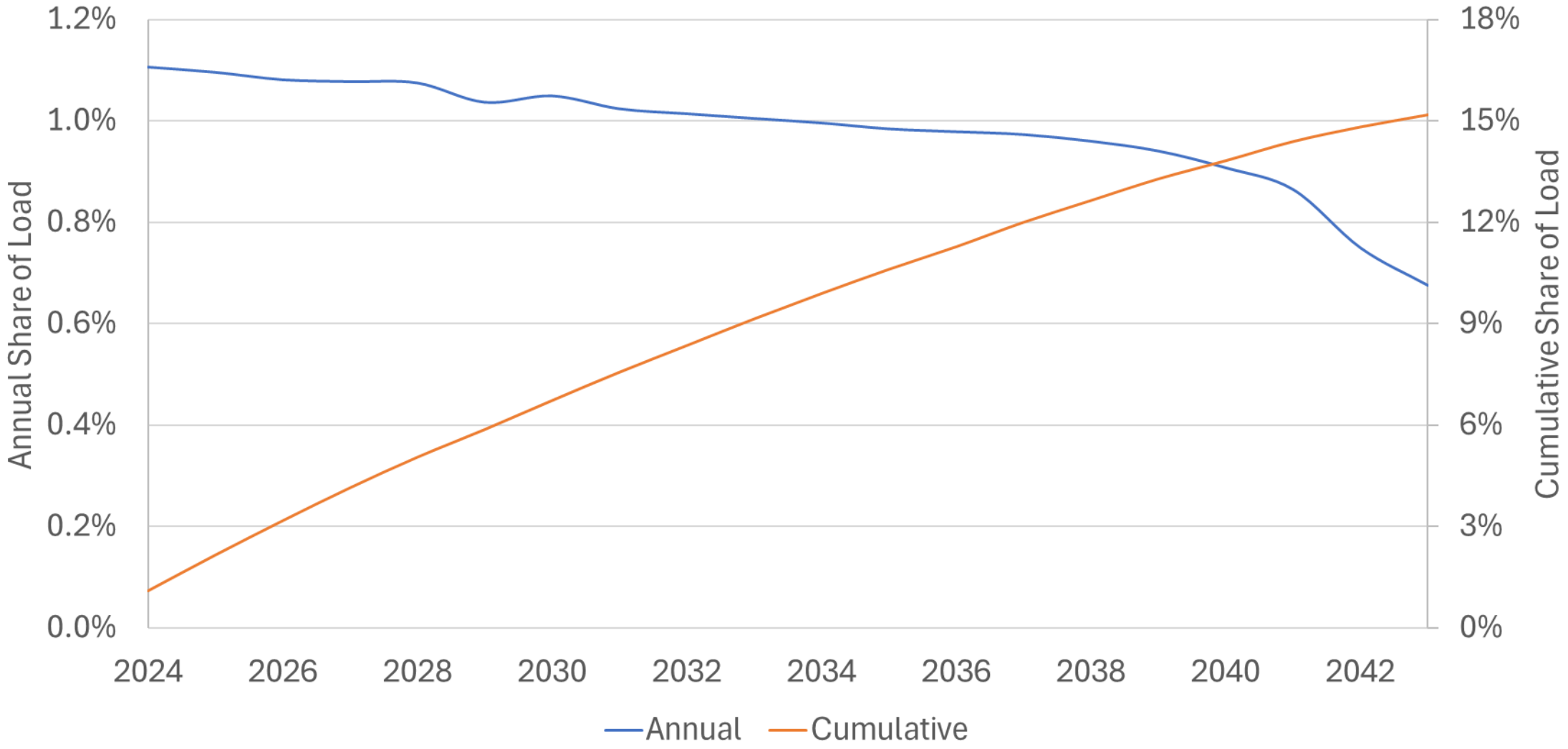


Chart shows total expected efficiency and includes savings from codes and standards. Energy Trust may not claim the entirety of savings depicted above.

Draft Deployed Savings Compared to PGE Load Forecast



Thank you

Kyle Morrill, Sr. Planning Project Manager
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EnergyTrust of Oregon

Community Benefit Indicators

Seth Wiggins, PGE

Scott Reeves, Cadeo

Community Benefit Indicators (CBIs) in the 2023 CEP/IRP

PGE received direction (from UM 2225) on how to incorporate CBIs:

Figure 48. OPUC Order 22-390: CBI Pathways

Resource (rCBI)	Portfolio (pCBI)	Informational (iCBIs)
• Informs and tracks progress on specific outcomes achieved through CBRE actions • Should be reflected in the CBRE potential study and in IRP portfolio scoring	• Addresses the impacts of the utility's portfolio on communities • May or may not be tied to CBREs, and should be reflected in IRP portfolio scoring	• Provides transparency into topics of importance to communities • May or may not directly inform portfolio scoring in the IRP

Community Benefit Indicators (CBIs) in the 2023 CEP/IRP

Following this direction PGE created quantifiable metrics for each:

CBIs	Metric
Resource (rCBI)	10% reduction in fixed costs for CBREs
Portfolio (pCBI)	1 MW of CBRE created 1 unit of pCBI benefit
Informational (iCBI)	Several listed in *Section 7.1.6 - Informational community benefits indicators,* though none were quantified in the filed 2023 CEP/IRP

Community Benefit Indicators (CBIs) in the 2023 CEP/IRP

Staff Recommendation 7:

- *(The OPUC should direct) PGE to conclude its process to develop informational and portfolio CBIs and provide baseline metrics prior to filing its next IRP/CEP Update. If PGE cannot complete this effort by this timeline, PGE should provide a detailed status update and explanation of how it will ensure that remaining issues are resolved as soon as practicable.*

LC 80 Order No. 24-096:

- *We adopt Staff's recommendation and reiterate our discussion that PGE must demonstrate development of CBIs to assist in our understanding tradeoffs between cost, risk, and community benefit, and when evaluating procurement decisions. We recognize that initial CBIs may not cover issues of concern to all communities, but we expect that some set of informational-only metrics be developed in time to be included with PGE's next RFP. If PGE cannot develop such metrics by its next IRP/CEP update, PGE must provide a detailed explanation of the barriers and constraints, along with a proposal for how and when PGE and its community stakeholders will be able to address them.*

To comply with this direction PGE has engaged Cadeo to help further develop its CBIs

September 2024

PGE Community Benefit Indicator Strategy

CBI CATALOG AND PRELIMINARY FINDINGS

Scott Reeves
Eli Font

Outline

- Background / Project goals
- Project Scope / Approach
- CBI Catalog – Approach
- CBIs Catalog – Mapping CBI by Characteristics
- Status Summary / Next steps
- Discussion

Acronyms

- **BTMS** – Behind-the-Meter Storage
- **CBI** – Community Benefit Indicator
- **CBRE** – Community-Based Renewable Energy projects
- **CBRE HY** – CBRE Small In-Conduit Hydropower projects (low-impact hydropower placing turbines within water supply or waste water systems)
- **CBRE MG** – CBRE Microgrid projects (combination of solar and storage with islanding control capability)
- **CBRE PV** – CBRE PV/solar projects (e.g., community-scale solar)
- **DR** – Demand Response (including direct load control, curtailment, peak time rebates, EV managed changing, battery DR, and dynamic or time-varying rates)
- **EE** – Energy Efficiency
- **PV** – Photovoltaic (e.g., rooftop solar)
- **TE** – Transportation Electrification (including public, private, and residential applications)
- **TOU** – Time-of-Use or time-varying rates

Background / Project Goals

CBI Definitions from 2023 CEP/IRP

PGE's 2023 Clean Energy Plan and Integrated Resource Plan (CEP/IRP) uses three classes of Community Benefit Indicators (CBIs) to incorporate the benefits of community-based renewable energy (CBRE) into resource portfolio analysis.

Figure 48. OPUC Order 22-390: CBI Pathways

Resource (rCBI)	Portfolio (pCBI)	Informational (iCBIs)
• Informs and tracks progress on specific outcomes achieved through CBRE actions • Should be reflected in the CBRE potential study and in IRP portfolio scoring	• Addresses the impacts of the utility's portfolio on communities • May or may not be tied to CBREs, and should be reflected in IRP portfolio scoring	• Provides transparency into topics of importance to communities • May or may not directly inform portfolio scoring in the IRP

Clean Energy Plan and Integrated Resource Plan 2023, Portland General Electric, p.142

PGE CBIs in the 2023 CEP/IRP

pCBI

1 MW of CBRE capacity

=

1 unit of benefit

rCBI

10% cost reduction adder applied to CBREs

iCBI

iCBI 1: Improve participation in clean energy programs by EJ communities	**Metric 1A:** DER program participation rates
	Metric 1B: Allocation of budget and/or savings goal within DER programs for EJ communities
iCBI 2: Increase energy affordability for EJ communities	**Metric 2A:** Customers w/ electricity bill burden
	Metric 2B: Number of customer arrearages
	Metric 2C: Number of customer disconnections
iCBI 3: Improved grid resiliency	**Metric 3A:** % of customers w/ frequent/long-duration outages
	Metric 3B: % of customers with access to emergency backup power
iCBI 4: Increased access to jobs	**Metric 4A:** Number of clean energy jobs related to CBRE goals and % held by members of EJ communities
	Metric 4B: Support workforce training opportunities for EJ communities
iCBI 5: Environment	**Metric 5:** Reduced GHG emissions
iCBI 6: Improve efficiency in (low-income) housing stock	**Metric 6A:** Amount of residential energy efficiency achieved in target communities
	Metric 6B: Work with weatherization/energy efficiency implementors for equitable distribution of EE benefits

Clean Energy Plan and Integrated Resource Plan 2023, Portland General Electric

	OPUC/ STAFF RECOMMENDATIONS	PROPOSED ACTIONS
pCBI	Expand pCBIs beyond CBREs in portfolio analysis – showing variable CBIs by portfolios	Develop quantitative, comprehensive pCBIs to be integrated into resource planning
rCBI	"Work toward a modeling approach that is reflective of trackable CBI benefits and allow comparison of CBRE and non-CBRE actions"	Refine rCBI calculation to include resilience impacts
iCBI	"Quantitative, precise, and reflect the priorities of [tribal] communities…" Understand "how they will be directly impacted by the resource options evaluated in the IRP/CEP"	Expand list of iCBIs to inform program design for underserved communities via customer participation analysis

Project Scope / Approach

CBI Strategy Study – Scope

Task 1. Identify list of CBIs – conduct review of community-based metrics to direct further CBI research and development

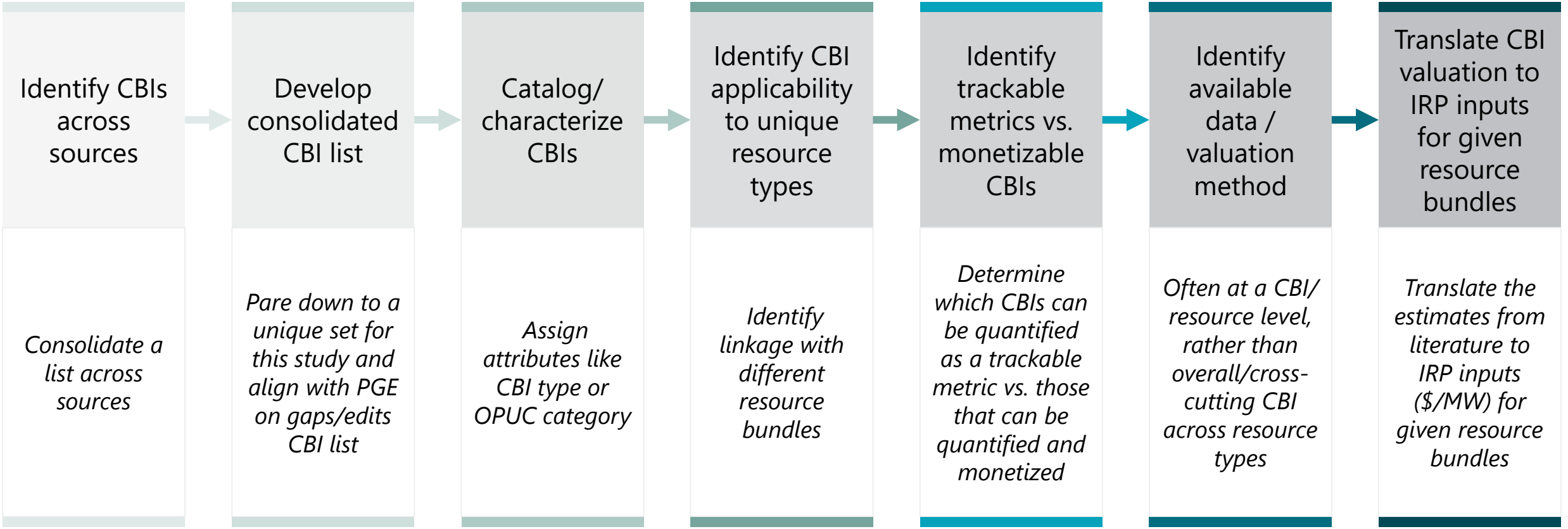
Task 2. Develop pCBIs for 2025 CEP/IRP filings – identify CBIs, quantification/valuation methods, estimate pCBI benefit per proxy resource

Task 3. Provide rCBI update for DSP – identify method for valuing resilience

Task 4. Evolve list of iCBIs with metrics for DSP/CEP filings – develop participation report based on available PGE/ETO data, recommend strategies for expanding participation to underserved communities

CBI Catalog – Approach

CBI Catalog – Approach Steps



CBI Sources / Literature Review

1. OPUC docket materials:
    1. UM 2225 Appendix A – ***Stakeholder CBI Proposal***
    2. UM 2114 list of energy equity metrics by ETO
2. PGE Research: Distributed Energy Resources: Non-Energy Impact Valuation (Cadmus)
3. PGE Research: iCBI Assessment for 2022 CEP/IRP (Cadeo)
4. National Standard Practice Manual
5. Washington Clean Energy Implementation Plans
6. Hawaiian Electric Company Performance-Based Ratemaking (PBR) Scorecard
7. PacifiCorp CEP

LIST OF IRP RESOURCES

Resource Type	Resource Name
CBRE	CBRE Solar
	CBRE Solar Microgrid
	CBRE Small Hydro
Portfolio Measure	Energy Efficiency
	Demand Response
Portfolio Power	Battery (2hr-24hr)
	Pumped Hydro Storage
	In-state Wind
	Out-of-state Wind
	In-state Solar
	Out-of-state Solar
	Solar-Storage Hybrid
	Combustion Turbine
	Hydrogen

- Simplified list from PGE IRP resource types
- Includes CBREs as well as portfolio resources
- For CBRE and Programs, CBI applicability can occur within subcategories
  - EE: Wx/HVAC bundles
  - DR: TOU, BTM storage, dispatchable DR (DLC, Interruptible)
  - CBREs: include in-front and behind-the-meter; may include EVSE in practice

CBI Categories – Working Definitions / Applications

pCBI

- **Definition:** CBIs corresponding to hypothetical or proxy resources allocated during the portfolio planning process.
- **Intended use:** IRP

rCBI

- **Definition:** Resource-specific benefits associated with individual CBRE systems.
- **Intended use:** CEP/ DSP / CBRE acquisition process

iCBI

- **Definition**: Informational metrics to assess and track the impacts of the existing portfolio on targeted communities.
- **Intended use:** Backward-looking analysis, including program evaluation

CBI Catalog

Overview of CBI Catalog

- Identified **30** CBIs
- Characterized by perspective, monetizable vs. trackable, companion metrics, and OPUC category
- CBIs do ***not*** have mutually exclusive categories

Perspective	Total CBIs by Perspective	Metric Type	
		Trackable	Monetizable
Societal	22	18	8
Host Customer	8	5	7
Utility	3	3	2

** Note, CBIs are not mutually exclusive to perspective or type*

CBI LIST

1	Economic development impact	7	Ancillary services	13	Increased availability of electricity storage in Tribal and non-Tribal communities	19	Increased satisfaction and pride	25	Improved grid resiliency
2	Increased access to jobs	8	Reduction in GHG Emissions	14	Increased number of clean energy generation that powers Tribal communities	20	Improved comfort in home	26	Increased resilience/reliability in targeted communities
3	Increased property or asset values	9	Improved access to reliable clean energy	15	Improve efficiency and housing stock in utility service territory, including LI housing	21	Improved public health outcomes	27	Reduction in recovery time and increase in survivability from outages
4	Economic well-being	10	Improved participation in clean energy programs by EJ communities	16	Increased energy affordability/reduction in energy burden for EJ communities	22	Improved community health outcomes in targeted communities	28	Reduction in frequency and duration of black/brownouts in target communities
5	Increased productivity	11	Increased awareness of utility programs for EJ communities	17	Reduced arrearages/late payments	23	Reduced local emissions (pollution burden, pollution exposure)	29	Reduced risk to targeted communities from outages
6	Energy security	12	Meaningful bilateral engagement between utilities and tribes on siting	18	Reduced residential disconnections and collections	24	Improved household health and safety outcomes in targeted communities	30	Increased neighborhood safety from natural disasters

CHARACTERIZING CBIS BY CATEGORY

Economic Impacts | Health + Community Wellbeing | Energy Equity | Resilience/Reliability | Environmental

1	Economic development impact	7	Ancillary services	13	Increased availability of electricity storage in Tribal and non-Tribal communities	19	Increased satisfaction and pride	25	Improved grid resiliency
2	Increased access to jobs	8	Reduction in GHG Emissions	14	Increased number of clean energy generation that powers Tribal communities	20	Improved comfort in home	26	Increased resilience/reliability in targeted communities
3	Increased property or asset values	9	Improved access to reliable clean energy	15	Improve efficiency and housing stock in utility service territory, including LI housing	21	Improved public health outcomes	27	Reduction in recovery time and increase in survivability from outages
4	Economic well-being	10	Improved participation in clean energy programs by EJ communities	16	Increased energy affordability/reduction in energy burden for EJ communities	22	Improved community health outcomes in targeted communities	28	Reduction in frequency and duration of black/brownouts in target communities
5	Increased productivity	11	Increased awareness of utility programs for EJ communities	17	Reduced arrearages/late payments	23	Reduced local emissions (pollution burden, pollution exposure)	29	Reduced risk to targeted communities from outages
6	Energy security	12	Meaningful bilateral engagement between utilities and tribes on siting	18	Reduced residential disconnections and collections	24	Improved household health and safety outcomes in targeted communities	30	Increased neighborhood safety from natural disasters

CHARACTERIZING CBIS BY PERSPECTIVE

Societal Host Customer Utility

1	Economic development impact	7	Ancillary services	13	Increased availability of electricity storage in Tribal and non-Tribal communities	19	Increased satisfaction and pride	25	Improved grid resiliency
2	Increased access to jobs	8	Reduction in GHG Emissions	14	Increased number of clean energy generation that powers Tribal communities	20	Improved comfort in home	26	Increased resilience/ reliability in targeted communities
3	Increased property or asset values	9	Improved access to reliable clean energy	15	Improve efficiency and housing stock in utility service territory, including LI housing	21	Improved public health outcomes	27	Reduction in recovery time and increase in survivability from outages
4	Economic well-being	10	Improved participation in clean energy programs by EJ communities	16	Increased energy affordability/reduction in energy burden for EJ communities	22	Improved community health outcomes in targeted communities	28	Reduction in frequency and duration of black/ brownouts in target communities
5	Increased productivity	11	Increased awareness of utility programs for EJ communities	17	Reduced arrearages/late payments	23	Reduced local emissions (pollution burden, pollution exposure)	29	Reduced risk to targeted communities from outages
6	Energy security	12	Meaningful bilateral engagement between utilities and tribes on siting	18	Reduced residential disconnections and collections	24	Improved household health and safety outcomes in targeted communities	30	Increased neighborhood safety from natural disasters

CHARACTERIZING CBIS BY METRIC TYPE

Monetizable Metric Trackable Metric

1	Economic development impact	7	Ancillary services	13	Increased availability of electricity storage in Tribal and non-Tribal communities	19	Increased satisfaction and pride	25	Improved grid resiliency
2	Increased access to jobs	8	Reduction in GHG Emissions*	14	Increased number of clean energy generation that powers Tribal communities	20	Improved comfort in home	26	Increased resilience/reliability in targeted communities
3	Increased property or asset values	9	Improved access to reliable clean energy	15	Improve efficiency and housing stock in utility service territory, including LI housing	21	Improved public health outcomes	27	Reduction in recovery time and increase in survivability from outages
4	Economic well-being	10	Improved participation in clean energy programs by EJ communities	16	Increased energy affordability/reduction in energy burden for EJ communities	22	Improved community health outcomes in targeted communities	28	Reduction in frequency and duration of black/brownouts in target communities
5	Increased productivity	11	Increased awareness of utility programs for EJ communities	17	Reduced arrearages/late payments	23	Reduced local emissions (pollution burden, pollution exposure)	29	Reduced risk to targeted communities from outages
6	Energy security	12	Meaningful bilateral engagement between utilities and tribes on siting	18	Reduced residential disconnections and collections	24	Improved household health and safety outcomes in targeted communities	30	Increased neighborhood safety from natural disasters

CHARACTERIZING CBIS
BY COMPANION CBIs

Group A
Group B
Group C
Group D
Group E
Group F

1	Economic development impact	7	Ancillary services	13	Increased availability of electricity storage in Tribal and non-Tribal communities	19	Increased satisfaction and pride	25	Improved grid resiliency
2	Increased access to jobs	8	Reduction in GHG Emissions	14	Increased number of clean energy generation that powers Tribal communities	20	Improved comfort in home	26	Increased resilience/reliability in targeted communities
3	Increased property or asset values	9	Improved access to reliable clean energy	15	Improve efficiency and housing stock in utility service territory, including LI housing	21	Improved public health outcomes	27	Reduction in recovery time and increase in survivability from outages
4	Economic well-being	10	Improved participation in clean energy programs by EJ communities	16	Increased energy affordability/reduction in energy burden for EJ communities	22	Improved community health outcomes in targeted communities	28	Reduction in frequency and duration of black/brownouts in target communities
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CHARACTERIZING CBIS
BY CATEGORY/RESOURCE APPLICABILITY:

ECONOMIC **ENVIRONENTAL**

No	CBI	Description	Resource Applicability
1	Economic development impact	Value of any incremental economic development provided by DERs (direct, indirect, induced effects)	All: EE, DR, TE, BTMS, CBREs - more pronounced with higher bill savings (EE, TOU, PV/CBRE PV)
2	Increased access to jobs	Associated job creation through development/operation of DERs (direct, indirect) and derived from induced effects (spending of increased revenue)	All: EE, DR, TE, BTMS, CBREs
3	Increased property or asset values	Value of increased property value of building or equipment as a result of DER installation.	EE, PV, BTMS, TE, and CBRE MG or PV (no DR)
4	Economic well-being	Impacts beyond bill savings (can include reduced complaint calls, disconnections/reconnections, foreclosures)	Associated with high bill reduction: EE, TOU, PV, CBRE PV/MG
5	Increased productivity	Changes in productivity, such as labor, operations, maintenance costs; operational flexibility; reduced waste streams and spoilage; reduced days of missed work / school due to avoided outage	BTMS, PV, CBRE PV/MG, and EE
6	Energy security	Reduced dependency of energy from external markets (volatile prices) or other resources not under contract	EE, DR, BTMS, PV, CBREs
7	Ancillary services	Services provided to ensure reliable operation of the electric grid (regulation, spinning and non-spinning reserves, etc.)	DR, BTMS, PV, CBREs
8	**Reduction in GHG Emissions***	Reduction in fossil fuel emissions from power generation associated with dispatch of non-emitting resources. This may not be relevant from an IRP context, due to baseline planning assumptions regarding clean power supply; however, in practice, dispatchable resources like DR could offset emissions associated with power purchases during peak or other periods.	* Any dispatchable resources offsetting power purchases associated with emitting resources (e.g., DR, BTMS, CBRE MG)

CHARACTERIZING CBIS
BY CATEGORY/RESOURCE APPLICABILITY:
EQUITY

No	CBI	Description	Resource Applicability
9	Improved access to reliable clean energy	Metric tracking progress toward increased accessibility of reliable clean energy	All: EE, DR, TE, PV, BTMS, CBRE PV/MG
10	Improved participation in clean energy programs by EJ communities	Metric tracking progress toward increased adoption and benefit attribution for EJ communities associated with energy investments.	All: EE, DR, TE, PV, BTMS, CBRE PV/MG
11	Increased awareness of utility programs for EJ communities	Metric tracking progress toward increased awareness of energy programs for customers within EJ communities; related to improved access and participation.	All: EE, DR, TE, PV, BTMS, CBRE PV/MG
12	Meaningful bilateral engagement between utilities and tribes on siting	Metric tracking progress toward increased adoption and benefit attribution for tribal communities associated with these investments.	All: EE, DR, TE, PV, BTMS, CBRE PV/MG
13	Increased availability of electricity storage in Tribal and non-Tribal communities	Metric tracking progress toward increased adoption and benefit attribution associated with these investments.	BTMS, CBRE MG
14	Increased number of clean energy generation that powers Tribal communities	Metric tracking progress toward increased adoption and benefit attribution associated with these investments.	PV, CBRE PV/MG, CBRE Hy
15	Improve efficiency and housing stock in utility service territory, including LI housing	Metric reflecting improvements in housing including bill savings, health and safety outcomes, and repairs via energy investments for a given community (related to several other CBIs)	EE (potentially TE, PV, BTMS if including electrical repairs/upgrades)
16	Increased energy affordability/reduction in energy burden for EJ communities	Metric tracking increased affordability primarily through bill reduction of energy investments; related to economic well-being.	Associated with high bill reduction: EE, TOU, PV, CBRE PV/MG
17	Reduced arrearages/late payments	Metric tracking reduced arrearages achieved primarily through bill reduction of energy investments; related to economic well-being and affordability.	Associated with high bill reduction: EE, TOU, PV, CBRE PV/MG
18	Reduced residential disconnections and collections	Metric tracking reduced disconnections/reconnections and other related financial penalties achieved primarily through bill reduction of energy investments; related to economic well-being and affordability.	Associated with high bill reduction: EE, TOU, PV, CBRE PV/MG

CHARACTERIZING CBIS
BY CATEGORY/RESOURCE APPLICABILITY:
HEALTH/COMMUNITY WELLBEING

No	CBI	Description	Resource Applicability
19	Increased satisfaction and pride	Increased satisfaction or pride in energy investments reflecting the reduced environmental impacts, related to aspects of perceived empowerment and energy independence.	EE, DR, TE, PV, BTMS, CBRE PV/MG
20	Improved comfort in home	Improved comfort either involving thermal comfort (e.g., ability to maintain comfortable home heating/cooling) or noise reduction (e.g., reduced noise from windows, insulation, infiltration controls).	EE
21	Improved public health outcomes	Changes in societal health outcomes, medical costs, and productivity affected by health and related to DER adoption. Typically related to reduced fossil fuel emissions and the economic impact of those reductions on health incidents such as mortality, hospital and emergency room visits, symptoms of chronic and acute illnesses, and lost workdays.	EE, TE, BTMS, CBRE MG
22	Improved community health outcomes in targeted communities	Metric tracking progress toward societal public health outcomes related to energy investments occurring in target communities	EE, TE, BTMS, CBRE MG
23	Reduced local emissions (pollution burden, pollution exposure)	Changes in local emissions created by increased investment in energy resources displacing those that require fossil fuel combustion. This is an input into health outcomes	EE, TE, BTMS, CBRE MG
24	Improved household health and safety outcomes in targeted communities	Impacts related to health, safety, and repair work completed as part of DERs investment, improving housing conditions and yielding health/safety outcomes. This may include outcomes related to health (remediation of mold, asbestos, lead, ventilation/HVAC, appliance safety), safety (lighting/doors/windows improving home security, repairs allowing for aging in place), and general repairs driving costs/hardship (e.g., roof repair or other that reduces exposure, improves comfort, reduces heating/cooling costs).	EE

CHARACTERIZING CBIS
BY CATEGORY/RESOURCE APPLICABILITY:
RESILIENCE

No	CBI	Description	Resource Applicability
25	Improved grid resiliency	Resilience (and reliability) have potential impacts at societal, host customer, and utility system levels, involving anticipation preparation, and recovery of disruptions, reducing duration and associated outages impacts. At a societal level, this goes beyond host and utility system such as maintaining critical facilities yielding health/safety benefits	EE, DR, PV, BTMS, CBRE PV/MG
26	Increased resilience/reliability in targeted communities	Metric tracking resilience outcomes related to siting DERs or infrastructure upgrades occurring in target communities; related to societal resilience.	EE, DR, PV, BTMS, CBRE PV/MG
27	Reduction in recovery time and increase in survivability from outages	Metric tracking resilience outcomes related to improvements in recovery time associated with energy investments; related to societal resilience.	EE, BTMS, CBRE MG
28	Reduction in frequency and duration of black/brownouts in target communities	Frequency and duration are metrics to track outage characteristics that can be used to identify patterns and target deployment of DERs and/or grid infrastructure upgrades to minimize impacts in target communities; related to societal resilience.	EE, DR, PV, BTMS, CBRE PV/MG
29	Reduced risk to targeted communities from outages	The concept of risk relates to a variety of impacts related to outages, including hardship, mobility, adverse health impacts, food spoilage; this metric is applicable to how these risk outcomes are minimized withing target communities relative to energy investments; related to societal resilience.	EE, PV, BTMS, CBRE PV/MG
30	Increased neighborhood safety from natural disasters	Metric tracks progress toward increased safety outcomes associated with energy investments, such as preservation of critical facilities, indirect benefits on health and safety, and latency of response/recovery in the event of disruption; related to societal resilience.	EE, PV, BTMS, CBRE PV/MG

Research Status + Next Steps

Research Steps / Status

Progress to Date

1. **Conducted Doc Review** – contextualize existing PGE CBIs, consolidate metrics from others (ETO, WA, HI, CA, NSPM, prior research)
2. **Developed CBI Catalog** – consolidate CBIs for study focus (n=30), characterize by various factors: source, five OPUC community impact categories, trackable metrics vs. monetizable CBIs, resource applicability
3. **Conducted Lit Review for Benefit Valuation** (in progress) – conducting research to identify valuation methods and benchmarking studies to quantify/monetize CBIs for different resource types

Next Steps

1. **Meet with CBIAG –** present study concepts and solicit feedback from CBIAG stakeholder group on CBIs, metrics, valuation approaches
2. **CBI Valuation for IRP** – translate valuation methods from literature review to apply to proxy resources for IRP application
3. **Resilience Valuation Method** – continue collaboration with PGE Asset Management group on methodology for valuation of resiliency impacts. Focusing on (1) resources reducing outage duration (e.g., storage) and (2) resources reducing likelihood of outages (e.g., dispatchable DR/DERs).
4. **iCBI Metric Assessment** – developed / coordinating request for program and utility data to estimate values for several CBI metrics, including participation in EE/DR/DER programs, outage frequency/duration metrics, and disconnections, etc.

Thank You!

Contact

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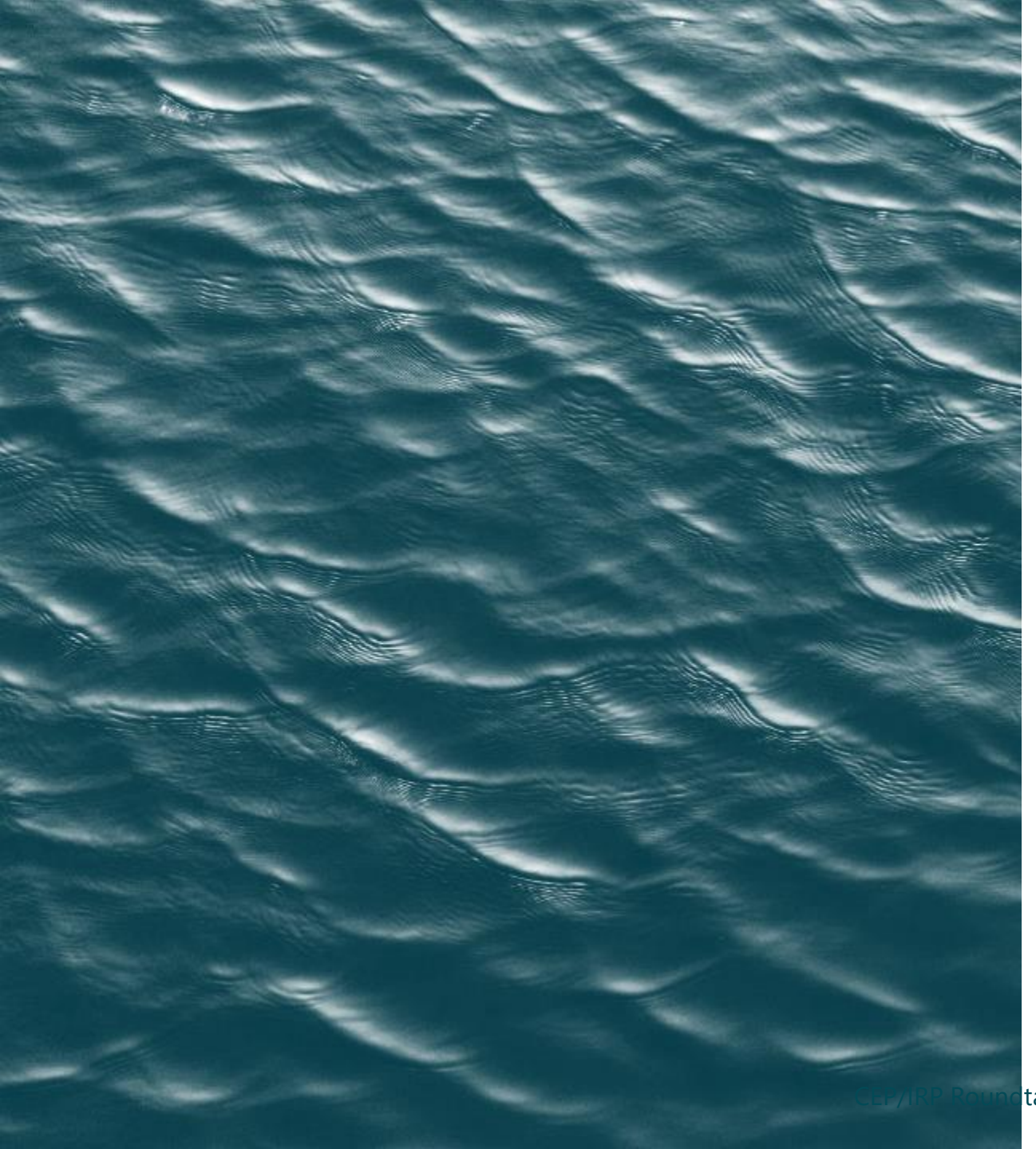

Appendix

Relevant Definitions

Resource: Any new additions contributing usable power to the electric grid, including CBREs, utility-scale generators and renewable energy plants, and demand-side energy efficiency and demand response measures.

CBI: Community Benefit Indicator – a positive effect/outcome attributed to a given resource that accrue back to targeted communities.

CBI Category: As directed by OPUC, CBIs must cover one of the five categories:

- resilience/reliability (system and community)
- health and community well-being
- environmental impacts
- energy equity
- economic impacts

Benefit/Metric: Defines whether a given CBI is monetizable as a benefit ($) or quantifiable as a tracking metric, such as a count or percentage.

Questions

NEXT STEPS

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

Upcoming Roundtable: October 2nd

Distribution System Workshop: September 12th

Thank you

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ACRONYMS

ARIMA: autoregressive integrated moving average
ART: annual revenue-requirement tool
ATC available transfer capability
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: colling 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
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
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