Integrated Resource Planning

ROUNDTABLE 22-5

MAY 2022





MEETING LOGISTICS

Electronic version of presentation:

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

Teams Meeting

Please click the meeting link sent to your email and here:
Join Microsoft Teams Meeting

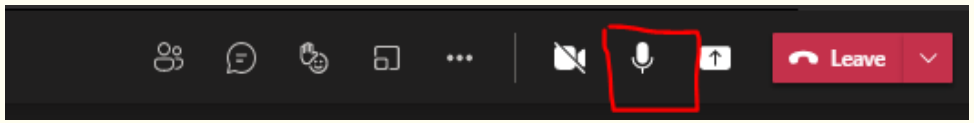
-OR-

Call this number on your phone:
+1 971-277-2317
Conference ID: 716 328 329#

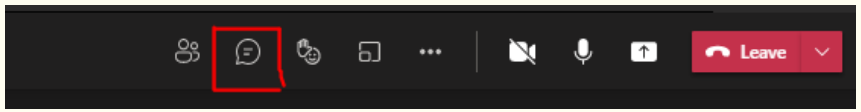
*Please use *Microsoft Edge* or *Google Chrome* for the best experience.

PARTICIPATION

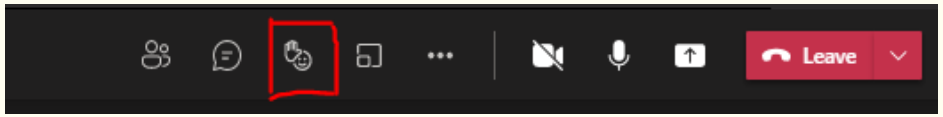
- Mute your mic while others are speaking; to unmute via phone press *6



- We will ask for comments and questions along the way
- Participate using the chat box or ask questions verbally

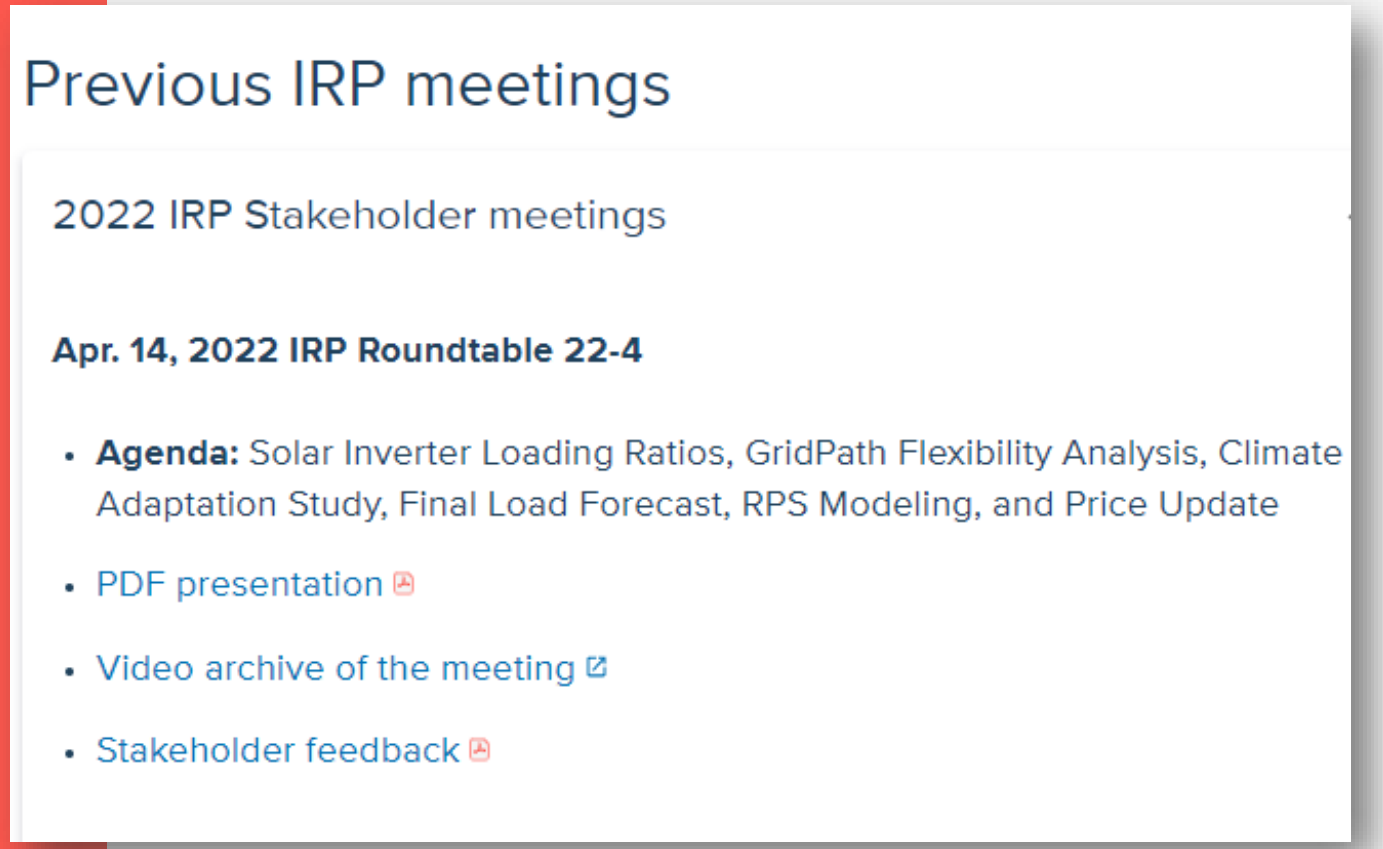


- Use the “raise hand” feature to signal you would like to ask your question verbally



- Wait to be called on
- Please be polite and respect all participants on the webinar
- Please stay on topic; we may interrupt or shorten questions to meet the time commitment of the meeting

STAKEHOLDER FEEDBACK



Previous IRP meetings

2022 IRP Stakeholder meetings

Apr. 14, 2022 IRP Roundtable 22-4

- **Agenda:** Solar Inverter Loading Ratios, GridPath Flexibility Analysis, Climate Adaptation Study, Final Load Forecast, RPS Modeling, and Price Update
- PDF presentation
- Video archive of the meeting
- Stakeholder feedback

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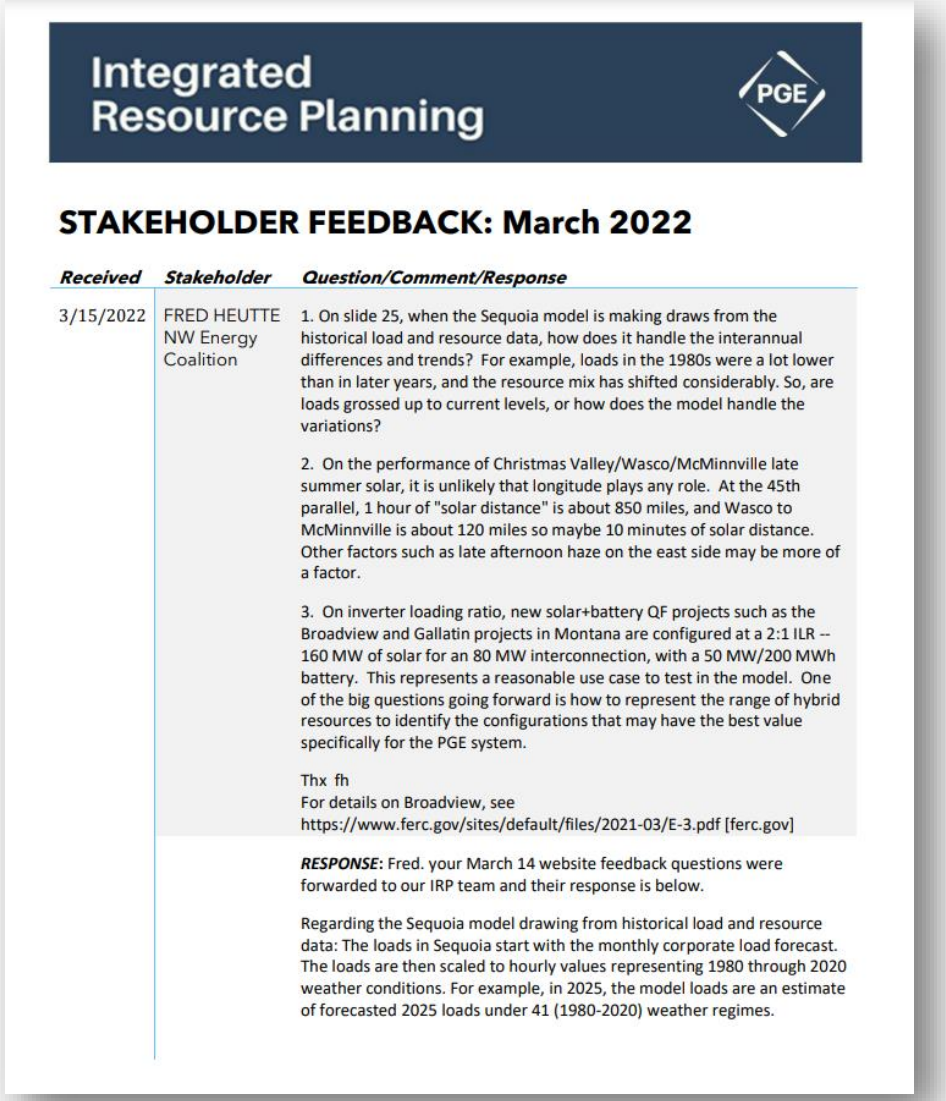
STAKEHOLDER FEEDBACK



Integrated Resource Planning

PGE

STAKEHOLDER FEEDBACK: March 2022

Received	*Stakeholder*	*Question/Comment/Response*
3/15/2022	FRED HEUTTE NW Energy Coalition	1. On slide 25, when the Sequoia model is making draws from the historical load and resource data, how does it handle the interannual differences and trends? For example, loads in the 1980s were a lot lower than in later years, and the resource mix has shifted considerably. So, are loads grossed up to current levels, or how does the model handle the variations? 2. On the performance of Christmas Valley/Wasco/McMinnville late summer solar, it is unlikely that longitude plays any role. At the 45th parallel, 1 hour of "solar distance" is about 850 miles, and Wasco to McMinnville is about 120 miles so maybe 10 minutes of solar distance. Other factors such as late afternoon haze on the east side may be more of a factor. 3. On inverter loading ratio, new solar+battery QF projects such as the Broadview and Gallatin projects in Montana are configured at a 2:1 ILR -- 160 MW of solar for an 80 MW interconnection, with a 50 MW/200 MWh battery. This represents a reasonable use case to test in the model. One of the big questions going forward is how to represent the range of hybrid resources to identify the configurations that may have the best value specifically for the PGE system. Thx fh For details on Broadview, see https://www.ferc.gov/sites/default/files/2021-03/E-3.pdf [ferc.gov]
		RESPONSE: Fred. your March 14 website feedback questions were forwarded to our IRP team and their response is below. Regarding the Sequoia model drawing from historical load and resource data: The loads in Sequoia start with the monthly corporate load forecast. The loads are then scaled to hourly values representing 1980 through 2020 weather conditions. For example, in 2025, the model loads are an estimate of forecasted 2025 loads under 41 (1980-2020) weather regimes.

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AGENDA

Welcome and Introductions	10 minutes
Safety Moment	5 minutes
SEQUOIA and ROSE-E Updates	40 minutes
Hybrid Resource Characteristics	20 minutes
Clean Energy Plan Update	45 minutes

SAFETY MOMENT

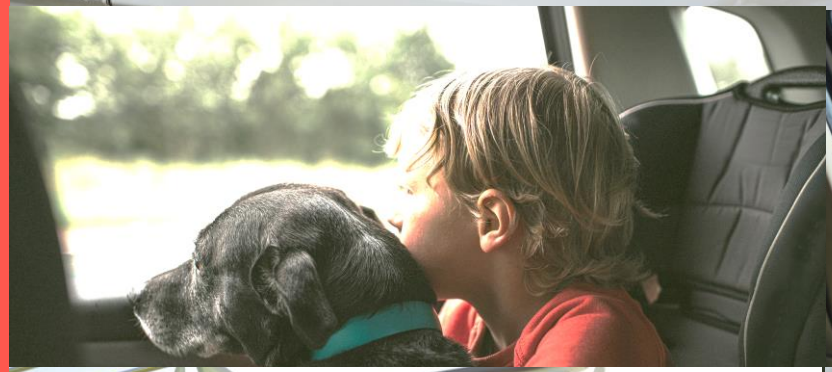
Road Trip Travel Safety

Whether it's a day trip to the coast or a week-long adventure – preparation will make the journey fun and safe!

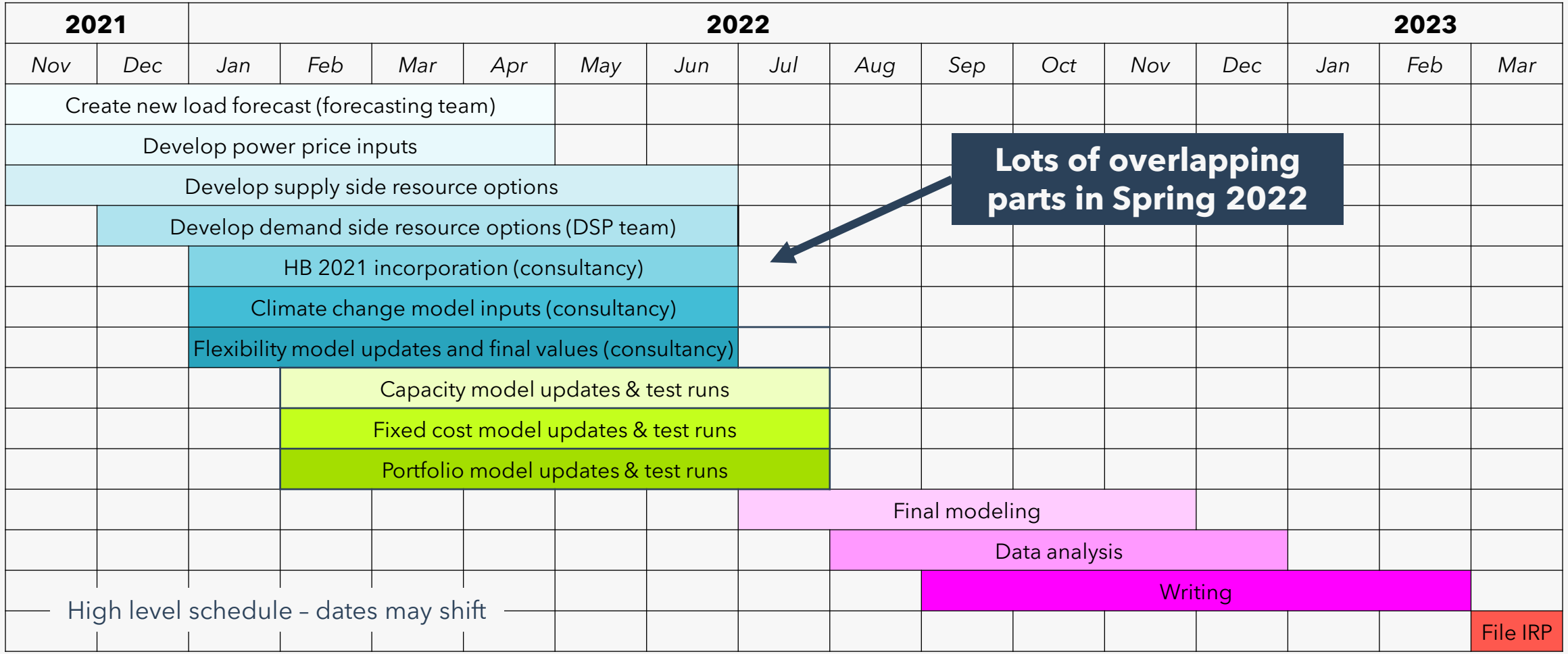
1. Get Your Car Serviced. This should always be your first step – especially if you haven't been driving it as frequently over the past year.

2. Bring Extra Supplies. Make sure you stock up, in case there are unexpected delays.

3. Pack A First Aid Kit. Injuries can happen no matter how careful you are. Traveling with a basic first aid kit is always a good idea.



HIGH LEVEL 2023 IRP SCHEDULE



SEQUOIA & ROSE-E UPDATES

TOMÁS MORRISSEY & ROB CAMPBELL

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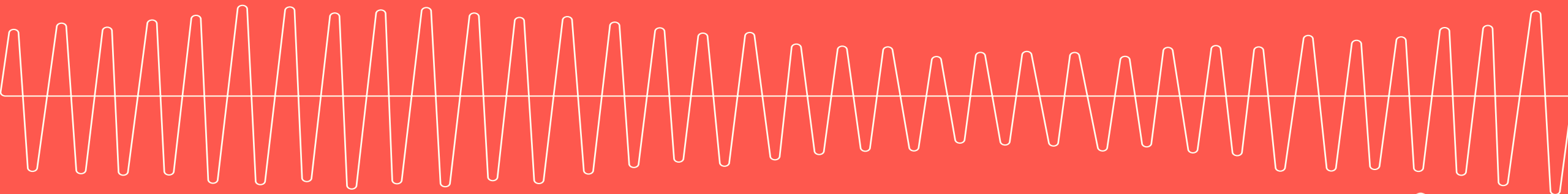


Moving to a Seasonal Capacity Model

- In the 2019 IRP Update, Sequoia provided yearly ELCC values, however, by season the ELCC may vary
- For example, in recent tests, a battery had an annual ELCC of 65%, a summer ELCC of 77%, and a winter ELCC of 55%
- If we solve an annual capacity need only with this battery, we will end up with a more adequate system, but with relatively more winter outages (due to the battery being more effective in the summer than winter)
- For the 2023 IRP, we are moving to winter/summer specific ELCC values (winter being October – March, summer April – September)

ELCC values are illustrative – actual 2023 IRP values will differ

Moving to a Seasonal Capacity Model (2)

Previous approach: Sequoia run yearly for capacity and ELCC values

Annual capacity need: 372 MW

Annual ELCC: 65% (4hr-batt)

ROSE-E selects resources to fill annual capacity needs

New approach: Sequoia run seasonally for capacity and ELCC values

Winter capacity need: 381 MW

Summer capacity need: 355 MW

Winter ELCC: 55% (4hr-batt)

Summer ELCC: 77% (4hr-batt)

ROSE-E selects resources to fill seasonal capacity needs

ELCC values are illustrative – actual 2023 IRP values will differ

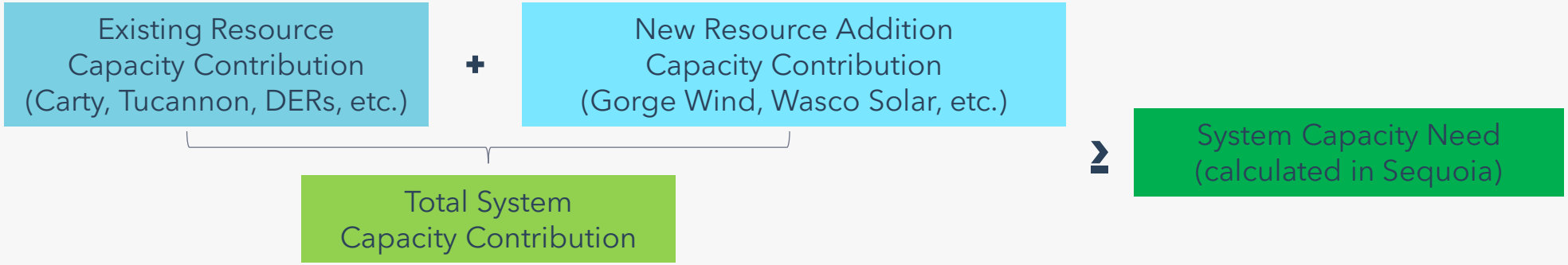
ROSE-E's Constrained Optimization

The model's optimization determines the optimal resource addition pathway

- Minimizing costs subject to several constraints

Resource adequacy is an important constraint in ROSE-E

- The following constraint was enforced for every year:



Previously, where the system capacity contribution was less than system capacity need, ROSE-E would add new resources such that yearly capacity needs are met

- For example, in a year with 1000 MW of capacity need and 800 MW of forecasted capacity contribution from existing resources, ROSE-E would find the most cost-effective way to add 200 MW of capacity contribution

Now Two Adequacy Constraints

Existing Resource Summer Capacity Contribution	+	New Resource Addition Summer Capacity Contribution	≥	System Summer Capacity Need
Existing Resource Winter Capacity Contribution	+	New Resource Addition Winter Capacity Contribution	≥	System Winter Capacity Need

Where the seasonal capacity contribution is less than that season's capacity need, ROSE-E will now add new resources such that season's capacity needs are met

All system costs and benefits of each incremental resource addition will be added as before

For example, if a solar resource is added to help address a summer capacity deficit, it also will:

- Reduce winter's capacity need by its associated winter capacity contribution
- Increase system costs by its associated fixed costs
- Decrease costs by its associated energy values

2019 IRP ELCC Methods

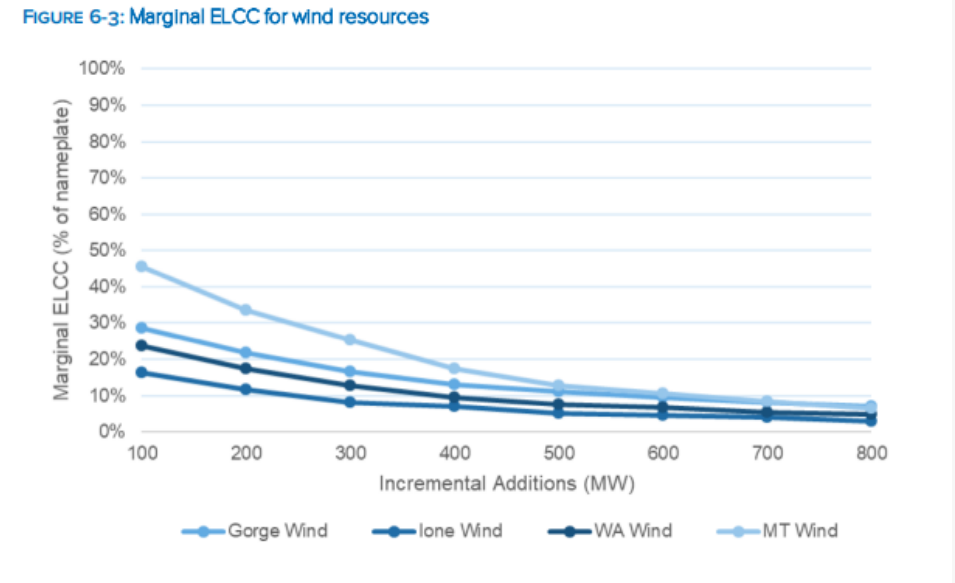
In the 2019 IRP (Update), RECAP (Sequoia) was run once per resource

- ELCCs were calculated with two dimensions: MW additions and capacity contribution

This method applied the near-term (2025) estimates of capacity contribution over the entire planning horizon

- For example, Gorge Wind's capacity contribution in 2048 depended only on how many MWs of Gorge Wind had been added 2023-2047

Given the size of the renewable additions being considered this was a reasonable approximation



Possible Methodological Change

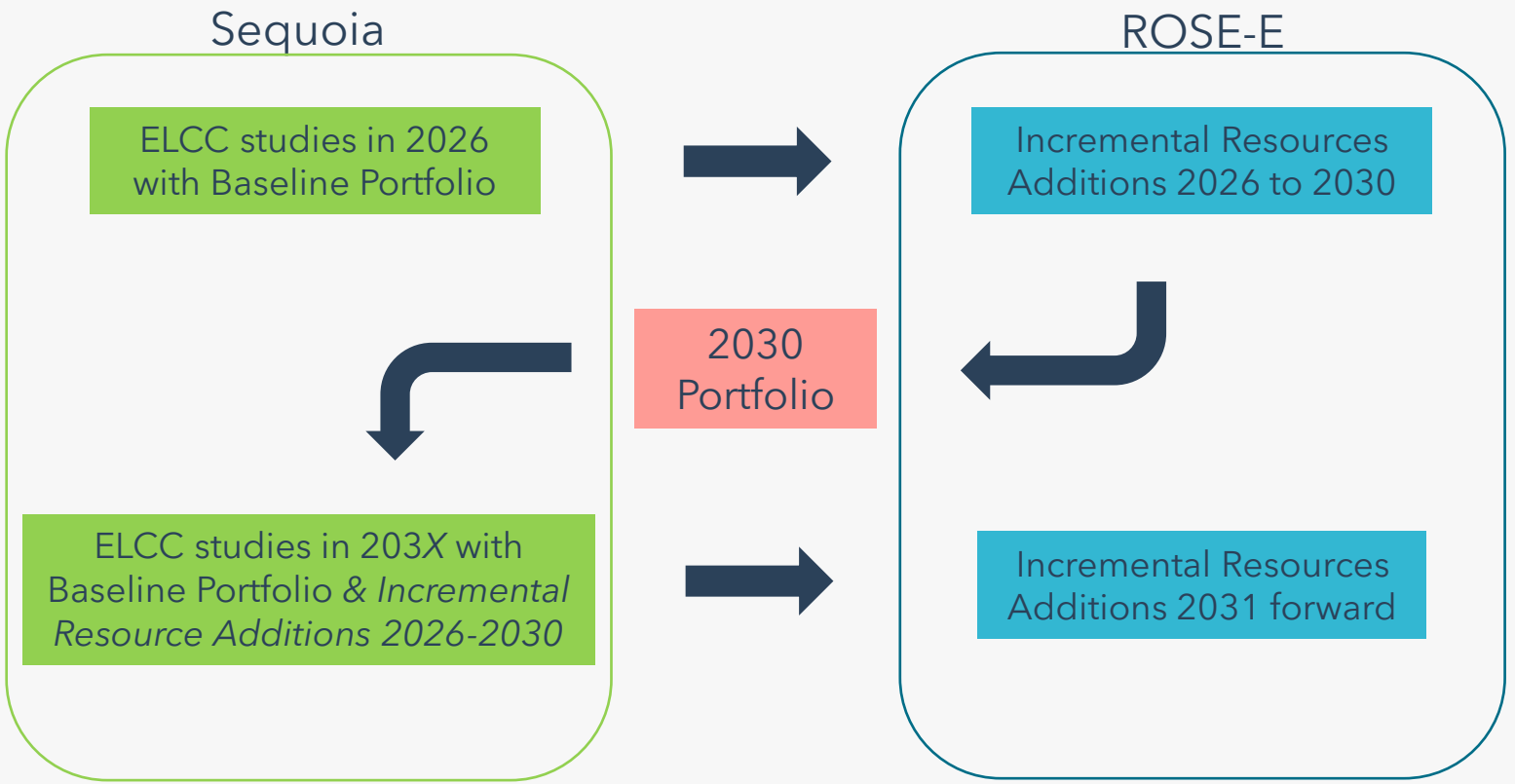
There are two additional dimensions to consider:

- **Baseline Portfolio**: changes to existing and contracted resources could influence need
  - *Colstrip's exit will increase capacity need across the year*
  - *Changing demand could affect the seasonality of need*
  - *Contract expirations could change the size and timing of resource need*

- **Other Incremental Resources**: additions could change a resource's capacity contribution
  - *Additional Wasco solar might affect the next addition of McMinnville Solar*
  - *Additional energy resources might increase battery storage's effectiveness*

To incorporate these extra dimensions, we are evaluating the possibility of iterating between ROSE-E and Sequoia for select set of portfolios in the 2023 IRP

Model Iteration Example



Each iteration increases model runtime by at least 100%

We also can apply iterations at certain stages of analysis (e.g. only for select portfolios or just the preferred portfolio)

We will be looking for an appropriate balance between the marginal costs and benefits associated with increasing iterations in portfolio analysis

HYBRID RESOURCE CHARACTERISTICS

ROBERT BROWN & TOMÁS MORRISSEY

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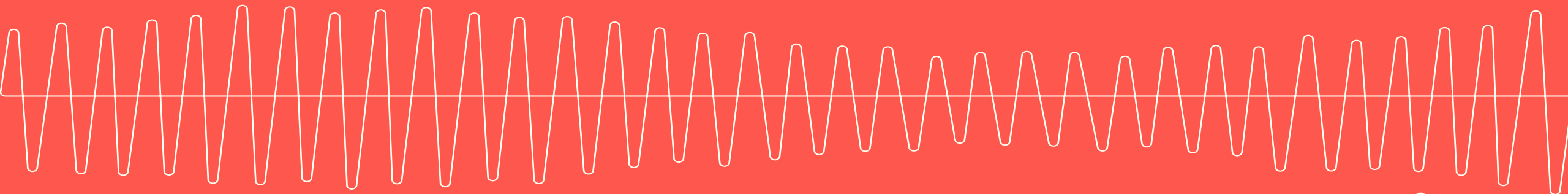
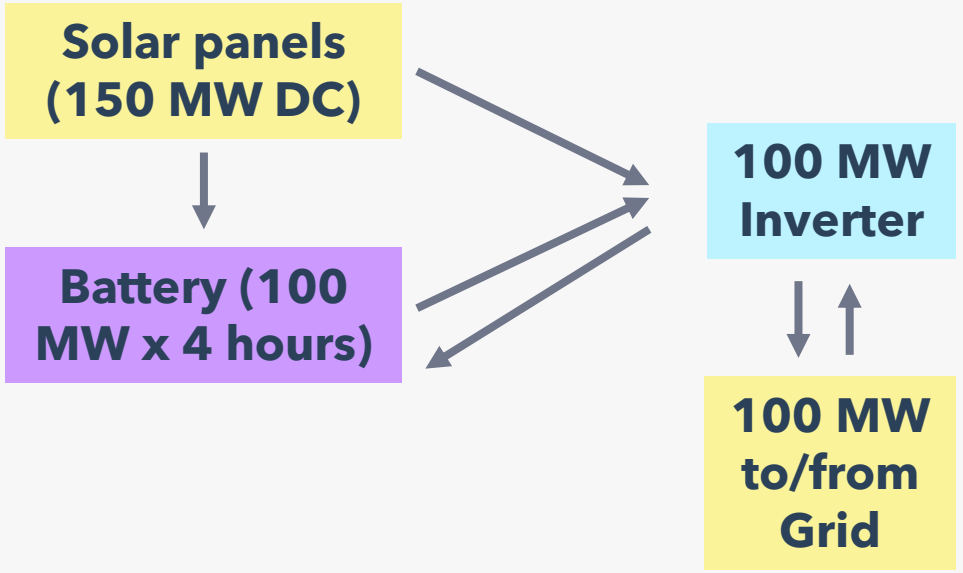


Hybrid Resources

- Hybrid resources pair renewable and storage resources together
- Resource size is defined by interconnection size; in the example to the right, this project would be 100 MW
- Resources can be AC or DC "coupled". DC coupling shares the inverter resource. One advantage of DC coupling with solar is the battery can store power that would otherwise be clipped by the inverter
- Projects often don't allow grid charging in first few years for tax incentive purposes



Hybrid Resources in 2023 IRP

- We are testing various configurations for hybrid solar + battery resources, looking for stakeholder input to narrow the options

- This presentation is focused on DC coupled projects with two inverter loading ratios and two battery sizes:
  - Inverter Loading Ratio* (ILR) of 1.34 and 1.50
  - Battery paired at 1:1 and 2:1**

- ELCC results today are for comparative/illustrative purposes; actual ELCC values will be different in 2023 IRP

** For more information about ILRs, see PGE's April 2022 Roundtable Presentation*

*** A solar:battery ratio of 2:1 signifies that the solar AC rating is twice the battery's capacity*

Hybrid Resource Synergies

DC linked resource	ELCC
100 MW Solar (1.34 ILR)	6%
100 MW Battery	65%
Sum	**71%**
100 MW Solar + 100 MW Storage (1.34 ILR, 1:1 Ratio, with Grid Charging)	**72%**

Hybrid resource ELCC can be higher than the sum of the parts, as seen in this example

ELCC values are illustrative – actual 2023 IRP values will differ

Larger Storage, ILRs Raise ELCCs…

		Solar:Battery* Ratio	
	ELCCs for 100 MWac Solar, Paired With:	**2:1 (50 MW Battery)**	**1:1 (100 MW Battery)**
ILR	1.34	38%	72%
	1.5	40%	74%

ELCC values are illustrative – actual 2023 IRP values will differ

* Battery with 2030 COD, DC coupled, 4-hour duration, with grid charging

…But Also Raise Costs

		Solar:Battery* Ratio	
	Cost (2019$/kW-AC) of 100 MW Solar, paired with:	2:1 (50 MW Battery)	1:1 (100 MW Battery)
ILR	1.34	$ 1,060	$ 1,413
	1.5	$ 1,118	$ 1,471

* Battery with 2030 COD, DC coupled, 4-hour duration

Solar + Battery Grid Charging Impact

DC linked resource	Grid charging	ELCC
100 MW battery + 100 MW solar (1.50 ILR)	Yes	74%
100 MW battery + 100 MW solar (1.50 ILR)	No	68%

Capacity contribution drops when battery is unable to grid charge

ELCC values are illustrative – actual 2023 IRP values will differ

Discussion / Feedback

- Planning to use two setups for IRP portfolio analysis:
  - 1.5 ILR solar DC coupled 1:1 with battery**
  - 1.5 ILR solar DC coupled 2:1 with battery

- Also, planning on evaluating other setups (such as wind + solar + battery)

- Goal is to have a general resource representation; prices (both power market and resource components) always are changing

- Thoughts/feedback on setup?

*** A solar:battery ratio of 2:1 signifies that the solar AC rating is twice the battery's capacity*

CLEAN ENERGY PLAN UPDATE

SAM NEWMAN & JACOB GOODSPEED

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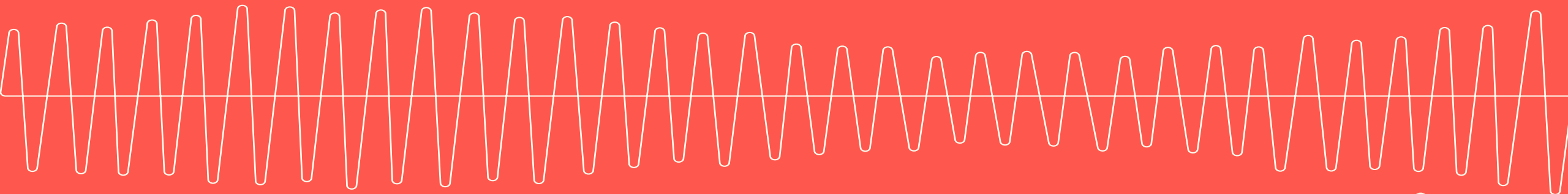

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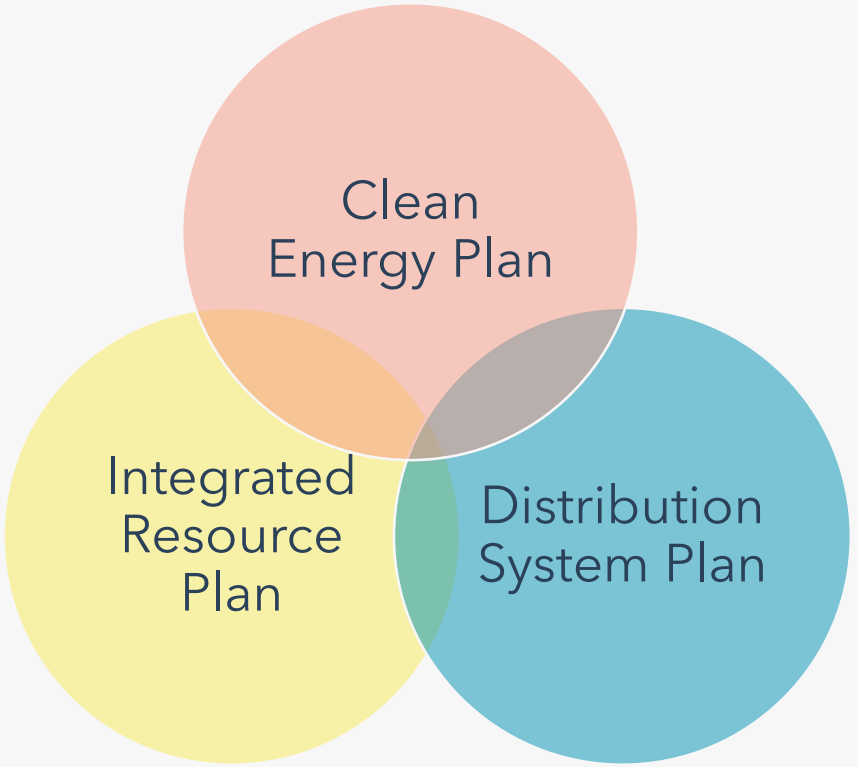
What is the CEP?

- Consistent with IRP action plan and DSP findings
- Applies a community lens to decarbonization planning as part of setting annual targets, community-based generation, and analysis around resiliency
- Robust engagement as CEP is developed – the process will be closely coordinated with the UCBIAG, DSP community engagement, and IRP public-input process
- The CEP will represent an **Oregon-centric document that discusses PGE and our actions through the lens of how we're building toward and equitable and carbon-free grid**



How does the CEP fit with other planning efforts?

DSP	IRP	CEP
Develops granular forecasts of load and DER potential that inform IRP and CEP	Determines near-term and long-term incremental needs	Consistent with IRP action plan - does not re-run system planning process
Provides transparency into distribution-level grid needs, solution and investments	Uses DSP forecasts as an input, along with any additional analysis directed by HB 2021	Reports on actual emissions performance
Publishes data that third parties can use to make investment decisions	Evaluates proxy portfolios for least-cost least-risk approach to reliability	Translates IRP analysis to HB 2021's annual "continual progress" expectation
Adopts human-centered approach and application of equity lens to grid planning	Recommends 2-4 year Action Plan to progress toward HB 2021 requirements	Provides holistic summary of roadmap alignment with public interest
Commission acceptance of initial DSP indicates fulfillment of guidance criteria	Commission acknowledges that IRP is consistent with Oregon rules	Commission acknowledgment in tandem with IRP

Conceptual Engagement Framework Approach

Framework builds on experience with DSP Partnership and Community workshops, plus IRP Roundtables and other best practices

Integration of equity lens as a process and an outcome

Community resiliency focus

- Particularly applicable related to CEP consideration of resiliency and community-based renewable energy opportunities

Human-centered design and planning

Results-based accountability; focusing on impact and benefit

For context, see PGE's "Conceptual Framework for Engagement". Filed in UM 2225 4/21/22: https://edocs.puc.state.or.us/efdocs/HAH/um2225hah175022.pdf

Community Benefit & Impact Advisory Group (CBIAG) Launch Approach

PGE CBIAG development will be guided by the Conceptual Framework

CBIAG activities are informed by HB 2021 direction

- Review and consult on PGE's biennial Community Benefits & Impacts report development
- Advise on community priorities and community engagement needs for PGE system plans, specifically the IRP, DSP, and CEP. Focus on future (>2023) planning cycles
- Inform community engagement plans across other PGE topics

Look to group members to help develop and structure the CBIAG

CEP Development Timeline

Please contact PGE's CEP Team at CEP@pgn.com

With feedback and/or for more information

Seeking community feedback for **CEP Engagement Strategy**

Q2 2022 – Seek Community Input based on framework filed 4/21/2022

Summer 2022 – Form UCBIAG

Seeking initial community feedback for **CBIAG Formation**

Fall 2022 – Initial Portfolio Results

Fall/Winter 2022 – Refine analysis and seek feedback

Throughout 2022 – OPUC UM 2225 Rulemaking provides guidance and stakeholder input

August 2022
DSP Part 2 Filing

March 2023
CEP Filing

QUESTIONS/ DISCUSSION?

NEXT STEPS

Upcoming 2022 Roundtables:

June 30

July 21

August 18

September 15

October 20

November 16

December 15

THANK YOU

CONTACT US AT:
IRP@PGN.COM