INTEGRATED RESOURCE PLANNING

ROUNDTABLE 21-7

OCTOBER 2021




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 or here:

Join Microsoft Teams Meeting

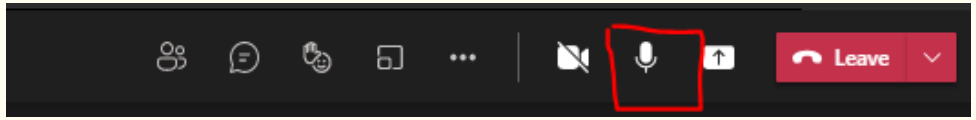
+1 971-277-2317 (dial this number into your phone for best results)

PW: 877 471 738#

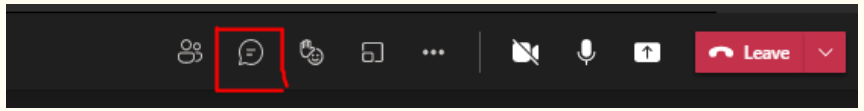
*Please use Microsoft Edge or Google Chrome with Teams as it will give you the best experience

PARTICIPATION

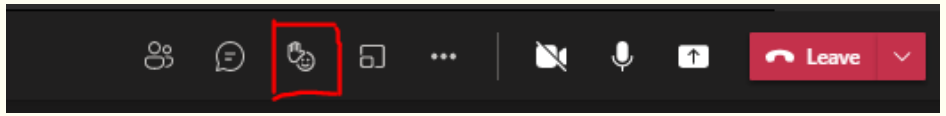
- Mute your mic while others are speaking; to unmute via phone press *6



- 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

AGENDA

Welcome and introductions	15 minutes
Safety moment	5 minutes
PGE's IRP filing date extension request	20 minutes
House Bill 2021	60 minutes
Portfolio requests from participants	5 minutes

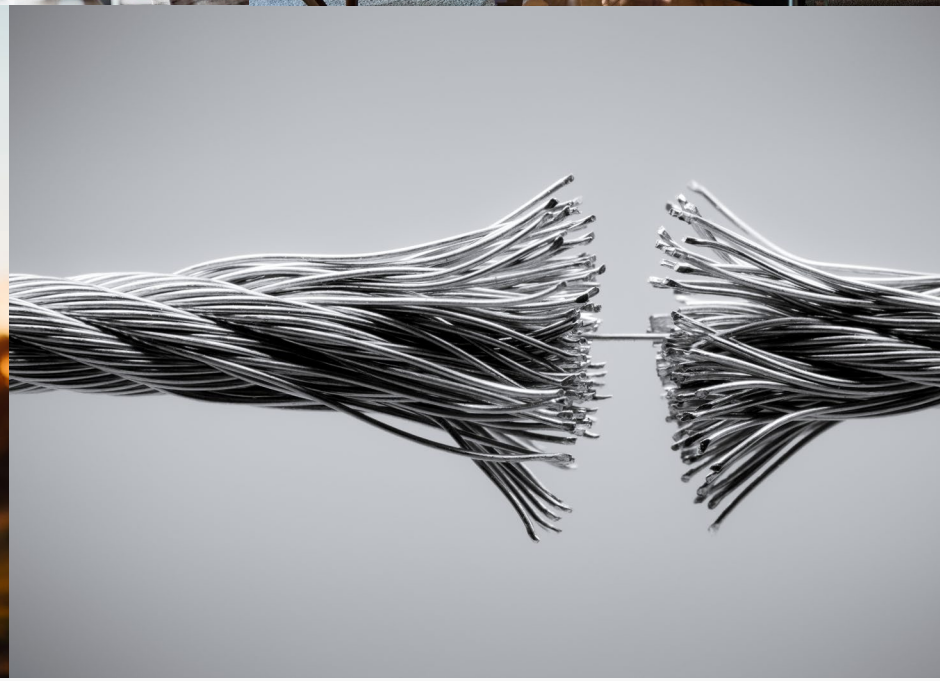
SAFETY MOMENT

Workplace stress

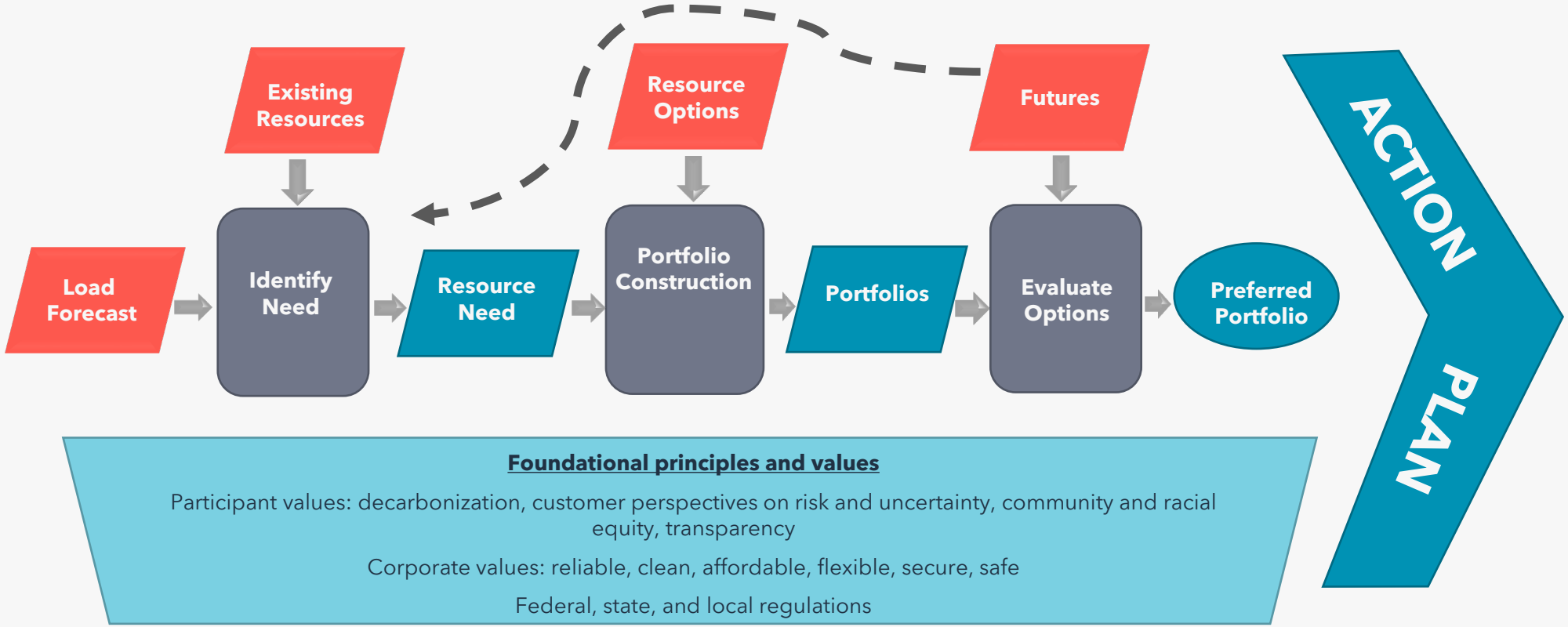
Stress is the result of any emotional, physical, social, economic, or other factor that requires an individual to respond or change. Workplace stress can be caused by many factors, such as shiftwork, role ambiguity and lack of autonomy.

There are serious physical and behavioral impacts as a response to stress. Each person has a unique reaction to stress but below are some counter measures to reduce stress from work.

- Take ten minutes at the start of each day to prioritize and organize your day
- Be honest with your colleagues, and be constructive if possible
- Be realistic about what you can change
- Do one thing at a time
- Speak up if you do not have the training, skills or resources that you need.
- Talk with somebody you trust
- Make a point to recall positive emotional moments



IRP ANALYSIS PROCESS



PGE's IRP FILING DATE EXTENSION REQUEST

Jessica Graeber

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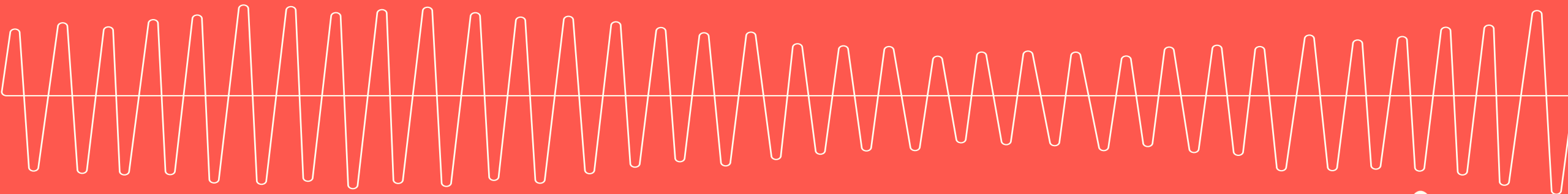

EXTENSION REQUEST

On October 15 PGE filed a waiver and an extension of time for the next IRP filing deadline

- Original filing deadline: March 16, 2022 (Order No. 20-152; LC 73)
- Requested extension: March 31, 2023 (filing)

OREGON HOUSE BILL 2021

Seth Wiggins

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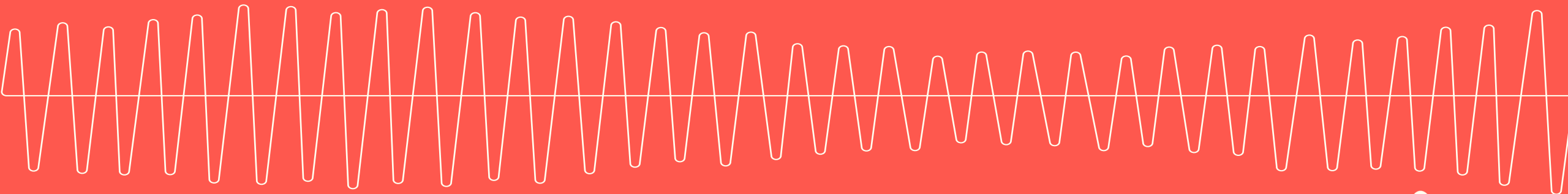


HB 2021: EFFECTIVE 9/25/2021

Establishes emission reduction targets associated with serving Oregon load

From the baseline period of 2010-2012 (average emissions reported to DEQ):

- 80% reduction by 2030
- 90% reduction by 2035
- 100% reduction by 2040

Requires the development of a Clean Energy Plan (CEP)

To be filed within 180 days of the next IRP

- The CEP uses traditional IRP outputs to create several new analyses

Utility Community Benefits and Impacts Advisory Group

Will provide PGE feedback from environmental justice communities and low-income customer advocates, and other stakeholders, and produce a biennial report that assesses the community impacts/benefits

ACTUAL GHG EMISSIONS REPORTING FOR SERVING CUSTOMER LOAD

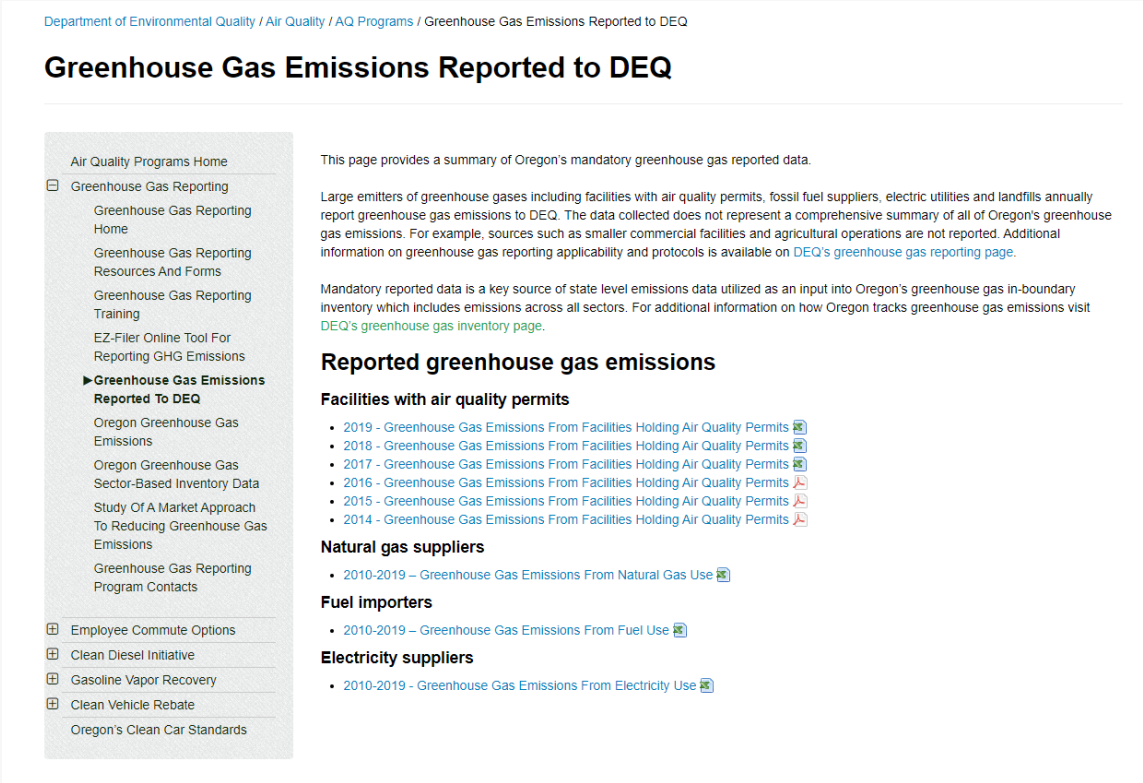
Per HB 2021, PGE will continue to report actual GHG emissions associated with serving customer load per existing Oregon DEQ rules and protocols

- PGE is not aware of any updates to these existing rules and protocols to implement HB 2021

PGE's DEQ reporting methodology:

- Annual generation data from PGE owned and operated facilities is collected
- Purchased power generation data is collected, based on specified purchases (contract to the power plus e-tag path) and unspecified purchases (all other purchases)
    - Includes BPA ACS power, QF generation, and EIM purchases (at the unspecified rate)

- Wholesale power sales are subtracted from facility level data
- Emission factors are applied to the generation data (both PGE owned and operated facilities and purchased power) to determine the emissions associated with serving customer load



Data available here: https://www.oregon.gov/deq/aq/programs/Pages/GHG-Emissions.aspx

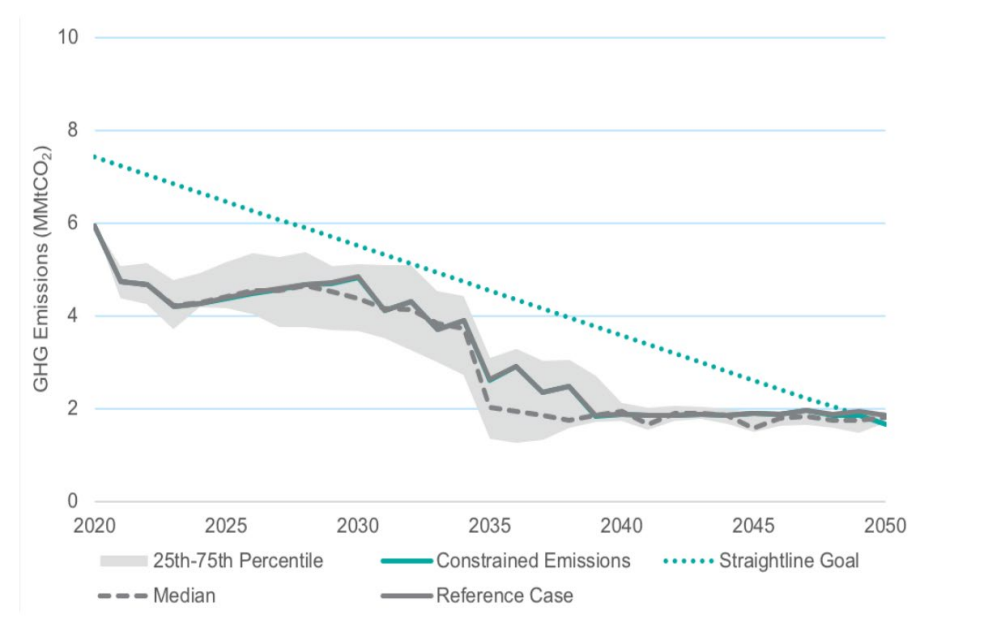
EMISSIONS FORECASTING

The main analysis in the 2019 IRP/Update did not impose emission constraints

- Constraints based on PGE's then straight-line 2050 emissions reduction goals were included for certain sensitivities (solid green line)

In the 2019 IRP/Update, CO2 emissions forecasts were formulated in two stages

- **Aurora:** Dispatched existing thermal resources economically against 54* hourly forecasts of market prices
- **ROSE-E:** Determined optimal type, size, and timing of resource additions in 270** futures, calculated emissions in 810*** futures



* 54 futures included combinations of the renewable buildout (R/H), natural gas (R/H/L) and carbon prices (R/H/L), and hydro (R/H/L) : 2*3*3*3 = 54 price futures
** 270 futures included combinations of price (18: not varying hydro), technology cost (R, Low-/High-Cost Wind/Solar), and Need (R/H/L) futures: 18*5*3=270 futures
*** 810 then incorporates hydro conditions (R/H/L): 270*3=810 futures

2019 IRP EMISSIONS METHODOLOGY

After determining resource additions, ROSE-E forecasts the resulting emissions in each future:

[Existing Thermal Gen + New Resource Gen + Net Market Purchases] * [Associated Emissions Rates]

Associated emission rates sources:

- Existing Thermal: PGE estimates
- New Resources: SSO study estimates
- Market: .428 MMtCO2e/MWh*

In the 2019 IRP, PGE evaluated twelve generation resources in portfolio analysis:

Non-Emitting	Thermal
Four wind locations (SE WA, Gorge, Ione, & MT)	SCCT
Solar	CCCT
Solar + Storage	Recips
Biomass**	LMS-100
Geothermal	

* This value was originally was calculated by the Western Climate Initiative (WCI) as the average marginal generation for power plants in the WECC. The California Air Resources Board (CARB) in 2018 determined the value to still be appropriate: https://ww2.arb.ca.gov/sites/default/files/classic/regact/2018/capandtrade18/ct18fsor.pdf

** We are currently evaluating whether we consider biomass as non-emitting for the next IRP

2019 IRP STORAGE EMISSIONS

Storage resources were modeled in Aurora to charge/discharge in the most opportune hours

- Negative capacity factors reflected round trip losses

Emissions for storage resources were modeled* as negative by assuming both that:

- Hydro and/or renewables were the marginal resource in charging hours, and
- Natural gas plants were the marginal resource in discharging hours

2019 Storage Resources	2025 Reference Case Net Capacity Factors	Emissions Rates (tCO2/MWh)
2hr Battery	-0.029%	0.33
4hr Battery	-0.021%	0.36
6hr Battery	-0.026%	0.51
Pumped Storage	-0.027%	0.61

* A negative capacity factor times a positive emissions rate generates negative forecasted emissions

EMISSIONS METHODOLOGY IN NEXT IRP

In the last IRP, ROSE-E calculated emissions at a yearly level

- We're interested in looking at greater resolution of greenhouse gas emissions

Additionally, In the next IRP PGE is considering the following changes to its emission forecasts:

- Emission forecasts will be reported in carbon dioxide equivalent (CO_2e)
- Emission constraints aligned with HB2021's emission reduction targets
    - Implementing targets will happen in three main IRP steps:

Model	Model Step	Carbon Constraint
Aurora	Generating baseline portfolio* from external price forecasts	Limiting existing thermal generating resources emissions
ROSE-E	Determining optimal size and timing of resource additions to meet energy and capacity needs	Limiting total system emissions (including those associated with storage and market purchases)
Sequoia	Evaluating capacity need	*Not covered in this presentation*

* PGE's 'baseline portfolio' is calculated as the sum of all existing and contracted resources. Dispatchable resources are economically dispatched against market prices.

QUESTIONS/ DISCUSSION?

PORTFOLIO REQUESTS FROM PARTICIPANTS

SETH WIGGINS

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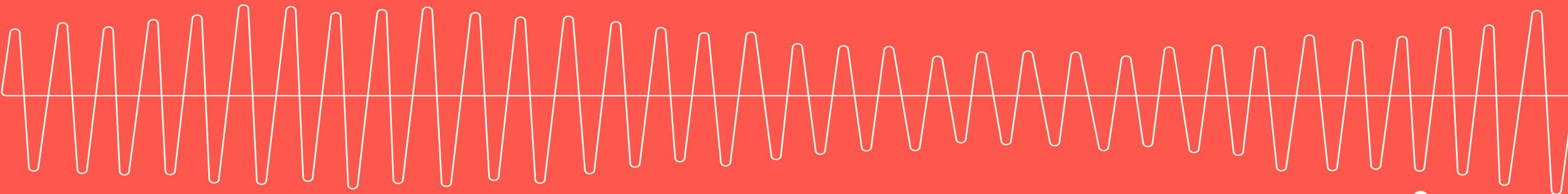

PGE

PORTFOLIO REQUESTS

- Our portfolio optimization model ROSE-E has flexibility to evaluate any specific resource/size/year combination
  - For example, we could estimate the portfolio effects of adding 235 MW of SE Washington wind in 2036 and/or 150 MW of 6-hr batteries in 2026
  - In the 2019 IRP, we used this capability to evaluate the size and timing of 16 different renewable additions MW/year combinations

- We are open to any suggestions for portfolio questions to be evaluated
  - Please contact us (email: IRP@PGN.com)

NEXT STEPS

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

Upcoming Roundtables:

November 18, 2021
December 15, 2021

THANK YOU

CONTACT US AT:
IRP@PGN.COM