Oregon
Tina Kotek, Governor

OREGON DEPARTMENT OF ENERGY

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AGENDA

Title: Electricity Generating Technologies Working Group – Oregon Energy Strategy

Date: August 5, 2024

Objectives:
The purpose of this Working Group is to:

- Understand foundational data sources expected to inform starting point for analysis and ask clarifying questions.
- Provide expertise and feedback on key assumptions related to electricity generation technologies out to 2050.
- Discuss "what if" questions to inform scenarios that can help understand trade-offs of different clean energy pathways.

Electricity Generating Technologies Working Group Members:

BlueGreen Alliance	Ranfis Villatoro
Climate Solutions	David Van't Hof
Columbia River Inter-Tribal Fish Commission	Christine Golightly
Oregon Citizens' Utility Board	Bob Jenks
DecisionWare Group; Mobilizing Climate Action Together	Pat DeLaquil
Emerald People's Utility District	Mitch Wagner
Self (former EFSC member)	Martha Dibblee
Idaho Power Company	Jon Moreno-Ramirez
International Brotherhood of Electrical Workers	Robert Westerman
Monmouth Power & Light	Wade Carey
Multnomah County Office of Sustainability	Silvia Tanner
NW Energy Coalition	Will Gehrke
NW Natural	Brenda Montanez Barragan and Zachary Sielicky
Northwest Power and Conservation Council	Annika Roberts
Oregon People's Utility District Association	Danelle Romain and Mike Freese
PacifiCorp	Tim Hemstreet
PaTu Wind Farm	Ormand Hilderbrand
Portland General Electric Company	Sarah Buchwalter and Troy Gagliano
Renewable Northwest	Emily Griffith
Sol Coast Consulting & Design	Shannon Souza
Umatilla Electric Cooperative	Alec Shebiel and Blake Weathers
Verde	Anahi Segovia Rodriguez

** Updated as of August 4, 2024.*

Agenda

1:00 – 1:10	Welcome and Introductions	Edith Bayer, ODOE
1:10 – 1:20	Setting the Stage	Edith Bayer, ODOE
1:20 – 1:35	How electricity generating technologies are considered in the Oregon Energy Strategy reference scenario	Jeremy Hargreaves, Evolved Energy Research
1:35 – 2:15	Discussion of reference scenario data and assumptions	Edith Bayer & Joni Sliger, ODOE Jeremy Hargreaves, Evolved Energy Research
2:15 – 2:50	Discussion of alternative scenarios	
2:50 – 3:00	Wrap up and Next Steps	Edith Bayer, ODOE

Note: ODOE will open the floor for comments and questions from observers if time permits. Comments and questions can also be submitted to https://odoe.powerappsportals.us/en-US/energy-strategy/

Oregon Department of **ENERGY**

Oregon Energy Strategy
Electricity Generating Technologies Working Group



Edith Bayer and Joni Sliger
August 5, 2024

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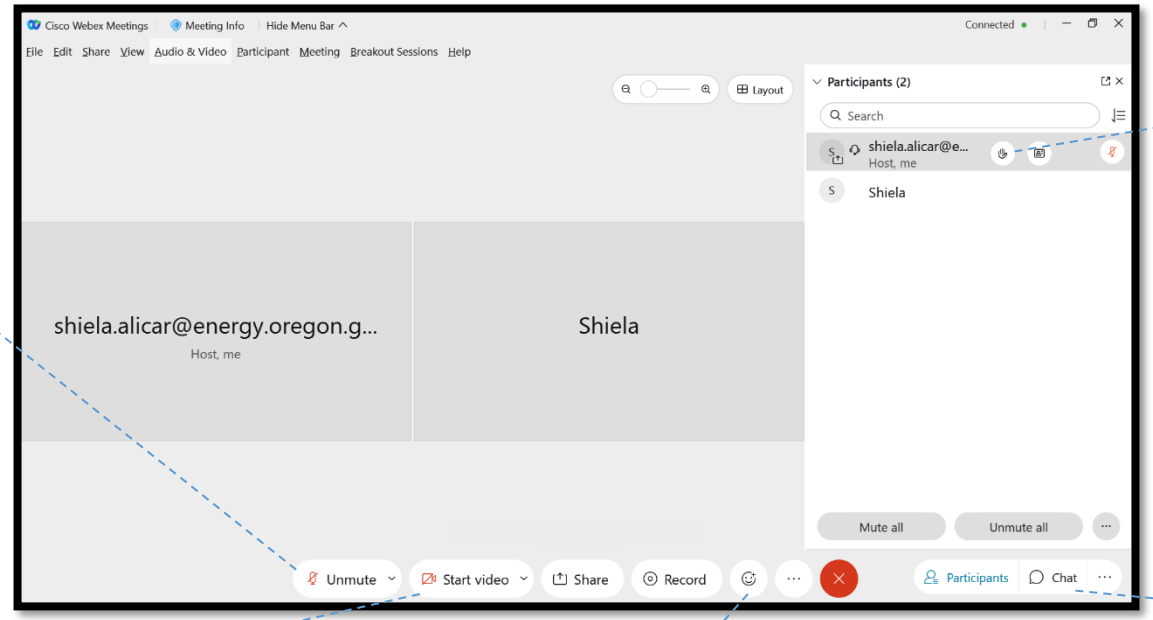
USING WEBEX



Audio Options

Mute — *Microphone On*

Unmute — *Microphone Off*

Video Options

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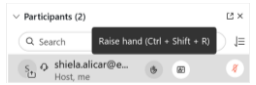
Start video — *Webcam Off*

Second Raise Hand Option

You can also click on the hand next to your name in the Participant list to raise your hand.



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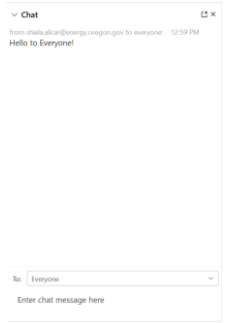
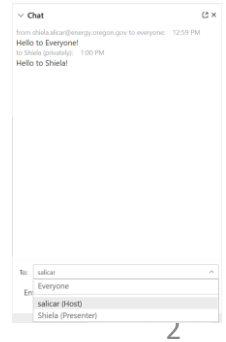
Chat

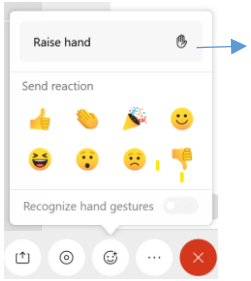


You can chat to Everyone in the meeting.

You can send a private message to the Host or Presenter (or all Panelists when there is a Panel).



Reactions



Click to Raise your hand.

Click on Lower hand when you are done.

PURPOSE OF THIS WORKING GROUP

- Understand foundational data sources expected to inform starting point for analysis and ask clarifying questions.

- Provide expertise and feedback on key assumptions related to electricity generation technologies out to 2050.

- Discuss “what if” questions to inform scenarios that can help understand trade-offs of different clean energy pathways.

Note: focus is on the modeling; discussion of policy recommendations will take place in early 2025.

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WORKING GROUP ROSTER

ORGANIZATION	NAME
BlueGreen Alliance	Ranfis Villatoro
Climate Solutions	David Van't Hof
Columbia River Inter-Tribal Fish Commission	Christine Golightly
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CLEAN ENERGY TRANSITION INSTITUTE TEAM

Project Management

- Overall Project Manager: Eileen V. Quigley, CETI
- Technical Project Manager: Ruby Moore-Bloom, CETI

Technical Modeling

- Technical Project Lead: Jeremy Hargreaves, Evolved
- Technical Advisors: Elaine Hart, Moment Energy Insights; Amy Wagner, Evolved
- Technical Project Support: Ryan Jones and Gabe Kwok, Evolved
- Health Impacts Lead: Jamil Farbes, Evolved

Equity Support

- Equity Advisor: Angela Long, Rockcress Consulting
- Equity Advisory & Data Analyst: Mariah Caballero, CETI

INTRODUCTIONS

- Please share the following with the group **via chat**:
  - Name
  - Affiliation
  - Geographic location you represent
  - A fun highlight from your weekend

Setting the Stage

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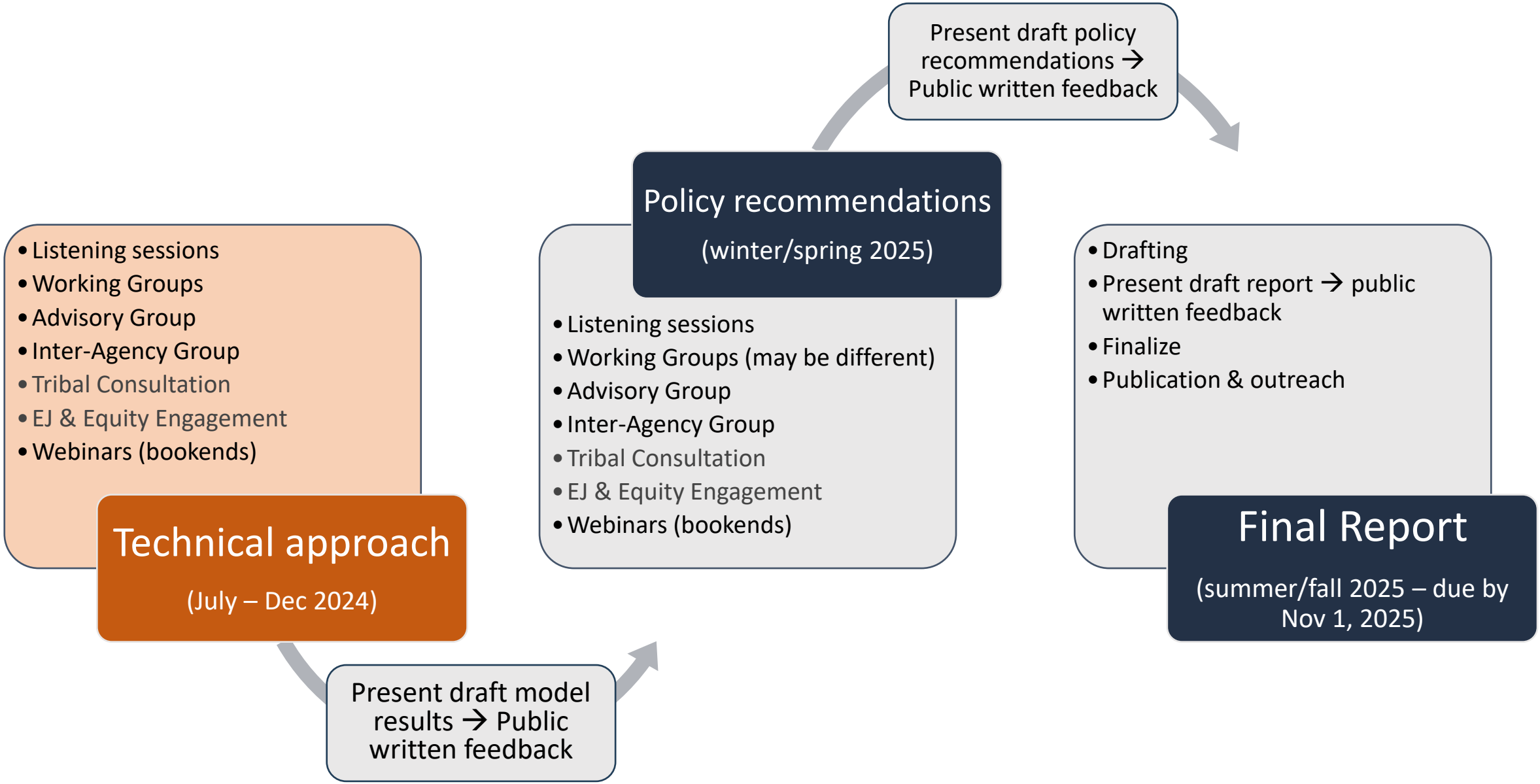
WHERE WE ARE IN THE PROCESS



SCOPE OF THE ENERGY STRATEGY

In identifying pathways to meeting the state's energy policy objectives, the state energy strategy must take into account, at a minimum:

- State Energy demand and trends
- Energy resources and tech choices considering costs, EE, feasibility & availability
- Existing & potential incentives to support EE
- Energy generation, transmission, distribution infrastructure
- Emerging tech & investment opportunities
- Environmental justice
- Community benefits
- Land use considerations
- Energy burden & affordability
- Econ and employment impacts
- Energy security and impacts of broader markets
- Energy resilience
- Community energy resilience

ENERGY POLICY OBJECTIVES

Economy-wide

- EO 20-04
- 80% GHG reduction by 2050

Electricity (IOUs*)

- HB 2021
- 100% clean by 2040

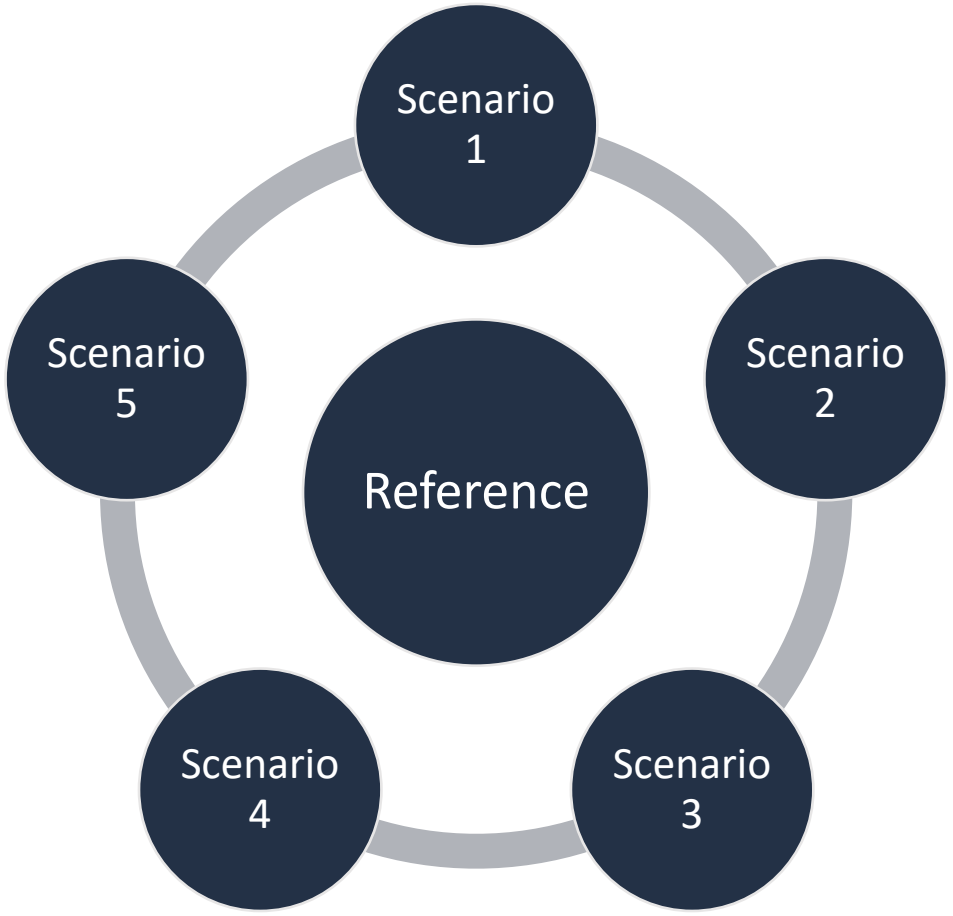
*HB 2021 applies to the large IOUs, PacifiCorp and Portland General Electric Company, as well as to electricity service suppliers.

Natural gas, liquid fuels, propane

- Climate Protection Program
- 90% GHG reduction by 2050

Policies driving and shaping compliance pathways:
Clean Fuels Program, Advanced Clean Cars II, Advanced Clean Trucks, Building Codes, Appliance Standards, and many more….

SUMMARY OF MODELING APPROACH



Reference: Combination of a set of reasonable assumptions demonstrating alignment with state energy goals to 2050

Scenarios 1-5: Test alternative pathways to uncover differences and trade-offs with reference pathway
(What if there is more or less transmission? What if heat pump or electric vehicle adoption is slower than expected? etc.)

How electricity generating technologies are considered in the Oregon Energy Strategy reference scenario

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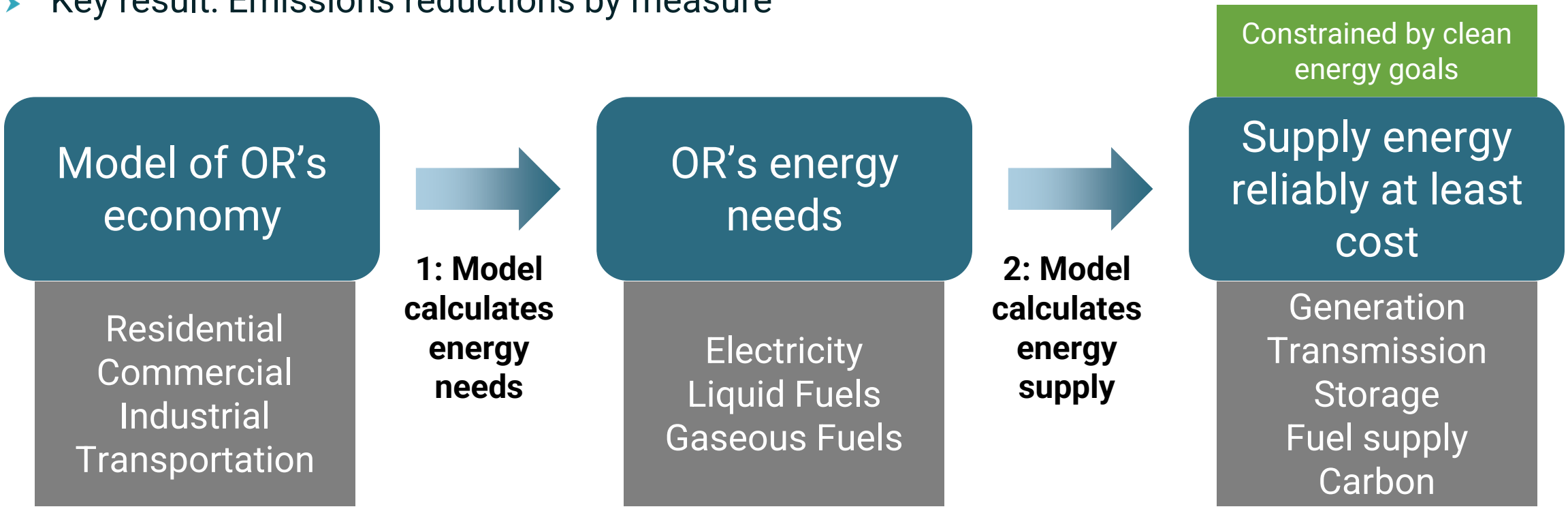
Oregon Energy Strategy Technical Consulting

High Level Description of Modeling Approach

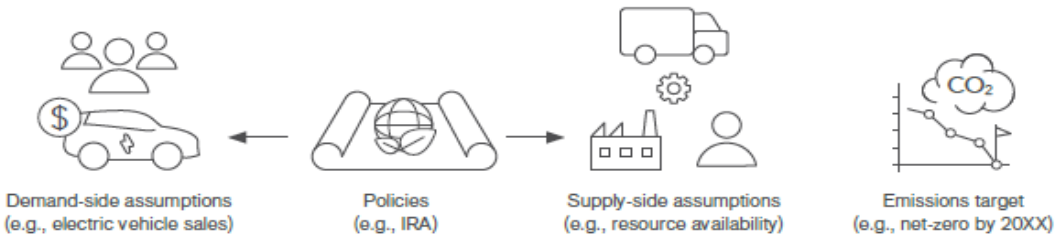
- Model calculates the energy needed to power OR's economy, and the least-cost way to provide that energy under clean electricity and emissions goals
- Key result: Emissions reductions by measure



Economy-Wide Energy Modeling

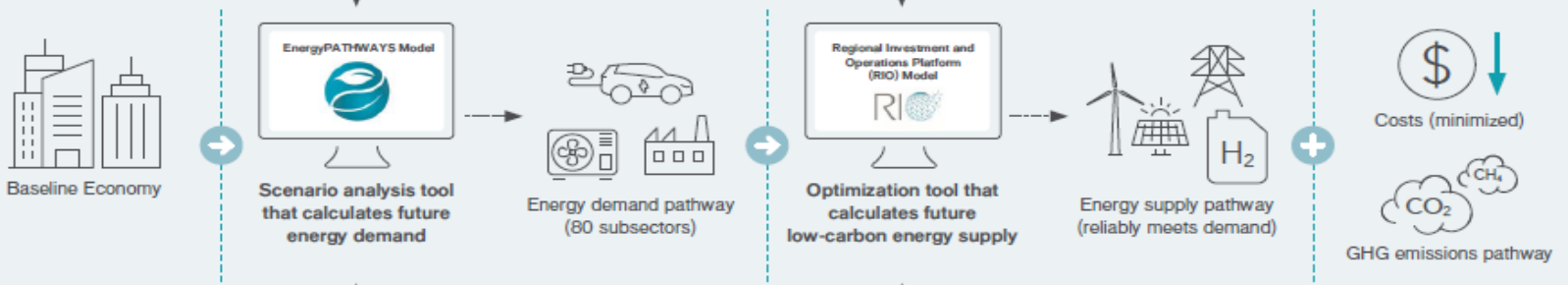
Scenario Assumptions

Model incorporates assumptions about demand-side uses, clean energy policies and incentives, and supply-side resources.



Energy Modeling

Evolved Energy Research uses two models to calculate the least-cost way to provide energy under an emission target: Energy Pathways for demand and RIO for supply.



Best Available Data

Model incorporates relevant and up-to-date energy data from reputable sources, substituted with local data where possible.

Underlying demand data

- Economic subsectors
- Demand technology characteristics
- Capital, operating, and installation costs
- Hourly demand shapes
- Current technology stocks
- Energy service demands
- Fuels efficiencies (electricity, pipeline gas, diesel, etc.)
- Demand drivers (e.g., population)
- Geographies

Underlying supply data

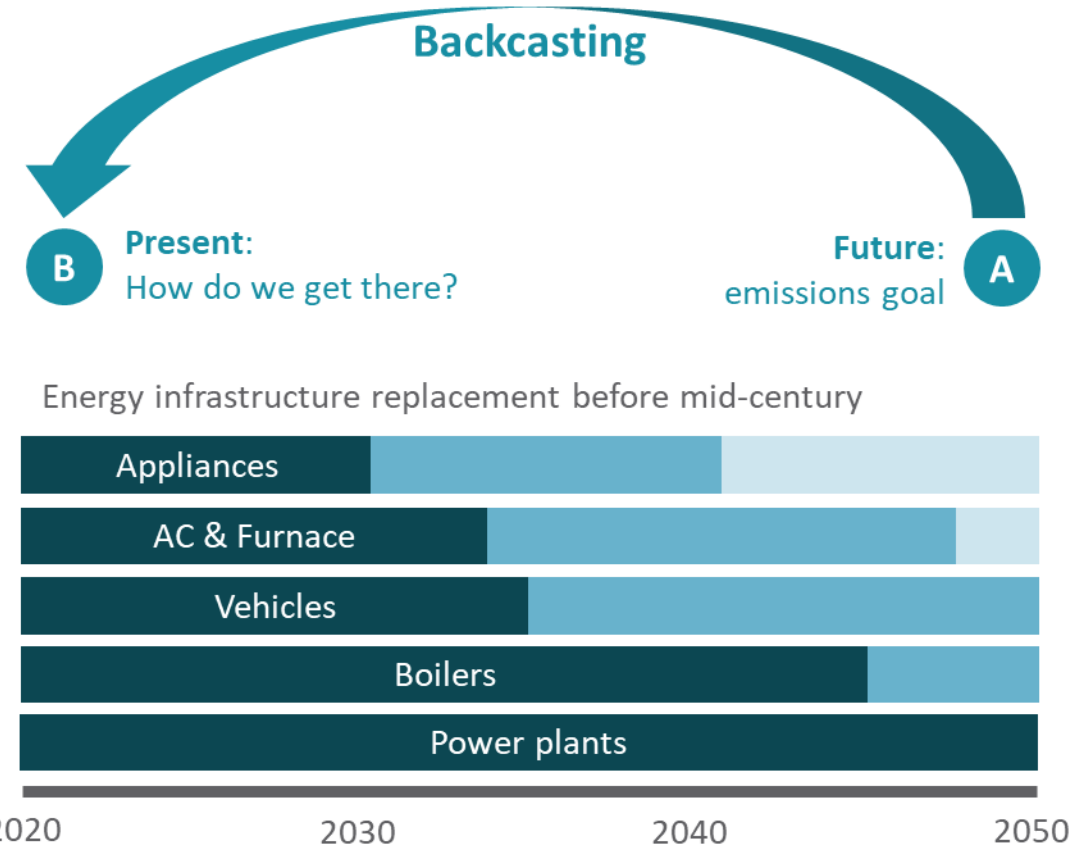
- Existing energy infrastructure
- Existing infratructure scheduled retirement
- Scheduled resource additions already committed
- Energy production and conversion infrastructure characteristics
- Energy transport, storage, and delivery options
- Capital, operating and maintenance, and installation costs
- Resource potentials
- Renewable resource production shapes
- Commodity costs and delivery costs
- Gas global warming potentials
- Land use
- Geographies

EVOLVED ENERGY RESEARCH

Clean Energy Transition Institute

Forecasting vs. Backcasting

- **Forecasting**: project changes based on expected customer behavior given incentives/technology
  - e.g result of current policy
- **Backcasting**: start with an end-point and work backwards to infer customer adoption over time
  - What is the best path to be on?
  - Target for future policymaking: Where is current policy falling short?
  - All options available in the long term



Backcasting Discussion

- Forecasting vs. backcasting efficiency and electrification can result in different long-term load forecasts
  - Forecast ‘reference’ case with 0.2% load growth
  - Back-cast ‘low carbon’ scenarios see periods with 2-3% load growth
  - Early 2020s may be seen, in retrospect, as a period of maximum load growth uncertainty
- Electricity infrastructure investments now will experience changing conditions over their lifetimes – transition to clean electricity and lower emissions
  - Near-term decision making in long-term context avoids locking into resources that don’t best serve Oregon

End-Use Sectors Modeled

- Approximately 80 demand sub-sectors represented
- Load uncertainty: how much electrification, data center growth etc.
- The major energy consuming sub-sectors are listed below:

Key energy-consuming subsectors:

Residential Sector

- Air-conditioning
- Space heating
- Water heating
- Lighting
- Cooking
- Dishwashing
- Freezing
- Refrigeration
- Clothes washing
- Clothes drying

Commercial Sector

- Air-conditioning
- Space heating
- Water heating
- Ventilation
- Lighting
- Cooking
- Refrigeration

Industrial Sector

- Boilers
- Process heat
- Space heating
- Curing
- Drying
- Machine drives
- Additional subsectors (e.g., machinery, cement)

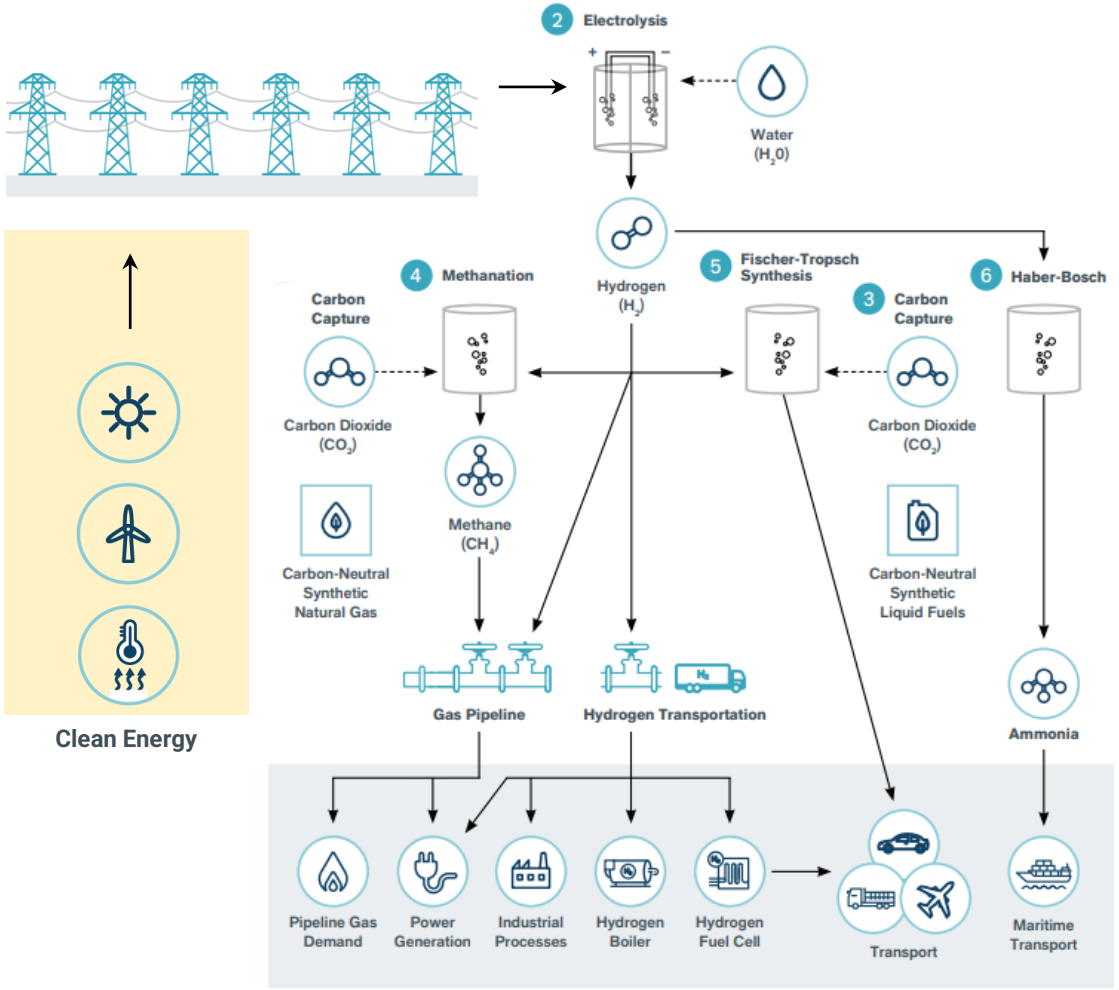
Transportation Sector

- Light-duty autos
- Light-duty trucks
- Medium-duty vehicles
- Heavy-duty vehicles
- Transit buses
- Aviation
- Marine vessels

Source: CETI, NWDDP, 2019

Integrated Supply Side: Electricity and Fuels

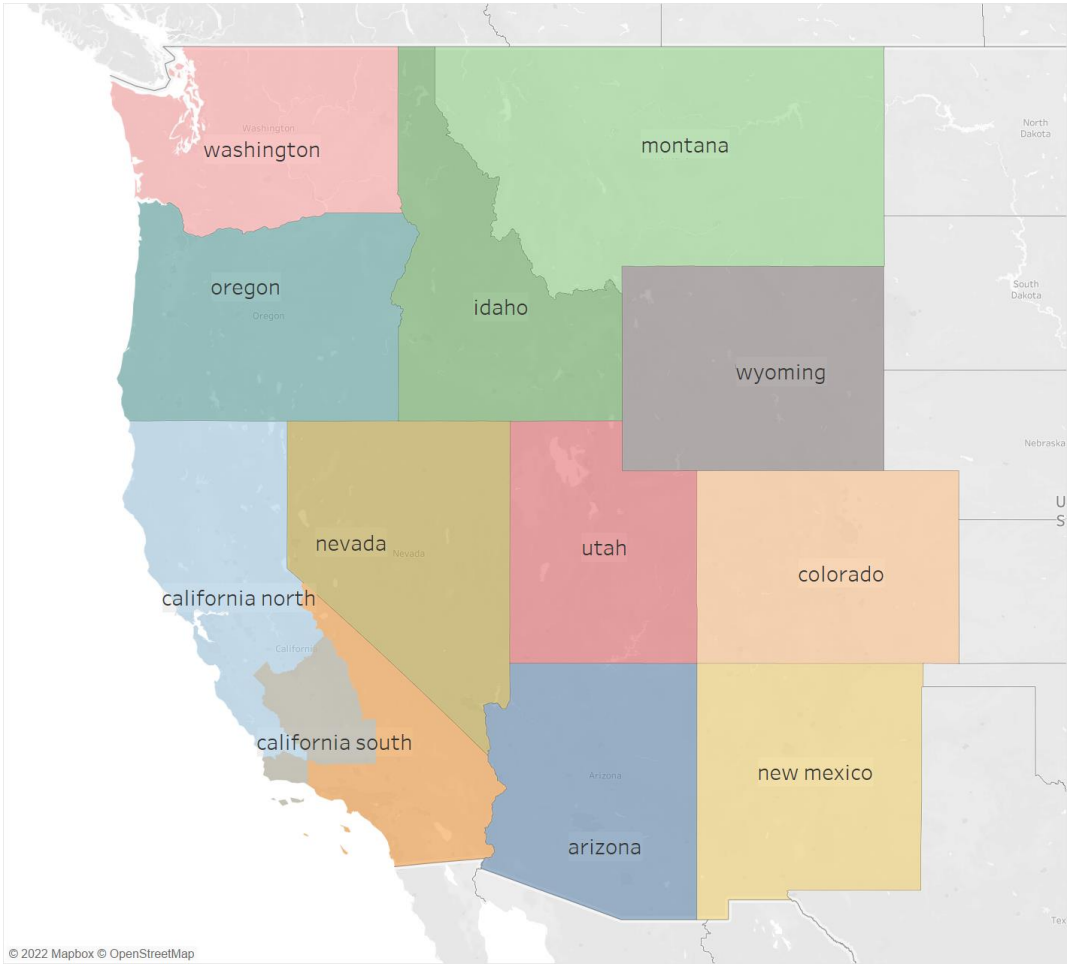
- What are the supply side investments that best meet energy demands?
- Conventional means of “balancing” the electricity grid may not be the most economic or meet clean energy goals
- New opportunities: Storage and flexible loads
- Fuels are another form of energy storage
- Large flexible loads from producing decarbonized fuels:
  - Electrolysis, synthetic fuels production



Source: CETI, NZNW, 2023

Model Geography

- Western United States with California represented as 2 zones and the rest of the US as a single zone
- Contextualizes the decisions made in Oregon operating as part of a larger energy system
  - Competition for fuels including biomass, renewables, and hydrogen derived from renewables
  - Balances the electricity system over a large and diverse region – assumes single balancing authority
  - Captures transmission line and pipeline flow and build constraints
  - Resource, load, and temporal diversity contribute to economy and region-wide least cost strategy to reach net zero
- Modeling 2 zones in Oregon to represent East-West Tx constraints



Potential Expansion Of Interstate Transmission

- Power of Place – West: Identified major substations for interties between states, the existing corridors, the potential to reconductor or co-locate transmission in those corridors, and new potential right of ways for additional transmission expansion

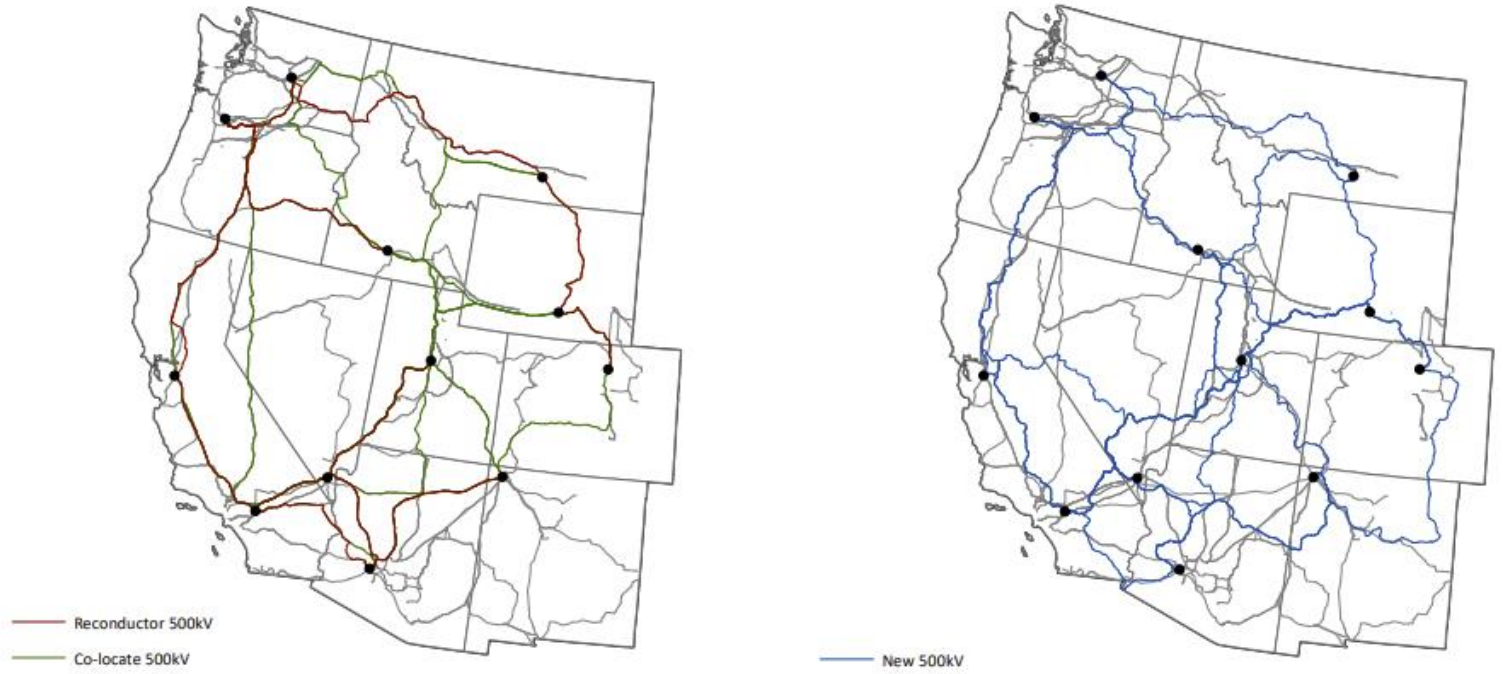
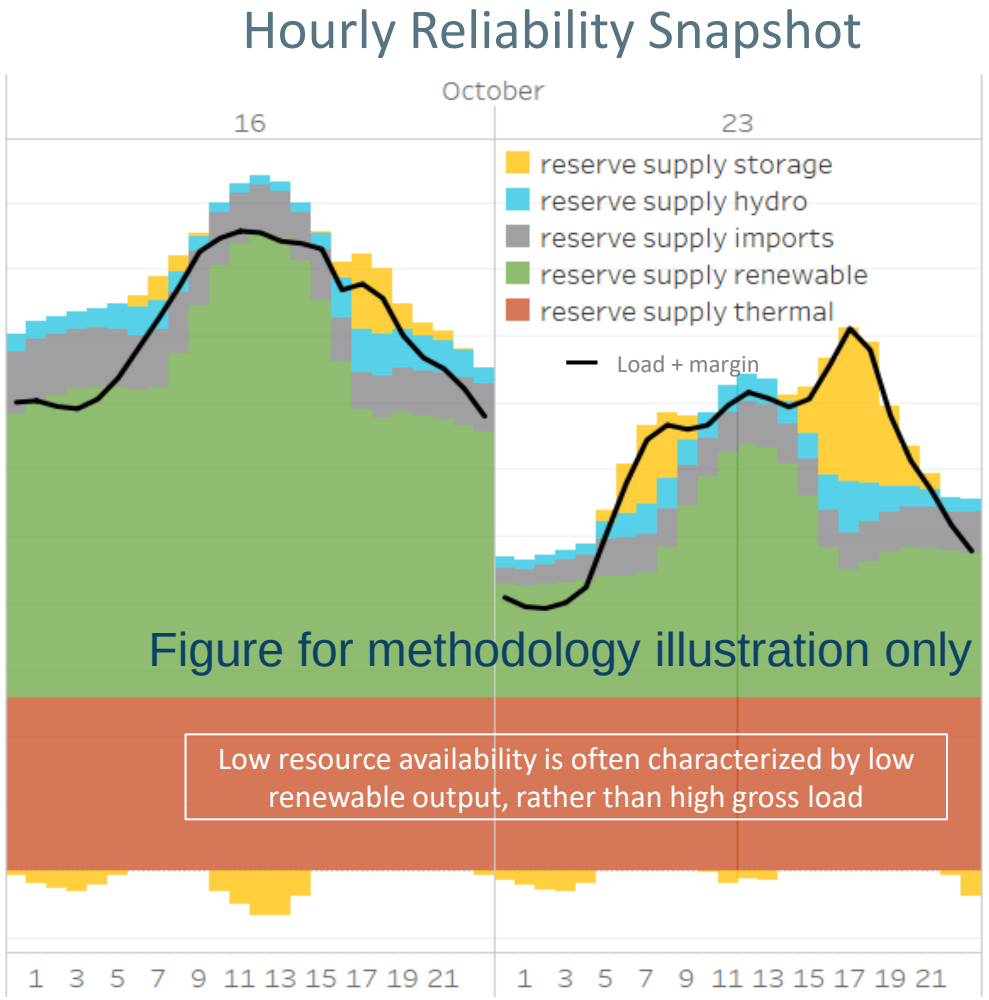


Fig. S8. Least cost path model results showing 500 kV transmission lines. Left: reconductored and co-located 500 kV lines only. Right: new 500 kV lines only.)
Source: Power of Place-West

How Does RIO Approach Reliability?

- Reliability is assessed across all modeled hours with explicit accounting for:
  - Demand side variations – higher gross load than sampled
  - Supply side availability – outage rates, renewable resource availability, energy availability risk, single largest contingencies
- Multiple years used in day sampling adds robustness
- Advantage over pre-computed reliability assessments because it accommodates changing load shapes and growing flexible load
  - Any pre-computed reliability assessment implicitly assumes a static load shape, which is not a realistic assumption
- No economic capacity expansion model can substitute fully for a LOLP study, but different models offer different levels of rigor



Hydro System Modeling

- Represented by aggregated hydro system by zone characterized by historical generation data from WECC
  - Constrained by daily energy budgets
  - Ramp constrained by maximum one hour and six hour ramps to represent river section flow constraints
  - Incorporates low, medium, and high hydro years and their relative frequency in the historical record
- Working on updating the representation to incorporate new hydro system modeling done by NWPCC
  - Includes climate impacts in the near-term

What if…?

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‘WHAT IF’ QUESTIONS

What do you think is the most important uncertainty for the modeling to explore in an alternative scenario?

- What would you assume for major drivers of load growth in a reference scenario over next 5, 10, 25 years? Specifically: electrification, data centers/crypto/chip manufacturing?
- What if load growth were higher (or lower) than expected?
- What would you assume for siting/permitting constraints in a reference scenario? What if siting/permitting constraints were higher or lower?
- What would you see as the bounds of a reference transmission scenario in the short-, mid-, and long-term? What if more or less expansion potential were available?
- What if Oregon sets a more ambitious economy-wide GHG target?

Wrap up and Next Steps

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OPPORTUNITIES FOR FURTHER ENGAGEMENT

Provide Written Public Comment

- Written public comment can be submitted at: https://odoe.powerappsportals.us/en-US/energy-strategy/
- Written public comment is open until August 31

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Thank you

RESOURCES:

Project page: https://www.oregon.gov/energy/Data-and-Reports/Pages/Energy-Strategy.aspx

ODOE's website: www.oregon.gov/energy

Contact us: energy.strategy@energy.Oregon.gov

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