Oregon Department of **ENERGY**

Oregon Energy Strategy
Phase 1 Update



Edith Bayer
September 24, 2024

OREGON DEPARTMENT OF ENERGY

OREGON DEPARTMENT OF ENERGY

Leading Oregon to a safe, equitable, clean, and sustainable energy future.

Our Mission

The Oregon Department of Energy helps Oregonians make informed decisions and maintain a resilient and affordable energy system. We advance solutions to shape an equitable clean energy transition, protect the environment and public health, and responsibly balance energy needs and impacts for current and future generations.

What We Do

On behalf of Oregonians across the state, the Oregon Department of Energy achieves its mission by providing:

- A Central Repository of Energy Data, Information, and Analysis
- A Venue for Problem-Solving Oregon's Energy Challenges
- Energy Education and Technical Assistance
- Regulation and Oversight
- Energy Programs and Activities

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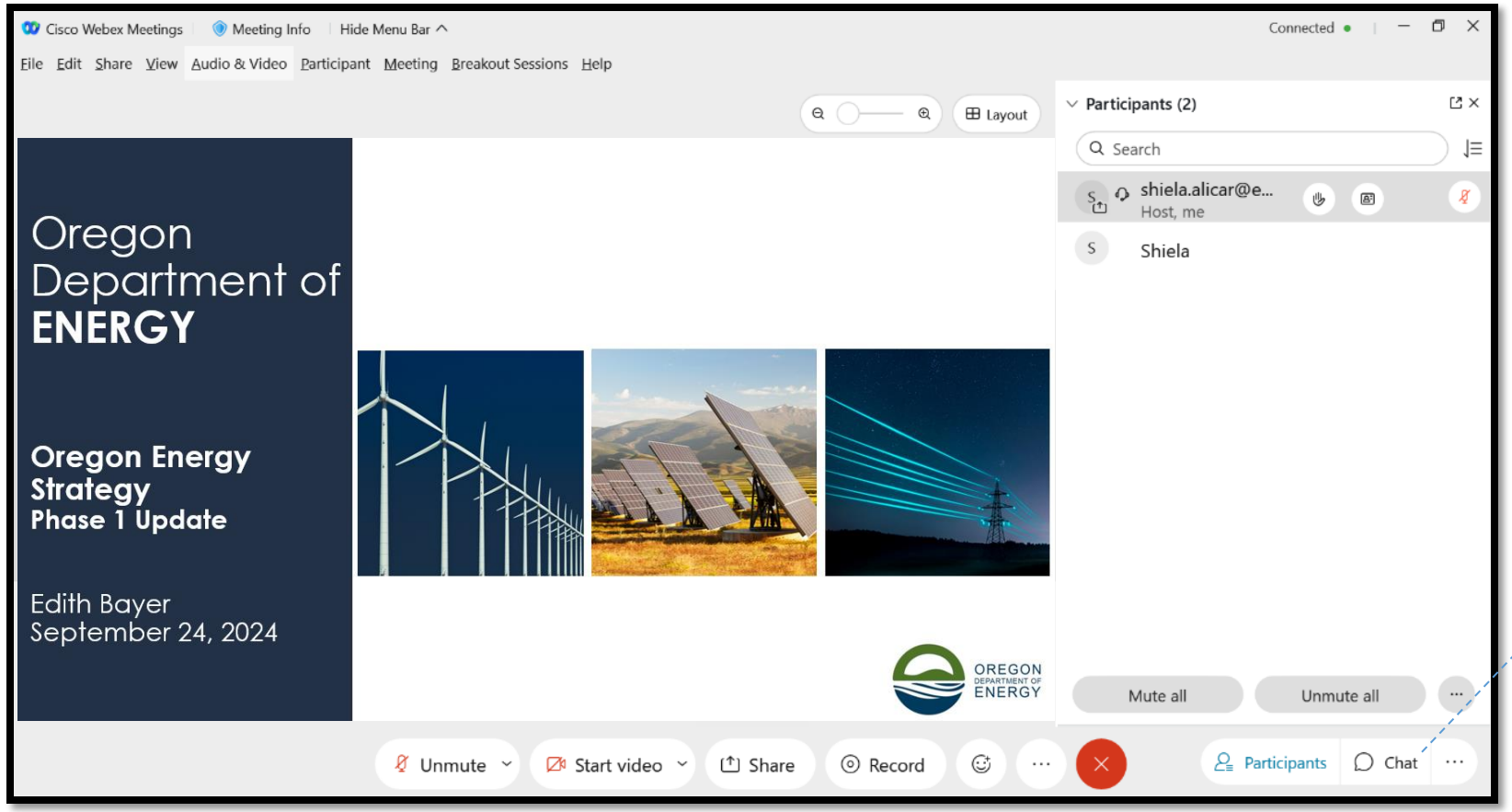
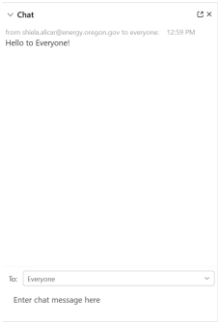


Chat



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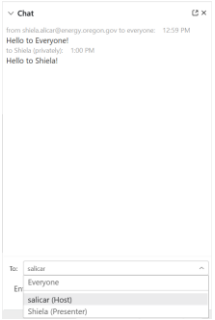

You can send a private message to the Host or Presenter (or all Panelists when there is a Panel).

Tech support chat with Abby Reeser (or email abigail.reeser@energy.oregon.gov)

AGENDA

Time	Topic
1:00 - 1:05 pm	Welcome and Agenda Review
1:05 – 1:20 pm	Overview of the Process
1:20 – 1:35 pm	Modeling Approach
1:35 – 2:15	The Reference Scenario
2:15 – 2:45 pm	Five Alternative Scenarios
2:45 - 3:00 pm	Q&A

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

OVERVIEW OF PROCESS

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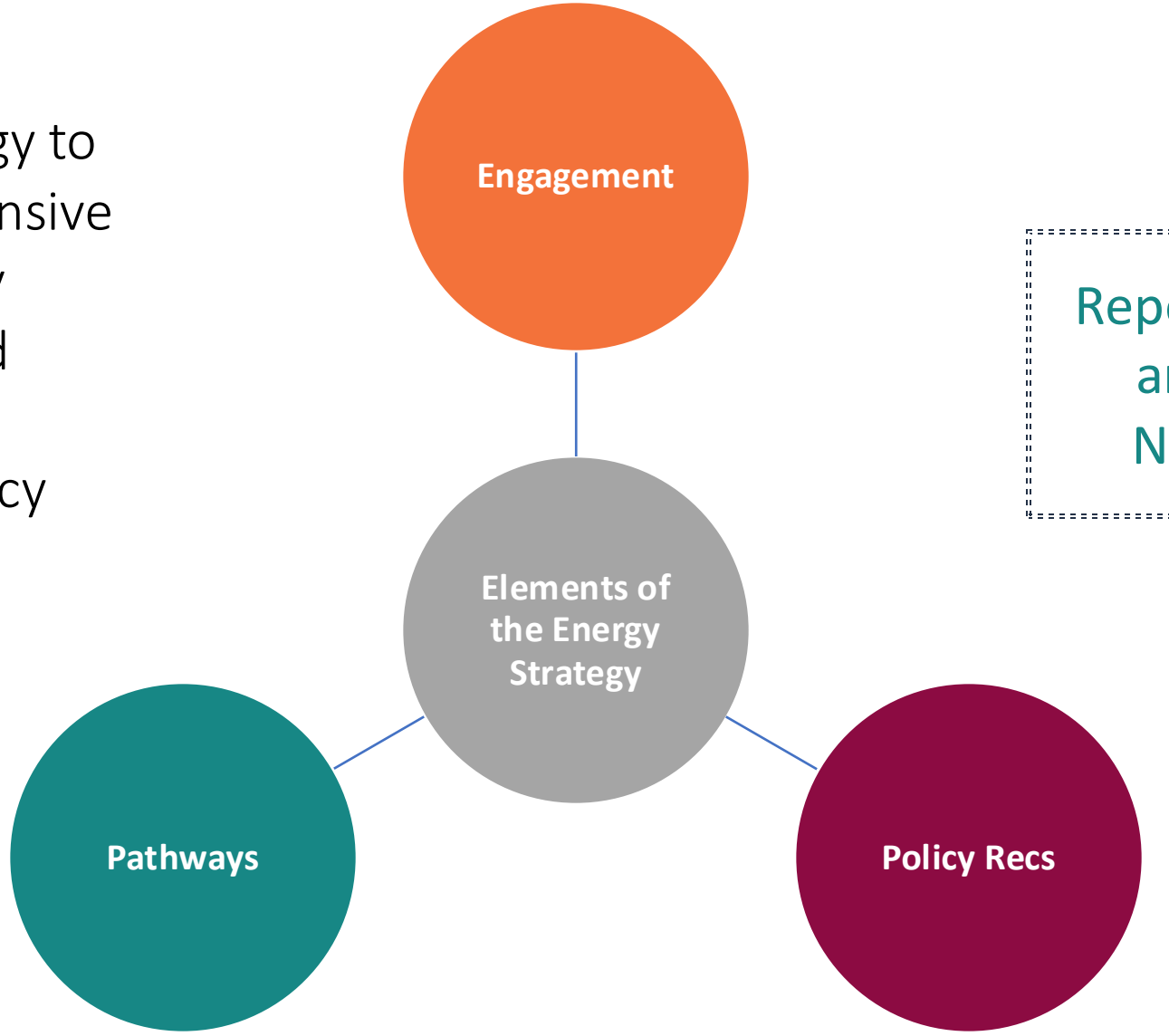
HB 3630: OREGON ENERGY STRATEGY

Directs the Oregon Department of Energy to develop a comprehensive state energy strategy identifying optimized pathways to achieve Oregon's energy policy objectives.



Report to the Governor and Legislature by November 1, 2025

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ELEMENTS OF THE OREGON ENERGY STRATEGY

PHASE

Technical analysis

1. *Technical Analysis:* Summary of the potential pathways to achieve Oregon's policy objectives

2. *Policy Discussions:* Using the output in phase 1, develop recommendations on policy options

3. *Report:* Will include recommendations and description of stakeholder engagement and how stakeholder perspectives informed the strategy

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IDENTIFYING PATHWAYS TO ACHIEVE OREGON'S ENERGY POLICY OBJECTIVES

Must be informed by:

- Stakeholder perspectives
- State laws, policies, targets re: energy and greenhouse gas emissions
- Existing energy and integrated resource plans
- Energy-related studies and data analysis
- State energy policy objectives

Must engage with state agencies, Tribes, and stakeholders with a diverse range of:

- Interests, perspectives, expertise, education
- Socioeconomic backgrounds
- Communities
- Geographic areas of the state

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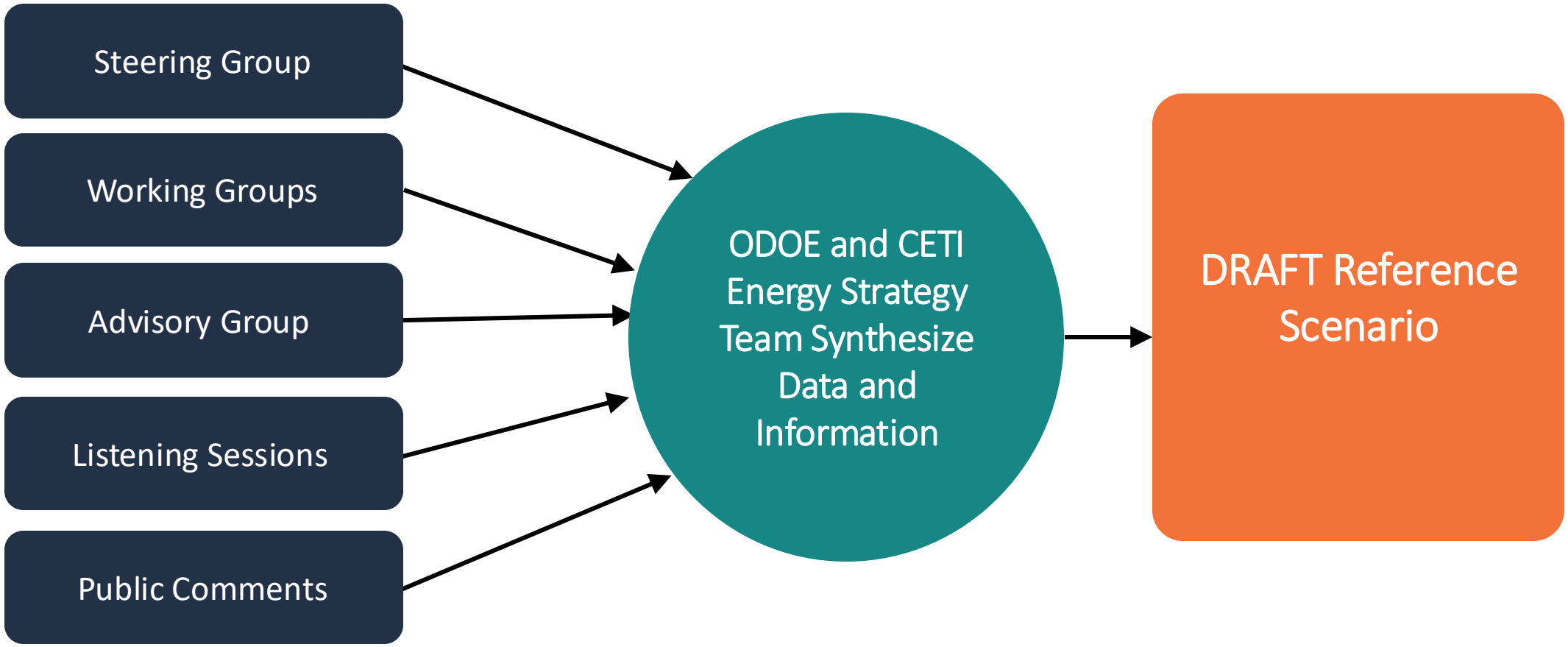
INFORMING MODEL DEVELOPMENT



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TRIBAL CONSULTATION

Government-to-Government letters submitted to Oregon's nine federally recognized Tribes in October 2023 and June 2024

Tribal perspectives and participation in the Advisory Group and Working Groups

ODOE is working on a new letter to consult with Tribes as we begin to plan for policy engagement (expected to kick off in early 2025)

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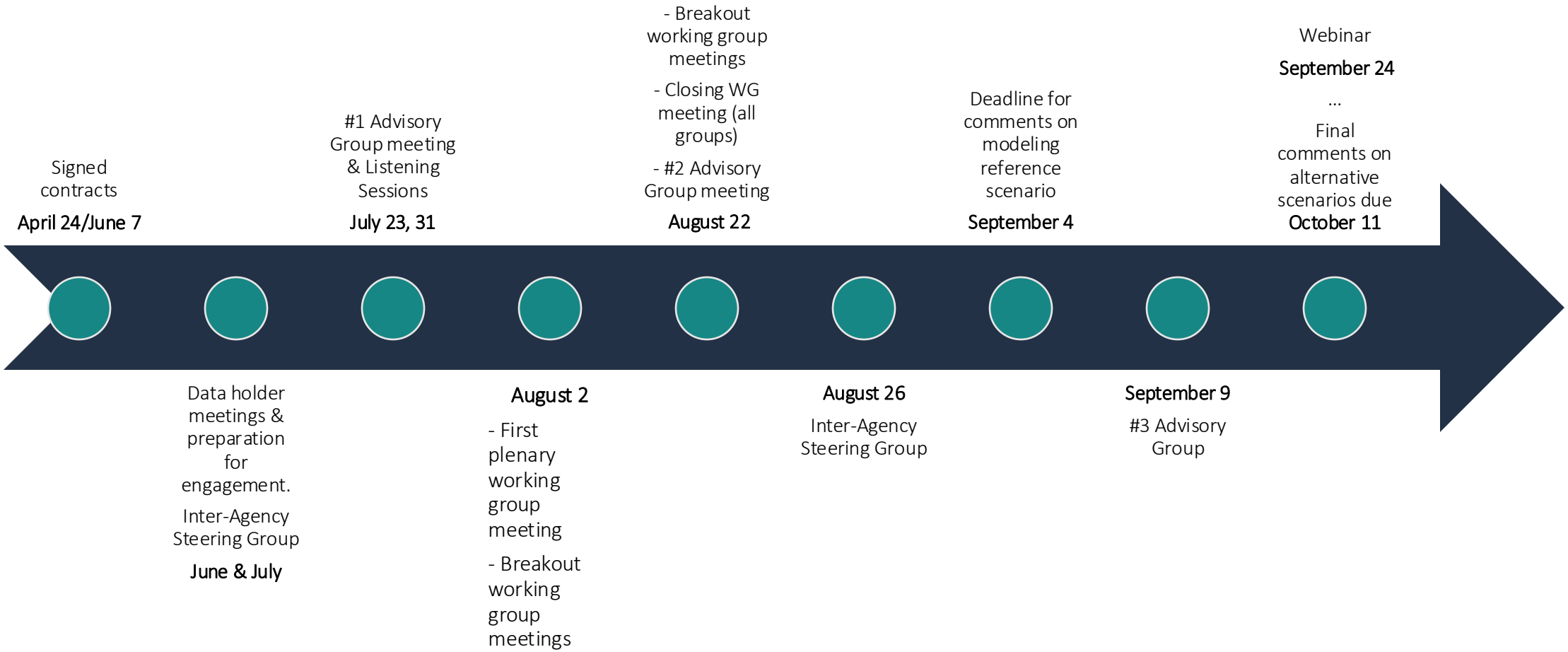
WORKING GROUPS

Working Group	Focus areas
Direct Use Fuels & Industry	Natural gas and fuels used in buildings and industry for heat and manufacturing, does not include fuels used in transportation or for electricity generation.
Electricity Generation Technologies	The facilities that produce electricity, such as rooftop solar and wind. Also discussed data center load growth as key uncertainty for future development needs.
Transportation	Transportation, including cars, trucks, buses, aviation, rail, and maritime transport, as well as alternative modes of transportation (e.g., biking, walking, transit).
Transmission & Distribution	The networks of wires and pipes that move electricity, natural gas, and other fuels from their source to where they're used.
Buildings	Energy use in buildings – residential and commercial.
Energy Efficiency & Load Flexibility	Energy efficiency and shifting the timing of energy use (for example, through managed vehicle charging or by heating water when electricity is cheap).
Equity & Environmental Justice	Equity and environmental justice in the modeling, and how additional analysis might be structured to gather insights from the modeling results.
Land Use & Natural Resources	Evaluation of land and natural resource availability for energy development in the model.

TIMELINE FOR MODELING INPUTS



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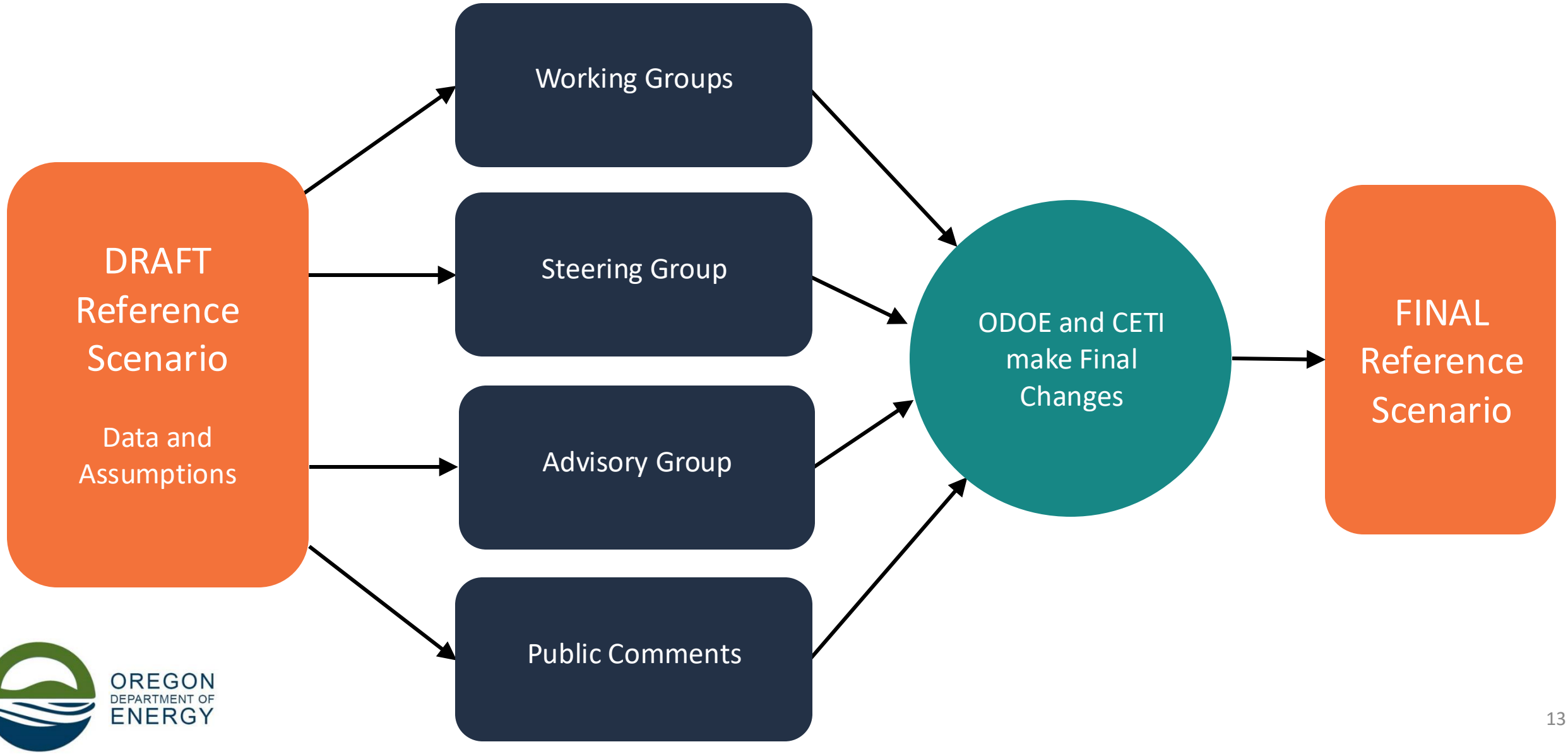
FINALIZING THE REFERENCE SCENARIO



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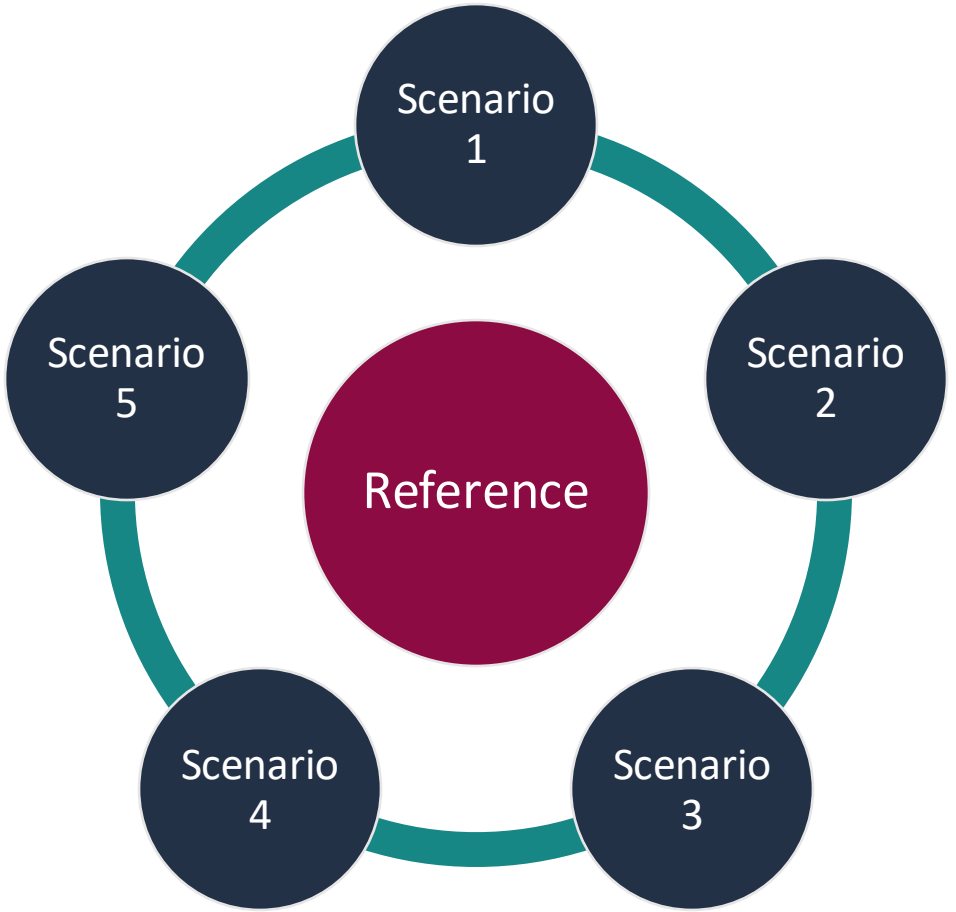
DEFINING ALTERNATIVE SCENARIOS



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MODELING APPROACH

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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

Reflects the best available info, data analyses and time horizons necessary to achieving the state's energy policy objectives

Periodically update the E Strategy to reflect current information, data analysis and state energy policy objectives

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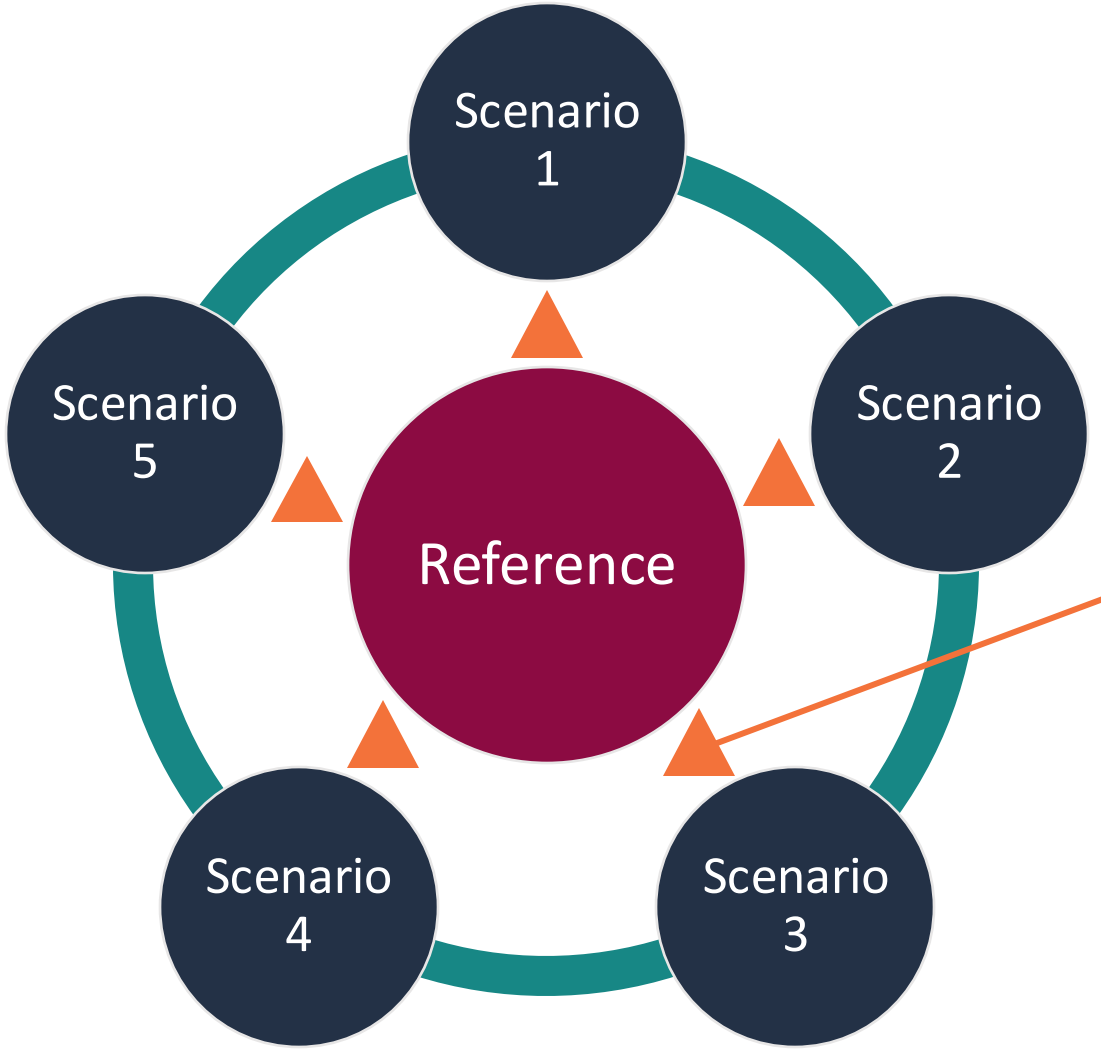
MODELING TO INFORM THE RECOMMENDATIONS



How does the change, or Delta, inform the Recommendations?

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DECISION-MAKING CRITERIA

Established modeling inputs, including:

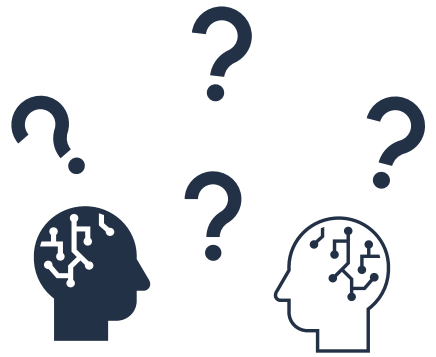
- Achieving state energy objectives, including greenhouse gas emissions goals
- Energy system reliability
- Existing laws and policies

Reference case focuses on “aggressive but achievable” levels of electrification, energy efficiency, and load flexibility

- Based on numerous other studies that identify these as part of a least-cost path to meeting energy and climate policy objectives
- Paired with scenarios that test alternative pathways with lower electrification and energy efficiency rates

Other considerations, including:

- Data availability and quality
- Focus on informing near-term decisions and recommendations



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WHAT THE ANALYSIS DOES AND DOESN'T DO

DOES

- Create an understanding of tradeoffs between different pathways, policies, and strategies to inform recommendations to meet Oregon's energy policy objectives
- Integrate detailed electricity sector modeling and fuels supply for an economy-wide perspective
- Set feasible but aggressive demand-side inputs for efficiency, electrification, and flexibility
- Create complementary analysis on co-benefits and costs: equity, environmental justice, land use, jobs, air quality, and public health

DOES NOT

- Serve the same purpose as utility IRP models
- Focus on any single utility service territory; it is a statewide model
- Forecast the future; it informs near-term decision-making in the face of uncertainty about meting our energy policy objectives
- Operate as a transmission planning model
- Provide location-specific outputs for resources or transmission lines

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SCENARIO DEVELOPMENT

Model of Oregon's Economy

- Residential
- Commercial
- Industrial
- Transportation

Oregon's Energy Needs

- Electricity
- Transportation fuels
- Direct use fuels

Meeting Our Energy Needs

- Reliability must be maintained
- Meet energy policy objectives
- Minimize cost
- Constraints lead to different results

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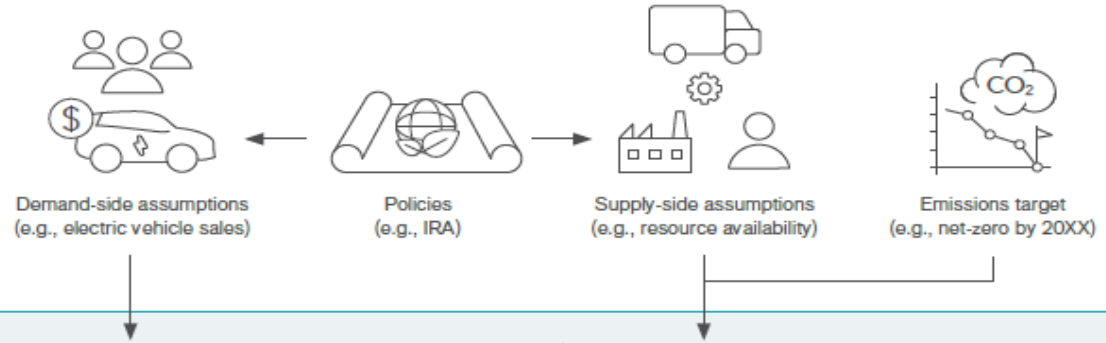
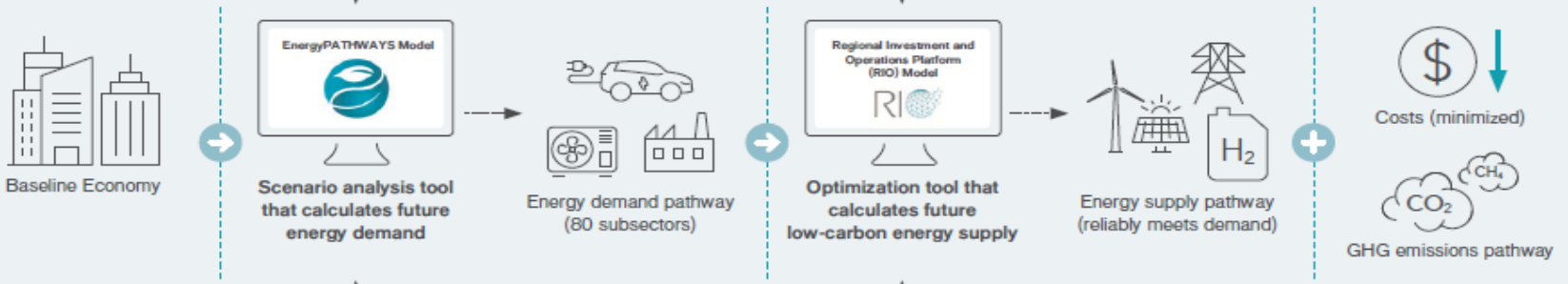
ECONOMY-WIDE ENERGY MODELING

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

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

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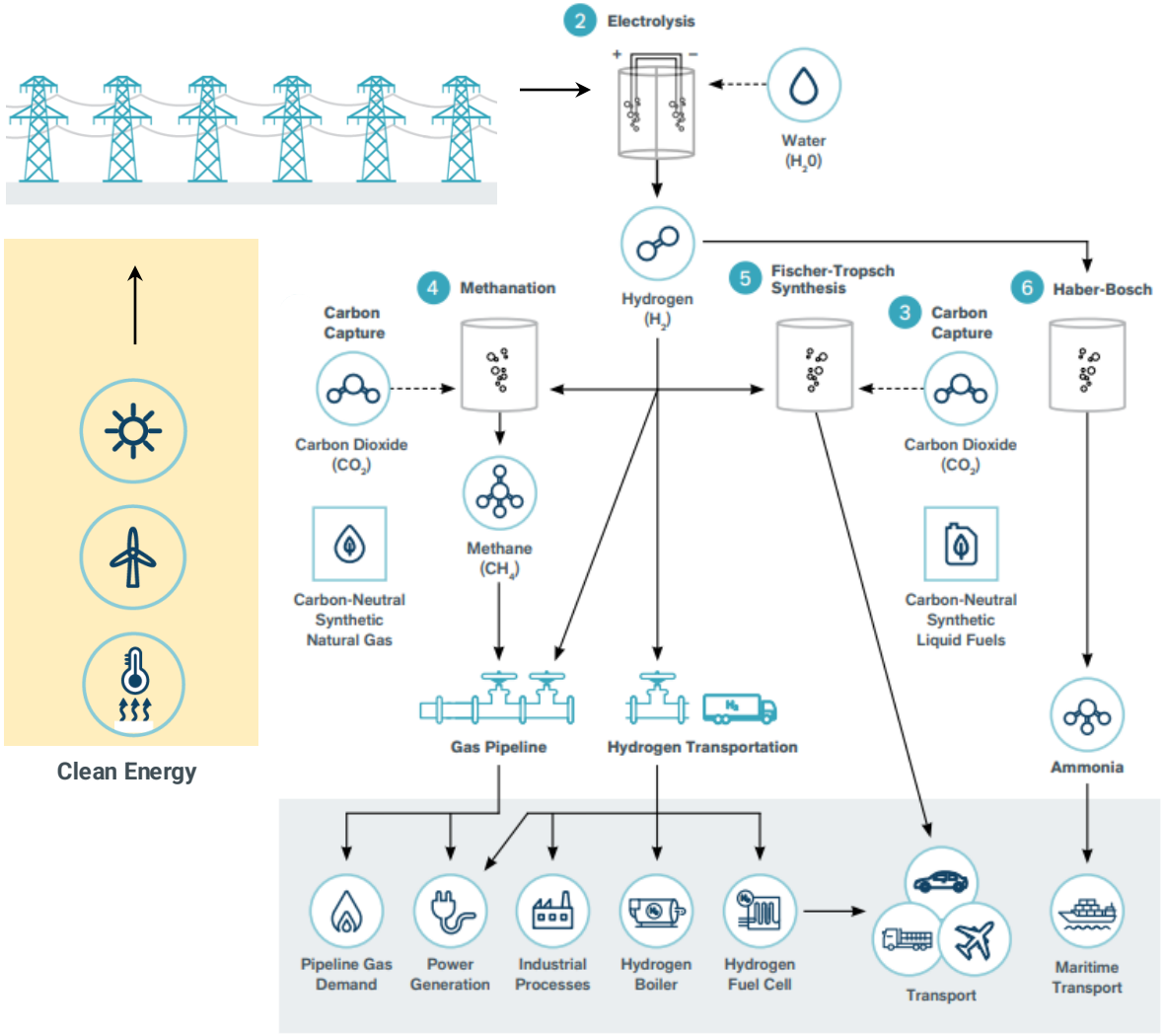
INTEGRATED SUPPLY SIDE: ELECTRICITY AND FUELS

- 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

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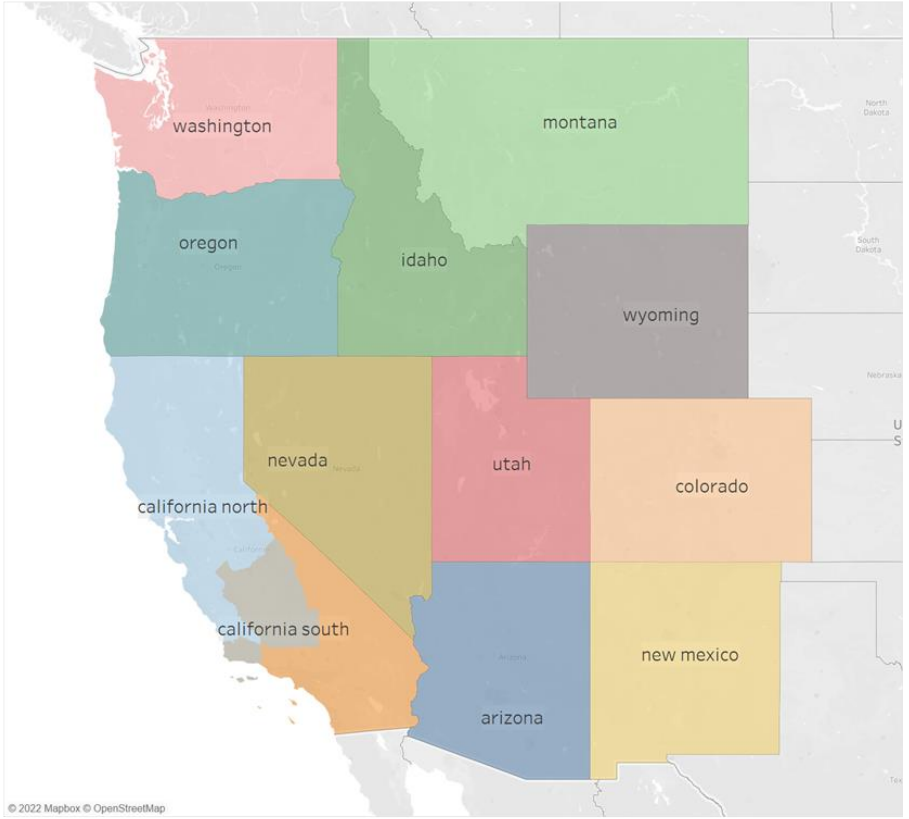
MODEL GEOGRAPHY

Western United States with state level representation, California represented as 2 zones, and a single rest-of-the-U.S. zone

Contextualizes the decisions made in Oregon operating a 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 transmission constraints



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EVOLVED ENERGY RESEARCH

Clean Energy Transition Institute

THE REFERENCE SCENARIO

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SCENARIO DEVELOPMENT

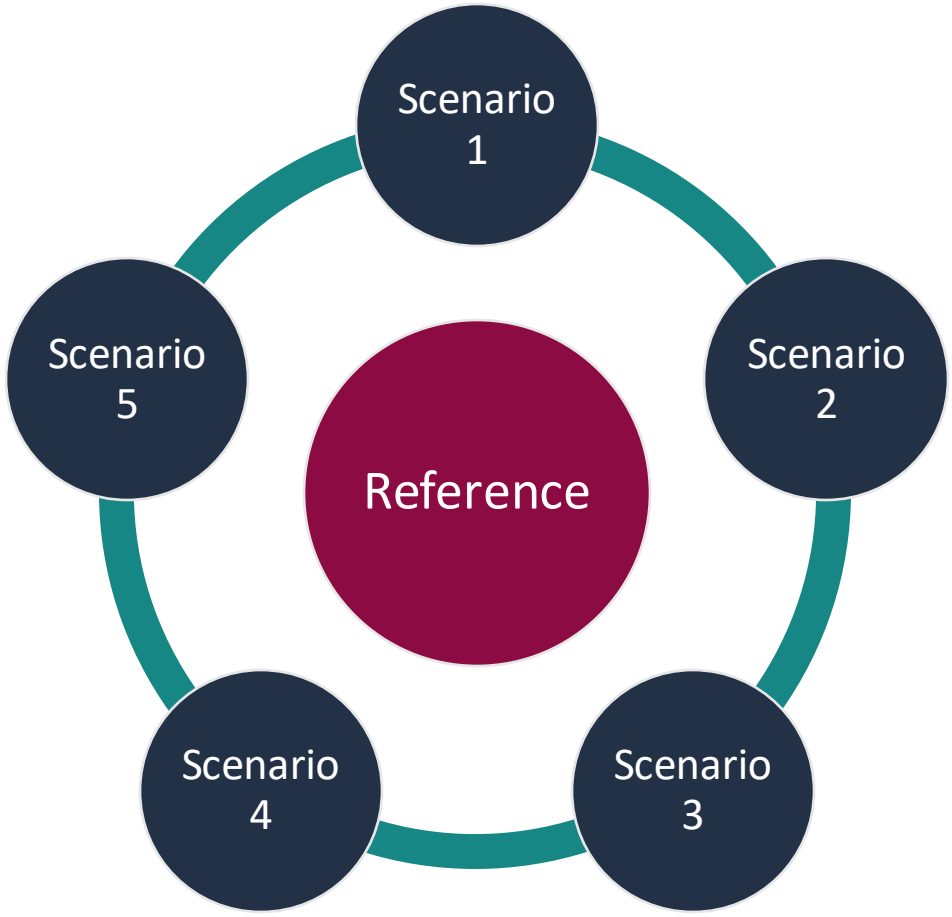
Reference Scenario

- Data: Develop Oregon specific database using best available resources
- Assumptions: Refine key assumptions with public partners

Alternative Scenarios

- Define set of key questions, building on public feedback and working with technical consultants to maximize learnings.

  What are the most pressing questions, uncertainties, and state priorities that will provide the most valuable information to policymakers?



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LIST OF KEY DATA & ASSUMPTIONS

1.2 Buildings: Key Assumptions

Residential Space Heating	Assume existing policies play out for all space heating technologies 65% heat pump sales by 2030; 90% by 2040

Commercial Space Heating	Weighted average of large and small commercial space heating loads, with the following framing:
	- Small commercial: follow residential
	- Large commercial:
	  ○ 2030: Electric heat pumps 15% of overall sales; other electric + electric hybrid systems (including hybrid heat pumps) 10% of overall sales
	  ○ 2045: Electric heat pumps 50% of overall sales; other electric + electric hybrid systems (including hybrid heat pumps) 40% of overall sales

Residential Water Heating	Incorporate Federal Energy Conservation Standards for Consumer Water Heaters (from May 6, 2029) Electric heat pump sales rising to 95% of overall sales by 2045
Commercial Water Heating	Weighted average of large and small commercial water heating loads, with the following framing: - Small commercial: follow residential - Large commercial: ○ 2035: Electric heat pumps for water heaters 15% of overall sales, other electric technologies 10% of overall sales

3.1 Transportation: Data sources for stocks

Light duty vehicle (LDV)current stocks	OR Dept. of Transportation – Driver & Motor Vehicle division (DMV) Data
Medium- and heavy-duty vehicle (MHDV) current stocks	OR Dept. of Transportation – Combination of Commerce and Compliance Division (CCD) and DMV data (depending on vehicle weight) *Note: propose to use Environmental Protection Agency's (EPA's) Motor Vehicle Emission Simulator (MOVES) model if cannot obtain CCD data
Transit Buses current stocks	National Transit Database / EPA MOVES
School Buses current stocks	OR Dept. of Transportation – DMV Data
Fuels current	OR Dept. of Environmental Quality Clean Fuels Program Data
Vehicle Miles Traveled (VMT) current	Dept. of Environmental Quality / EPA MOVES (data comes from Highway Performance Monitoring System)
Fuel Economy current	EPA MOVES, Historical average fuel economy by vintage and vehicle type
LDV sales shares MHDV sales shares	Advanced Clean Cars I / Advanced Clean Cars II Internation Council on Clean Transportation (ICCT) forecasts based on IRA incentives Advanced Clean Trucks through 2035 ICCT forecasts based on IRA incentives

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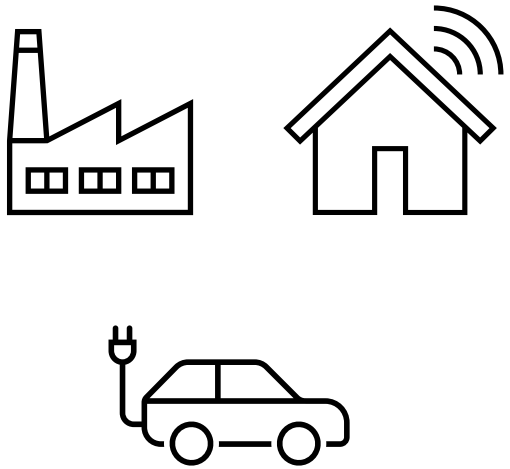
Key data and assumptions are available on our website:
[State of Oregon: DATA & REPORTS - Oregon Energy Strategy]

ENERGY EFFICIENCY AND LOAD FLEXIBILITY

Covered Buildings | Transportation | Industry | Electrification | Fuels

- Discussion around the potential for **weatherizing buildings** and the **levels of energy savings** to expect from weatherization
- Discussion around how to define aggressive rates of adoption of **electric and hybrid heat pumps**
- Discussion around how much **demand response** we might expect from different end-uses, including electric loads, EVs, and batteries



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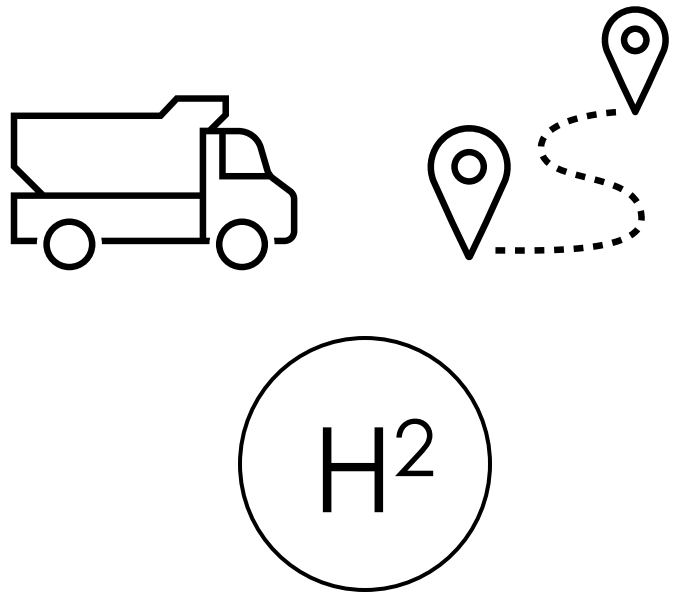
TRANSPORTATION

Electrification, alternative fuels , and vehicle miles traveled

- Discussion around how aggressive **medium- and heavy-duty electrification rates** should be
- Discussions around the role of **alternative** and **low carbon fuels**
- Discussion around the role of **hydrogen fuel cell vehicles** in various transportation sectors
- Discussion around **vehicle miles traveled** and what reduction targets to include in reference vs. alternative scenarios



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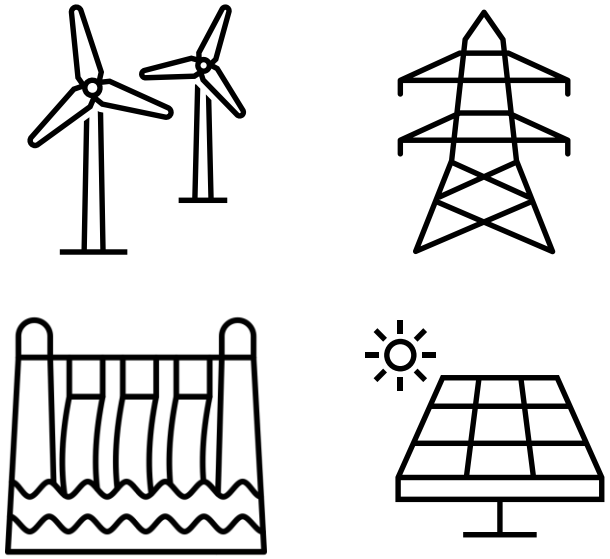
ELECTRICITY GENERATION TECHNOLOGIES

Focus on electricity generation needs and mix

- Members discussed **uncertainties** around load growth and transmission availability
- For **siting and land use**, concerns about effects of siting restrictions on development; at the same time, interest in modeling more distributed resource development
- **Other topics,** including can we look at a high jobs scenario? A nuclear scenario (SMRs)? Importance of fully valuing Oregon's "timber basket" – biofuels



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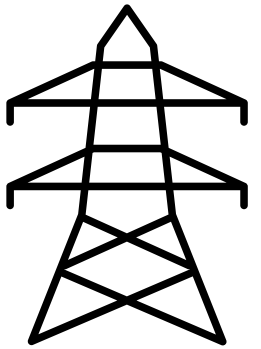
TRANSMISSION & DISTRIBUTION

Focus on electric wires and gas pipes

- Discussed how the economy-wide, multi-state **modeling for the Oregon Energy Strategy is at a higher-level** and differs from the more focused, sector and system specific modeling for utility planning
- Heard **input on completion timelines for planned transmission system** expansion projects for the power grid
- Heard **input on rising costs for distribution system** upgrades for the power grid
- Heard **input on potential need to expand pipeline infrastructure** for the gas network depending on pace of electrification



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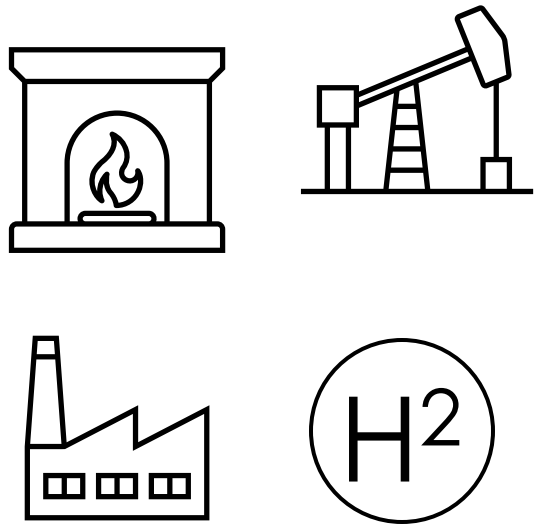
DIRECT USE FUELS AND INDUSTRY

Economic, workforce, and infrastructure costs and opportunities

- Discussion of how aggressive electrification and alternative fuel adoption **timeline assumptions** should be
- Discussion of the **geographic influences** of national and Canadian energy markets on Oregon's fuel supply and demand
- Interest in **non-energy benefits and costs** of the energy transition
- Members shared **studies and resources** to inform model data and assumptions



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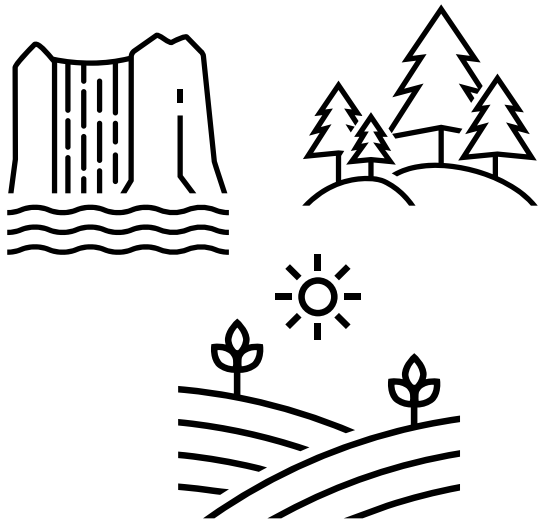
LAND USE AND NATURAL RESOURCES

Evaluating land use and natural resource considerations?

- Members evaluated land use screens to determine **appropriate assumptions for potential land availability** for energy projects
- **Not an analysis of site-specific projects** in Oregon, instead an **evaluation of total availability of land for energy development projects**
- Elected to limit development on **Oregon's legally and administratively protected areas**



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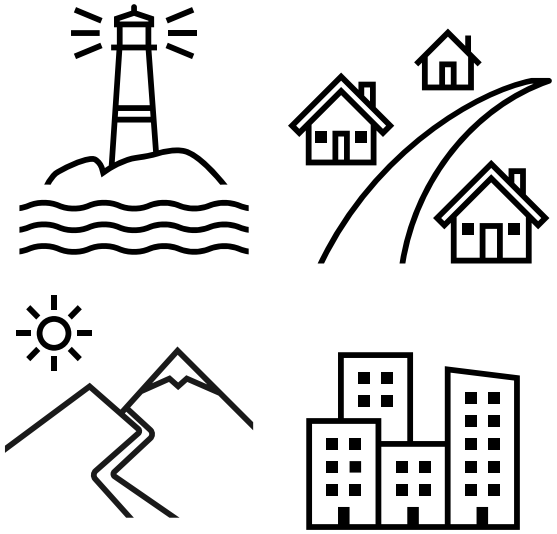
ENVIRONMENTAL JUSTICE AND EQUITY

Focus on disparities and differences

- Uncertainty that the **current disparities** will not change in the energy transition
- Identify need to **distinguish between single family versus multi-family**, renter versus homeowner when thinking about energy wallet
- Interest in understanding how **granular the approach can be**, rural is different from coast to Eastern Oregon



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UNDERSTANDING AND BUILDING ON THE ENERGY PATHWAYS MODELING RESULTS

Energy Modeling Results

Model calculates energy needed to power Oregon's economy, and least-cost way to provide that energy under clean electricity and emissions goals.

Energy Wallet

Energy spending and energy burden for different customer types, impact of timing of investing in electrification

Air Quality Modeling

Model calculates how changes in air quality affect health outcomes and economic benefits

Employment Effects

Model calculates the effects of the pathways analysis on direct, indirect, and induced energy sector employment

Geospatial Mapping

Maps explore community-level energy inequities and relationship to socioeconomic disparities – to help interpret energy modeling results, energy wallet analysis, air quality modeling, and employment effects

ALTERNATIVE SCENARIOS

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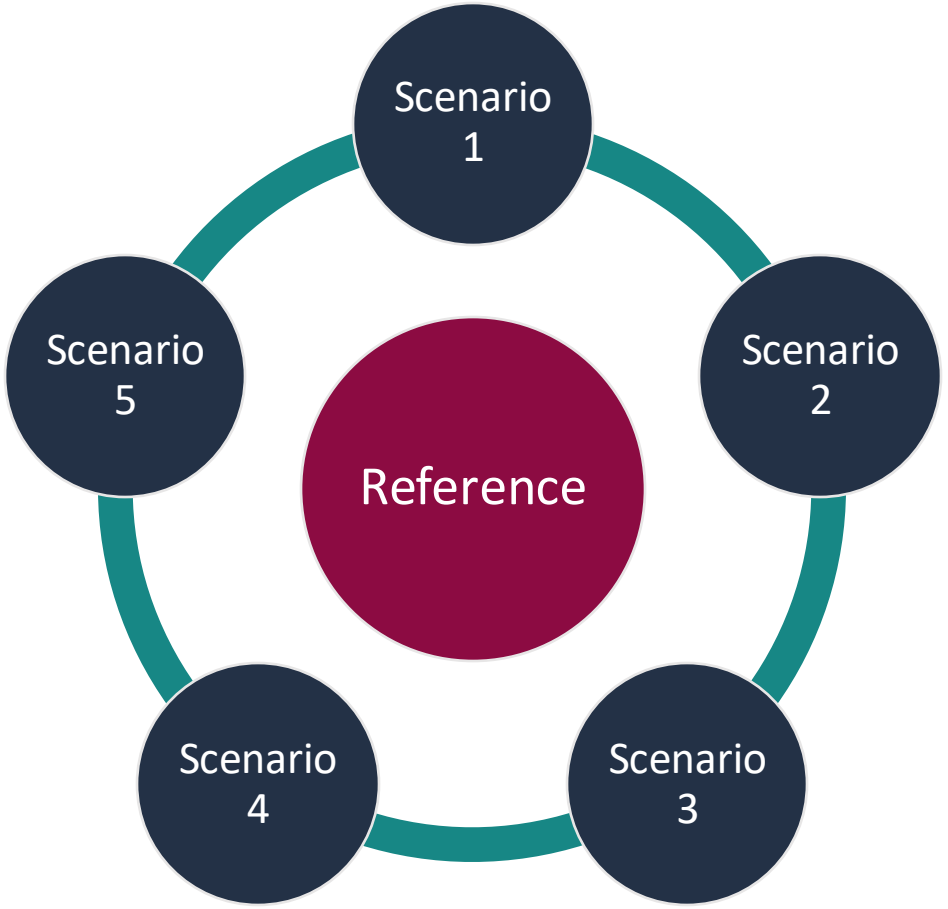
FRAMING ALTERNATIVE SCENARIOS

Potential Alternative Scenarios

- Lower energy efficiency and electrification
- Lower electrification of transportation
- Lower demand response
- Constrained transmission
- Constrained transmission + constrained utility-scale generation
- Higher hydrogen availability
- More ambitious GHG emission reductions



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LOWER ENERGY EFFICIENCY AND ELECTRIFICATION IN BUILDINGS

- Delay residential sales shares by 10 years for:
  - Electric and hybrid heat pump space heating
  - Electric and hybrid heat pump water heating
- Delay commercial sales shares by 10 years for:
  - Electric and hybrid heat pump space heating
  - Electric hot water heating
- Reduce level of industrial electrification by half
- Reduce improvement in industrial process efficiency from 1% to 0.5% per year

- What if it takes longer to reach the levels of energy efficiency and electrification in the reference scenario?
- What if current levels of energy efficiency and electrification are maintained?
- What if process-related energy efficiency in industrial sectors is slower than in the reference?
- Do we rely more on alternative fuels to meet demand for space and water heating?

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LOWER ELECTRIFICATION OF TRANSPORTATION

- Advanced Clean Trucks targets are met through 2035
- 2040 sales shares are delayed to 2050
  - (100% zero emission vehicle sales for Class 2b-8 vehicles)
  - (35% hydrogen fuel cell; 65% battery electric for all other classes / long haul)
- Additional sensitivity – higher/lower VMT reductions in (1) REFERENCE and (2) CONSTRAINED TRANSMISSION scenarios.
  - Reference: 20% VMT reduction
  - Sensitivities: 30% and 5%

- What if it takes longer to reach the levels of energy efficiency and electrification in the reference scenario?
- What if current levels of energy efficiency and electrification are maintained?
- What if process-related energy efficiency in industrial sectors is slower than in the reference?
- Do we rely more on alternative fuels to meet demand for space and water heating?

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CONSTRAINED TRANSMISSION

- Delay greenfield transmission development until 2045 across the West (assume 20 years to build new transmission lines)
- Allow for reconductoring of existing lines
- Additional sensitivity – East/West constraint in (1) REFERENCE and (2) CONSTRAINED TRANSMISSION scenarios

- What if it took longer to construct transmission across the West, including between Oregon and other states?
- What if East-West transmission expansion across the Cascades in Oregon was delayed?
- What if we had to rely only on reconductoring to meet transmission needs?
- What if we relied more on in-state resources?

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CONSTRAINED UTILITY-SCALE RENEWABLES

- Includes constraints from "Constrained Transmission" scenario
- Power of Place West, Level 3 restrictions are applied, affecting siting availability for both transmission and utility-scale generation

- What if, in addition to constrained transmission, utility-scale renewable development was delayed?
- What if more restrictive land use protections were applied?
- What if we had to rely more strongly on distributed resources to meet our energy needs?

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HIGHER HYDROGEN AVAILABILITY

- Allow hydrogen pipeline build in 2030 (compared to 2035 in Reference Scenario)
- Increase the rate of hydrogen supply chain infrastructure build compared to Reference Scenario

- What if the cost of green hydrogen was lower than expected?
- What if the hydrogen supply chain were built out more quickly?
- What role could hydrogen play to support energy storage and power sector decarbonization if it was more available?

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WHAT IF THERE IS LIMITED DEMAND RESPONSE?

- Residential and commercial participation in firm demand response programs – 5%
- 20% of residential EVs participate in managed charging by 2030
- No medium- or heavy- duty vehicles participate in managed charging
- No vehicle-to-grid

- What if demand response continued at roughly the levels seen today?
- What if we relied primarily on supply-side solutions to integrate variable renewable resources and meet system peaks?
- What if electrification happens, but new electric loads are not managed flexibly?

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MORE AGGRESSIVE GHG REDUCTION

- Oregon Climate Action Council recommendation of 95% greenhouse gas emission reductions by 2050*

- What would it take to achieve more aggressive greenhouse gas emission goals?
- Where would additional greenhouse gas emission reductions need to come from?
- Are there additional investments in existing or new technologies that would be needed, and by when?

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Recommendation 2B, Oregon Climate Action Roadmap to 2030, Commission Recommendations

NEXT STEPS

- Due by October 11, 2024 at 5 p.m. | Comments on alternative scenarios
- Fall 2024: Modeling taking place
- Early 2025: Sharing out Modeling Results from Phase 1
- Early 2025: Kicking off Phase 2 Policy discussions

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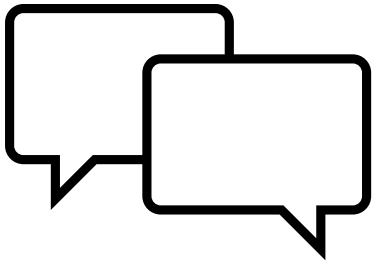
OPPORTUNITIES FOR PUBLIC COMMENT

Comments on the Alternate Scenarios through October 11, 2024, by 5:00pm



Provide written public comment

https://odoe.powerappsportals.us/en-US/energy-strategy/

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Thank You!

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