Oregon
Tina Kotek, Governor

OREGON DEPARTMENT OF ENERGY

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AGENDA

Oregon Energy Strategy Working Group Meeting

August 22, 2024, 1:00 pm – 3:00 pm

Objectives:

- Summarize discussions in working group breakout meetings
- Present first draft of reference scenario
- Provide overview of "what if" questions informing alternative scenarios
- Fill in gaps in understanding to enable working group members to submit written comments by **August 31**, focusing on: (1) whether we've missed anything important; (2) whether the reference scenario captured what working group members expected to see, and if not, why not; and (3) additional "what if" questions that working group members would like to share, now that there is a draft reference scenario to work from.

Time	Topic	Lead
1:00 – 1:10	Welcome & brief overview of meetings held	Edith Bayer, ODOE
1:10 – 2:00	Overview and highlights from each working group	ODOE Working Group leads
2:00 – 2:20	Draft reference scenario	Jeremy Hargreaves, Evolved Energy Research
2:20 – 2:30	Summary of "what if" questions	Edith Bayer, ODOE
2:30 – 2:55	Review questions from chat	Edith Bayer, ODOE Jessica Reichers, ODOE

2:55 – 3:00	Next steps	Edith Bayer, ODOE

Oregon Department of **ENERGY**



Oregon Energy Strategy Working Group

Edith Bayer
August 22, 2024

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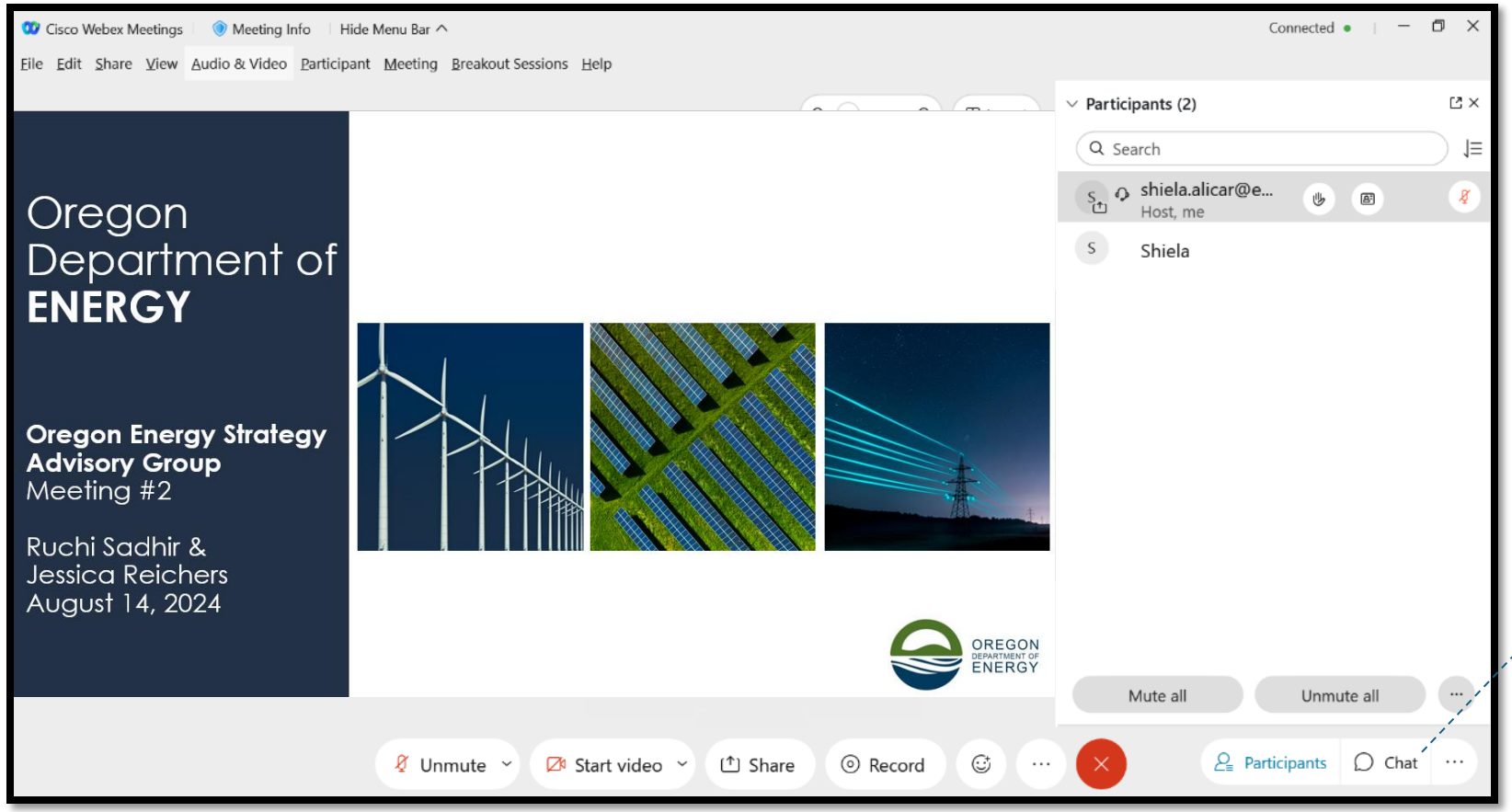
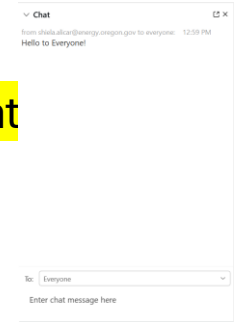
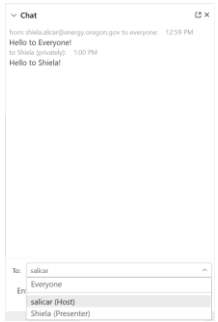
USING WEBEX



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).

Tech support chat with Abby Reeser

GROUP AGREEMENTS

- Listen carefully; seek to understand each other's perspective
- Keep an open mind
- Ask questions in the chat to clarify and understand the information
- Be respectful of questions asked
- Create space for others to ask clarifying questions

GOALS OF TODAY'S MEETING

1. Summarize discussions in working group breakout meetings
2. Present first draft of reference scenario
3. Provide overview of "what if" questions we've heard so far
4. Fill in gaps in understanding to written comments by **August 31**, focusing on:
    a. Whether we've missed anything important
    b. Whether the draft reference scenario captures what working group members expected to see, and if not, why not
    c. Additional "what if" questions that working group members would like to share, now that there is a draft reference scenario to work from

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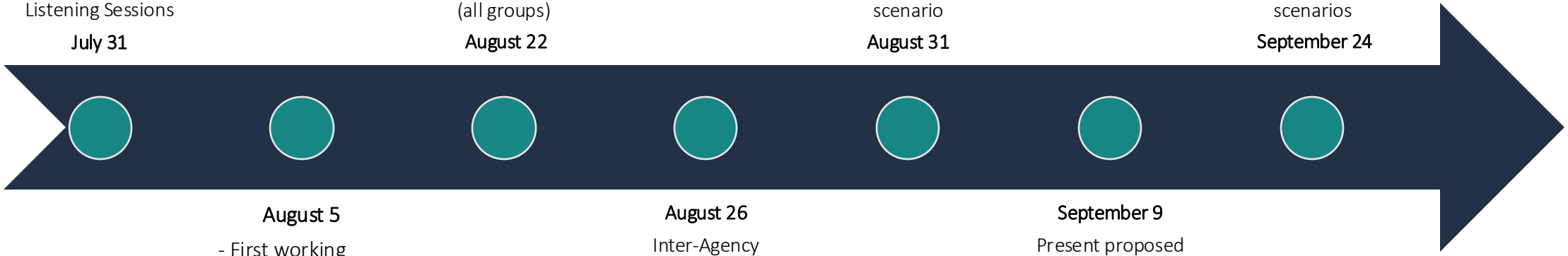
TIMELINE FOR MODELING INPUTS



Listening Sessions

July 31

August 5

- First working group (plenary)
- EE and load flex
- Land use and natural resources
- Electricity generation techs
- Direct use fuels & industry
- Environmental justice and equity
- Transportation

- Land use and natural resources #2
- Transmission & distribution
- Buildings
- Environmental justice and equity #2
- Closing meeting (all groups)

August 22

August 26

Inter-Agency Steering Group

Deadline for comments on modeling reference scenario

August 31

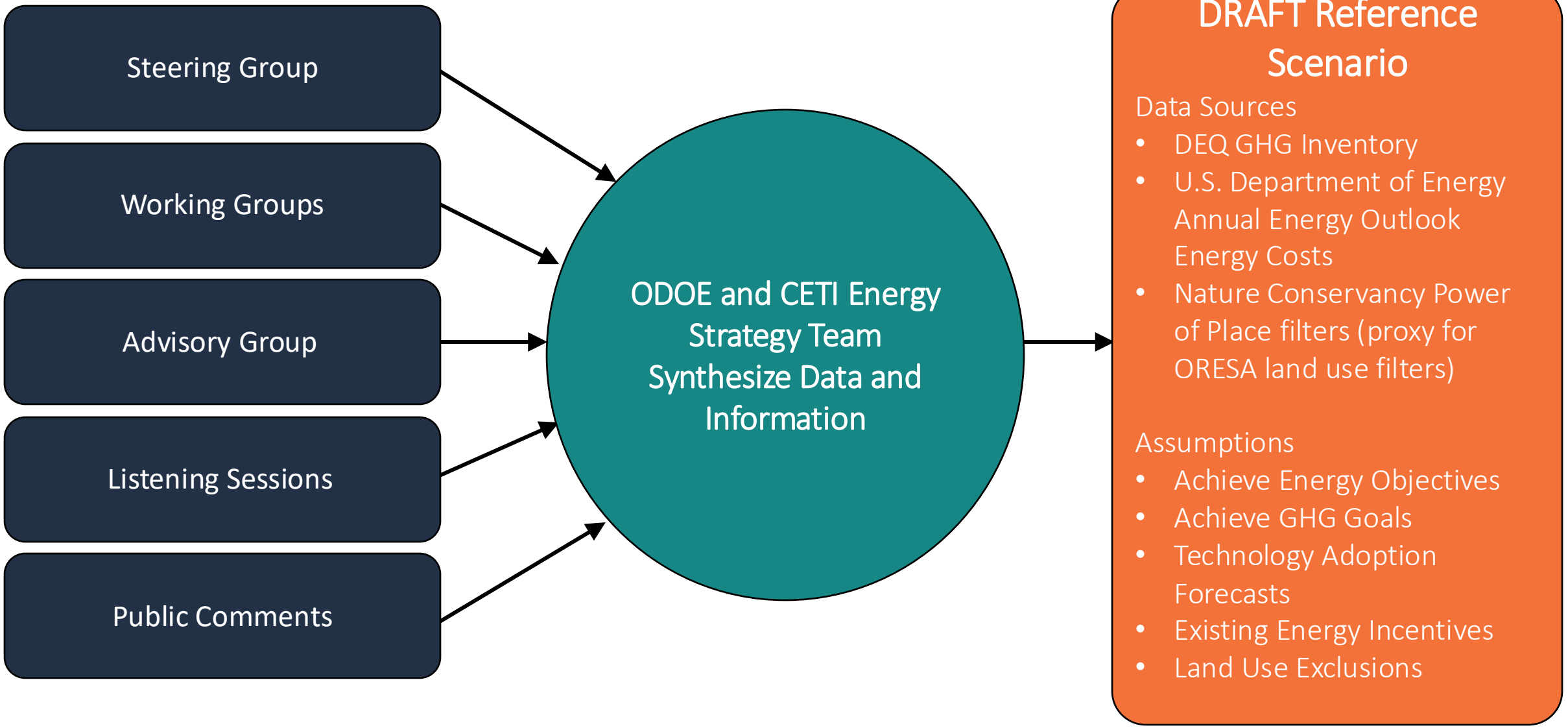
September 9

Present proposed modeling approach and scenarios to Advisory Group

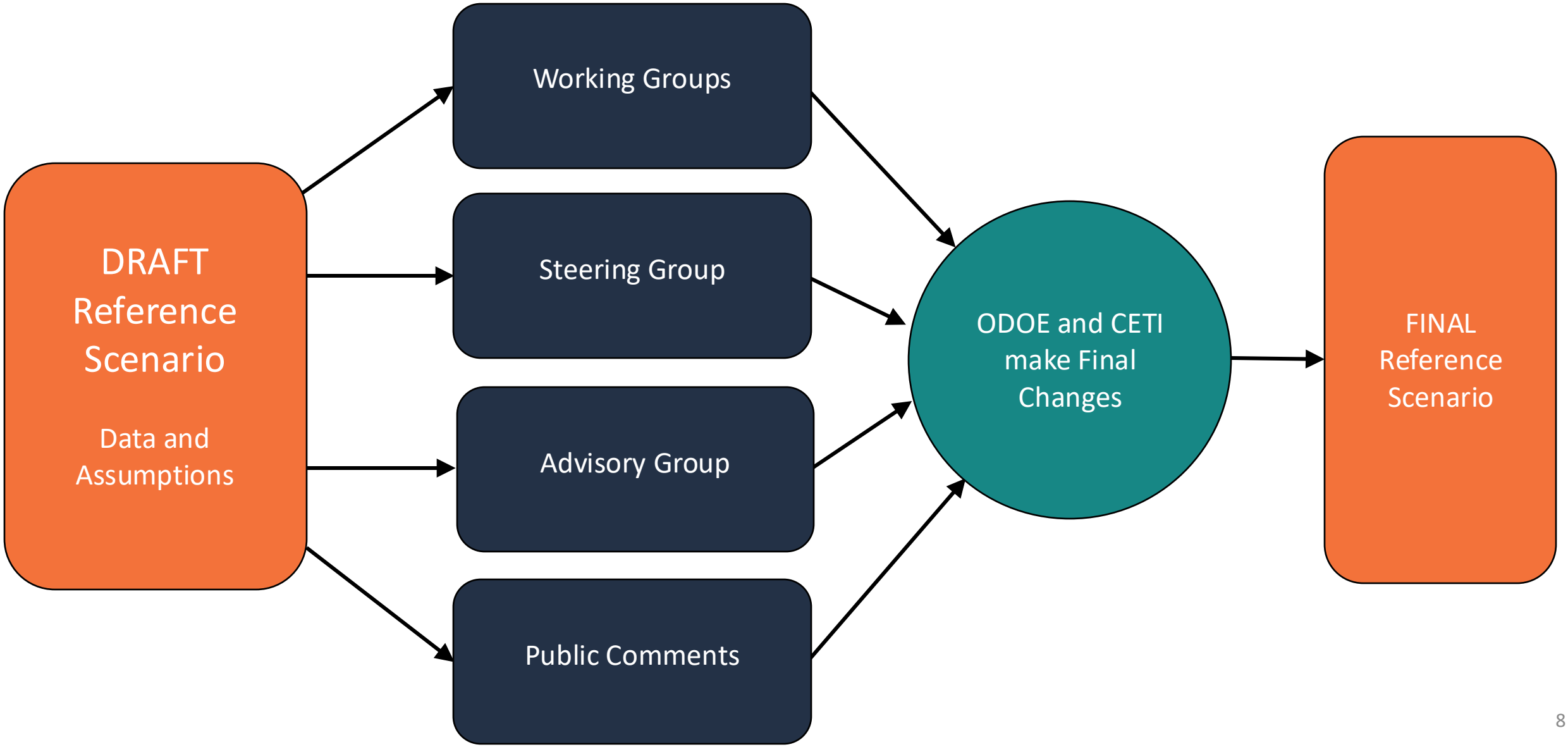
Public webinar to present modeling approach, reference scenario, potentially alternative scenarios

September 24

INFORMING MODEL DEVELOPMENT



FINALIZING THE REFERENCE SCENARIO



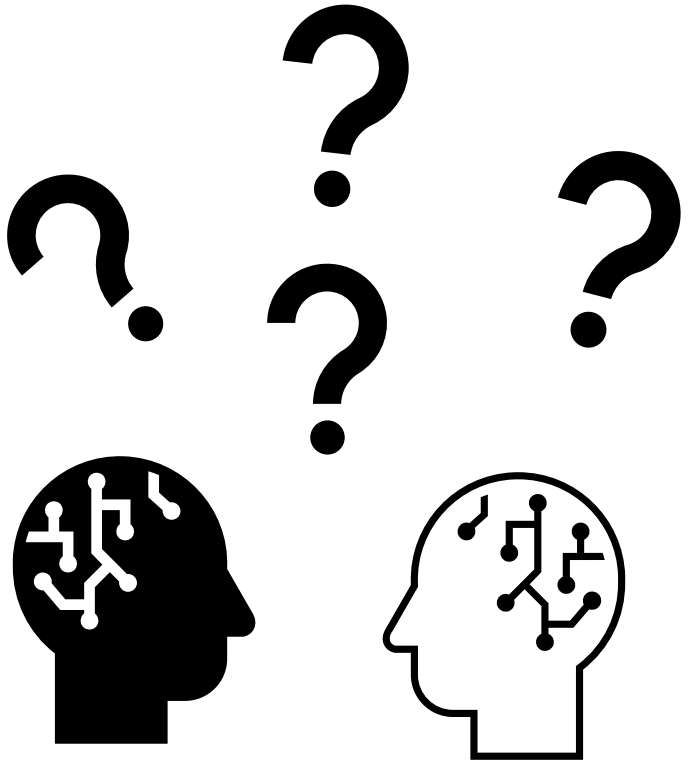
DECISION-MAKING CRITERIA

Established modeling inputs, including:

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

Other considerations, including:

- Data availability and quality
- Informs near-term decisions and recommendations



WHAT THE ANALYSIS DOES AND DOESN'T DO

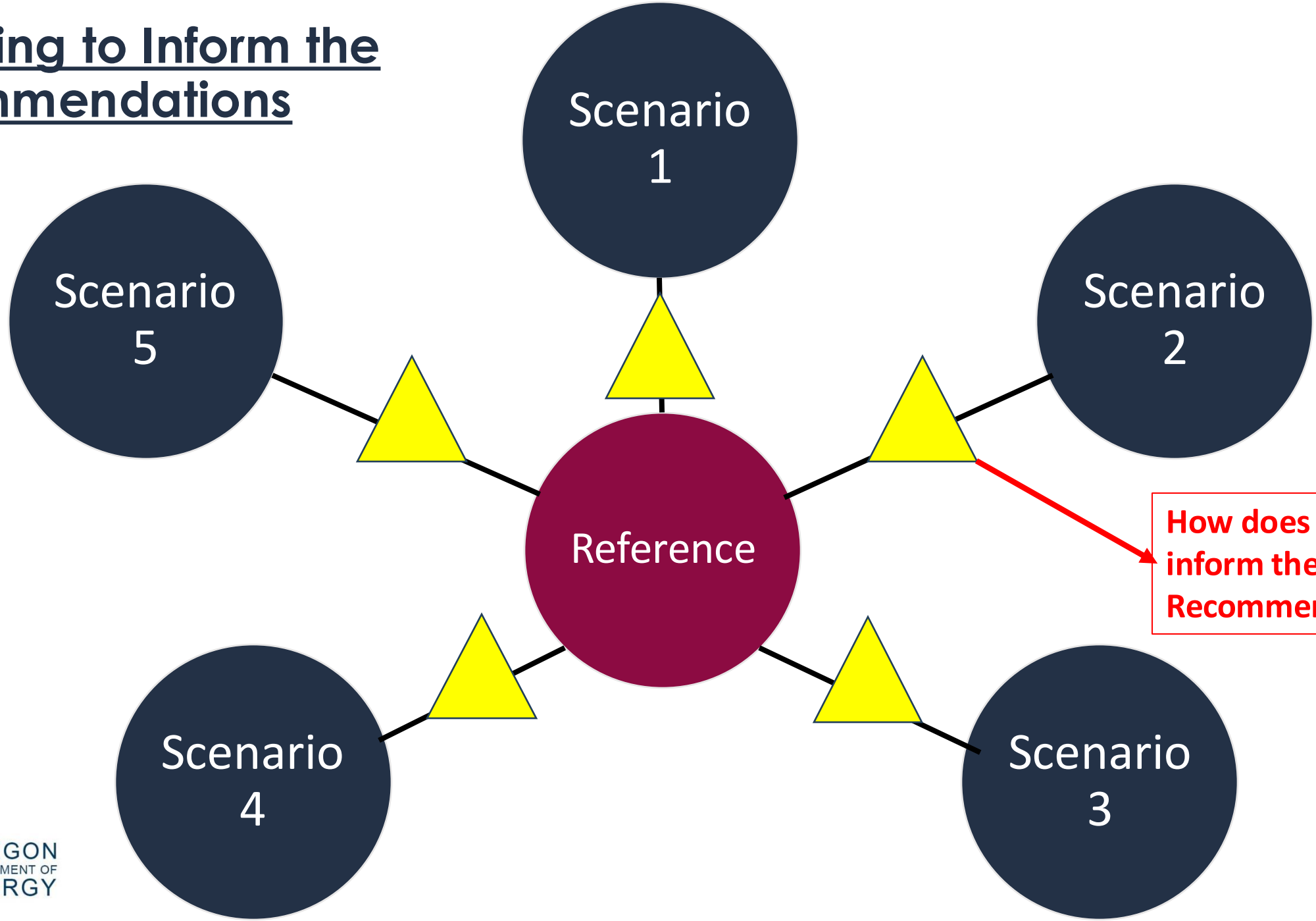
DOES

- 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

Modeling to Inform the Recommendations



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Energy Efficiency and Load Flexibility

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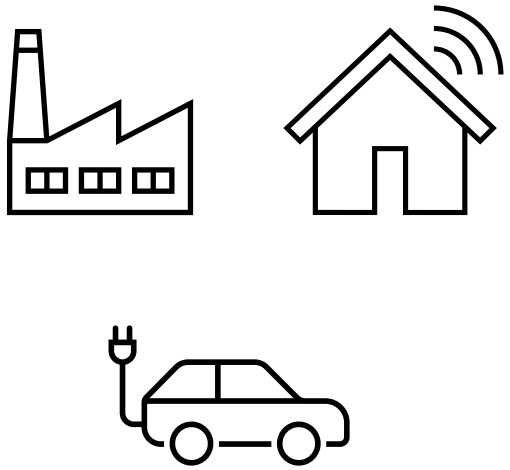
OVERVIEW

- This group focused on end-use energy efficiency and load flexibility
- Covered: residential, commercial, and industrial sectors
- Introduction focused on:
  - Role of existing policy and back-casting
  - Feasible but aggressive assumptions for future conditions (to 2050)
- Covered:
  - Data sources for existing stocks
  - Key assumptions for energy efficiency in buildings (building shell, space and hot water heating, appliances, average annual efficiency improvement for industry)
  - Key assumptions for load flexibility in buildings, including appliances, batteries, EVs
  - “What if” questions

MEETING HIGHLIGHTS

Covered Buildings | Transportation | Industry | Electrification | Fuels

- **Weatherization** potential in buildings
- **Heat pump hot water heaters** becoming more prevalent
- **Heat pumps** – Oregon's 500,000 goal, federal standard, and technical issues
- How much **demand response** might expect from different end-uses – EVs and batteries in particular
- **Energy burden** and **equity**



Buildings

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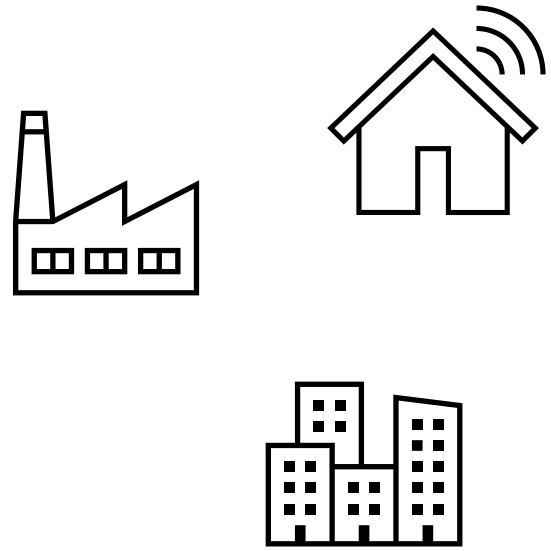
OVERVIEW

- This group focused on electrification, fuels, and energy efficiency of buildings
- Covered: residential & commercial space and water heating, building shells, technology stock replacement, cooking and other appliances, and lighting
- Key assumptions for existing conditions and future conditions reference scenarios
- The model is approaching this topic in the following ways (examples):
  - Role of existing policy and back-casting
  - Aggressive vs realistic assumptions for future conditions
  - Using the best available data for existing conditions, basing future conditions on a referenced policy

MEETING HIGHLIGHTS

Covered Buildings | Industry | Electrification | Fuels

- Discussion around data on **state-specific heat pump sales**
- Discussion on **gas equipment efficiency gains** are included for commercial buildings
- Discussion on the potential need for incorporating **other service demand reductions** into the model, in addition to weatherization measures (such as from operational changes, heat recovery, etc.)
- Discussion on how the model incorporates **demand-response interaction** between buildings and electricity



SUGGESTED CHANGES TO ASSUMPTIONS

Model Input	Starting Point	Suggested Change
Space Heating	Assume existing policies play out Gas space heating efficiency increases by vintage as technology improves and standards become tighter Option for hybrid or dual gas/electric heat pump systems; differentiated by climate zone **Residential:** 65% heat pump sales by 2030, 90% by 2040 (DEQ MOU) *(Added for Buildings WG only)* **Commercial:** ??	Residential: Electric heat pump sales 95% of overall sales by 2040 Small Commercial: Follow residential Large Commercial: electric heat pump sales 75% of overall sales by 2045
Water Heating	Assume existing policies play out **Residential:** • 65% heat pump sales by 2030, 90% by 2040 (DEQ MOU) *(Added for Buildings WG only)* • USDOE standard effective 2029 requiring new electric consumer water heating be done via HPWH *(Added for Buildings WG only)* **Commercial:** Small commercial is similar to residential, impacted by same HPWH standards by USDOE. Large commercial very small percentage heat pump in the near/mid term. *(Added for Buildings WG only)*	Incorporate Federal Energy Conservation Standards for Consumer Water Heaters (from May 6, 2029) Residential: Electric heat pump sales 95% of overall sales by 2045. Small Commercial: Follow residential. Larger Commercial: 25% heat pump sales by 2030 and 90% by 2045
Building Electrification	100% sales of new appliances are electric by 2035 (suggested starting point based on Oregon Climate Action Commission TIGHGER Analysis)	95% sales of new appliances are electric by 2035
Industrial Processes	1% average improvement to process efficiency per year in all sectors Fuel switching measures from fuels to electricity	No change

SUGGESTED CHANGES TO ASSUMPTIONS

Model Input	Starting Point	Suggested Change
Flexible Loads (EVs) - residential	Start at 0, ramp up to 2/3 of residential EVs participate in managed charging by 2030	No change
Flexible Loads (EVs) - commercial	Start at 0, ramp up to 1/3 of commercial EVs participate in managed charging by 2030	No change
Vehicle-To-Grid (V2G)	No V2G	No change
DR – households, commercial, industrial	Includes space heating, cooling, water heating, electric vehicles, customer side batteries if they are participating	**What % of eligible stock is participating?**
Customer sited stand- alone storage		**What level of grid services should we model?**

Direct Use Fuels and Industry

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OVERVIEW

This group focused on direct use fuels use in Oregon's industrial sector and beyond to inform the Reference Scenario Data and Assumptions

- Energy Modeling
- Clean Fuels Supply and Demand
- Electrification
- Geography

FOCUS OF MEETING

- What should the model assume for the costs and availability of alternative fuel pathways?
- How should the model reflect potential technological opportunities such as advanced geothermal?
- What alternative scenarios should be considered?

SUGGESTED CHANGES TO ASSUMPTIONS

Fuel Data

Model Input	Starting Point	Suggested Change
Demand Side Assumptions	Modeled residential, commercial, and industrial demand end use using assumptions about sales shares in EnergyPATHWAYS	No change
Supply-side Fuel Assumptions	Existing NG utility IRPs- Near-term investments and operations Survey of peer reviewed and government agency sources of capital and operating costs and performance (ADP Technical Documentation 2023, p61)	No change
Fuel Supply and Price Forecasting	EIA Annual Energy Outlook NW Power and Conservation Council's Fuels Advisory Committee natural gas price forecast DOE Billion Ton Study	**Evaluating biomass data**
Alternative Clean Fuels	Biomass-derived fuels, hydrogen, and hydrogen-derived fuels qualify as clean (if green hydrogen used). Imported fuels are counted as zero emissions (credit for negative emissions from processes like BECCS are retained by producing state). Clean Fuel Standard incorporated	No change

SUGGESTED CHANGES TO ASSUMPTIONS

Industrial Efficiency And Electrification

Model Input	Starting Point	Suggested Change
Electrification	100% of machine drives by 2035 100% of heat by 2050 in low temperature industries, including in Oregon's largest industrials such as computer and electronics products 50% of heat in bulk chemicals production by 2050, 25% of heat in glass production 50% of integrated steam production, and 80% of integrated steam production in food manufacturing, by 2045 100% of refrigeration by 2040 90% of industrial HVAC loads across industrial subsectors 80% of industrial vehicles including in agriculture by 2050	**At what rate will low heat industrial applications electrify?**
Switch to Hydrogen	50% of heat in bulk chemicals (not a large industry in OR) 20% of construction energy demand 20% of industrial vehicles by 2050	**At what rate will high heat industrial applications adopt hydrogen?**

Transportation

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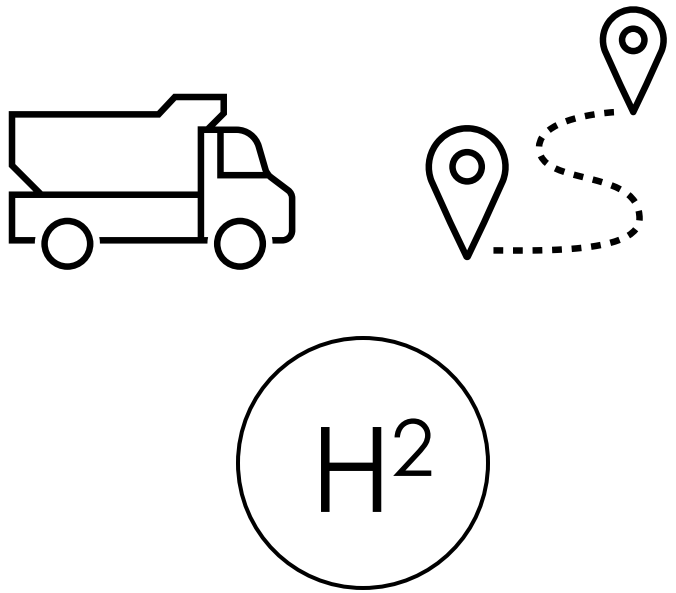
OVERVIEW

- Reviewed how model considers transportation:
  - Demand-side modeling
  - Transport technology / consumer adoption is model input
  - On road vehicles: vehicle stock, including rollover of stock over time, used to generate energy demand
  - Aviation/maritime/rail/industrial: fuel blend used to generate energy demand
  - Using best available, Oregon specific data, existing policy and studies
- Reviewed transportation-related data sources and existing policies that will build out the reference case in the energy model
- Discussed assumptions for future conditions, particularly areas not covered by existing policy
- Discussed “what if” questions for consideration in scenario development that reflect transportation concerns and priorities

TRANSPORTATION WORKING GROUP HIGHLIGHTS

Electrification, alternative Fuels , and vehicle miles traveled

- Discussion around how aggressive **medium- and heavy-duty electrification rates** should be.
- Discussion around rates of **hydrogen fuel cell** penetration in various transportation sectors
- Discussions around the timing of **alternative fuels** and the role of **lower carbon fuels** in the near-term
- Discussion around whether to include **vehicle miles traveled reduction** in reference case or test in alternative scenario



SUGGESTED CHANGES TO ASSUMPTIONS

Model Input	Starting Point Assumption	Suggested Change
Medium and Heavy-Duty Vehicles	100% new Class 2b-8 vehicles are ZEVs by 2036	**100% new Class 2b-8 vehicles are ZEVs by 2040**
Transit and School Buses	100% new buses are ZEVs by 2036	No change
Hydrogen		
Medium Duty Vehicles	100% BEVs by 2040	No change
Long Haul & Transit	80% electric, 20% H2 by 2040	**75% electric, 25% H2 by 2040**
Rail	20% electric, 70% H2 by 2050	No change
Maritime	Domestic: 10% electric, 20% H2, 50% ammonia by 2050 International: 20% H2, 60% ammonia by 2050	No change

Transmission & Distribution

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OVERVIEW

- **Reviewed approach to modeling the transmission and distribution system**
  - Other than Oregon and California, each state is its own energy zone
    - **Oregon = East & West zones**; California = North & South zones
  - Energy (gas and power) can be transferred within and between states
  - Ability to transfer energy is modeled based on flow ratings of the interstate gas and electricity transmission systems (pipes and wires)
  - Modeling major interstate pathways; not a detailed, nodal & hourly transmission study
  - In-state transmission and distribution expansion track trends in the system peak
  - Distribution system costs are represented by a proxy value based on historic costs
- **Reviewed data sources that will build out the reference case**
- **Discussed assumptions for future conditions**
- **Discussed "what if" questions for consideration in scenario development**

HIGHLIGHTS

Heard interest in:

- Specific policies of Oregon and other states being modeled
- How the existing transmission system is modeled
- Skepticism about new gas pipelines coming to Oregon in the future
- Less gas throughput is likely to result in similar O&M costs
- Modeling extreme weather events, like January 2024 ice storm
- Ability to model grid-enhancing technologies (GETs)
- How electric distribution systems will be modeled
- How transmission expansion for offshore wind will be modeled

SUGGESTED CHANGES TO ASSUMPTIONS

Model Input	Starting Point Assumption	Suggested Change
Gas Pipelines	No new infrastructure development beyond O&M	**Other future costs to consider? Considerations for repurposing pipelines for alternative fuels? Costs to distribute alternative fuels?**
Electricity Transmission Topology and Cost Assumptions	Power of Place West • Major interstate pathways • Existing ability to transfer X MWs • Costs to expand (reconductor, co-locate, new corridor)	**Other future costs to consider, such as costs to repair or mitigate effects of wildfires and other extreme events?**
Electricity Transfer Capacity Between East and West Oregon	Publicly available BPA data	**How/when do we account for BPA and PGE's planned rebuild projects across the Cascades? Such as: Big Eddy to Chemawa and Round Butte to Bethel?**
Timing of New Electricity Transmission	No new transmission until 2035 • B2H in 2025; Gateway in 2035	**Should timing of any planned or under construction transmission projects be changed?**
Distribution System Cost Assumption	Uses proxy value based on historic costs from EIA	**Should historic costs be increased to account for increased upgrades needed to support electrification and adaptation to extreme weather events, including wildfires? If so, how much?**

Electricity Generation Technologies

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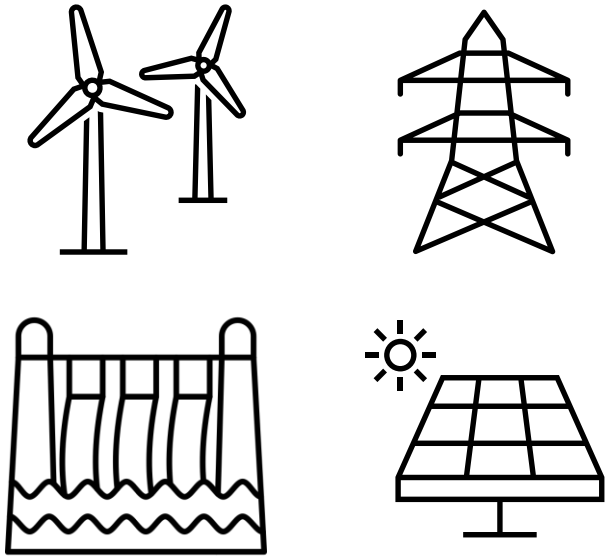
OVERVIEW

- This group focused on electricity generation, from rooftop solar to offshore wind
- Evolved Energy Research presented on how electricity generation is treated in the model and answered questions about modeling and data inputs
- ODOE focused discussion on some of the key uncertainties that may affect electricity generation modeling, including:
  - How much load growth should we assume from data centers or electrification?
  - What if siting/permitting constraints were higher or lower?
  - What if more or less transmission potential were available?

FOCUS OF MEETING

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,** like can we look at a high jobs scenario? A nuclear scenario (SMRs)? Importance of fully valuing Oregon's "timber basket" – biofuels



SUGGESTED CHANGES TO ASSUMPTIONS

Model Input	Starting Point Assumption	Suggested Change
Data Center Load Growth	Northwest Power and Conservation Council Pacific Northwest Power Supply Adequacy Assessment for 2029 base case, with load differentiated across modeling zones	No change
Generation Options	Established resource technologies only (hydropower, solar, on/offshore wind, biomass, gas, renewable natural gas, etc.) No siting of new natural gas or nuclear power plants in OR	No change
Biomass Potential	Billion Ton Study 2016 Update, with option of adjustments for Northwest using University of Washington's LURA model (Washington's 2021 State Energy Strategy)	**Billion Ton Study 2023 Update**
Transmission	The Nature Conservancy Power of Place West (inter-zonal) Publicly available Bonneville Power Administration data (for Oregon East-West zones) No new inter-zonal transmission is built until 2035	No change

Environmental Justice and Equity

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OVERVIEW

Environmental Justice and Equity

- This working group provides feedback, input, and expertise to understand and evaluate the benefits and burdens of energy choices on environmental justice communities
- Their expertise informs how the energy strategy model can provide insight into community concerns about the energy transition, and how the transition can lead to community benefits
- This working group intersects with each of the other working groups and addresses environmental justice and equity considerations across topics

FOCUS OF MEETING

Environmental Justice and Equity

- 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 (example: rural can be different on the coast and in Eastern Oregon)
- Scenario planning for different load demands are tied to economic development
- Recognizing the modeling only gives us tradeoffs and there are more conversations necessary to dig into policy

HIGHLIGHTS

Environmental Justice and Equity

- Geospatial mapping can layer throughout the “energy wallet” analysis and air quality modeling
- Even if we can’t model all barriers, we can begin to think about them for upcoming policy conversations
- Interest in weighing societal benefits and recognizing that not all technology is equal in the potential adverse impacts on communities
- Wildfire is an important consideration

Land Use and Natural Resources

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OVERVIEW

- What level of resource siting limitations should be incorporated into the model?
  - Model strengths and weaknesses
  - Land and natural resource availability
  - Geography

POWER OF PLACE – WEST SCREENS

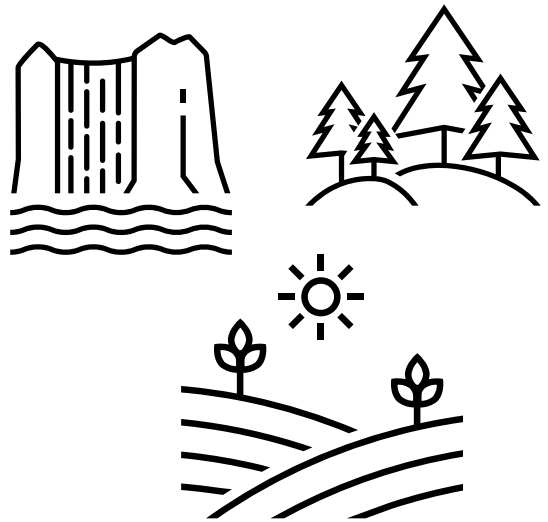
Exclusion Category	Definition of Category	Examples	Biomass	Recommendation
Level 1	Legally protected: Areas with existing legal restrictions	National Wildlife Refuges, National Parks, Marine Sanctuaries, Military Training Areas	All feedstocks included, exclude potential supply from conservation reserve program land	**Reference Case**
Level 2	Administratively protected: Level 1 + areas with existing administrative and legal designations where state or federal law requires consultation or review and lands owned by non-governmental organizations (NGOs) on which there are conservation restrictions.	Critical Habitat for Threatened or Endangered Species, Sage Grouse Priority Habitat Management Areas, vernal pools and wetlands, tribal lands	No net expansion of land for purpose-grown herbaceous biomass crops. Specifically, land available for herbaceous biomass crops (miscanthus and switchgrass) is limited to the share of land currently cultivated for corn that is eventually consumed as corn ethanol, which is phased out in all net zero scenarios by 2050.	
Level 3	High conservation value: Level 1 + Level 2 + areas with high conservation value as determined through multi-state or ecoregional analysis (e.g., state, federal, academic, NGO) and lands with social, economic, or cultural value.	Prime Farmland, Important Bird Areas, big game priority habitat and corridors, TNC Ecologically Core Areas, “Resilient and Connected Network”	Same as Level 2	**Potential Scenario**

https://www.nature.org/en-us/what-we-do/our-priorities/tackle-climate-change/climate-change-stories/power-of-place/

HIGHLIGHTS

How will the Energy Strategy incorporate land use considerations?

- Should **vehicle miles traveled reduction targets** be incorporated in the reference scenario?
- How can **environmental justice and equity** concerns and effects be reflected in the model?
- What would be **valuable to learn** from this technical analysis?
- What **alternative scenarios** should be considered?



Draft Reference Scenario

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ENERGY POLICY OBJECTIVES

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

Economy-wide

- EO 20-04
- 80% 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….

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REFERENCE CASE POLICY AND SUPPLY-SIDE ASSUMPTIONS

Assumption Type	Reference Scenario Assumptions
GHG Targets (economy-wide)	EO 20-04: 80% GHG reduction below 1990 levels by 2050
GHG Targets (electricity)	HB 2021: 100% clean electricity by 2040 for PacifiCorp, PGE, electricity service suppliers
GHG Targets (fuels)	Climate Protection Program: 90% reduction in GHG emissions from direct use fuels (natural gas, liquid fuels, and propane) by 2050
Electricity Generation Technologies	Established resource technologies only (hydropower, solar, on/offshore wind, biomass, gas, renewable natural gas, etc.) No siting of new natural gas or nuclear power plants in OR
Generation and Interconnection Siting Restrictions	Administratively and legally protected land is not available for new energy development
Inflation Reduction Act (IRA) Incentives	Supply-side incentives included for hydrogen production, renewable electricity generation, battery storage, carbon capture, clean fuels, out-of-state nuclear
Transmission Availability	The Nature Conservancy Power of Place West (inter-zonal) BPA (for Oregon East-West zones) No new inter-zonal transmission is built until 2035
Fuels	Optimize capital investments & operations across all elements of clean fuel supply chains; model accounts for national competition for fuels

REFERENCE CASE DEMAND-SIDE ASSUMPTIONS

Assumption Type	Reference Scenario Assumptions
Data Center Load Growth	Northwest Power and Conservation Council Pacific Northwest Power Supply Adequacy Assessment for 2029 base case, with load differentiated across modeling zones
Buildings: Residential Electrification	Space heating/cooling: Electric heat pump sales 95% of overall sales by 2040 Water heating: Electric heat pump sales rising to 95% of overall sales by 2045
Buildings: Commercial Electrification	Space heating/cooling: Small buildings follow residential; large buildings electric heat pump sales 75% of overall sales by 2045 Water heating: Small buildings follow residential; large buildings achieve 25% of all new large commercial HVAC are heat pumps by 2030 and 90% by 2045
Transp.: Light-Duty	100% battery electric vehicle sales by 2035
Transp.: Transit and School Buses	100% zero emission vehicle sales by 2036; Transit: 75% BEV / 25% hydrogen
Transp.: Medium & Heavy Duty	100% zero emission vehicle sales by 2040; Long Haul: 75% BEV / 25% hydrogen
Industry	1% average annual improvement in process efficiency across all industrial sectors
Distributed Energy Resources (DER) Scheduled Additions	Northwest Power and Conservation Council March 2024 rooftop solar projections

WHAT-IF QUESTIONS – EMERGING TOPICS

- What if we max out energy efficiency? What do we get?
- What if we achieve less energy efficiency?
- What if we have more aggressive electrification?
- What if we rely more on alternative fuels?

More/less energy efficiency and electrification in buildings

- What if we build more non-EV transportation alternatives?
- What if we test urban planning and behavior on transportation and buildings energy demand?

What if we constrain vehicle miles traveled?

- What if transmission doesn't get built or takes longer than expected?
- What if we rely on more local resources? What would this mean for jobs?

Constrained transmission

- Concern over limiting natural gas in homes
- How much/quickly can industry electrify?
- What if we electrify more slowly?

Enhanced alternative fuels

- What if we can't electrify transportation as quickly?
- What if barriers prevent heavy-duty vehicles from electrifying?

Constrained transportation electrification

- Concern over data centers, electrification, growing cooling loads.

What if load growth is much faster or greater than expected?

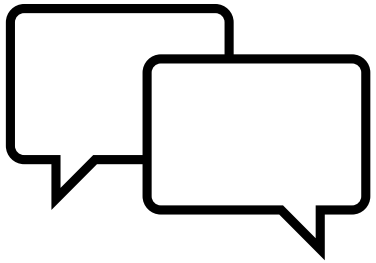
- Do we want to understand the implications of a more ambitious decarbonization trajectory?

More ambitious decarbonization scenario

- What if more or less offshore wind is built?
- What if we model more grid-enhancing technologies?

Others

OPPORTUNITIES FOR PUBLIC COMMENT



Provide written public comment through September 4, 2024 by visiting:

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

OREGON DEPARTMENT OF ENERGY

Thank You!