Oregon
Tina Kotek, Governor

OREGON DEPARTMENT OF ENERGY

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AGENDA

Title: Buildings Working Group – Oregon Energy Strategy

Date: August 16, 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 buildings out to 2050.
- Discuss "what if" questions to inform scenarios that can help understand trade-offs of different clean energy pathways.

Buildings Working Group Members:

Ryan Brown	Northwest Energy Efficiency Alliance (NEEA)
Sarah Buchwalter	Portland General Electric
Ian Casey	NW Natural
Kevin Duell	NW Natural
Dan Elliott	Oregon Housing and Community Services
Farrah Fatemi	DEQ Clean Air-Wood Stove Replacement Programs
Hallie Gallinger	PacifiCorp
Mark Heizer	DCBS Building Codes Division
Sam Henstell	Oregon Health Authority
David Heslam	Earth Advantage
Fred Heutte	NW Energy Coalition
Dirk Larson	The Home Performance Guild of Oregon
Casey McDonald	RDH Building Science Inc
Marshall McGrady	IBEW, Local 48
Kerry Meade	Building Potential (Formerly NEEC)
Spencer Moersfelder	Energy Trust of Oregon
Claire Prihoda	Climate Solutions
Maddy Salzman	Earth Advantage
Melissa Sokolowsky	Building Potential (Formerly NEEC)
Kelly Thomas	DCBS Building Codes Division
Matt Tidwell	Portland General Electric
Elizabeth Torske	Cascade Natural Gas
Forest Tanier-Gesner	PAE
Bret van den Heuvel	Gensco Inc

Agenda

Time	Topic	Who
9:00-9:10	Welcome and introductions	Blake Shelide, ODOE
9:10-9:20	Setting the stage	Stephanie Kruse, ODOE
9:20-9:35	How buildings are considered in the Oregon Energy Strategy reference scenario	Jeremy Hargreaves, Evolved Energy Research
9:35-10:15	Discussion of reference scenario data and assumptions	Stephanie Kruse & Blake Shelide, ODOE
10:15-10:50	Discussion of alternative scenarios	Jeremy Hargreaves, Evolved Energy Research
10:50-11:00	Wrap up and next steps	Blake Shelide, ODOE

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

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Oregon Energy Strategy
Buildings Working Group

Stephanie Kruse and
Blake Shelide
August 16, 2024

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USING WEBEX

Audio Options

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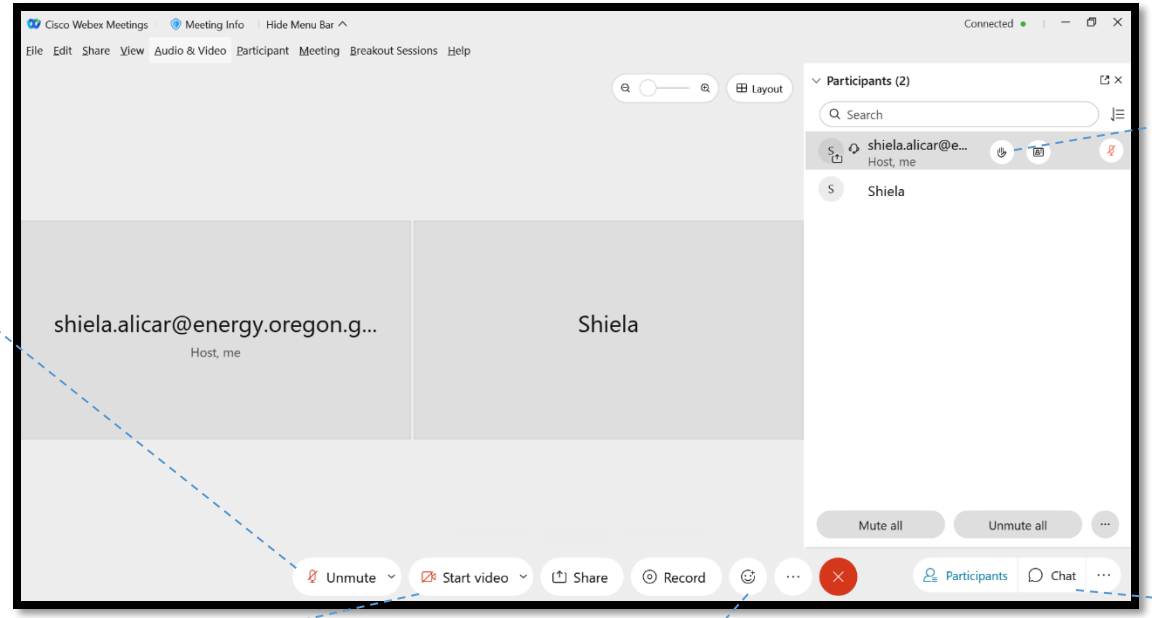
Unmute — *Microphone Off*



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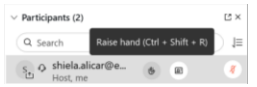

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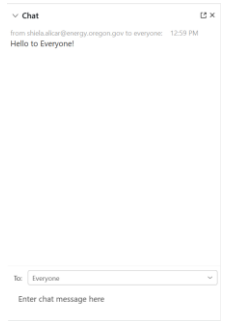
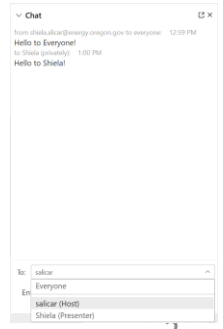
Chat



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).



Video Options

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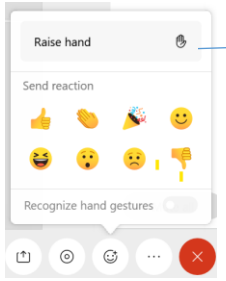
Reactions



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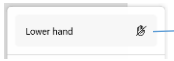

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PURPOSE OF THIS WORKING GROUP

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

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

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9:35 – 10:15	Discussion of reference scenario data and assumptions	Stephanie Kruse & Blake Shelide, ODOE Jeremy Hargreaves, Evolved Energy Research
10:15 – 2:50	Discussion of alternative scenarios	
2:50 – 3:00	Wrap up and Next Steps	Blake Shelide, ODOE

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

WORKING GROUP ROSTER

ORGANIZATION	NAME
Northwest Energy Efficiency Alliance (NEEA)	Ryan Brown
Portland General Electric	Sarah Buchwalter
IBEW, Local 659	Nick Carpenter
NW Natural	Ian Casey
NW Natural	Kevin Duell
Oregon Housing and Community Services	Dan Elliott
DEQ Clean Air-Wood Stove Replacement Programs	Farrah Fatemi
DCBS Building Codes Division	Mark Heizer
Oregon Health Authority	Sam Henstell
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NW Energy Coalition	Fred Heutte
The Home Performance Guild of Oregon	Dirk Larson

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RDH Building Science Inc	Casey McDonald
IBEW, Local 48	Marshall McGrady
Building Potential (Formerly NEEC)	Kerry Meade
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Climate Solutions	Claire Prihoda
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Cascade Natural Gas	Elizabeth Torske
PAE	Forest Tanier-Gesner
Gensco Inc	Bret van den Heuvel

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PROJECT TEAM & WORKING GROUP LEADS

ODOE Project Leads

- Alan Zelenka - Assistant Director for Planning and Innovation
- Jessica Reichers - Manager, Policy & Innovation
- Edith Bayer - Oregon Energy Strategy Team Lead

Buildings Working Group Team Leads

- Stephanie Kruse - Facilities Engineer: Electricity Resource Mix, Rural and Agricultural Energy Audits, Schools
- Blake Shelide - Codes and Standards Manager: Building Codes, Appliance and Equipment Standards, Building Performance Standards Program
- Mary Kopriva - Economist

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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

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PLEASE TELL US ABOUT YOURSELF IN THE GROUP CHAT

- Name
- Affiliation
- Geographic location you represent
- Icebreaker question!
  - What older (10+ years) song is in heavy rotation in your playlist (or that you just get really excited if it comes on the radio)?

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Setting the Stage

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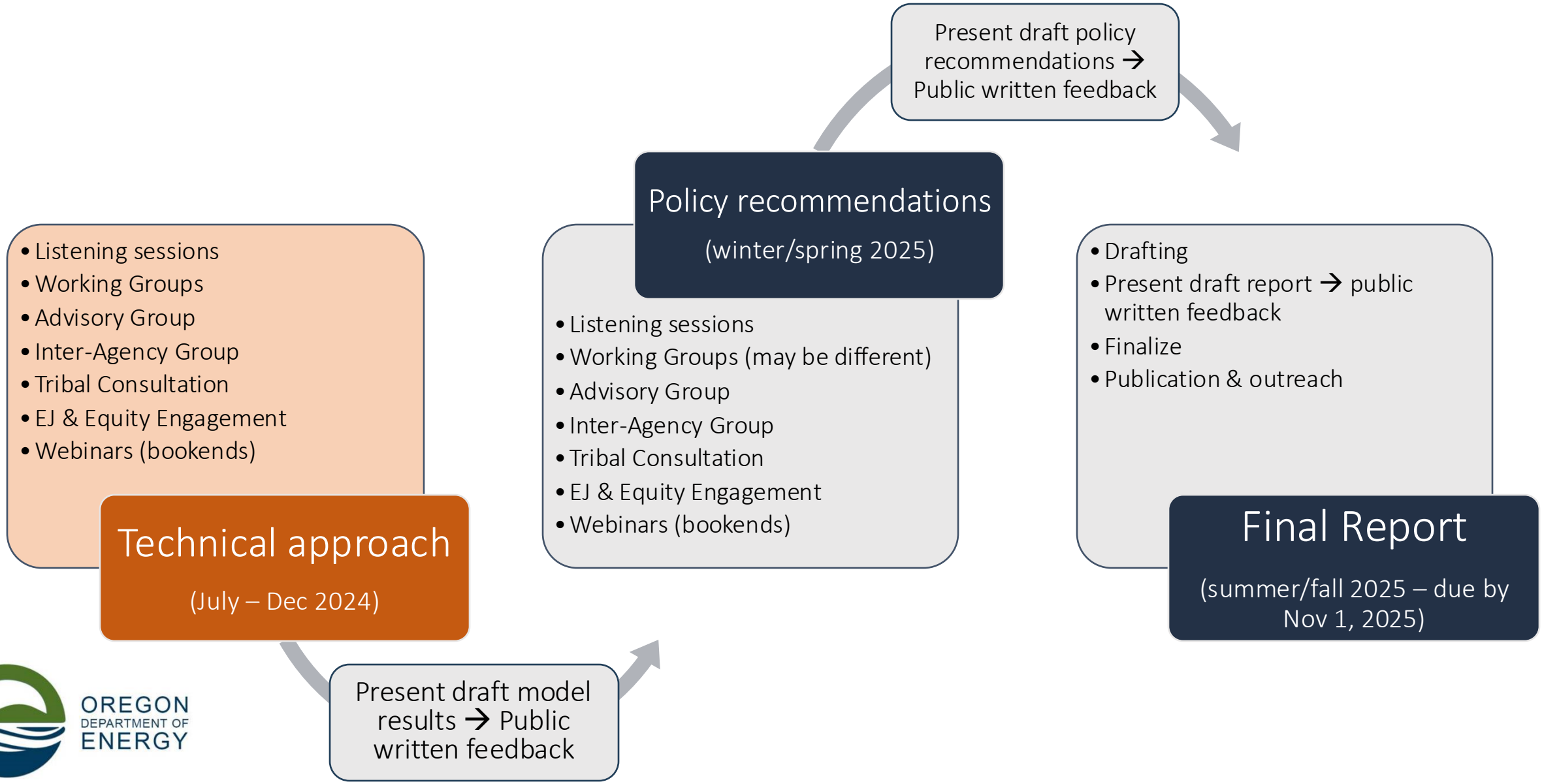
WHERE WE ARE IN THE PROCESS



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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

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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….

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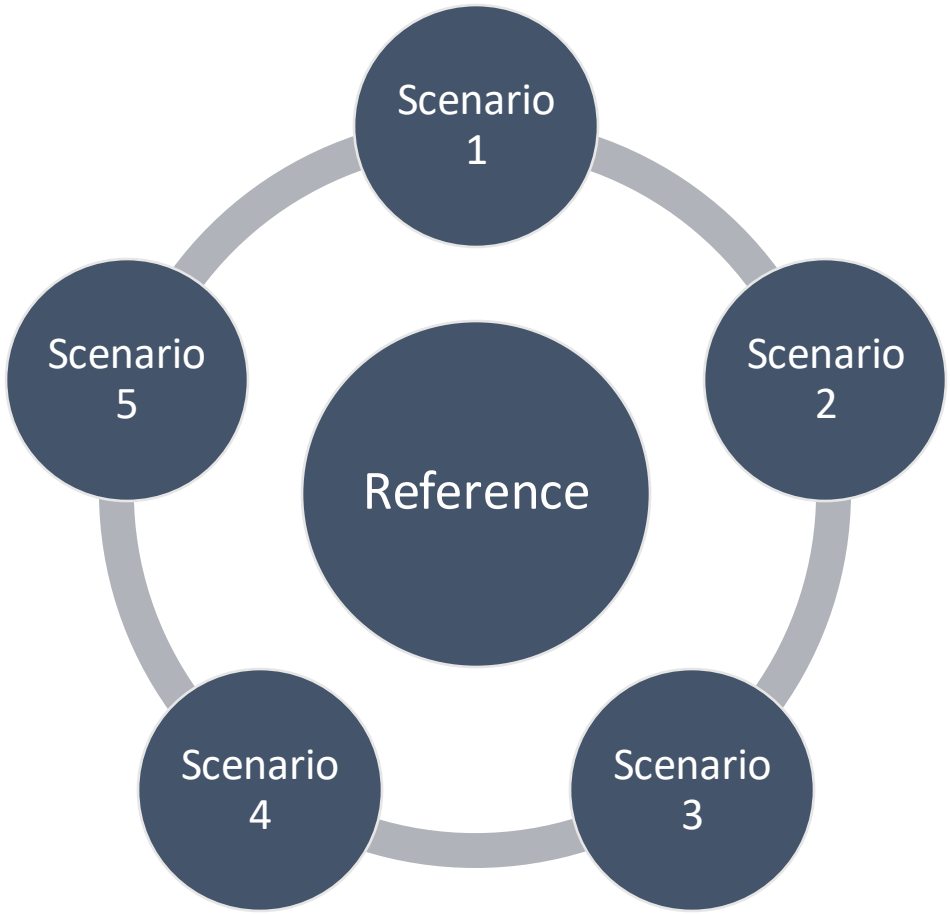
SUMMARY OF MODELING APPROACH

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.)



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How buildings are considered in the Oregon Energy Strategy reference scenario

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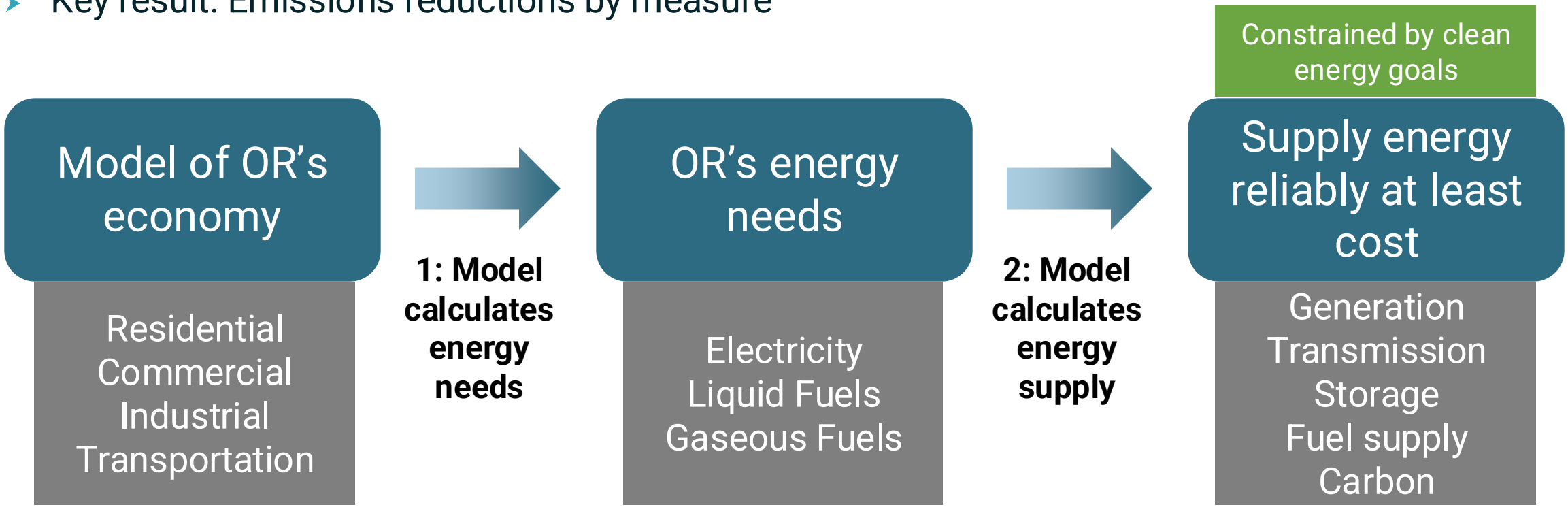
Oregon Energy Strategy Technical Consulting

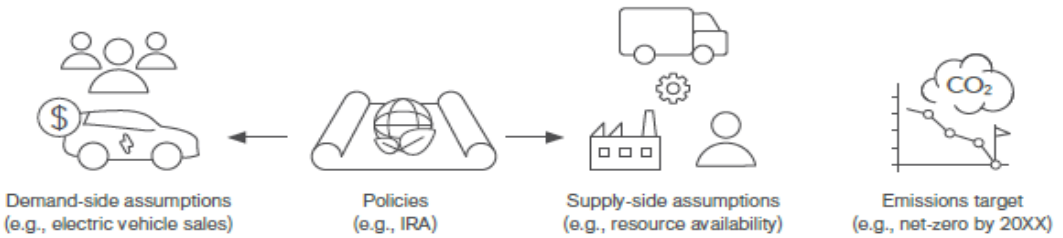
High Level Description of Modeling Approach

- 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

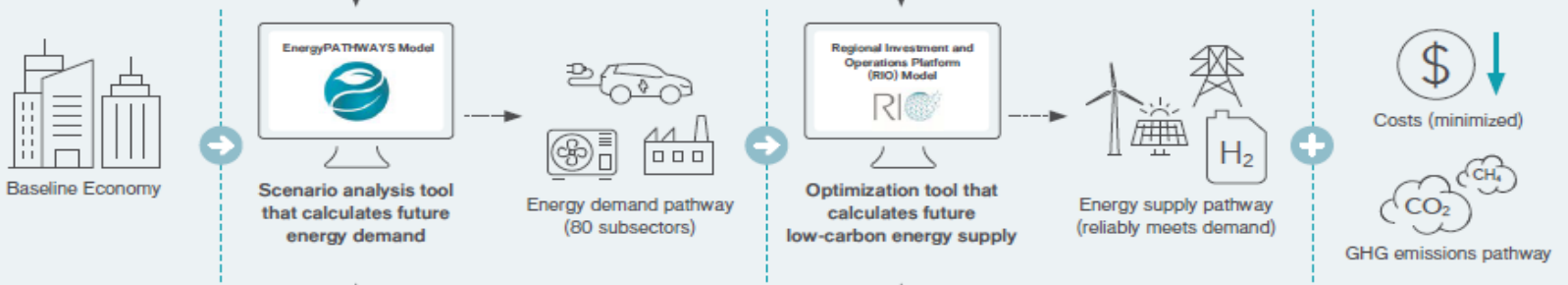


Economy-Wide Energy Modeling

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

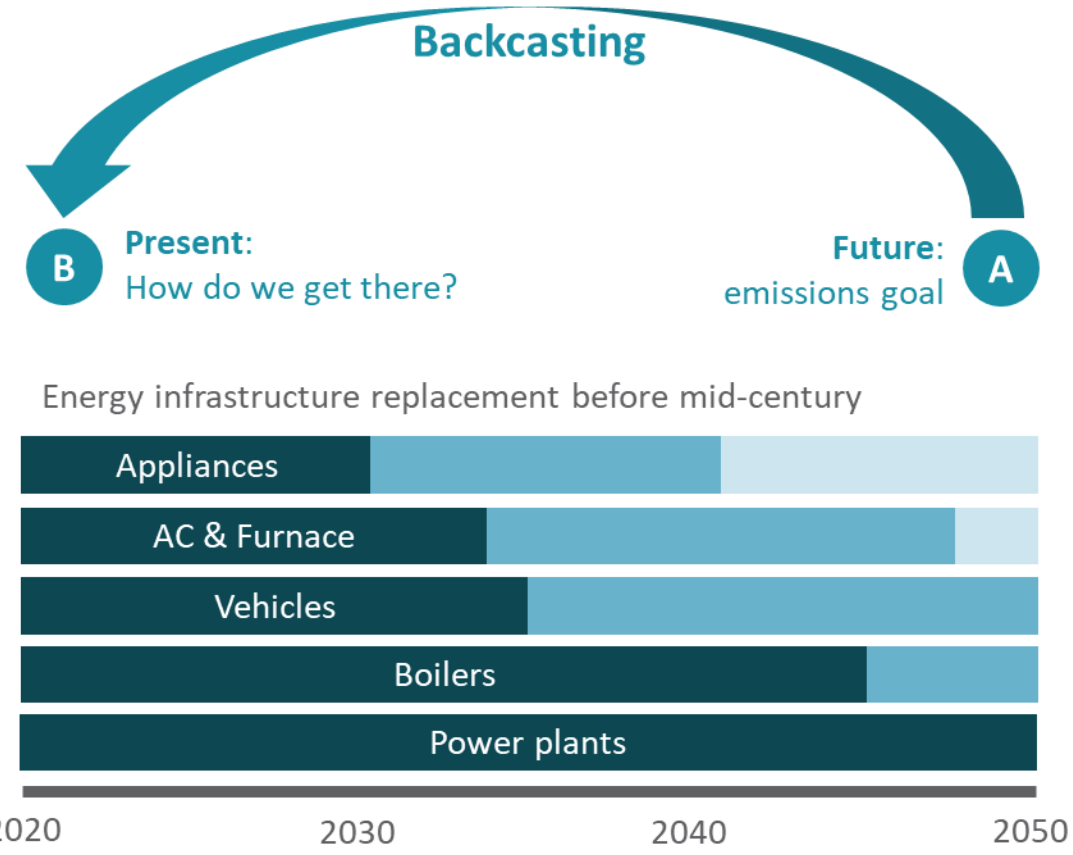
Underlying supply data
- Existing energy infrastructure
- Existing infratructure scheduled retirement
- Scheduled resource additions already committed
- Energy production and conversion infrastructure characteristics
- Energy transport, storage, and delivery options
- Capital, operating and maintenance, 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
- Efficiency and electrification required for feasible low-emissions pathway
  - Timing of electrification has more uncertainty than its long-term scale

End-Use Sectors Modeled

- Approximately 80 demand sub-sectors represented
- 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

Demand-Side Modeling

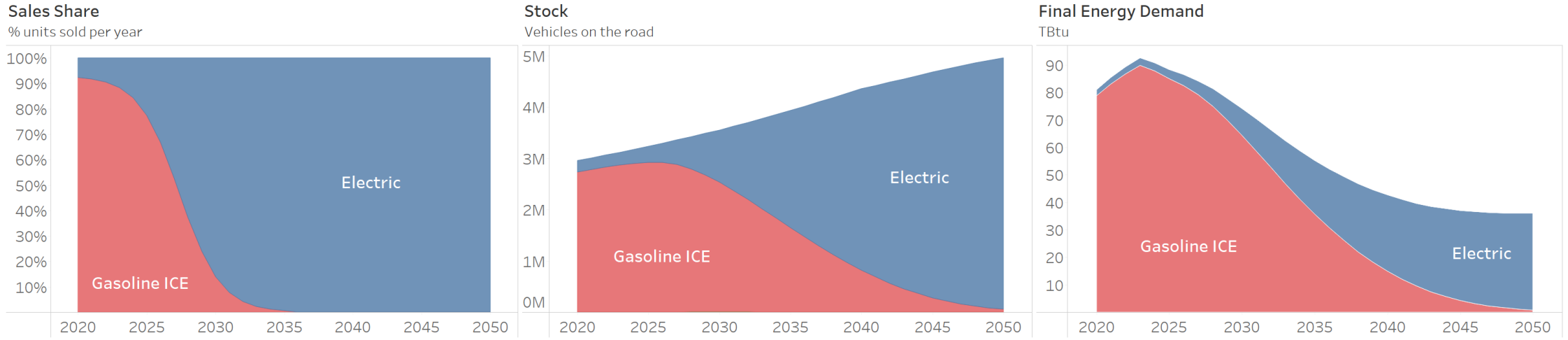
- Scenario-based, bottom-up energy model (not optimization-based)
- Characterizes rollover of stock over time
- Simulates the change in total energy demand and load shape for every end use

Illustration of model inputs and outputs for light-duty vehicles

Input: Consumer Adoption
EV sales are 100% of consumer adoption by 2035 and thereafter

Output: Vehicle Stock
Stocks turn-over as vehicles age and retire

Output: Energy Demand
EV drive-train efficiency results in a drop in final-energy demand



Reference scenario data and assumptions

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KEY DATA SOURCES FOR EXISTING CONDITIONS

Model Input	Data Source for Existing Conditions	
Space Heating	Residential: NEEA Residential Building Stock Assessment & Home Energy Score Data*	
	Commercial: NEEA Commercial Building Stock Assessment	
Water Heating	Residential: NEEA Residential Building Stock Assessment & Home Energy Score Data*	
	Commercial: NEEA Commercial Building Stock Assessment	
Building Shells	Residential: NEEA Residential Building Stock Assessment & Home Energy Score Data*	
	Commercial: NEEA Commercial Building Stock Assessment	
Technology Stock Replacement	Residential: EIA Residential Energy Consumption Survey	Potentially supplemented by local/regional data (still in discovery)
	Commercial: EIA Annual Energy Outlook	
Cooking & Other Appliances	Residential: NEEA Residential Building Stock Assessment	
	Commercial: NEEA Commercial Building Stock Assessment	
Lighting	Residential: NEEA Residential Building Stock Assessment	
	Commercial: NEEA Commercial Building Stock Assessment	

Notes: EIA stands for Energy Information Administration; NEEA stands for Northwest Energy Efficiency Alliance
**Oregon's Home Energy Score data comes from Earth Advantage*

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STARTING POINT FOR FUTURE CONDITIONS

Model Input	Starting Point for Future Conditions Informed by Policy and Past Studies
Space Heating	Assume existing policies play out. Residential: 65% heat pump sales by 2030, 90% by 2040 (DEQ MOU) 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
Water Heating	Assume existing policies play out. Residential: 65% heat pump sales by 2030, 90% by 2040 (DEQ MOU) USDOE standard effective 2029 requiring new electric consumer water heating be done via HPWH
	Assume existing policies play out. 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.
Building Shells	Weatherize 95% of existing commercial and residential home envelopes by 2040 (suggested starting point based on Oregon Climate Action Commission Analysis*) to achieve 10-20% reduction in energy use by 2040 (USDOE)
Technology Stock Replacement	No requirement for adoption of high efficiency gas appliances
Cooking & Other Appliances	100% sales of new appliances are electric by 2035 (suggested starting point based on Oregon Climate Action Commission Analysis*)
Lighting	100% LED sales by 2025 (HB2531)

**Oregon Climate Action Roadmap to 2030,* Roadmap to 2030 — Oregon Climate Action Commission

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DISCUSSION QUESTION #1

What should the model assume for residential and commercial building adoption of heat pumps?

Starting point:

DEQ MOU (website)

- Residential: 65% heat pump sales by 2030; 90% by 2040
- Commercial: ??

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DISCUSSION QUESTION #2

What should the model assume for residential and commercial building water heating?

Starting points:

DEQ MOU (website). USDOE Standard (Announcement)

- Residential
  - 65% heat pump sales by 2030, 90% by 2040?
  - USDOE standard effective 2029 requiring electric consumer water heating be done via heat pump water heaters?
- Commercial: Small commercial is similar to residential, impacted by same heat pump water heaters standards by USDOE. Large commercial very small percentage heat pump in the near/mid term.

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DISCUSSION QUESTION #3

What should the model assume about percent reduction in service demand for heating and cooling?

Starting point:

Oregon Climate Action Roadmap to 2030 (report)

- Weatherize 95% of existing commercial and residential home envelopes by 2040

U.S. Department of Energy (article)

- to achieve 10-20% reduction in energy use by 2040?

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DISCUSSION QUESTION #4

Do the assumptions around cooking, other appliances, and lighting seem reasonable?

Starting point:

Oregon Climate Action Roadmap to 2030 (report)

- 100% sales of new appliances are electric by 2035

HB 2531 (bill)

- 100% LED sales by 2025

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What if…?

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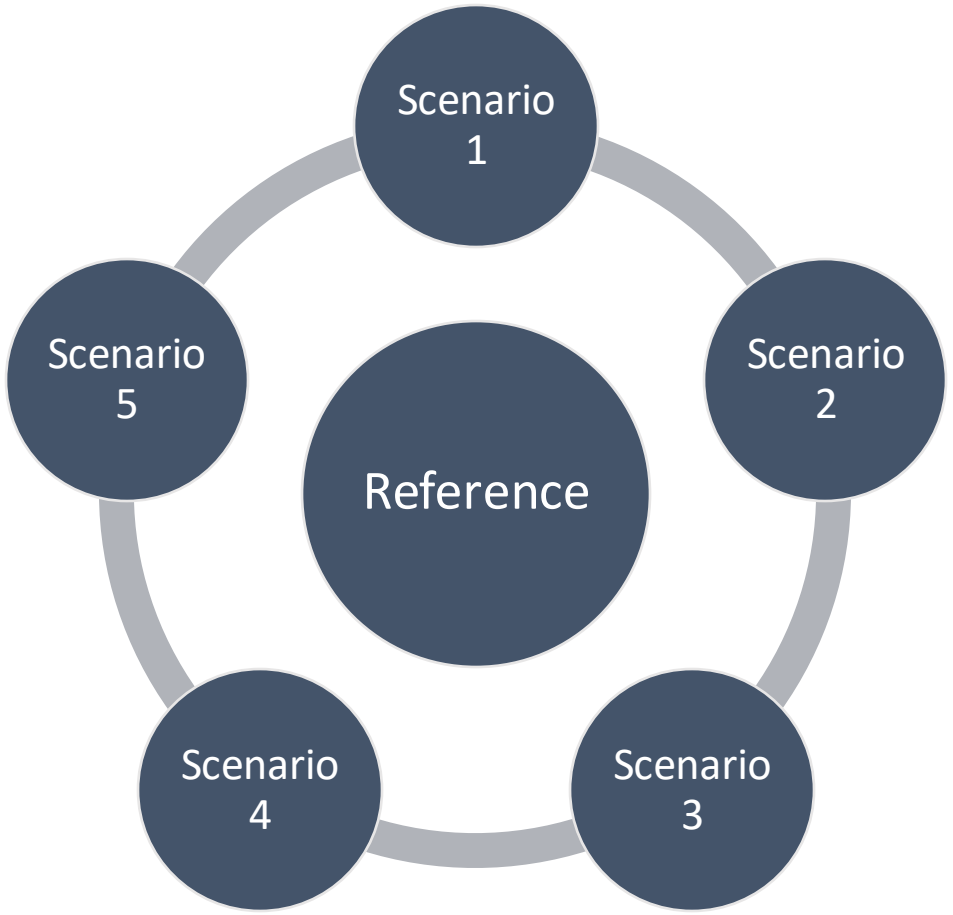

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Scenario Examples From WA State Energy Strategy

Scenario Assumptions	Reference (R)	Electrification (E)	Transport Fuels (TF)	Gas in Buildings (GB)	Constrained Resources (CR)	Behavior Change (BC)
Clean Electricity Policy	CETA: Coal retirements 2025; 100% carbon neutral 2030 (with alternative compliance); 100% RE 2045					
Economy-Wide GHG Policy	None	Reduction below 1990: 45% by 2030; 70% by 2040; 95% and net zero by 2050				
Buildings: Electrification	AEO	Fully electrified appliance sales in most sub-sectors by 2050		**Gas appliances replaced with new gas sales**	Fully electrified appliance sales in most sub-sectors by 2050	
Buildings: Energy Efficiency	AEO	Sales of high efficiency tech: 100% in 2035				
Transportation: Light-Duty Vehicles	AEO	100% electric sales by 2035	**75% electric sales by 2045**	100% electric sales by 2035		
Transportation: Freight Trucks	AEO	Same as GB, CR, and BC Cases	**Half the electric sales/no hydrogen adoption**	HDV long-haul: 25% electric, 75% hydrogen sales by 2045 HDV short-haul: 100% electric sales by 2045 MDV: 70% electric sales by 2045		
Industry	AEO	Generic efficiency improvements over Reference of 1% a year; fuel switching measures; 75% decrease in refining and mining to reflect reduced demand				
Service Demand Reductions	Baseline service demand informed by AEO					**VMT by 2050: 29% LDV, 15% MDV/HDV 15% Com, 10% Res**
Resource Availability	NREL resource potential; 6 GW of additional transmission potential per path; SMRs permitted				**Washington: No new TX**	Same as R, E, TF, and GB Cases

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Example for Washington 2021 State Energy Strategy

Guided Discussion on Alternative Scenarios/Levers

What if the deployment of heat pumps is slower than expected and gas continues to be used in buildings?

What if Oregon sets a more ambitious economy-wide GHG target?

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Wrap up and Next Steps

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ADDITIONAL ENGAGEMENT

Share Written Public Comment

- Please submit comments online: https://odoe.powerappsportals.us/en-US/energy-strategy/
- Comment portal open through Aug. 31, 2024
- Next meeting – Final Summary for all working groups: August 22, 2024, 1pm-3pm

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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