Oregon
Tina Kotek, Governor

OREGON DEPARTMENT OF ENERGY

550 Capitol St. NE
Salem, OR 97301
Phone: 503-378-4040
Toll Free: 1-800-221-8035
FAX: 503-373-7806
www.oregon.gov/energy

AGENDA

Title: Land Use and Natural Resources Working Group – Oregon Energy Strategy

Date: August 5, 2024, 10 am – 12 pm

Objectives:
The purpose of this Working Group is to:

- Understand foundational data sources that will inform the energy strategy and ask clarifying questions.
- Provide expertise and feedback on key assumptions related to land use and natural resources.
- Discuss "what if" questions and priorities for a scenario analysis that can help illuminate trade-offs of different clean energy pathways.
- Foster transparency in the Energy Strategy technical analysis through information sharing on the scope, data sources, and development process of the modeling tools.

Land Use and Natural Resources Working Group Members:

NW Natural	Mary Moerlins
Cascade Natural Gas	Alyn Spector
Oregon Department of Fish and Wildlife	Jeremy Thompson
Oregon Department of Agriculture	Jim Johnson
Morrow County	Tamra Mabbott
Benton County	Petra Schuetz
League of Oregon Cities	Nolan Plese
Oregon Hunters Association	Mike Totey
1000 Friends of Oregon	Andrew Mulkey
Oregon Cattlemen's Association	Jack Southworth
Columbia Riverkeeper	Kelly Campbell
Kalmiopsis Audubon Society	Ann Vileisis
Sunstone Energy	Amy Berg Pickett
Wasco County	Kelly Howsley-Glover
Portland General Electric	Keith Johnson
Renewable Northwest	Emily Griffith,
Rancher	Michael Eng
Oregon Department of Forestry	John Tokarczyk
Umatilla Electric Cooperative	Alec Shebiel
The Nature Conservancy	Lauren Link
Business Oregon	Michael Held
Department of State Lands	Nataliya Stranadko
Department of Land Conservation and Development	Jon Jinings

Agenda

Topic	Who	Time
Welcome and Introductions	Ruchi Sadhir, ODOE	10 min
Setting the Stage	Michael Freels, ODOE	10 min
How Land Use and Natural Resources are considered in the Oregon Energy Strategy reference scenario	Jeremy Hargreaves, Evolved Energy Research	15 min
Guided discussion on the reference scenario: • What are your thoughts/reactions to the starting point assumptions presented here? • Is there anything in the assumptions or modeling that you would like to understand more?	Michael Freels, ODOE Jeremy Hargreaves, Evolved Energy Research	40 min
Guided discussion on alternative scenarios/levers: • What are your Land Use and Natural Resources priorities and how might they be reflected in a scenario analysis?	Michael Freels, ODOE Jeremy Hargreaves, Evolved Energy Research	40 min
Wrap up and Next Steps	Ruchi Sadhir, ODOE	5 min

Oregon Department of **ENERGY**

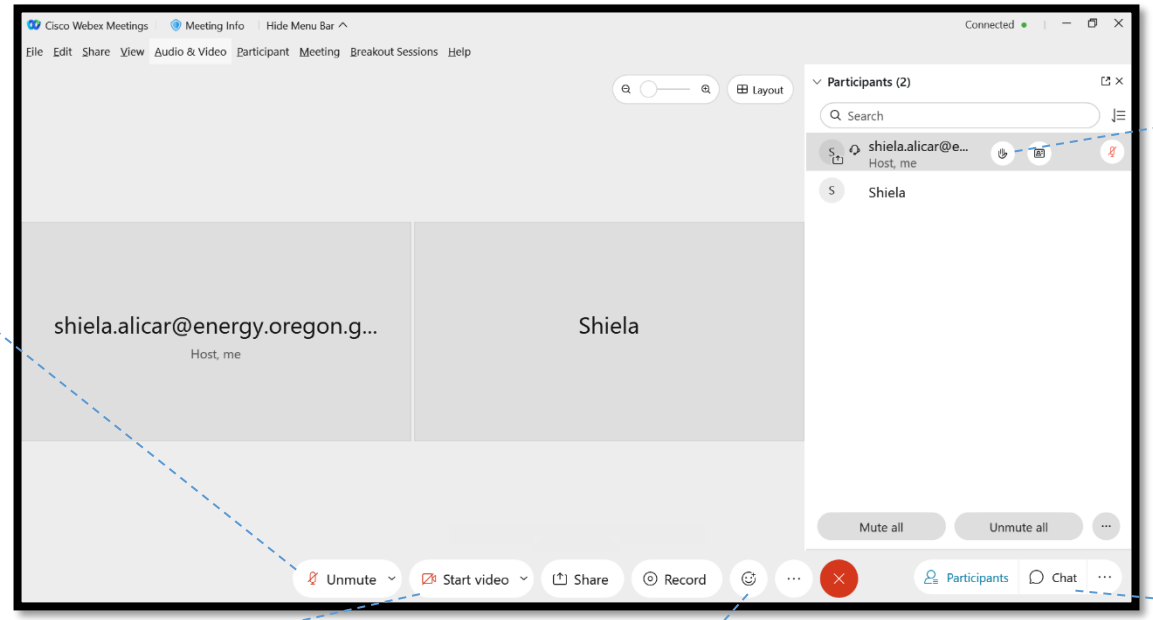


Oregon Energy Strategy
Land Use and Natural Resources Working Group

Michael Freels and Ruchi Sadhir
August 5, 2024

OREGON DEPARTMENT OF ENERGY

USING WEBEX



Audio Options

Mute — *Microphone On*

Unmute — *Microphone Off*

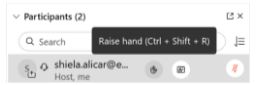
Video Options

Stop video — *Webcam On*

Start video — *Webcam Off*

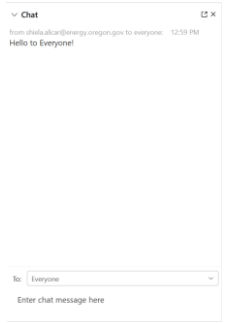
Second Raise Hand Option

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



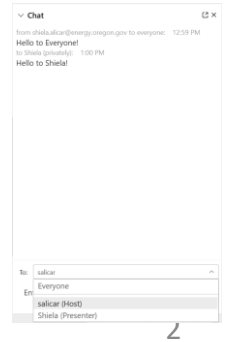
Click on Lower hand when you are done.

Chat

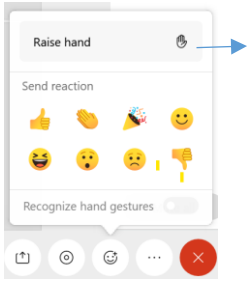


You can chat to Everyone in the meeting.

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 land use and natural resources out to 2050.

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

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

OREGON DEPARTMENT OF ENERGY

AGENDA

9:00 – 9:05	Welcome and Introductions	Ruchi Sadhir, Associate Director for Strategic Engagement
9:05 – 9:25	Setting the Stage	Michael Freels, Senior Policy Analyst
9:25 – 9:40	How Land Use and Natural Resources are considered in the Oregon Energy Strategy reference scenario	Jeremy Hargreaves, Evolved Energy Research
9:40 – 10:20	Discussion of reference scenario data and assumptions	Michael Freels & Ruchi Sadhir, ODOE Jeremy Hargreaves, Evolved Energy Research
10:20 – 10:55	Discussion of alternative scenarios	
10:55 – 11:00	Wrap up and Next Steps	Ruchi Sadhir, Associate Director for Strategic Engagement

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
NW Natural	Mary Moerlins
Cascade Natural Gas	Alyn Spector
Oregon Department of Fish and Wildlife	Jeremy Thompson
Oregon Department of Agriculture	Jim Johnson
Morrow County	Tamra Mabbott
Benton County	Petra Schuetz
League of Oregon Cities	Nolan Plese
Oregon Hunters Association	Mike Totey
1000 Friends of Oregon	Andrew Mulkey
Oregon Cattlemen's Association	Jack Southworth
Columbia Riverkeeper	Kelly Campbell
Kalmiopsis Audubon Society	Ann Vileisis
Sunstone Energy	Amy Berg Pickett
Wasco County	Kelly Howsley-Glover
Portland General Electric	Keith Johnson
Renewable Northwest	Emily Griffith,
Ranchers	Michael Eng
Oregon Department of Forestry	John Tokarczyk
Umatilla Electric Cooperative	Alec Shebiel
The Nature Conservancy	Lauren Link
Business Oregon	Michael Held
Department of State Lands	Nataliya Stranadko
Department of Land Conservation and Development	Jon Jinings

OREGON DEPARTMENT OF ENERGY

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

OREGON DEPARTMENT OF ENERGY

INTRODUCTIONS

- Please share the following with the group **via chat**:
  - name
  - affiliation
  - geographic location you represent
  - what are you doing for fun this summer?

OREGON DEPARTMENT OF ENERGY

Setting the Stage

OREGON DEPARTMENT OF ENERGY

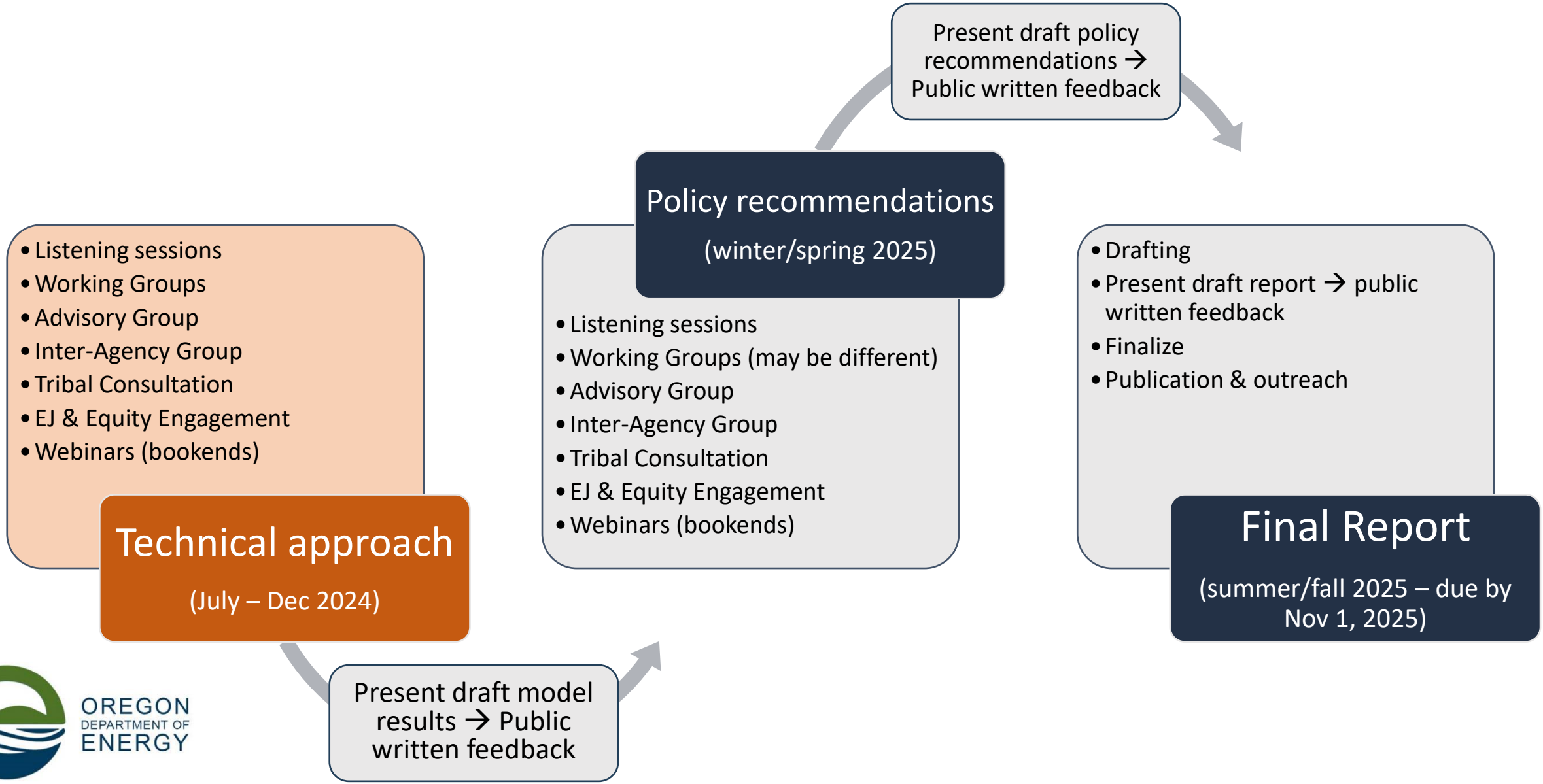
Working Group Meeting #1 Check in

- *Review Summary of Energy Modeling and Land Use Considerations*

- *Do you have any clarifying questions from the first working group meeting?*

OREGON DEPARTMENT OF ENERGY

WHERE WE ARE IN THE PROCESS



OREGON DEPARTMENT OF ENERGY

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
- Economic 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.

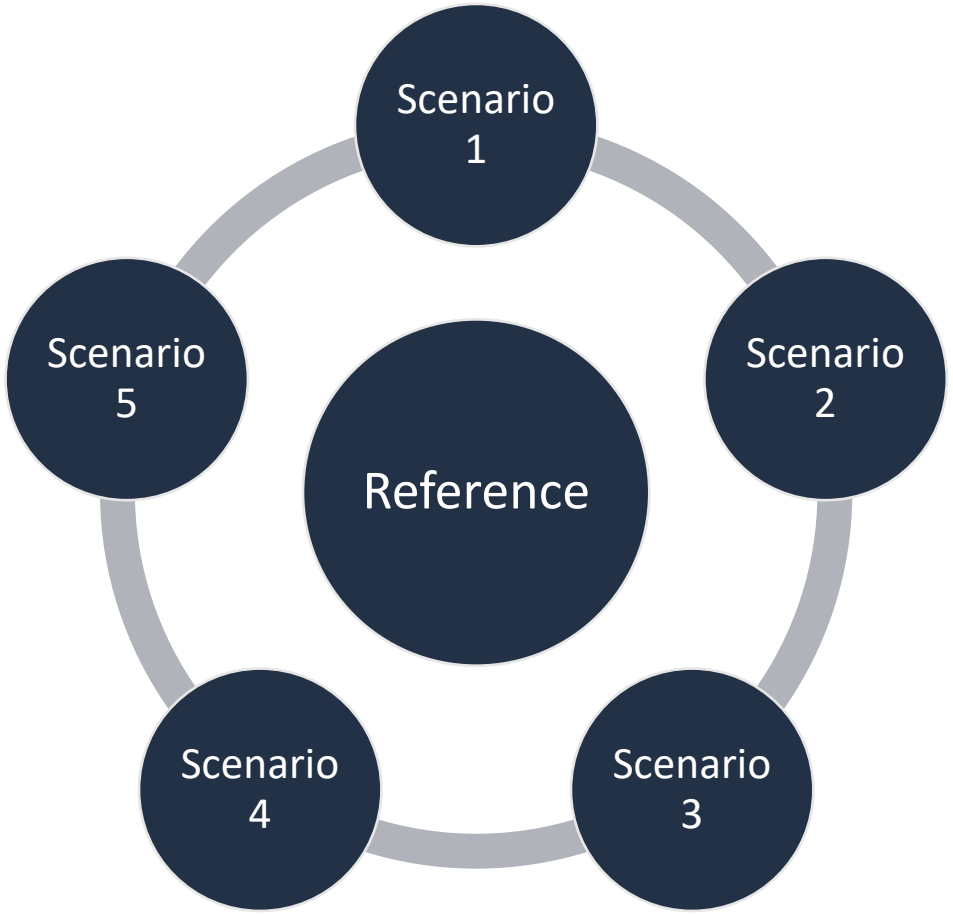
Natural gas, liquid fuels, propane

- 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….

OREGON DEPARTMENT OF ENERGY

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.)

OREGON DEPARTMENT OF ENERGY

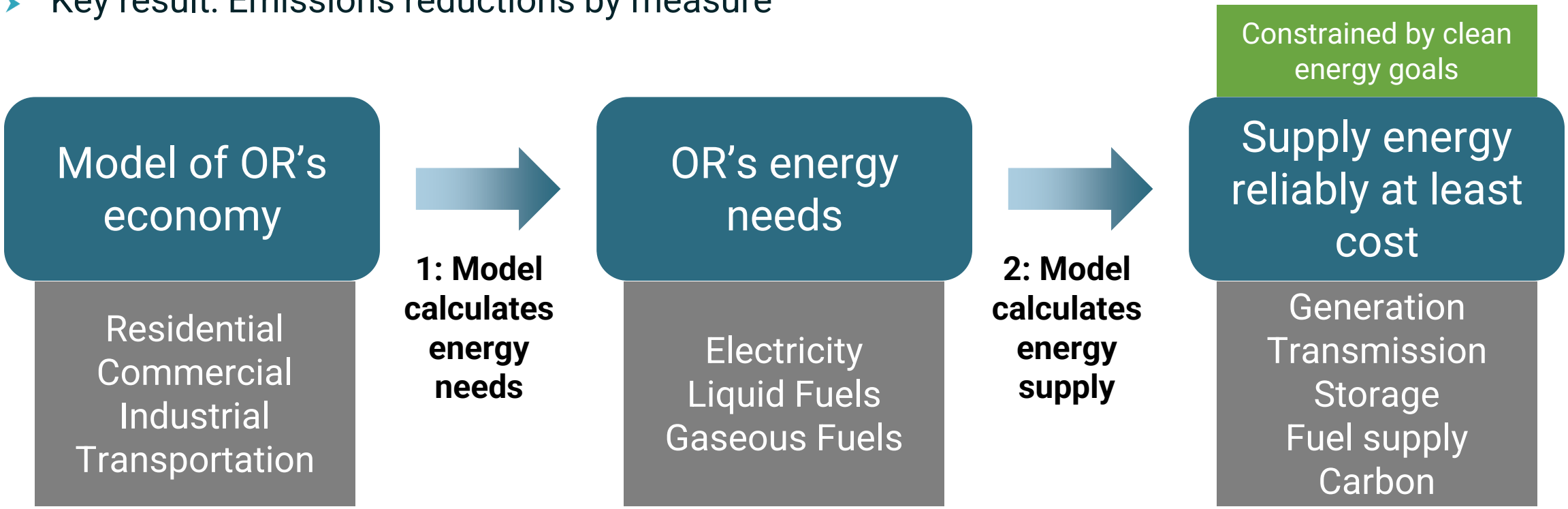
How land use and natural resources are considered in the Oregon Energy Strategy reference scenario

OREGON DEPARTMENT OF ENERGY

Oregon Energy Strategy Technical Consulting

High Level Description of Modeling Approach

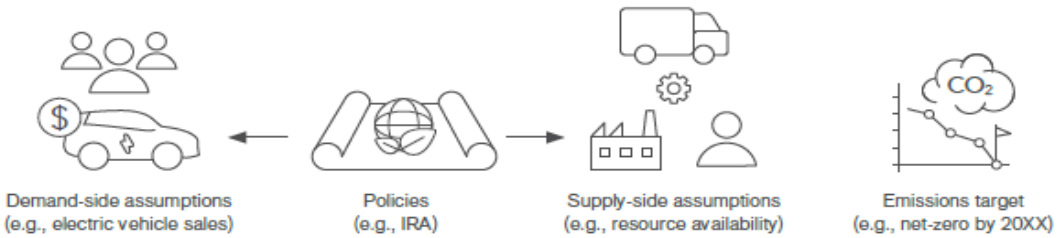
- Model calculates the energy needed to power OR's economy, and the least-cost way to provide that energy under clean electricity and emissions goals
- Key result: Emissions reductions by measure



Economy-Wide Energy Modeling

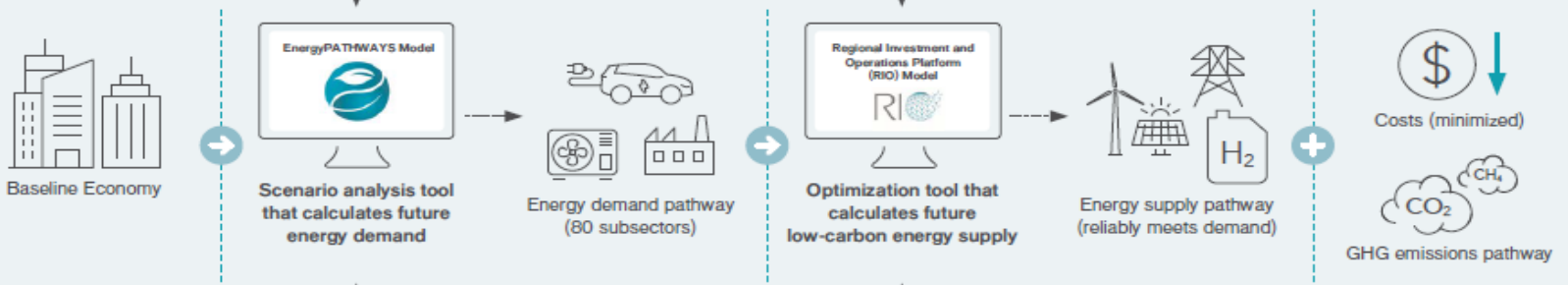
Scenario Assumptions

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

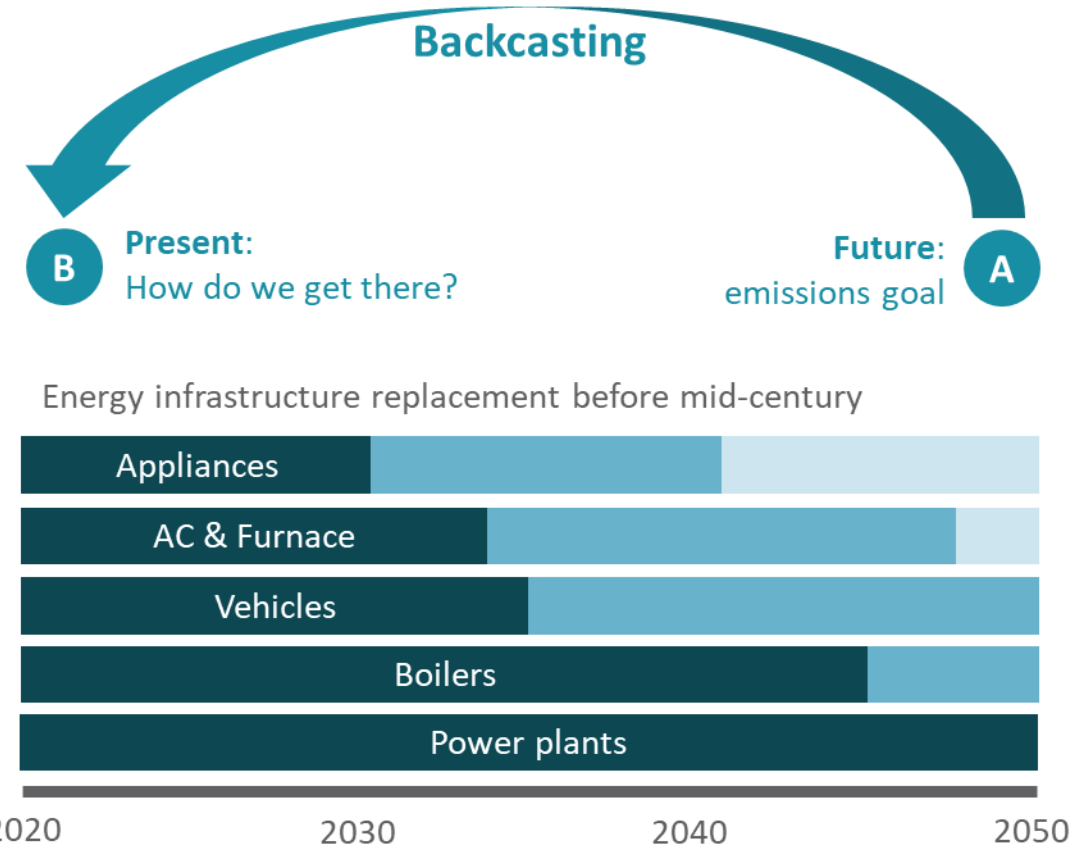
- Existing energy infrastructure
- Existing infratructure scheduled retirement
- Scheduled resource additions already committed
- Energy production and conversion infrastructure characteristics
- Energy transport, storage, and delivery options
- Capital, operating and maintenance, and installation costs
- 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
- Importance of land use and natural resource availability
  - Understanding where new and long-lived resources can go is key to making near-term policy decisions for a sustainable energy future

Land Use and Natural Resources

- Resource siting
  - The model operates at aggregated granularity: 2 Oregon zones
  - Land use considerations are an input to the model through screening at a disaggregated level of where infrastructure projects could be located
  - Where can new resources be located?
  - What are the restrictions on transmission development?
- Spatial planning
  - Spatial planning can impact future energy usage, VMT for example
  - We can model potential VMT reductions to represent spatial planning outcomes

Near-Term Decisions in Long-Term Context

- Use utility IRPs to incorporate planned resource additions
- Incorporate forecasted rooftop PV and distributed generation additions
- Demand-side transformation: Energy demand that grid-scale resources must meet in the future
  - Impacts the land area required to achieve emissions and clean energy goals
- Cost estimates of new resources and transmission
  - Incorporate factors like topology, land use, fire risk
- In-state versus out-of-state opportunities
- Biomass supply curve: DOE Billion Ton Study

Input Opportunities

- What level of resource siting restrictions should be incorporated into the model?
  - Past modeling of resource hourly production shapes in different weather conditions across different sites: The Nature Conservancy Power of Place – West Study
    - Publication in Proceedings of the National Academy of Sciences (PNAS): https://www.pnas.org/doi/10.1073/pnas.2204098120
    - Multiple screening levels to choose from
  - ORESA tool, what screens should be incorporated for renewable resource scenarios?
- What level of VMT savings should be assumed based on future spatial planning activities?
- What "what if" questions impacting these inputs should be considered?
- Post-analysis to this modeling could include more detailed consideration of siting impacts, downscaling aggregated 2-zone resource builds to potential local impacts
- Studies of biomass potential in Oregon

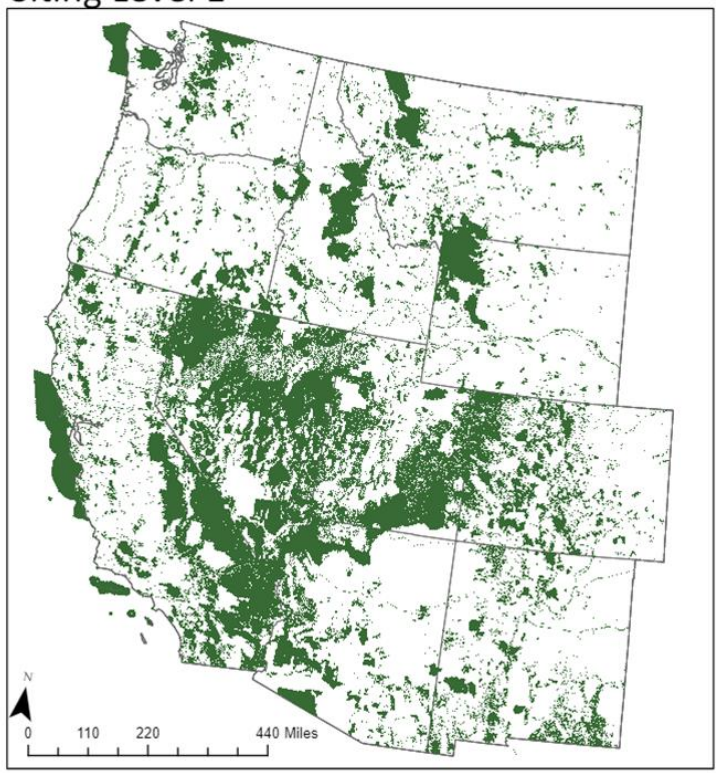
Power of Place – West Screens

Categories of Exclusion	Definition of Category	Examples	Biomass
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
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

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

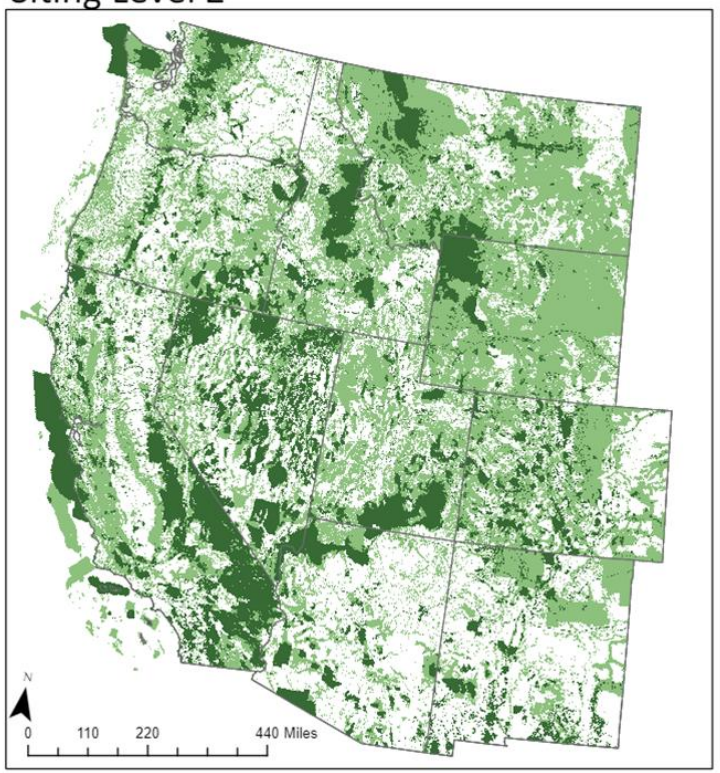
Power of Place – West Screened Out Land

Siting Level 1



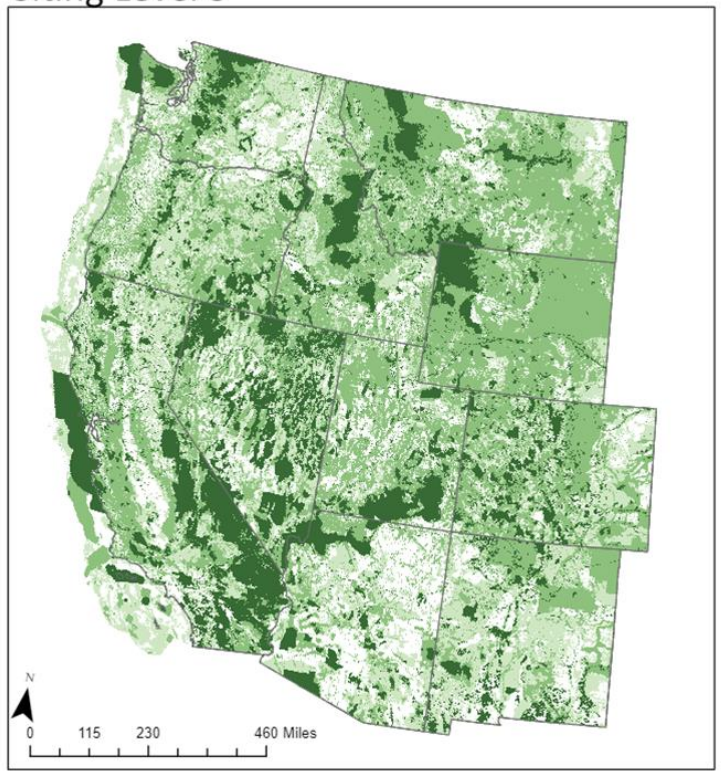
Excludes Category 1

Siting Level 2



Excludes Category 1, 2

Siting Level 3



Excludes Category 1, 2, 3

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

Pop West - Sources of Screens, General

Area Type	Description	Source	URL
Administratively protected areas (Environmental Category 2)	Administratively protected under current policy	Wu et al 2023, WECC Environmental Data Task Force, BLM West-Wide Wind Mapping Project	https://www.pnas.org/doi/10.1073/pnas.2204098120
High conservation value areas (Environmental Category 3)	Land with high conservation value that may not be currently protected	Wu et al 2023, Wu et al 2023, WECC Environmental Data Task Force, BLM West-Wide Wind Mapping Project	https://www.pnas.org/doi/10.1073/pnas.2204098120
Wetlands	National Wetlands Inventory (NWI)	USFWS National Wetlands Inventory	https://www.fws.gov/program/national-wetlands-inventory
Forests	Areas where the existing vegetation type life form is classified as tree	Landfire 2020	https://landfire.gov/evt.php
Conifer forest	Areas where the existing vegetation type physiognomy is conifer or conifer-hardwood	Landfire 2020	https://landfire.gov/evt.php
Shrublands	Areas where the existing vegetation type life form is classified as shrub	Landfire 2020	https://landfire.gov/evt.php
Grasslands	Areas where the existing vegetation type life form is classified as herbaceous	Landfire 2020	https://landfire.gov/evt.php
Resilient and connected network	A subset of The Nature Conservancy's Resilient Connected Network, including only Prioritized Network areas with Resilient, Concentrated Flow (Climate Informed), Recognized Biodiversity	The Nature Conservancy Resilient, Connected, Network	https://www.conservationgateway.org/ConservationPractices/ClimateChange/Pages/RCN-Downloads.aspx
Intact lands	Areas largely undisturbed by human modification. HMI < 0.082, except where modified per Hise et al 2022 (central U.S.)	Theobald Human Modification Index, others	https://datadryad.org/stash/dataset/doi:10.5061/dryad.n5tb2rbs1, https://www.mdpi.com/2073-445X/11/4/462
Intact tallgrass prairie	Landscapes in the eastern Great Plains with largely intact natural vegetation	Ostlie, W. Untilled Landscapes of the Great Plains; The Nature Conservancy: Minneapolis, MN, USA, 2003.	87

https://www.nature.org/content/dam/tnc/nature/en/documents/TNC_Power_of_Place_National_Technical_Briefing.pdf

Pop West - Sources of Screens, Species

Area Type	Description	Source	URL
Grouse habitat (e.g., sage grouse and prairie chicken)	Habitat with conservation importance for grouse and prairie chicken species	Hise et al 2022, Wu et al 2023	https://www.mdpi.com/2073-445X/11/4/462, https://www.pnas.org/doi/10.1073/pnas.2204098120
Sensitive desert species habitat (e.g., desert and gopher tortoises)	Habitat with conservation importance for imperiled tortoise species	Wu et al 2023, USGS Southeast gopher tortoise habitat mode	https://www.pnas.org/doi/10.1073/pnas.2204098120, https://www.sciencebase.gov/catalog/item/5d0d4ba0e4b0941bde52a306
Sensitive whooping crane habitat	Key whooping crane stopover sites	Hise et al 2022	https://www.mdpi.com/2073-445X/11/4/462
Bat habitat	Key bat roosting areas in the central U.S. per Hise et al 2022, USFWS critical habitat for threatened and endangered species	Hise et al 2022	https://www.fws.gov/endangered/what-we-do/critical-habitats.html

https://www.nature.org/content/dam/tnc/nature/en/documents/TNC_Power_of_Place_National_Technical_Briefing.pdf

Pop West - Sources of Screens, Social

Area Type	Description	Source	URL
Energy Communities	Brownfields [not mapped], areas with significant fossil fuel employment, and areas with retired coal power plants	2022 Inflation Reduction Act	https://www.congress.gov/117/bills/hr5376/BILLS-117hr5376enr.pdf
Low-Income Communities	Areas with high poverty rates according to the U.S. Census	2022 Inflation Reduction Act	https://www.congress.gov/117/bills/hr5376/BILLS-117hr5376enr.pdf
Croplands (general)	Vegetation of agricultural lands, including row crops, intensive pastures, orchards, vineyards, plowed or harvested fallow fields, rice paddies, and farm ponds	Landfire 2020	https://landfire.gov/evt.php
Productive farmland	Productive Versatile Resilient farmland (value = 0.53 on a scale of 0-1)	American Farmland Trust "Farms Under Threat" Report	https://farmlandinfo.org/publications/farms-under-threat-the-state-of-the-states/ https://farmlandinfo.org/wp-content/uploads/sites/2/2020/05/AFT_FUT_PVR_Fact_Sheet.pdf
Marginal farmland	Challenging soil' based on USDA Gridded Soil Survey Geographic Database	USDA Gridded Soil Survey Geographic Database	https://www.nrcs.usda.gov/resources/data-and-reports/gridded-soil-survey-geographic-gssurgo-database

https://www.nature.org/content/dam/tnc/nature/en/documents/TNC_Power_of_Place_National_Technical_Briefing.pdf

ORESA Tool

- What type of land use layers should be incorporated in developing renewable resource assessments for the energy strategy?
- Scenario development
  - Renewable potential in Reference scenario
  - More restrictive renewable scenario?

CARBON MANAGEMENT

- Economy-wide gross emissions constraint
  - EO 20-04:
    - 45% below 1990 levels by 2035
    - 80% below 1990 levels by 2050
- Clean fuels
  - Clean Fuels Program
  - Climate Protection Program
- Carbon Capture and Storage or Sequestration

OREGON DEPARTMENT OF ENERGY

DISCUSSION QUESTION

The Oregon Transportation Plan has a target of a 20 percent Vehicle Miles Traveled reduction for passenger vehicles by 2050.

Based on current and future spatial planning activities, what level of VMT savings should be assumed?

OREGON DEPARTMENT OF ENERGY

DISCUSSION QUESTION

After the modeling is complete, the analysis could include more detailed consideration of

- siting impacts,
- downscaling aggregated 2-zone resource builds potential local impacts
- Water consumption
- Biomass consumption

What would be valuable to learn from this technical analysis?

OREGON DEPARTMENT OF ENERGY

What if…?

OREGON DEPARTMENT OF ENERGY

Guided Discussion on Alternative Scenarios/Levers

- What if there is much more energy efficiency, distributed energy, and load flexibility? How much less would we need to build?
- What if Oregon made a policy decision to construct 3GW of offshore wind?
- What if electrification of transportation and heating is delayed?
- What if transmission can not be built in Oregon?
- What if Oregon sets a more ambitious economy-wide GHG target??

OREGON DEPARTMENT OF ENERGY

Public Comment

OREGON DEPARTMENT OF ENERGY

PUBLIC COMMENT

- We are interested in hearing your Energy Strategy interests, priorities, and expectations.
- Please raise your hand if you would like to ask a question or provide a comment.
- Please be brief as we want to hear from as many people as we can in the time available.

OREGON DEPARTMENT OF ENERGY

Wrap up and Next Steps

OREGON DEPARTMENT OF ENERGY

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

OREGON DEPARTMENT OF ENERGY

OREGON DEPARTMENT OF ENERGY

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

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

Extra Draft Slides

OREGON DEPARTMENT OF ENERGY

CARBON MANAGEMENT

Input	All Scenarios
Economy-wide gross emissions constraint	EO 20-04: 45% below 1990 levels by 2035, 80% below 1990 levels by 2050
Clean fuels	CPP: 50% reduction in fossil fuel emissions by 2035, 90% reduction in fossil fuel emissions by 2050 relative to base cap (2017 to 2019 average). Eligible 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
Carbon Capture and Storage	Retrofits permitted, sequestration opportunities limited to saline aquifer formations using NETL supply curve with none in Oregon. Oregon can offset emissions with sequestration in other states.
Non-CO2, non-energy	EPA developed supply curves of measures to reduce non-CO2 and non-energy emissions, e.g. reducing CH4 leakage, reducing f-gasses in industrial processes and products, reducing N2O from soil management. Optimized by the model against energy emissions reduction measures. We can also use a fixed trajectory of these emissions reductions if preferred.

OREGON DEPARTMENT OF ENERGY

Implementation of Policy

- EO 20-04
  - 45% below 1990 levels by 2035, 80% below 1990 levels by 2050
  - Economy-wide emissions target implemented in the model
  - Includes all sources of emissions
- CPP
  - 50% reduction in fossil fuel emissions by 2035, 90% reduction in fossil fuel emissions by 2050 relative to 2017 to 2019 average (not including jet fuel or maritime fuel)
  - Not implemented in the model directly (check for compliance)
- HB 2021
  - 80%, 90%, 100% emissions free electricity by 2030, 2035, 2040, respectively. Baseline set by 2010,2011,2012 emissions average. Applies only to 60% of electricity generation
  - Implemented in the model as a converted clean electricity standard

CARBON MANAGEMENT

Input	All Scenarios
Economy-wide gross emissions constraint	EO 20-04: 45% below 1990 levels by 2035, 80% below 1990 levels by 2050
Clean fuels	CPP: 50% reduction in fossil fuel emissions by 2035, 90% reduction in fossil fuel emissions by 2050 relative to base cap (2017 to 2019 average). Eligible 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
Carbon Capture and Storage	Retrofits permitted, sequestration opportunities limited to saline aquifer formations using NETL supply curve with none in Oregon. Oregon can offset emissions with sequestration in other states.
Non-CO2, non-energy	EPA developed supply curves of measures to reduce non-CO2 and non-energy emissions, e.g. reducing CH4 leakage, reducing f-gasses in industrial processes and products, reducing N2O from soil management. Optimized by the model against energy emissions reduction measures. We can also use a fixed trajectory of these emissions reductions if preferred.

OREGON DEPARTMENT OF ENERGY

CARBON MANAGEMENT

OREGON DEPARTMENT OF ENERGY

Carbon Management

Input	All Scenarios
Economy-wide gross emissions constraint	EO 20-04: 45% below 1990 levels by 2035, 80% below 1990 levels by 2050
Clean fuels	CPP: 50% reduction in fossil fuel emissions by 2035, 90% reduction in fossil fuel emissions by 2050 relative to base cap (2017 to 2019 average) Eligible 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
Carbon Capture and Storage	Retrofits permitted, sequestration opportunities limited to saline aquifer formations using NETL supply curve with none in Oregon. Oregon can offset emissions with sequestration in other states.
Non-CO2, non-energy	EPA developed supply curves of measures to reduce non-CO2 and non-energy emissions, e.g. reducing CH4 leakage, reducing f-gasses in industrial processes and products, reducing N2O from soil management. Optimized by the model against energy emissions reduction measures. We can also use a fixed trajectory of these emissions reductions if preferred.

Land use

Discussion of land use screens. Can you create tables with a breakdown of the land use and natural resource inputs that are going in the model

Yes, Jeremy will work this into a slide. What kind of screens are in place in POP study. And how incorporating POP and ORESA.

Planned Oregon energy facilities and transmission projects

- Demonstrate these are being incorporated
- How do we determine what projects are real enough/what stage in development

The Nature Conservancy's Power of Place West Study

- Demonstrate how this land data influences the model

Oregon Renewable Energy Siting Assessment (ORESA)

- What screens are being used in the reference scenario or could be used to create restrictions
- What questions do we have for the working group?
- What options are available?

Existing Oregon Policies

- What existing Oregon land use and natural resource policies are being incorporated in the model?

OREGON DEPARTMENT OF ENERGY

Land use

Demand Side Transformation Forecasts

- How they will drive growth, what are they based on

Transmission cost estimates in evaluating expanding existing or developing new greenfield transmission.

- land use, topology, fire risk

Access to energy

- in-state and out of state access

Equity and EJ

- Land use, public health, economic
- How can the model reflect these considerations?

How will these land use issues be reflected in the model? What data and assumptions will be used?

- **First 3 points Jeremy can respond to. Look at screens. POP.**
- Equity and EJ – some addressed by screens

OREGON DEPARTMENT OF ENERGY

Electric Supply Resource Eligibility / RPS / CES

Input	Starting Point, informed by past Oregon studies	Suggested Changes from ODOE and Working Group Input
Reliability Resource Eligibility	All in-state resources plus out of state contribution over transmission Tx import reliability contribution dynamic based on available resources	
Clean Electricity Resource Eligibility	Qualifying generation: Solar, wind, wave, tidal, ocean thermal, geothermal. Woody biomass, manure, small hydro. Clean fuels.	Include nuclear as a qualifying clean energy resource
Resource Availability	NREL resource potential; TNC new transmission supply curves, 4th generation and SMR nuclear not permitted in Oregon or California. New gas build not permitted in Oregon	Use Oregon ORESA instead of NREL resource potentials
RPS Constraint	CES: 80%, 90%, 100% emissions free electricity by 2030, 2035, 2040, respectively. Baseline set by 2010,2011,2012 emissions average. RPS: 25% by 2025, 50% by 2040	Revisit with Oregon team to understand if nuances of HB 2021 will impact the implementation of the standard in the model **HB2021 sales to end users in Oregon**
Planned and targeted resource procurement	3 GW of offshore wind by 2030	Do not model a target, allow model to determine economic capacity investment
Inflation Reduction Act Incentives	Supply-side incentives included for hydrogen production, renewable electricity generation, battery storage, carbon sequestration, clean fuels, and nuclear	

OTHER QUESTIONS

OREGON DEPARTMENT OF ENERGY

STARTING POINT FOR EXISTING CONDITIONS

Model Input	Data Source for Existing Conditions
Light-duty vehicles	OR Dept. of Transportation – Driver & Motor Vehicle division (DMV) Data
Medium- and heavy-duty vehicles	OR Dept. of Transportation – Combination of Commerce and Compliance Division (CCD) and DMV data (depending on vehicle weight *Note: propose to use EPA MOVES if cannot obtain CCD data
Transit Buses	National Transit Database
School Buses	OR Dept. of Transportation – DMV Data
Fuels	OR Dept. of Environmental Quality Clean Fuels Program Data
Vehicle Miles Traveled (VMT)	EPA MOVES (data comes from Highway Performance Monitoring System)
Fuel Economy	Energy Information Administration Annual Energy Outlook Historical Average Fuel Economy by vintage and vehicle type

OREGON DEPARTMENT OF ENERGY

Reference Scenario Data and Assumptions

OREGON DEPARTMENT OF ENERGY

Carbon Management

Input	All Scenarios	Suggested Changes from MWW, Other Studies, and Working Group Input
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	Use emissions factor for existing clean fuels supply. Use zero emissions for future clean fuels supply chains. Evolved action item: share sources of fuels pricing with ODOE
CCS	Retrofits permitted, sequestration opportunities limited to saline aquifer formations using NETL supply curve with none in Oregon. Oregon can offset emissions with sequestration in other states.	No CCS permitted in 80% scenarios. CCS may be permitted in 95% or net zero scenarios. No data for CCS potential Oregon. Evolved to do further exploring for data sources
Land sink	Supply curve of land sink measures from Joseph E. Fargione et al., Natural climate solutions for the United States. Sci.Adv.4, eaat1869(2018). DOI:10.1126/sciadv.aat1869 Optimized by the model against energy emissions reduction measures. We can also use a fixed trajectory of these emissions reductions if preferred.	ODOE to share NWL studies from Oregon Climate Action Commission and others that may characterize the opportunity better than Evolved downscaled land sink measures

DER Adoption and Participation

Input	Starting Point, informed by past Oregon studies	Suggested Changes from ODOE and Working Group Input
BTM PV	NWPCC 2021 Power Plan rooftop solar forecast	ODOE to provide most current installed capacity number for rooftop solar
Community Solar		Include mandated community solar capacity
BTM Storage Adoption	Installed systems but none participate in offering grid services so not tracked by the model	Default is no participation, but we can include BTM storage. Open question for ODOE
BTM Storage Parameters	N/A	
Flexible Loads	10% of electric appliance installations by 2050, including space heating, water heating, and air conditioning (linear growth from 0 in 2025) 2/3 of residential electric vehicles in all years and 1/3 commercial vehicles can participate in managed charging	Ramp up participation from 0% of vehicles today to 2/3 or 1/3 for res and com, respectively, by 2030? Open question for ODOE
V2G	None (charging only)	
Flexible Load Parameters	Space heating loads can be delayed or advanced by 1 hour Water heating loads can be delayed or advanced by up to 2 hours Air conditioning can be delayed or advanced by 1 hour Residential vehicle charging can be delayed by up to 8 hours and commercial vehicle charging up to 3 hours	

KEY ASSUMPTIONS

Area	Assumptions	Questions
Reliability resource eligibility	- All in-state resources plus out of state contribution over transmission - Tx import reliability contribution dynamic based on available resources	
Clean electricity resources modeled	Solar, wind, wave, tidal, ocean thermal, geothermal, advanced geothermal, offshore wind. Woody biomass, manure, small hydro. Clean fuels. Nuclear (outside of OR).	
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.	
Hydro system operations	Data source / key characteristics – Jeremy – this could go in the data slide up top, and then here we talk about anything that's up for discussion.	
Balancing across the WECC	Assume a single balancing authority	This could be controversial. Is there a way to factor in some inefficiencies to reflect the risk that will not have a seamless region with an RTO? And the reality that if we get there, it'll be down the road?

RESOURCE COSTS & POTENTIALS

Area	Assumption	Questions
Resource costs	- Jeremy	I suspect this will come up. Could go up top in data sources, or here if we think there are particular resources where this is up for bigger discussion.
Resource potentials	- ORESA resource potentials	

OREGON DEPARTMENT OF ENERGY

CLIMATE IMPACTS, RELIABILITY, RESILIENCE

	Data source	Questions
Climate impacts on the power system	Historical weather and hydro years	
Hydro system variability	Low, average, and high hydro year (data source)	
Resilience	Are we doing anything to measure more extreme events than usual reliability analysis – like week-long heat dome + wildfires, etc.?	

OREGON DEPARTMENT OF ENERGY

OTHER QUESTIONS

OREGON DEPARTMENT OF ENERGY

STARTING POINT FOR EXISTING SYSTEM

Data	Data source	Questions
Existing resource mix (utility-scale)	- All in-state resources plus out of state contribution over transmission - Utility IRPs and CEPs - PNUCC 2024 Regional Forecast? - Jeremy to fill in main data sources	
Existing resource mix (distributed)		
Utility-scale storage		
Transmission system	X, Y, Z	
Energy Efficiency		
Flexibility		

OREGON DEPARTMENT OF ENERGY

POLICY-DRIVEN ASSUMPTIONS

Area	Assumption	Questions
Resource constraints	No nuclear or new natural gas sited in OR.	
CCS	Retrofits permitted, sequestration opportunities limited to saline aquifer formations using NETL supply curve with none in Oregon. Oregon can offset emissions with sequestration in other states.	
Inflation Reduction Act Incentives	Supply-side incentives included for hydrogen production, renewable electricity generation, battery storage, carbon sequestration, clean fuels, and nuclear	
HB 2021	IOU Carbon Budgets are met under HB 2021.	
RPS – ORS 469A.052 and 055	RPS requirements are met	
Community solar	Include mandated community solar capacity.	

DISCUSSION QUESTION 1

Discussions so far have suggested no eligibility for natural climate solutions. Is this the path we should pursue?

OREGON DEPARTMENT OF ENERGY

DISCUSSION QUESTION 2

- Discussions so far have CCS not permitted under an 80% target. What should we allow in a 95% scenario?
  - Should we allow credits from out of state CCS?

OREGON DEPARTMENT OF ENERGY

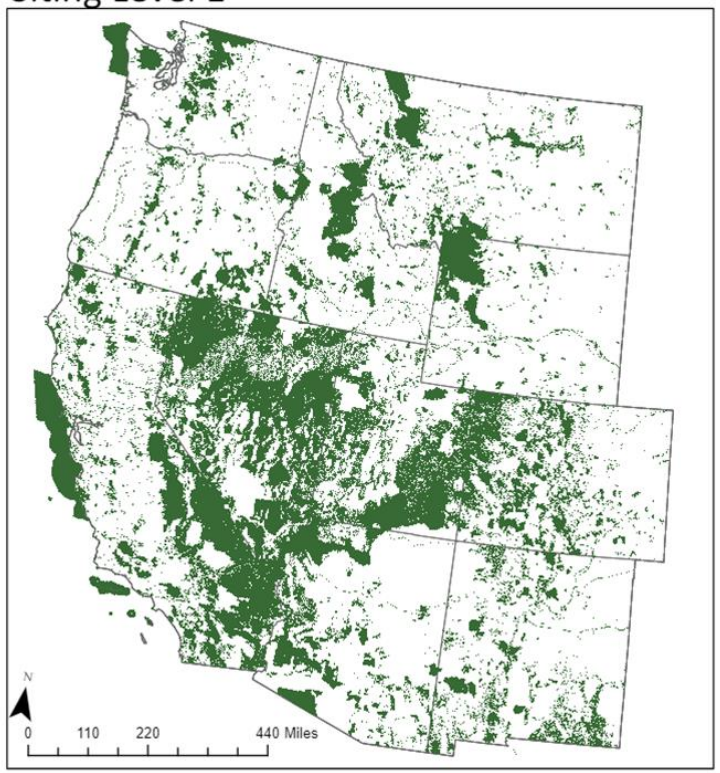
POWER OF PLACE – WEST SCREENS

Categories of Exclusion	Definition of Category	Examples	Biomass
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
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

OREGON DEPARTMENT OF ENERGY

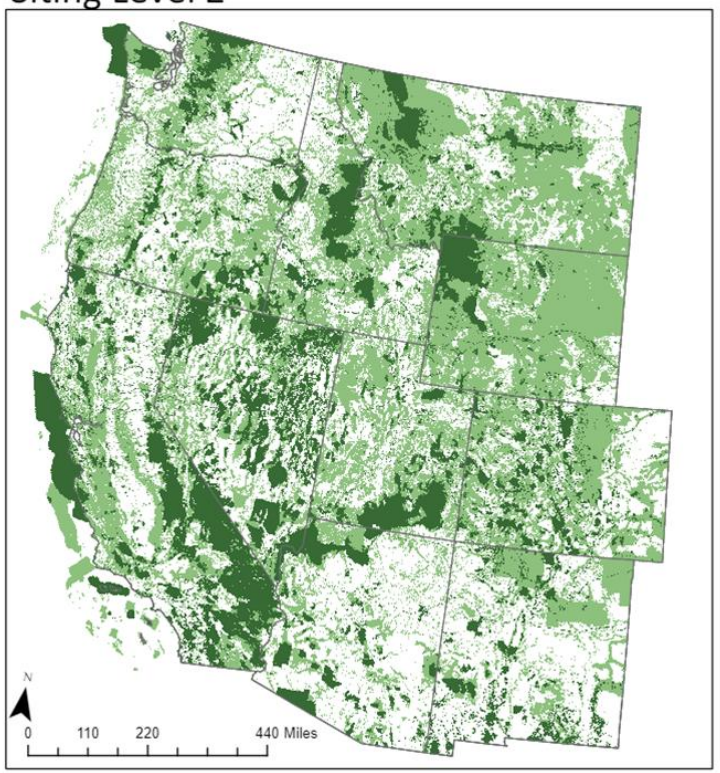
POWER OF PLACE: SCREENED OUT LAND

Siting Level 1



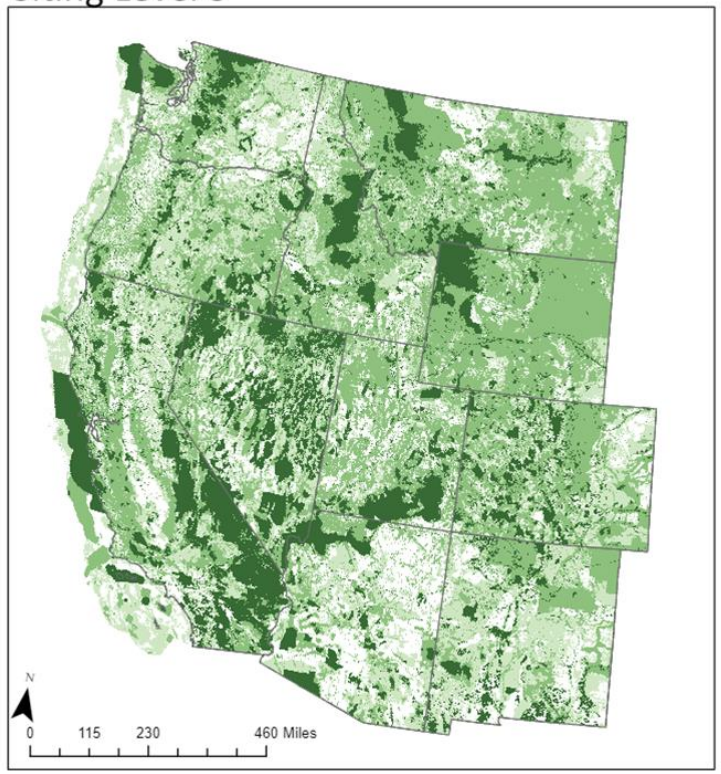
Excludes Category 1

Siting Level 2



Excludes Category 1, 2

Siting Level 3



Excludes Category 1, 2, 3

OREGON DEPARTMENT OF ENERGY

Placeholder: LAND USE IN THE MODEL

Data	Data source	Questions
Cellulosic biomass from forestry	How is this addressed in model?	
Other biomass/biofuels	How is this addressed in model?	
Water demands	How is this addressed in model?	

Jeremy can put in more general slide on biomass in the model and supply curve for biomass.
Removed natural climate solutions.
Water demands are not a constraint in the model, but can calculate what water demands look like later.

OREGON DEPARTMENT OF ENERGY

Display Name-Land Use working group
Nataliya Stranadko
Ann Vileisis
Kelly
Andrea Kreiner, OACD
Annika Roberts
Nolan Pleše he/him - LOC
Jack Southworth
Tess Milio she/her
Emily Eckert
Ashley Audycki
Lauren Link, TNC
Mike Totey
Mary Moerlins- NW Natural she/her
Emily Griffith, Renewable NW
Amy Berg Pickett
Alec Shebiel
Jeremy Thompson
John Tokarczyk
Bryan He/Him
Michael Eng, Wallowa County
Jim Johnson
Kelly Campbell
Andrew Mulkey
Zachary Sielicky
Tucker Billman
Toby Kinkaid
Shannon Bush, Benton County
Morgan B Schafer she/hers
Michael Held
Shannon Bush, Benton County