



Oregon

Tina Kotek, Governor



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Oregon State Energy Strategy Public Meeting Feedback

The following is a compilation of feedback received during public meetings held between July 23 and September 9, 2024. These meetings served to inform the modeling and technical analysis for the Oregon Energy Strategy. The Oregon Department of Energy solicited feedback throughout this time period to inform the key data and assumptions applied in the reference scenario and to provide ideas for alternative scenarios.

This record reflects feedback received during meetings of the Oregon Energy Strategy Advisory Group, Working Groups, and public Listening Sessions.

House Bill 3630 directs the Oregon Department of Energy to develop an Oregon Energy Strategy that identifies pathways to achieving the state's energy policy objectives, develops policy recommendations to help achieve these objectives, and that is informed by robust stakeholder engagement. The Energy Strategy is meant to serve as a resource over time through continued analysis and engagement to help Oregon achieve emissions reductions in line with state energy and climate policy goals.

The process to develop the Oregon Energy Strategy is divided into three phases: Phase 1 focuses on the modeling and technical analysis to explore different pathways to meeting the state's energy policy objectives. Phase 2 applies learnings from this analysis to inform policy discussion and develop policy recommendations. Phase 3 involves the development of the final report, which must include: a summary of pathways to achieve Oregon's energy policy objectives, policy recommendations, and a description of the engagement process and how stakeholder perspectives informed the Energy Strategy.

The Oregon Department of Energy continues to invite written feedback on the Energy Strategy comment portal throughout the development of the Energy Strategy. The comment portal can be found here: <https://odoe.powerappsportals.us/en-US/energy-strategy/>

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Electricity Generation Technology Working Group

David Van't Hof – Climate Solutions

Will scenarios look at different timing windows? For instance, how IOUs meet the 2030 energy targets may take different strategies than meeting 2040 or 2050 targets.

Shannon Souza – Oregon Coast Energy Alliance Network

I'm curious about the projected new gen driven by clean fuels, noted in the net zero NW model that there was very little bio fuel inclusion and why that is so?

Response to Q&A: look at the IRS's interpretation to the NW hydro system, what have here is timber basket, a lot of ag waste products. Forest Service and US DOE. Rethink that for our region. [follow-up] now pelletizing our biomass waste, exporting to Japan. Following up on OSU to use state fuels into diesel. Hopefully looking at biomass.

Multiple Working Group Members

There was discussion on various biofuel and biofuel opportunities. Jeremy explained the current modeling, and there was an encouragement for further comments to be submitted in writing.

"Biofuel-related questions included:

Also wondering to what extent aero space and maritime are included in the overall clean fuels demand?

What about biofuels into transport/aviation

Why aren't beets included into EtOH? Beets are a very usable biofuel source.

what about paper mill liquors -- in hearing about a waste resource (from Angela) shipped to Japan for fuel."

Shannon Souza – Oregon Coast Energy Alliance Network

For that Econ wide energy modeling and basing on existing infrastructure, shall we assume that Dynamic Line Rating would be included with respect to the capacity of our existing TX and IX infrastructure?

Response to Q&A: that is helpful and also troubling. I serve on the board for OSEA and for OCEAN. Serious concerns about the modeling that is provided by the utilities. Not transparent. Not believe that we are experiencing the full capacity of what could be extracted from that. Not challenging you as you have budget models. Relying on the black box, self-serving IRPs.

Martha Dibblee – Self (former Energy Facility Siting Council member)

I see there's no nuclear. SMRs can provide bolus amounts of electricity for data centers, industry & communities eliminating the need for transmission. [follow-up] SMRs are transmission reduction. seems like that's a viable discussion point.

Robert Westerman – International Brotherhood of Electrical Workers

Concur that a scenario that includes nuclear power should [sic] be modeled.

Tim Hemstreet – PacifiCorp

Also agree that nuclear power should be considered in the strategy.

Ranfis Villatoro – BlueGreen Alliance

how detailed will we get with each scenario on economic and employment impacts? It will important to know what additional needs are needed to inform key stakeholders on this topic.

Shannon Souza – Oregon Coast Energy Alliance Network

Wondering to what extent that high level view of TX and DSP captures how much of our generation is lost through transmission?

Martha Dibblee – Self (former Energy Facility Siting Council member)

why not incorporate solar into transmission to help mitigate transmission losses

Shannon Souza – Oregon Coast Energy Alliance Network

intermodal port facility being planned for Coos Bay and this would bring a lot of new maritime fuel loads. Could be a scenario.

Dave Van't Hof – Climate Solutions

I think load growth (what and where) along with transmission constraints (where, new lines for siting and greater efficiencies in the system etc) combined with storage needs are the two largest uncertainties.

Tim Hemstreet – PacifiCorp

Data centers is the major driver of load growth we anticipate.

Martha Dibblee – Self (former Energy Facility Siting Council member)

EV sales are slumping. This is one of the sales sectors that is going to be volatile but market is seeing steady hybrid growth because of slow infrastructure development.

Dave Van't Hof – Climate Solutions

I understand that an AI supported internet search takes 10 x the electricity as non AI supported. If that is accurate, data center load growth may go through the roof!

Ranfis Villatoro – BlueGreen Alliance

a lot of the what if's are still hard for me on the jobs and economic impacts as well as meeting energy goals. Understand focus on least-cost, any of these scenarios should be balancing least cost with jobs and employment opportunities in Oregon for workers in the energy transition.

Shannon Souza – Oregon Coast Energy Alliance Network

what do the different cost points mean for what the full potential of our existing transmission system are? And what are the impacts of strengthening our jobs and economic development in the state if we rely less on transmission system and more on local gen and storage potential... also these are readily and rapidly deployable.... All while we wait for more reconductoring and new transmission to be built and online

Tim Hemstreet – PacifiCorp

I believe siting and permitting constraints for utility-scale projects are likely to become more restrictive as the most readily developed sites move to the rear-view mirror and there becomes public fatigue around energy facility siting/development.

Martha Dibblee – Self (former Energy Facility Siting Council member)

Hemmingway transmission line still isn't sited. If this is an example of timelines then we're much better off using the current transmission system & using SMRs, which don't require transmission lines. [follow-up:] Hemmingway is >10 yrs

Martha Dibblee – Self (former Energy Facility Siting Council member)

What is the long-term goal in supporting more PUDs? PUDs are public utility districts without a commercial/investor-owned utility. Community board forms the utility.

Robert Westerman – International Brotherhood of Electrical Workers

Are there different scenarios for off shore wind being considered? 3 Gigs., 10 gigs, etc. Is there a scenarion [sic] where off shore wind is deployed off the Oregon Coast but not interconnected with our grid?

Shannon Souza – Oregon Coast Energy Alliance Network

Follow up on Westerman's ? re: OSW - does the 1.2 GW Oregon OSW connected to Oregon's grid reflect the grid values of that western infusion of electricity to our central and eastern Oregon TX capacity (extracting more value out of our existing system)? Also, Integrating H2 generation at the Oregon landing was included in Oregon's state planning goal of 3 GW which enables clean fuels gen on OR south coast for maritime decarb and land transportation & energy security in this highly exposed and underemployed region.

John Garrett – Oregon Citizens' Utility Board

Hi I'm John Garrett with Oregon CUB. Jeremy discussed managing the difficulty/ uncertainty of modeling lab or emergent technologies, and your generally conservative approach to including

emergent technologies. How are you treating renewable hydrogen (and the different ways of producing it and the energy losses associated with them)? This may be a better question for direct fuels, but it's something I deal with in terms of understanding how much and how quickly electrification may occur. I am also concerned over the cost-effective options for mass hydrogen storage, which may affect what hydrogen can be used for. Generally I see this as a significant subtopic within the broader concern over load growth for the grid.

Robert Westerman – International Brotherhood of Electrical Workers

Is there discussion to set a more ambitious goal? It seems to be an open question as whether [sic] or not we can meet our current goals. What if Oregon does not meet its goals?

Brenda Montanez Barragan – NW Natural

With uncertainties about Tx and Dx, increasing waiting times to interconnect, and increasing demand my thoughts is that consumers would be looking to supply their own energy maybe integrating several energy sources or permanent. In these scenarios more permitting flexibility to generate power on site, incentives, or rates to promote the investment would be necessary.

Shannon Souza – Oregon Coast Energy Alliance Network

is there a reason this rather essential working group is only meeting once?

Pat DeLaquil – DecisionWare Group/Mobilizing Climate Action Together

Like their use of the higher cost data set [Power of Place transmission]

Please clarify the nature of both the Energy Pathways and the RIO models (i.e., optimization versus simulation).

Please clarify the time steps used in each model and how the results from one model are provided to the next, and if any iteration is involved. My understanding is that the Energy Pathways model uses 5-year time steps, and RIO is an hourly model.

How do you determine hourly demand shapes for the Energy Pathways model?

As I understand it, EnergyPathways is a scenario simulation model that needs to make assumptions regarding new device market shares. Does the model require iteration to achieve the GHG targets, and if so, how if that performed.

I appreciate the level of detail included in the model for the demand sectors. What types of input data templates will be provided for review? Preferably structured by resource options and individual demand sectors, to facilitate expert review. See the Minimum Data Requirements section below.

In the Energy Pathways model, how do you characterize the timing of demand devices and what options exist for demand-avoiding technologies?

Can we provide technology characterization for emerging supply and demand devices that are in early commercial operation?

How will the model incorporate expected improvements in technology costs through learning curve effects?

I was surprised to the amount of time spent on the hydrogen module in their model. It's good that the model has this capability, but I would have liked to have seen similar detail on each sector of the model. Question: How are H2 infrastructure costs developed?

What are the timelines for each option? GETs, Reconductoring, Co-location and New.

Biofuel discussion: Will the model use carbon intensity for biofuels? e.g., Agricultural emissions for biomass resources: resource transportation, processing and fuel delivery emissions – many of which are non-energy emissions or incremental to the historical transport demands.

What infrastructure improvements does you pipe flow transmission modelling allow for? What are the key data inputs?

What is the data source for transmission capacity?

All of the [hypothetical what-if] questions below [shared in the meeting] assume some changes from the Reference case, and while the questions below are some of the most critical questions, these questions can only be answered on the context of what is the Ref case value, and what level of change is being projected in the scenario.

Proposed a possible scenario matrix [comments ~2 pages; see Word file]

Brenda Montanez Barragan – NW Natural

NW Natural was encouraged by the integrated supply side discussion surrounding increased integration of the electric system and fuels.

" However, the focus was heavily on green hydrogen adoption and its transformation into other products. There are significant constraints beyond the development of electrolyzers [sic], including the lack of new renewable

energy projects—along with the time it takes to develop and interconnect these projects—lack of transmission capacity,

uncertainty around policies and incentives for green hydrogen, and the storage and transportation costs to end users. "

recommends a more comprehensive approach to integrated supply could include dual fuel alternatives for residential, commercial, and industrial applications, integrating existing fuels or other forms of hydrogen

policies and incentives should be developed for utilities to collaborate on these solutions, determining which would be the most cost-effective.

It is essential to consider the need for a complementary role of dispatchable energy sources such as fuel-based back-up generation. This might be contradictory to reducing fuel consumption but will be crucial for providing grid stability during peak times. Relying solely on batteries and green hydrogen for this purpose might not be feasible due to the high cost and challenges of integrating new renewable energy projects as previously mentioned.

For the supply side, instead of using fixed outage rates, a range of possible outages should be incorporated, including correlated failures, climate impacts on renewable resources (including hydro), and the increasing frequency of extreme weather events like wildfires. NW Natural encourages ODOE to update the model to reflect current baselines. Failure to update the model can lead to proposed strategies that may not reflect the real baseline and could be biased toward what we want to see rather than what is realistic.

Emily Griffith – Renewable NW

We would like to stress the importance of sufficiently capturing dynamic load growth in Oregon. There are many new and future large single load customers in the state and the numbers are projected to increase in all service territories, investor-owned utility (IOU) and consumer-owned utility (COU) territory alike. We note that load increases are noted in the Energy Efficiency and Load Flexibility supply-side assumptions, however we would like to ensure these dynamics are sufficiently captured in the demand side of the model. We also recommend reflecting these load increases in the Transmission and Distribution section, as well, as they will implicate transmission and distribution system capacity.

We support the inclusion of a scenario that meets net-zero emission reduction targets. Including this as an alternate scenario in addition to the others would provide an interesting pathway to compare to. We are not advocating for replacing this scenario with the HB2021 target in the reference scenario, but including it among the alternatives. If this is an option, we believe that it would be beneficial to see this pathway illustrated on an achievable timeline following the 2040 HB2021 target, such as 2050.

We appreciate the use of the Evolved Energy Research models to inform Energy Demand agree with the sentiment that siting restrictions apply to new generation, interconnection, and transmission and out-of-state generation requires transmission

We agree that relying on out-of-state generation too heavily creates a scenario where we rely more heavily on transmission that will likely take too long to develop. This would also not contribute greatly to the goal of maintaining reliability. Resources developed closer to energy load (or demand) increase reliability of the grid for local Oregon communities.

At the last large Advisory Group meeting, the use of biofuels was heavily emphasized as a Generating Option. While biofuels and clean fuels may have a role in the clean energy transition, we would like to ensure that the modeling of these generation options include their associated emissions when implemented. We have heard that the model will choose technologies based on reliability and cost, and therefore, we expect the model to choose wind, solar, geothermal, and hydropower over biofuels in most cases - in addition to the fact that they are non-emitting.

While the benefits of coal, gas, and nuclear were all brought up in the working group, Renewable Northwest strongly opposes any inclusion of these resources as they are not aligned with the states goals and the legislative direction to model the pathways to achieving HB2021 reduction targets.

although not a “generating” resource, utility-scale Battery Energy Storage Systems (BESS) should also be included in the reference scenario and included in this section. We expect more storage to be added to the grid. Storage will be an integral part of meeting GHG reduction goals and maintaining reliability - one of the characteristics that the model was said to prioritize.

Shannon Souza – Oregon Coast Energy Alliance Network

It is imperative that ODOE’s work to identify optimal pathways for achieving our state energy policy objectives embraces the reality of increasingly frequent extreme weather events and the opportunities for substantially strengthening our grid resilience with resources locate in and near our communities.

Based on the content and discussion at the meetings of the Strategy Advisors, Generation Workgroup and All Workgroups and after review of the Draft Reference Scenario (Reference) we are concerned about the ability of the proposed policy framework, modeling approach or reference scenario to capture the values to Oregon’s grid, communities and ecosystems of local renewable energy, clean fuels and smart grids. As the only readily actionable path that is neither contingent upon nor disruptive of transmission planning and development timelines, extracting maximum value out of our existing infrastructure with community sized, locally accessible resources is a commercially viable pathway demanding adequate, transparent evaluation.

"The modeling approach must enable rate payers and lawmakers to compare the full costs, timelines and grid values of local renewables with those of imported energy delivered to Oregon communities. This comparison is not provided in Integrated Resource or Clean Energy Plans and is essential to ODOE’s identification of optimized pathways to achieving the state’s energy policy objectives. ... The modeling approach presented by CETI does not support a comparison of energy made in Oregon, sized and located to meet our load demands and grid constraints vs large new distant generation requiring new transmission. Instead, the approach presented is to aggregate reliability and loads across the entire state and only capture high level transmission conditions across two regions. As such, this approach does not comply with the statutory direction to

“identify optimized pathways to achieving the state’s energy policy objectives.””

The “anchor policy” framework of the modeling proposed by ODOE does not include essential components of HB2021 including Sec 2.(2) directing benefits to communities in the forms of creating and sustaining meaningful living wage jobs, promoting workforce equity and increasing energy security and resiliency as well as the rapidly approaching 80% decarbonization by 2030 milestone. ... The Draft Reference Scenario Key Data and Assumptions proposes to adhere only to “anchor policies” that do not, evidently, include HB 2021 Sec 2.(2) directing benefits to communities in the forms of creating and sustaining meaningful living wage jobs, promoting workforce equity and increasing energy security and resiliency. We strenuously object to this exclusion. ...

The grid, economic and resilience values of rooftop, community, commercial, small qualifying facilities and utility scale renewables, storage and advanced grid technologies should be able to be reflected by the modeling framework and evaluated in Reference and Alternate scenarios and we do not believe that the proposed approach can do so.

Likewise, the rapidly approaching 80% carbon reduction by 2030 should be included as an anchor policy and strategies imbedded in all scenarios intended to meet this goal.

the reference must also reflect near term actions such as distributed resources opportunistically sited closer to load centers and advanced grid management technologies unlocking additional efficiencies, safety measures and hosting capacity within our existing distribution and transmission systems ahead of the 2030 milestone

The modeling must support an evaluation of the impacts of wildfires, earthquakes, heavy snow and other weather events that impact Oregonian communities access to energy and fuels in both Reference and Alternate scenarios.

"The reference scenario should reflect near term in-Oregon, technically feasible infrastructure potential as well as the existing policies, planning and funding streams available to support from rooftop to large scale solar and other non-emitting generation and energy storage within Oregon including:

- PURPA
- Solar For All
- Building Resilience Infrastructure and Communities
- County Energy Resilience Plans
- Tribal Climate Adaptation and Mitigation Plans
- Western Resource Adequacy Program
- Tribal energy funding
- Community Renewable Energy Program"

The Reference scenario should include a growing number of moderately sized solar projects located throughout Oregon. Projects of 3 to 60 MW, small qualifying facilities, are easier to site and interconnect than larger utility scale projects, are right sized for many large new clean tech loads, can be more desirable to host communities and, when paired with storage, can make lifesaving contributions to grid and community resilience. In addition to federal grant funding and tax incentives available for these projects, the historically undervalued avoided costs assigned to PURPA and Community Solar is poised for re-evaluation in Oregon PUC's Capacity docket UM2000.

The reference scenario should not dismiss renewables developed in COU service territory.

The reference scenario should not rely on predicting the success of our neighboring states in accomplishing their energy, climate and technology deployment goals in a manner that can and will accommodate the needs of Oregonians.

The proposed reference scenario should not incorporate the most recently filed Integrated Resource Plans or Clean Energy Plans from PGE or PacifiCorp as neither has been acknowledged by Oregon Public Utility Commission and neither achieves 80% carbon reductions by 2030, which the reference scenario does not appear to acknowledge.

HB 3375 established our state OSW planning threshold of 3 GW, a number designed to balance and maximize the interconnection capacity of Oregon's coastal and inland grid while providing ample variable surplus clean electricity for the generation of green electrolytic hydrogen at and near the International Port of Coos Bay. The values of direct interconnection into Oregon's grid and opportunity for Oregon's coastal communities to access secure, clean fuels to support maritime and land based transportation should not be dismissed nor should reasonable development timelines be deferred by the assumed displacement by California OSW imports in the reference scenario.

"The reference scenario should include a full spectrum of renewable, clean energy deployments available within Oregon including:

Rooftop Solar: 5 – 10 kW

Commercial Solar: 10 kW – 1 MW

Community Solar: 1 – 3 MW

PURPA Solar, Hydro and Wind: 3 – 50 MW

Utility Scale Solar and Wind: 50 – 500 MW

Oregon Offshore Wind: 3 GW"

Section 3 Alternate Scenario: Extract Maximum Value of Oregon Infrastructure (EMVOI) [see pages 4-6 of comments]

ODOE should consult with Oregon Departments of Forestry and Agriculture regarding resource availability and status of energy related studies.

Jennifer Joly – Oregon Municipal Electric Utilities Association

How does the 26% of the state served by Oregon consumer-owned utilities (COUs) factor into the statewide model for electricity? While COUs are not subject to HB 2021 because of our existing clean energy mix, what assumptions are made in our years regarding the necessity of additional generation to meet COU load growth from electrification and economic development using the “back casting approach”?

With respect to 100% clean electricity by 2040 for PacifiCorp, PGE, and electricity service suppliers, it is unclear how the reference case will also incorporate the statutorily authorized “reliability pauses” and required cost caps.

SMRs should be modeled in one of the scenarios

Tucker Billman – Oregon Rural Electric Cooperative Association

I appreciate the acknowledgement of hydropower playing a key role in meeting the state’s clean energy objectives. This is a critical acknowledgement, especially for consumer-owned utilities who are already nearly 100% free of greenhouse gas (GHG) emissions and who serve a geographic majority of the state. We are already doing our part to help the state achieve its GHG goals.

Fred Heutte – NW Energy Coalition

"The NW Energy Coalition (NVEC) thanks the Oregon Department of Energy for the background materials and extensive advisory committee and subgroup review of the inputs for the reference scenario modeling supporting the 2025 Oregon Energy Strategy.

In general we are supportive of the breadth and details of the key data and assumptions, and provide some additional comments and suggestions as follows: ... Energy Generation Technologies – no comments at this time"

Aja K. DeCoteau – Columbia River Inter-Tribal Fish Commission

We appreciate ODOE’s effort to include accurate hydropower system operations forecasts in this baseline model by incorporating current energy budgets, flow-constraints, and low/ medium/ high hydro year data.

To begin, ODOE’s current approach to incorporate data from the Northwest Power and Conservation Council (NPCC) is an appropriate starting point. NPCC’s GENESYS model integrates both historic and future flow simulations, taking into account climate projections and some requirements for fish survival.

The Baseline should reflect minimum biological constraints. ... We understand that NPCC staff are addressing this problem, which is not inherent to the GENESYS model. But to ensure the baseline OSES model does not also inadvertently overestimate hydro capacity for load-following and peaking, we recommend ODOE work directly with NPCC to ensure the model accounts for minimum flows, spill requirements, and other fish constraints detailed in fish and water

management plans. 6 If, as a result, Oregon's energy needs require additional generation, storage, grid flexibility, or efficiency measures to meet both clean energy targets and minimum fish requirements, the baseline model should reflect this fundamental reality.

The Baseline should incorporate binding USG Commitments improving hydro operations.

Hydro operations have changed significantly over time, which affects the ability to use historic hydro calculations for future analysis. What is the timeframe for the historic calculations in the model? The last 10 years, the last 20 and/or the last 5 years? The further out the timeframe, the further the assumptions are from what is actual.

"Spring operations have been altered a lot in the last two to four years; the model is likely to overestimate the capabilities or load capacity of the Columbia hydro system current operations. Appendix B in the RCBA should help clarify how the current operations match up with historic.

The new summer operations actually have an opposite effect since spill has been reduced on August 1. If the model is using data from 2005 when summer spill was added through August 31, the current reduced summer spill operations should actually show as a net positive in hydro capacity. "

The ramp rates of 1 and 6 hours need to be clarified for where the control points are. Is this Grand Coulee ramp rates? Do the rates change daily? seasonally? The time of year plays a major role in this. Also, do they account for different flow years since it is easier to change the ramp rates in low to medium flow years than high flow years.

The model being developed for the USG commitments considers breach of the LSRD in its longer-term forecast. Because this outcome is a real possibility for the region, the OSES model should incorporate replacement reliability needs from the Snake River dams, especially in the model's forecast of energy reliability in future decades.

Looking ahead, ODOE should model a scenario for a low-peak, low-hydro reliance energy future that aligns with recommendation in the Energy Vision.

Joshua Basofin – Climate Solutions

"We recommend that ODOE identify additional data for the following areas:

1. Existing and New technology options with cost and performance data, and constraints (growth rates, resource limits, market share constraints, etc.). These should be categorized by sector and energy service.
2. Existing and new energy resource supply options, cost curves and resource projections for all fossil, renewable and imported resource options.
3. Existing and projected load duration curves for electricity demands 5. Methodology and assumptions (e.g., reserve margin) for determining peak loads (and capacity needs). "

ODOE should articulate its criteria for determining when specific technologies are existing vs emerging, and the modeling should reflect the potential scaling of generation and fuel

technologies accordingly. Below are a few examples of technologies that are more nuanced in terms of growth.

Floating offshore wind is an existing technology and has been deployed in several regions globally. A total capacity of 3 GWs by 2030 is possible for offshore wind on the Oregon coast.

SMRs are not operational in any geographies yet and therefore can be considered emerging

Some geothermal technologies are existing and operational, but nextgen geothermal is still emerging.

Green electrolytic hydrogen is an existing technology that has been deployed extensively in Europe and in limited areas in the US.

Microgrids and small-scale renewable energy facilities are existing technologies, have limited deployment in Oregon, and can potentially be scaled to provide substantial energy capacity, resilience, and economic benefits.

Mary Moerlins – NW Natural

NW Natural wonders why Carbon Capture Storage, CCS, is not permitted in Oregon under the reference scenario? CCS is supported by the Infrastructure Investment and Jobs Act and the IRA. CCS is an important component of a clean fuels pathway and by leaving it out of the reference scenario it makes it more difficult and expensive to increase the use of clean fuels. NW Natural recommends adding CCS to the reference scenario.

Jennifer Joly – Oregon Municipal Electric Utilities Association

While we understand that HB 2021 prohibits the siting of new natural gas plants, threats to reliability —particularly due to more frequent extreme weather events— and affordability require that model assumptions be conservative about the near-term phase out of existing natural gas plants in Oregon. It may be good to look at natural gas peaker [sic] plants in one of the scenarios.

In looking at solar generation, it is important to consider the impact of climate change.

In their report to the Northwest Power & Conservation Council (NWPCC) regarding the Northwest Power Supply Adequacy Assessment for 2029, NWPCC staff indicated that the assumptions in their “base case” are not more probable than the “mid case” scenario, which is informed by utility forecasts. Given the uncertainty of data center load growth, NWPCC’s datacenter range spans from a floor of 1,800 aMW to a ceiling of 6,500 aMW. Given this range, the lack of certainty in this area, and the loads we are seeing in the BPA the interconnection queue, it makes more sense to look to the middle of the uncertainty band—3,976 aMW, rather than the NWPCC base case of 2,400 aMW. We don’t recall any discussion of why this base case was assumed instead of the mid case in the reference scenario.

Erin Childs – Renewable Hydrogen Alliance

For electricity generation options, RHA recommends that ODOE include hydrogen combustion as a resource, both as a blend with natural gas and with turbines that can operate on 100 percent hydrogen. It is also essential to note that the new 100 percent hydrogen turbines being designed and tested today will still require some natural gas blending for a startup phase. Additionally, it is possible that thermal plants using 100 percent hydrogen turbines would still retain natural gas as a backup fuel when hydrogen is in short supply.

Given the model's assumption of no new interzonal transmission until 2035, RHA strongly recommends that the model be permitted to consider dedicated hydrogen pipelines as an alternative or a complement to transmission upgrades to alleviate pressure on the transmission system and support timely development and delivery of renewable hydrogen, in alignment with state climate objectives.

Kelly Campbell – Columbia Riverkeeper

Is new nuclear power built in other states being included in the reference scenario or alternative scenarios? And if so, how are you calculating the cost and timeframe for any nuclear projects? In its 2024 report, the Institute for Energy Economics and Financial Analysis (IEEFA) finds that "small modular reactors still look to be too expensive, too slow to build, and too risky to play a significant role in transitioning from fossil fuels in the coming 10-15 years." They also caution that the opportunity costs associated with investing in SMNRs will restrict funding for renewable energy

We note that small modular nuclear reactors should not be considered an existing technology since they have not been built in the U.S. We suggest that energy from new nuclear power should not be included in the reference scenario as there are not credible datasets available to support accurate modeling. ... not consistent with spirit of current Oregon law to propose additional nuclear plants and nuclear waste on communities outside of our state to supply energy to oregonians.

"Lower Snake River Dams Removal: Does the reference scenario or other modeling include removal of the four lower Snake River dams? Given the Columbia Basin Restoration Initiative lays out a pathway toward breaching the dams, this is a realistic scenario that should be included in one of the models. Our energy future should be compatible with a thriving salmon population."

Does the reference scenario consider significant snowpack reduction or other changes in precipitation volume and timing? This would have significant impacts on hydro power

Does the reference scenario make any assumptions around hydropower? If so, what are they?

Will a robust plan for rooftop solar, community solar and storage, and other distributed energy be included in the reference model or other models? How are co-benefits being considered? How is EJ being prioritized?

Does the reference scenario or other scenario include hydrogen as an electricity generating resource? If so, does it include hydrogen blending with methane gas? Is it limited to “green” hydrogen and reserved exclusively for the most difficult to electrify sectors?

Is biomass included in the reference scenario, and if so, how will you model the air pollution impacts from it?

Are biogas facilities included in the reference scenario, and if so, how will you model the air pollution impacts from facilities producing biogas?

How, if at all, is energy for additional data centers and AI being addressed in the reference scenario and other scenarios? Is there an option to propose new policy to limit these in Oregon?

How will the reference scenario or other scenarios model the effects of expanding regional day-ahead and other energy markets? What assumptions are you making about how those regional markets, and participation in them, will change over the next decade or more?

Mark Heizer – Oregon Building Code Division

Data center and chip fabrication load growth trajectory : IS this realistic?

Rooftop solar scheduled additions: How to increase uptake (including limitations on VNM and non-IOU limits)

Direct use fuels - demand-side assumptions: Nothing on "micro-grid"/storage (how to incentivize) to reduce impact locally (bigger demand response), PV legal changes. Community solar/storage demand response (VNM). CODE and appliance standards for demand responsive buildings (regulatory, legal)

Pamela Barrow – Food Northwest

"Availability and reliability concerns also arise from the unexpected increase in electricity demand from proliferation of data centers in the Pacific Northwest. See recent article

<https://washingtonstatestandard.com/2024/08/26/energy-demand-fromdata-centers-growing-faster-than-west-can-supply-experts-say/>

We appreciate ODOE including Data Center Load Growth in the reference case. What assumption will be used for the increase in demand? There is a considerable difference between the Council’s projection and PNUCC’s"

Ann Vileisis – Kalmiopsis Audubon Society

"CAUTION ABOUT CONSIDERATION OF TIMBER BIOMASS FOR ELECTRICITY GENERATION

The ODOE Energy Strategy Electric GeneraJon [sic] Working Group idenJfied [sic] interest to further explore biomass from Oregon’s “Jmber [sic] basket” as a potenJal [sic] means for future electric generaJon [sic], based on the vision set forth in the U.S. DOE’s 2023 Billion-Ton Biomass

study. That study focused on agricultural crops to generate biomass for liquid fuels and energy generation [sic]. Using biomass from forest materials as a means of electric generation [sic] is higher cost compared to other potential [sic] renewable energy sources, but most important, using Oregon's forest resources to generate electricity has a higher potential [sic] to create conflict and environmental harms without very careful constraints."

Chris Kroeker – NW Natural

NW Natural is concerned by the cost and/or reliability off-ramps taken by Oregon electric IOUs thereby missing HB2021 decarbonization targets.

Alexis Hammer – Oregon Department of Land Conservation and Development

This seems like a broad statement [siting restrictions] with many devils in the details. How will these siting restrictions be operationalized in the model? Will it be a time add-on, total developable area reduction, coin toss on whether a chosen generation option succeeds or fails against opposition? Some other method?

How many GW of offshore wind are assumed developed off Oregon? Will you stick to the 3GW planning goal, will you use the NREL model of offshore wind (under development) for future projections, or something else?

I don't have a source of projected LCOE/EROI for offshore wind, but I know they are out there. Is there a cost point that FOSW must meet to be allowed to be purchased in Oregon? How will the model handle generation sources that are significantly more expensive than solar or hydro? Does the reference scenario assume that those costs are borne by customers? Aren't there PUC policies and restrictions on utilities to provide least cost power or something of that sort?

On a related note, I've heard it said that creating generation west of the valley would permit more solar growth in the east side because the east-west grid would be less congested. Does that benefit get monetized in any way to give a cost-averaging credit to offshore wind?

Is the purpose of the Transmission Availability category to assess our ability to purchase or exchange renewable energy from other states, or is the purpose to assess the feasibility and scale/location of potential energy generation growth within the state? How regional does this model get?

Does the model assess what happens if we sell "expensive" offshore wind power to California or Washington and "import" less expensive power from out of state? To what extent is Oregon on our own to meet our energy targets, within our own available lands/waters, versus taking an import-based approach to meeting targets?

Transmission Availability: The Power of Place transmission figure cited here does not include any new transmission between Bend and the coast, yet the transmission workshops I've attended, hosted by USDOE, include new potential transmission routes between the coast and the valley, modeled by NREL. From my non-expert vantage, transmission seems like one of the

major bottlenecks and decisive factors in the energy mix modeling. If offshore wind is assumed to be added to the grid under the reference scenario, you should include the NREL offshore wind transmission study currently under development, and build in those costs to the model.

Amy Berg Pickett – Oregon Solar + Storage Industries Association

the scenarios need to have the right components. They need to accurately reflect Oregon’s climate and energy goals and laws as well as on the ground conditions and the increased power outages we are experiencing in Oregon.

Oregon policymakers can only be fully informed if there is a scenario included that only reflects physical and technical restraints to achieving Oregon’s climate and energy goals. This scenario should not include other current policies, which can be changed by the legislature. The legislature needs to know the full realm of the possible and not have current policies constrain innovative thinking about how we reach our energy goals.

The presented policy framework, modeling approach and proposed reference scenario all fail to meet the statutory objective of HB3630 of identifying optimized pathways to achieving the state’s climate and energy policies and policy objectives. [Comments list concerns regarding energy policies, see pages 1-2 and related mentions at 3]

The grid, economic and resilience values of rooftop, community, commercial (PURPA) and utility scale renewables, storage and advanced grid technologies should be able to be reflected by the modeling framework and evaluated in Reference and Alternate scenarios.

The modeling approach presented by CETI does not support a comparison of energy made in Oregon, sized and located to meet our load demands and grid constraints vs large new distant generation requiring new transmission. Instead, the approach presented is to aggregate reliability and loads across the entire state and only capture high level transmission conditions across two regions. This does not provide the level of locational resolution necessary to recognize or effectively weigh the significant implications of resource, storage and load locations on grid reliability, community energy security or economic harm or benefit. As such, this approach does not comply with the statutory direction to “identify optimized pathways to achieving the state’s energy policy objectives.”

The modeling must support an evaluation of the impacts of wildfires, earthquakes, heavy snow and other weather events that impact Oregonians access to energy and fuels Reference and Alternate scenarios but does not appear to do so.

The reference scenario should not rely on predicting the success of our neighboring states in accomplishing their energy, climate and technology deployment goals in a manner that can and will accommodate the needs of Oregonians.

The proposed reference scenario should not acknowledge the most recently filed Integrated Resource Plans or Clean Energy Plans from PGE or PacifiCorp as neither has been acknowledged by Oregon Public Utility Commission and neither achieves 80% carbon reductions by 2030.

Physical upgrades to Oregon's energy structure must be assumed under a realistic timeline. The draft Reference Scenario presumes that neighboring states will achieve their technology deployment and clean energy generation goals and that these resources will necessarily be available in time to meet Oregon's needs through transmission routes that have not been constructed. As a result, the Reference categorically omits or delays consideration of significant renewable resources available within Oregon and off of state shores to strengthen our grid and economy.

Clean energy generation and storage assets can be strategically located within Oregon to reduce line loss distances between generation and load, complement legacy and evolving power flows, insert firm generating resources into energy island pockets, increase community energy security, improve power and air quality, reduce wildfire risks and make meaningful contributions of geographic and resource diversity to a robust WECC.

"The reference scenario should reflect near term in-Oregon, technically feasible infrastructure potential as well as the existing policies, planning and funding streams available to support from rooftop to large scale solar and other non-emitting generation and energy storage within Oregon including:

PURPA

Solar For All

Building Resilience Infrastructure and Communities

County Energy Resilience Plans

Tribal Climate Adaptation and Mitigation Plans

Western Resource Adequacy Program

Community Renewable Energy Program

Community Solar

Net metering "

"Additionally, the Reference scenario should not presume that the historically undervalued avoided costs assigned to PURPA projects prevail in future procurement rounds. Oregon PUC's Capacity docket, UM2000, is poised to embark on a re-evaluation of avoided cost models. Staff's proposal is framed with the goal of "sending more precise signals about what provides value to the utility system and its users, which includes:

- Reflecting the importance of reliability under a changing system.
- Recognizing the transmission expansion required to acquire the resources identified in the utilities' resource strategies.
- And Aligning with changing resource procurement drivers and approaches, which includes:

- Providing more realistic avoided resource characteristics.
- Recognizing the shift to more frequent and nimbler, all source procurements.
- Reflecting the ability of small QFs to contribute to Portland General Electric and Pacific Power's small-scale resource (SSR) requirements.
- Recognizing that RPS compliance is not likely to drive procurement for Portland General Electric and Pacific Power. "

While COU development of renewables to serve internal loads may currently be restricted by BPAs preference customer program, renewable development within COU preference customer networks remains an open right under PURPA and open access transmission and provides a timely and valuable pathway toward meaningful contributions to achieving state energy, reliability and climate objectives.

"The reference scenario should include a full spectrum of renewable, clean energy deployments available within Oregon including:

Rooftop Solar: 5 – 10 kW

Commercial Solar: 10 kW – 1 MW

Community Solar: 1 – 3 MW

PURPA Solar, Hydro and Wind: 3 – 50 MW

Utility Scale Solar and Wind: 50 – 500 MW

Oregon Offshore Wind: 3 GW "

Section 3 Alternate Scenario: Extract Maximum Value of Oregon Infrastructure (EMVOI) [see proposal on pages 5-7]

Erin Childs – Renewable Hydrogen Alliance

For electricity generation options, RHA recommends that ODOE include hydrogen combustion as a resource, both as a blend with natural gas and with turbines that can operate on 100 percent hydrogen. It is also essential to note that the new 100 percent hydrogen turbines being designed and tested today will still require some natural gas blending for a startup phase. Additionally, it is possible that thermal plants using 100 percent hydrogen turbines would still retain natural gas as a backup fuel when hydrogen is in short supply.

Direct Use Fuels and Industry Working Group

Lee Archer – Portland General Electric

"Are you pulling in work done by PNNL or WSU?"

Will consider today's discussion and follow up if he thinks recent models/studies from PNNL are relevant. In particular, may want to look at their better modeling / testing, hydrogen, and carbon capture studies?"

Rebecca Smith – Renewable Hydrogen Alliance

"Happy to see slide showing regional context but curious about exclusion of B.C. – there's a lot of relevance there when it comes to hydrogen (WA Dept. of Commerce is doing a study looking at linkages for hydrogen production); Will check in with Commerce to see if they have any useful data

IRA will play a role but also possibility of companies producing other H₂ that's not IRA compliant. Could be input/export market."

Tim Miller – Oregon Business for Climate

does the model get at all the investment decisions that players make? Industrial, commercial or consumer investments? And the various thought processes they have – ROI, payback, consumer looking to reduce monthly costs? How do you translate these costs and demands into triggers that drive investments? Does model have ability to determine where policies will enable a technology to take off?

Michael Meyers – NW Natural

"Echo concerns Rebecca had; importance of BC and Alberta for natural gas markets and east of there, biofuels and RNG markets

Is this model a CGE model? Or is it two models where results of one feed another?"

John Garrett – Oregon Citizens Utility Board

"Good study with regionally specific analysis of space heating appliances: Lauren Ross et al., Analysis of Electric and Gas Decarbonization Options for Homes and Apartments,

American Council for an Energy-Efficient Economy, at 37-38 (September 2022)

<https://www.aceee.org/sites/default/files/pdfs/b2205.pdf>"

Karl Haapala – Oregon State University

these targets could be more aggressive: e.g., this reference indicates 25-35% in the first six years (I'm not sure of the basis of this number, however):

<https://www.encyvermont.com/services/project-support/strategic-energy-management>

Michael Meyers – NW Natural

are these numbers from studies that say these numbers can be achieved?

Michael Meyers – NW Natural

Want to make sure these are all realistic assumptions being made, because we know electrification is difficult in specific sectors

Sharla Moffett – Oregon Business and Industry

"trying to figure out what technology this is achievable by? Electricity has not proven to be possible for many sectors you have listed here.

How does this work / how have you estimated this?"

Rebecca Smith – Renewable Hydrogen Alliance

"1) Glad you mentioned high heat, electrification not feasible for those end uses, but don't see explicitly here that hydrogen is called as potential fuel for high heat – is hydrogen in mix?

2) When you say 20% of industrial vehicles for switch to hydrogen – what are underlying assumptions that get to that figure?

-ODOT TEINA sub study for hydrogen pathways came up with targets based on ZEV goals and extrapolating to transportation"

Sam Lehr – The Coalition for Renewable Natural Gas

"understanding there may be a limited potential for RNG given all the sectors that use natural gas – renewable methane could be included where using hydrogen – why not using this?

Should be note in final study that there is uncertainty around this

Provided study with data on RNG:

<https://static1.squarespace.com/static/53a09c47e4b050b5ad5bf4f5/t/633232e43e255c03baf1c40/1664234232436/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf>"

Lee Archer – Portland General Electric

Q related to hydrogen – does model assume that PNW Hydrogen Hub is built out as designed or does model try to predict the outcome of the hub based on all the variables currently making it a challenge for that hub? This relates to questions asked earlier by RHA.

Michael Meyers – NW Natural

Comment – if it is something a levelized cost can be produced for, then yes include it, but if do not have a reliable data source, then difficult to include in model outside an undefined resource mix

Lee Archer – Portland General Electric

thinking about investment as it relates to energy strategy, there's a real infrastructure need for jumping the next hurdle as it relates to bringing on new technologies. For example, for hydrogen and RNG, moving this product by truck is not most efficient so what would the transportation medium be? Do we need more piping, rail, shipping? What other elements need to be built out to make it efficient and productive? Bigger than just transmission

Tim Miller – Oregon Business for Climate

you should look at 100% decarbonized (net) scenario, since that is clearly what is required by science more broadly, and likely by policy in long term

John Garrett – Oregon Citizens Utility Board

one thing CUB is considering: when we weigh electrification against direct fuels use, particularly in building sector, concerned about meeting winter peaking load. This is something the direct fuels providers are suited to do now b/c of big storage facilities. But thinking of electrification, need to think in terms of building out energy storage technologies and haven't heard this discussed yet. What energy storage technologies are you looking at and what different factors are you looking at to consider optimal use of RE sources that are not dispatchable?

Sharla Moffett – Oregon Business and Industry

are we considering including these questions in the model? Question is directed at achievability. 80% reduction is extremely difficult as it is – very expensive, many technological challenges. I would be very concerned about how this would be couched in the report and what the viability is of truly doing something like this b/c don't think have a path forward to getting there.

Valerie Egon – Business Oregon

How is the model looking at workforce or infrastructure in that sense and what the needs and trends would be in that area in alignment with goals? E.g. if we're talking about a scenario of greater investment in EE, what does this mean for workforce needs in productions, operations, maintenance, etc.?

Chris Kroeker – NW Natural

"NW Natural suggest that ODOE investigate the significant supplies of low-carbon hydrogen shipped via pipeline from Canada including BC and Alberta. Resources regarding this future can be found here at BC Hydrogen and Alberta Hydrogen. In addition to low-carbon hydrogen in Canada, there are significant supplies of synthetic methane produced from green hydrogen and waste CO2 becoming available in the region.

<https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/renewable-energy/hydrogen-office>

<https://www.alberta.ca/hydrogen-roadmap>"

"NW Natural wonders why are larger industries, such as pulp and paper, not being considered in the Direct Use Fuels and Industry section?"

The comment was made that it was challenging to incorporate technologies like advanced geothermal as limited data are available. There are limited data for other future technologies, such as low and high temperature heat for industry, etc., yet there are back-casted electrification goals for these. Why are these being included? What is backing up these electrification goals? Why have them if there is nothing to support them? NW Natural suggests removing these as they are highly subjective.

NW Natural recommends incorporation of applicable data and analysis produced by GTI Energy around Net Zero Infrastructure: <https://nzip.gti.energy/>

Michael Meyers – NW Natural

NW Natural appreciates that Evolved Energy Research used two models, a demand side and supply side model, for their analysis, we do not agree with this approach. NW Natural recommends using a Computable General Equilibrium (CGE) model, which captures price changes and substitution effects between production, consumption, and trade. NW Natural believes the CGE model is the preferred model for policy analysis and recommends running analysis using this model.

NW Natural is concerned with the electrification assumption made across industrial sectors. NW Natural believes that the best source of information for changes in our state are Oregon residents and businesses and is concerned that electrification assumptions are broad generalizations based on national assumptions. NW Natural implores ODOE to reconsider electrification assumptions.

NW Natural is extremely concerned that the outcomes of the Oregon Energy Strategy are not greenhouse gas emission reductions, but electrification goals. NW Natural is disappointed that ODOE implied that GHG emission reductions can only be achieved through electrification throughout the presentation, discussion, and draft documentation. NW Natural hopes a stronger emphasis on GHG emissions reductions will occur in future discussions.

Alyn Spector – Cascade Natural Gas

formally request to be included as members of the Oregon Energy Strategy Advisory Group as the next phase of modeling commences.

"Draft assumptions should be realistic, rather than aspirational. While Cascade appreciates that ODOE is modeling its assumptions from the state's energy objectives and greenhouse gas reduction goals, differentiation should be made between goals and outcomes. For instance, while a goal may be to achieve a target such as 95% of overall space/water heating sales for electric heat pump sales by 2040, this outcome will be dependent upon myriad factors including equipment affordability, market adaptation, and individual consumer actions.

For the Energy Strategy to be useful, it will be important that each energy goal is reviewed to determine if it is currently on track to achieve the desired outcomes. Models should include accurate market saturation rates to take a baseline of where we are today, and the anticipated trajectory of market transformation. Cost/benefit analysis and economic modeling is likewise essential since all pathways to decarbonization will have tradeoffs and could have significant economic impacts on ratepayers, industry, and small businesses. The inclusion of co-benefits should likewise be balanced with the need for continued energy reliability, affordability, and system resilience and should factor for leakage of employees, jobs, and emissions to other states. Without acknowledgement that some outcomes may not currently be achievable, the strategy may unintentionally become an aspirational document, rather than a practical roadmap."

"ODOE lists the Climate Protection Program as one of the key policies driving energy policy objectives in Oregon. However, the CPP was invalidated by The Oregon State Court of Appeals following a ruling which showed the Environmental Quality Commission (EQC) did not fully meet disclosure requirements in 2021. Although an alternative rule is now in development, the CPP referenced in ODOE's modeling assumptions has been officially invalidated and no longer in effect.

Until the new CPP rulemaking is complete and that program has been finalized and enacted, there is no formal program from which ODOE can base or model these assumptions as modeling from a replacement to the CPP would be premature."

during the August 22 Working Group Meeting, geothermal energy appeared to have been removed as an option to support Oregon's State Energy Strategy. Cascade believes this technology should not be dismissed and is a potentially significant tool to support the state's emissions reduction goals.

In Washington State, a Thermal Energy Network (TENs) law was recently passed that empowers natural gas utilities to invest in projects that provide heating and cooling through the use of non-combustion liquids as a conduit for ground-source heat pump technology. The law allows local distribution companies to embrace non-gas alternatives while reducing the strain on the electric system associated with traditional electrification pathways. Not limited to geothermal, TENs technologies could encompass a range of heat sources including wastewater/sewage generated thermal energy, thermal energy from abandoned coal mines, and waste heat reclamation from data centers. As more states embrace the inclusion of networked thermal energy as pathways toward a just energy transition, Oregon should likewise consider these pathways in its strategic planning efforts.

building electrification input assumptions are unrealistic and will not provide an accurate assessment of the policies and actions needed to support effective decarbonization. Cascade recommends that ODOE consult with the Northwest Energy Efficiency Alliance (NEEA) and

Energy Trust of Oregon to confirm these assumptions are consistent with their plans and modeling regarding equipment availability and market transformation.

"Cascade encourages ODOE to continue exploring "what if" questions and emerging topics such as the

availability of transmission to support aggressive electrification, and concerns over limiting natural gas in homes, which were communicated on slides at their August 22 meeting. These concerns are consistent with a poll conducted by DHM Research in 2023, which indicates that voters in Deschutes County, an area which represents a large number of Cascade customers, overwhelmingly opposes all types of bans on natural gas. It was likewise shown these voters supported local government encouragement of renewable natural gas, and wanted Cascade to focus on providing opportunities and incentives to purchase renewable energy, and to make energy efficient appliances and heating more available."

Pamela Barrow – Food Northwest

"Industrial Efficiency

1% process efficiency improvements per year in all sectors: This seems to be a reasonable assumption, including for the food industry.

Electrification

- 100% of refrigeration by 2040 – seems reasonable assumption given the current use of electricity in the food industry.
- 80% of integrated steam production in food manufacturing by 2045 – this seems high given the many barriers to adoption. We recommend 50%. Alternative scenarios could use higher and lower numbers.
- 90% of industrial HVAC loads across industrial subsectors. This seems high. Washington state Energy Strategy has a target of 75% of building heating and cooling by 2050.
- 100% of machine drives by 2035. Probably reasonable, especially if opportunities for incentives continue."

"U.S. Department of Energy's (USDOE) Industrial Decarbonization Roadmap identifies strategies, technologies, costs, and pathways for several industrial sectors, including food processing.

<https://www.energy.gov/sites/default/files/2022-09/Industrial%20Decarbonization%20Roadmap.pdf>

It also discusses challenges and barriers. While electrification is sometimes viewed as an easy solution to decarbonize food processing, the transition from natural gas may be slower than desired. USDOE states "While the technology solutions to decarbonize FandB [Food

and Beverage] may be comparatively simple, there is a challenging case for investment, given the industry's low margins." They go on to say that "The low margins of FandB players are often

a limiting factor to upfront capex investment, even if there is potential for long-term economic benefits.” See Pathways to Commercial Liftoff: Industrial Decarbonization, p. 48-49

https://liftoff.energy.gov/wp-content/uploads/2024/02/LIFTOFF_DOE_IndustrialDecarbonization_REV022724.pdf

Food Northwest’s experience is consistent with USDOE’s assessment and leads us to lower targets in the reference case.”

What greenhouse gas emissions reduction target will be used in the reference case? The Executive Order target is 80% below 1990 levels, while the Climate Protection Program (CPP) target is 90% below 1990 levels. Some are calling for a greater reduction target. Food Northwest urges ODOE to use the 90% target since this is in the CPP. Alternative scenarios could have higher targets in the interest of determining the requirements and costs to achieve them. We believe, however, that it will be very difficult and costly to achieve even 90%

Cory Scott – PacifiCorp

"Questions:

- Does the use of utility near-term investments and operations include proxy resources identified in its IRP preferred portfolio?
- Does the use of utility near-term investments and operations include transmission selected in its IRP (even if that transmission is expected to be online before 2035)?

PacifiCorp Assumptions:

- Transmission and resources selected anywhere on the system are eligible for Oregon participation"

Mary Moerlins – NW Natural

NW Natural is troubled by the statement “95% of new appliances sales are electric by 2035” and lack of source data to provide insight into why this target was selected. NW Natural asks that this target be removed from the plan. Gas appliances increase a home’s resilience by providing reliable energy during extreme weather.

NW Natural is concerned that the electrification assumptions across industrial sectors are broad generalizations based on national assumptions without any direct feedback from impacted industries in Oregon. Feedback should be gathered from businesses to make informed electrification assumptions for impacted industrial sectors.

NW Natural recommends using a Computable General Equilibrium (CGE) model, which captures price changes and substitution effects between production, consumption, and trade. CGE models are standard for policy analyses such as the Oregon Energy Strategy to quantify effects of policies and regulations that occur outside directly regulated industries. NW Natural believes

a CGE model is the preferred model for this type of policy analysis and recommends running analysis using this type of model.

NW Natural recommends that the Pipeline Infrastructure Assumptions allow for infrastructure development beyond operations and maintenance as the gas system adapts to using clean fuels

NW Natural wonders why Carbon Capture Storage, CCS, is not permitted in Oregon under the reference scenario? CCS is supported by the Infrastructure Investment and Jobs Act and the IRA. CCS is an important component of a clean fuels pathway and by leaving it out of the reference scenario it makes it more difficult and expensive to increase the use of clean fuels. NW Natural recommends adding CCS to the reference scenario.

Erin Childs – Renewable Hydrogen Alliance

For hydrogen production, the model should include methane pyrolysis and solid oxide electrolysis.

It is critical that ODOE allows for the model to select hydrogen and hydrogen-derived fuels for industrial and transportation end uses.

RHA encourages ODOE to provide additional transparency around its key assumptions for the industrial sector, including 50% of integrated steam production electrified and 80% of integrated steam production electrified in food manufacturing

Spencer Moersfelder – Energy Trust of Oregon

"Assumption: Industrial Processes. 1% average improvement to process efficiency per year in all sectors. Fuel switching measures from fuels to electricity.

Planning feedback: Seems reasonable."

Brenda Montanez Barragan – NW Natural

recommends a more comprehensive approach to integrated supply could include dual fuel alternatives for residential, commercial, and industrial applications, integrating existing fuels or other forms of hydrogen

policies and incentives should be developed for utilities to collaborate on these solutions, determining which would be the most cost-effective.

Jennifer Joly – Oregon Municipal Electric Utilities Association

Suggestion to account for the following CPP elements in the modeling: The rule provides that if "retail customer rates have increased or are projected to change significantly due to local distribution companies' cost to comply with this rule, DEQ will consider recommending changes." Additionally, to ensure reliability in the near term, natural gas should be assumed as "bridge fuel" until more transmission and proven commercial battery storage comes online to complement renewables

While we understand that HB 2021 prohibits the siting of new natural gas plants, threats to reliability—particularly due to more frequent extreme weather events— and affordability require that model assumptions be conservative about the near-term phase out of existing natural gas plants in Oregon. It may be good to look at natural gas peaker [sic] plants in one of the scenarios.

Kelly Campbell – Columbia Riverkeeper

Does the reference scenario or other scenario include hydrogen as an electricity generating resource? If so, does it include hydrogen blending with methane gas? Is it limited to “green” hydrogen and reserved exclusively for the most difficult to electrify sectors?

How is declining water supply in eastern Oregon being considered for any potential use of groundwater for electrolysis?

Is biomass included in the reference scenario, and if so, how will you model the air pollution impacts from it?

Are biogas facilities included in the reference scenario, and if so, how will you model the air pollution impacts from facilities producing biogas?

"What kinds of alternative fuels will be included in the reference model or other models?

Will the greenhouse gas lifecycle emissions from these fuels be accounted for in the modeling?"

Pipe leaks: Does the reference scenario acknowledge and account for pipeline leakage from methane gas?

Michael Jung – Modern Hydrogen

Modern Hydrogen encourages the inclusion of the decarbonization of natural gas using methane pyrolysis to remove carbon from both biogenic and geologic methane to produce clean hydrogen and useful solid carbon.

Clarify if the 100% electrification assumption for industrial heat by 2050 refers to space heat, process heat, or both.

Clarify whether "green hydrogen" refers to hydrogen with low carbon intensity or only hydrogen produced via electrolysis and specify if this applies to both hydrogen and hydrogen-derived fuels.

Clarify if the restriction on CCS refers to geologic sequestration specifically or includes above ground permanent sequestration. How does this apply to technologies like methane pyrolysis of biogenic methane?

Ann Vileisis – Kalmiopsis Audubon Society

SUPPORT FOR CONSIDERATION OF FULL LIFE CYCLE ANALYSIS FOR DIFFERENT ENERGY OPPORTUNITIES

Joshua Basofin – Climate Solutions

If the model is going to use utility IRPs to forecast fuel uses, we'd like that to be restricted to only acknowledged IRPs. So far, the PUC has not acknowledged gas utility proposals that rely on hydrogen blending. For RNG forecasting, the model should take into account that despite attempts by gas utilities to procure and blend RNG at rates of 3%, so far they have not even reached 0.5% blend rates.

Sam Lehr – The Coalition for Renewable Natural Gas

I'm also curious if you are modeling RNG as a feedstock for other fuels like methanol or hydrogen? The methanol pathway in particular is of significant interest to international shipping players. You have a very good graphic on this, but it wasn't immediately clear to me.

John Tokarczyk – Oregon Department of Forestry

The 2023 DOE study will function well. It is an improvement over the prior iteration. A challenge with woody biomass feedstock analyses is that they are generally more narrow in range and temporal in validity, not overly functional for this analysis.

Buildings Working Group

Maddy Salzman – Earth Advantage

I am curious if this issue has to be an assumption or if it could be a variable in the system based on ideas about how much market transformation work the state takes on? Perhaps to clarify -- is the key question here what the assumption should be for the business as usual / base case in the scenario?

Forest Tanier-Gesner – PAE

Approach on commercial space heating? Big difference. New construction pushing more rapidly but existing buildings are a challenge. New commercial easier to forecast, existing more challenging and may be forced by standards regulating emissions. Can assumptions differentiate between new buildings and existing buildings? Market will develop differently.

Mark Heizer – Oregon Department of Consumer & Business Services, Building Codes Division

Commercial sector for small-scale HVAC, could be similar to residential. Large buildings (commercial office sector) will be smaller scale

Ryan Brown – Northwest Energy Efficiency Alliance

We collect HVAC sales data, partner with BPA to analyze. Currently finalizing 2023 data, 2022 report found that first time combined heat pump sales outweighed gas furnace sales - <https://www.bpa.gov/-/media/Aep/energy-efficiency/momentum-savings/2022-hvac-market-snapshot.pdf> (NW-wide) BPA residential HVAC model (whole NW) – through 2027. Interim model results this fall.

<https://www.bpa.gov/-/media/Aep/energy-efficiency/momentum-savings/2022-hvac-market-snapshot.pdf>

David Heslam – Earth Advantage

The national AHRI data on HVAC sales that I mentioned are market reports that are regularly reported on their website. Since it covers all shipments it includes HVAC sales for both new construction and replacement of existing [sic] systems

Maddy Salzman – Earth Advantage

65% of just heating equipment? – any central AC sold should probably be heat pump instead? That is another part of the market to eclipse. Are we measuring against central AC as well? Any BAU / Ref case should be relatively based on what we're seeing in marketplace. Risk of Ref being optimistic vs. pessimistic – if we are pessimistic maybe we do too much work to achieve goals but if too optimistic we could not do enough to meet our goals

Ryan Brown – Northwest Energy Efficiency Alliance

Variability of performance of heat pumps?

Kevin Duell – Northwest Natural

What data is Earth Advantage providing?

Is the assumption of 65% heat pumps sales by 2030 for all space heating, or just electric heating?

Ryan Brown – Northwest Energy Efficiency Alliance

Commercial – electrification and adoption of heat pumps only or other types of efficiency improvements? NEEA working on efficiency improvements in gas equipment, shell improvements, insulation – 10-20% efficiency. Also heat recovery strategy.

Kevin Duell – Northwest Natural

Where did "100% sales of new appliances are electric by 2025" come from? I see no reference to this in the "Roadmap to 2030".

Ryan Brown – Northwest Energy Efficiency Alliance

@ Jeremy - feel free to follow up with me about heat recovery and other efficiency improvements to gas commercial HVAC

Ken Morgan – Gensco

Sales may not accurately represent what's actually happening in the market. What if gas or oil furnace has long lifespan, sales may not accurately track what's happening.

Forest Tanier-Gesner – PAE

I'm curious if refrigerant emissions are being accounted [sic] for in the overall emissions and how lower GWP refrigerants are going to be reflected in the adoption scenarios.

Ryan Brown – Northwest Energy Efficiency Alliance

+1 to Forest's comment on refrigerants, also curious about fugitive refrigerant emissions related to this explosion of heat pumps that are forecasted

Ken Morgan – Gensco

End of 2024 can no longer manufacture higher GWP refrigerants

Elizabeth Torske – Cascade Natural Gas

95% building shells by 2040, 100% cooking appliances, etc. seem overly optimistic – understand that some of these goals are required to meet laws but from construction management / boots on the ground perspective doesn't seem reasonable to me. Feels like setting up for failure. We're creating a model but one size fits all limits flexibility. Appreciate that hybrid heat pumps are on the table. '100%' feels like limiting potential solutions. Worry that sales are confirmation bias w/ data – sales don't tell you that people who don't want to transition just keep what they have. 75% shell buildings would even be unbelievable. Some of these numbers seem too ambitious.

Ryan Brown – Northwest Energy Efficiency Alliance

The shell improvements in particular seem unrealistic to me. Need significant capital to get there beyond what is available today and there are other challenges with aging and disinvested building stock

Maddy Salzman – Earth Advantage

Also important to consider that in many cases a solid portion of adoption we're seeing today is low-hanging fruit scenarios - people with cash on hand, already improved envelopes, etc. - and at least in some cases the marginal transition costs will be higher for homes that aren't being reached yet (of course, we hope market innovation keeps up and counteracts this)

Kevin Duell – Northwest Natural

What provisions are being considered for gas heat pumps for space and water heating?
Commercial and residential?

Mark Heizer – Oregon Department of Consumer & Business Services, Building Codes Division

What is expected uptake of Demand Responsive controls? And extent of complimentary "Storage" in buildings?

David Heslam – Earth Advantage

% heat pumps assumptions = sales share or stock?

Wood heat included in modeling? Not insignificant

Forest Tanier-Gesner – PAE

Question on the Building Shell assumption: is the 10-20% reduction in energy reflecting whole building energy or just heating/cooling end-use energy? If whole building, this seems overly optimistic [sic] across all markets, particularly when heat pump transition has already occurred.

Mark Heizer – Oregon Department of Consumer & Business Services, Building Codes Division

"Is increase in AI data centers being considered... New AI data centers can reach 1-GW"

Fred Heutte – NW Energy Coalition

Data centers are certainly in buildings! but my sense is that HVAC and shell are already highly optimized so the prospects for building efficiency aren't large

Kevin Duell – Northwest Natural

Since all data and calculations have uncertainty and errors, how is propagation of uncertainty handled in the analysis?

Fred Heutte – NW Energy Coalition

In the modeling do you have an approach to technology innovation, cost reduction for building efficiency related technologies? Incremental improvements in heat pumps but also a lot of other opportunities – lighting, etc.

Fred Heutte/Ian Casey – NW Energy Coalition

NW Natural recommends looking at efficiency gains outside of heating and cooling equipment. Other efficiency strategies including heat recovery, advanced HVAC controls, and dedicated outside air will have efficiency gains regardless of HVAC / water heating fuel source. Diversifying tools used for efficiency gains will promote a variety of pathways to improving efficiency.

NW Natural is concerned by the assumption “95% of new appliances sales are electric by 2035” and lack of source data to provide insight into why this target was selected. NW Natural asks that this target be removed from the plan. Gas appliances increase a home’s resilience by providing reliable energy during extreme weather situations.

NW Natural recommends polling consumers about electric heat pumps policies and incentives and using that data to set a target % for heat pump sales by 2030. NW Natural believes our customers are the best source of information and that inaccurate targets can do more harm than good.

NW Natural has concerns about the modeling around heat pumps. Many ductless heat pump installations, new and retrofit, still rely partly on electric resistance heat (cadet-style) during winter months. NW Natural urge modeling to approximate for these secondary heating sources in electric heat pumps homes. NW Natural also recommends including gas heat pump adoption in some of the modeling scenarios. By updating the model to approximate the secondary heat sources in heat pumps homes and gas heat pump adoption, the model becomes more accurate, giving policy makers a better understanding of energy issues in their area.

Mark Heizer – Oregon Department of Consumer & Business Services, Building Codes Division

[comment on Buildings: Key Assumptions] Nothing about energy codes for new buildings (impact/reduction in load growth) and/or renewables/demand response via code. Nothing on "uptake" in PV on existing buildings (even though code is requiring buildings to be PV ready.) Nothing on fixes required to encourage PV uptake.

[comment on cooking assumption]: Appliance standards can get to Energy Star TODAY. Getting to all-electric can align with federal ENERGYSTAR.

[comment on technology stock replacement assumption about dual gas/electric heat pump systems]: Would be a great transition option (and for remote/LP locations), but a little too late

[comment on building shells]: NEED a "focus" by age of homes (pre-code vs. 1980s, 1990s-2005 codes, post 2005.)

[comment on lighting]: Federal rules for more efficient bulbs (what is effect)

[comment on hybrid boilers]: Recognition that Hydrogen infrastructure will not be here until after 2040; Hybrid possible for intermediate term.

[comment on Buildings data]: this should be "Northwest"

Ryan Brown – Northwest Energy Efficiency Alliance

[comment on water heating]: This federal standard allows for certain sizes and form factors of water heaters to be exempted from the rule so solutions for those products will also need to be widely available and adopted to get to 95%. NEEA is working on this now. In addition, there is a possible future where this rule pushes more of the market towards gas tanked and tankless water heaters if that's an option for the home.

[comment on cooking assumption]: moving to near 100% electric cooking will be unpopular and may have some cultural dimensions to certain culinary traditions based around specific equipment, especially in restaurants.

[comment on building shells]: There may be some limits to weatherization before other structural improvements and deferred maintenance needs are addressed. Not sure whether the 20% that will remain unweatherized account for those. There is a significant equity concern here however if the policy recommendations focus on the 80% that is easy to weatherize and leaves out those households with the highest needs.

I know policy recommendations come later in the process and the MOU already commits the state to something similar to this, but 95% is very aggressive. The market structures in place are very entrenched and it will require very significant money and systemic interventions that are self-sustaining to make this happen. I understand that the model will compute the costs, but this level of public investment seems like it would be quite historic.

This 75% of large commercial is similarly ambitious to the statement above on residential

DR - household participation. Linear forecasting for 25 years makes me nervous, depends highly on the details of the DR program how many households they can enroll. I know PGE has been working for years and invested a ton and still their program is relatively small (though meaningful and an impressive accomplishment!).

DR starting point: You might look to the PNUCC for information about DR and regional peaks: <https://www.pnucc.org/wp-content/uploads/2024-PNUCC-Northwest-Regional-Forecast-final.pdf>

Spencer Moersfelder – Energy Trust of Oregon

"Assumption: 95% of electric HP sales in Residential by 2040

Planning feedback: This percentage seems too high. 80% seems optimistic and more achievable.
Additional Notes:

- This assumption seems to be more aggressive than the assumptions we are using in our electric utility IRP work.
- This seems particularly aggressive for the multifamily and rental markets where there are significant economic barriers to getting HPs installed that replace end of life gas HVAC equipment.
- A 95% share of equipment sales is extremely high, this level of HP sales seems like it might only be achievable through something like a code requirement (e.g. it becomes illegal to sell gas equipment except for certain rare circumstances which account for the remaining 5% of sales)."

"Assumption: 75% commercial HPs sales by 2045

Planning feedback: This feels a bit high due to the difficulty in switching some commercial buildings from gas to electric systems. 60% feels optimistic and more achievable."

"Assumption: 95% HPWH sales in residential and small commercial by 2045.

Planning feedback: same as residential space heat assumption, 95% is a really high number unless there is a standard that eliminates gas equipment from the market. 75% seems optimistic and more achievable.

Additional notes:

- Technical suitability for HPWHs is not 100%. There are fairly significant space constraints and comfort issues related to HPWHs when the equipment is not located in a garage or basement."

"Assumption: Building Electrification, 95% new appliance sales electric by 2035

Planning feedback: this % seems too high. 80% seems optimistic and more achievable.

Additional Notes:

- Other jurisdictions (e.g., Berkeley gas appliance ban) have tried to get to 100% electric appliance sales through policy but have not been successful.
- Small commercial restaurants getting to 95% electric sales seems unrealistic.
- Are gas fireplaces included here, and if so, is it realistic to assume the market for these will disappear almost entirely?"

Jennifer Joly – Oregon Municipal Electric Utilities Association

"Given the price point of electric heat pumps, the assumption of 95% of overall sales by 2040 seems too aggressive. The BPA incentives for low-income customers cover nearly 100% of heat pump costs, however we need to understand assumptions out to 2040 for customers that are not low income. The slides do not provide any information about existing heat pump sales in Oregon in order to evaluate whether 65% by 2030 and 90% by 2040 is realistic given the high initial price point. In any event, 90% by 2040 as in the DEQ MOU seems more feasible than the suggested change of 95%. Again, the reference scenario should be feasible. More aggressive assumptions should be saved for the scenarios. "

"The assumptions in this area (commercial electrification) seem highly dependent on the availability of incentives. Do these assumptions factor in BPA and Energy Trust incentives?"

Joshua Basofin – Climate Solutions

"The model is currently set to allow investment in dual fuel electric and gas boilers as well as hydrogen boilers. We'd like to ensure that there is transparency about how the model considers these dual fuel boilers, to what extent they are forecasted and in what applications."

Mary Moerlins – NW Natural

NW Natural is troubled by the statement "95% of new appliances sales are electric by 2035" and lack of source data to provide insight into why this target was selected. NW Natural asks that this target be removed from the plan. Gas appliances increase a home's resilience by providing reliable energy during extreme weather.

"NW Natural has concerns about the modeling around heat pumps. Many ductless heat pump installations, new and retrofit, still partly rely on electric resistance heat during winter months. NW Natural urge modeling to approximate for these secondary heating sources in electric heat pumps homes. NW Natural also recommends including gas heat pump adoption in some of the modeling scenarios. By updating the model to approximate the secondary heat sources in heat pumps homes and gas heat pump adoption, the model becomes more accurate, giving policy makers a better understanding of energy issues in their area."

"NW Natural worries that the model will just look at which changes have the most emission impacts, which neglects uncertainty in cost impacts. By choosing to only model health impacts and no other non-energy cost/benefit, ODOE is unable to provide an accurate analysis. NW Natural recommends adding other non-energy costs and benefits to the model to improve accuracy. In addition to adding non-energy costs and benefits to the model, NW Natural advocates that data collected be unbiased and any such additional data collected not skew the regional model results in one way or another"

"NW Natural supports using weatherization as a key energy efficiency driver given the benefits regardless of fuel-type, however, 95% of buildings being weatherized seems like a high percentage. Community action agencies have been doing this work for many years and should be consulted about presumed adoption for residential. Inaccurate estimates discredit meaningful steps forward by minimizing weatherization updates/upgrades made by homeowners."

Mark Heizer – Oregon Building Code Division

100% heat by 2050...NEW data center impact!!!

Thermal energy storage - economic adoption modeled in industrial sector - Data Center near city/town, BUT need financial (and regulatory) framework to make it feasible

Fred Heutte – NW Energy Coalition

"In addition to the data sources from the NW Energy Efficiency Alliance, we encourage ODOE and the Northwest Power and Conservation Council to coordinate further on current data and future projections -- relating to building stock, lighting, appliance and end user behavior -- from the Council's extensive assessment process"

"For residential and commercial water heating, we believe market saturation will occur faster than the baseline in the draft: 95% of electric heat pump sales by 2045 (residential) and similar results for commercial (somewhat differentiated by small and large users). On the details, we recommend coordination with the Advanced Water Heater Initiative, a national effort with USDOE support based here in Oregon which has established a goal of all new residential water heating sales of heat pump water heaters by 2030 as well as advanced goals for commercial water heating, and has developed extensive analysis and plans (www.advancedwaterheatinginitiative.org). In addition, NEEA is developing a related load flex effort that is closely aligned with its EE market transformation work.... Along with other flexible demand efforts, there is potential for major – multi-hundred megawatt and perhaps more – load flexibility for grid reliability and cost containment in Oregon"

Chris Kroeker – NW Natural

NW Natural believes that ODOE should investigate the significantly lower adoption of electric heat pumps due to increased energy costs

Alyn Spector – Cascade Natural Gas

building electrification input assumptions are unrealistic and will not provide an accurate assessment of the policies and actions needed to support effective decarbonization. Cascade recommends that ODOE consult with the Northwest Energy Efficiency Alliance (NEEA) and Energy Trust of Oregon to confirm these assumptions are consistent with their plans and modeling regarding equipment availability and market transformation.

Land Use and Natural Resources Working Group

Jon Jinings – Oregon Department of Land Conservation and Development

What if the energy generated by future projects developed in Oregon does not go to serve Oregon markets?

Ann Vileisis – Kalmiopsis Audubon Society

“Least-cost option” — How do you deal with externalities?

Andrew Mulkey – 1000 Friends of Oregon

Different types of solar that could be implemented – rooftop (residential + commercial), utility-scale. Mark Jacobson model for OR shows a lot of rooftop solar. Stanford energy scenario model for Oregon shows a lot of residential and commercial rooftop solar. Understand rooftop solar is more expensive than utility-scale but what about cost to the residential/commercial customer?

Nataliya Stranadko – Oregon Department of State Lands

How would you consider climate change scenarios in the model? Energy demand will increase due to increased AC use. And GHG calculations. What base year will you use? Will you use IPCC methodology for calculating GHG emissions and sinks?

Michael Eng – Rancher

How are you modeling equity issues? Haven't seen ODOE address data centers, crypto mining. Recent article Pro Publica Seattle Times. Framing as equity issue – renewable energy going to data centers instead of residential/commercial use. WA has projections for this, and they frame it as an equity issue. We could build a lot of new renewable resources and have all that power used by the data centers.

Amy Berg Pickett – Oregon Solar + Storage Industries Association

Will the model look at utilizing existing capacity on the grid (transmission & Distribution) siting renewables in Oregon? Without any layers of constraints (land use etc.) will land use and others be a lever for scenarios? Do we have a way to look at out of state energy sources and Oregonians exporting externalities with out of state energy imports? ☐ Some already covered but to clarify: Will the model show what we can develop w/o restrictions (as reference) and restrictions are the levers in scenarios?

Mike Totey – Oregon Hunters Association

How will the model select energy sources when we compare imported energy vs energy produced in-state? Is this only decided by lowest cost?

Does model assume if we're generating power in OR it stays there?

Nataliya Stranadko – Oregon Department of State Lands

What is the name of model do you plan to use for energy modeling and GHG calculation?

Depending on the model, can it be linked to other models such as PRIMES or GAINS when assessing energy, climate and environmental policies?

My understanding also that a model doesn't consider energy price to assess policies. Is it correct?

Amy Berg Pickett – Oregon Solar + Storage Industries Association

Does the model take into account proximity to the grid?

Lauren Link – The Nature Conservancy

Are you going to incorporate findings/rules from current state and rulemakings and federal processes in place that are looking at least conflict areas for siting, such as the Eastern Oregon Solar RAC and the BLM PEIS?

John Tokarczyk – Oregon Department of Forestry

Beyond listed habitat, are considerations made for state identified habitat. Thinking specifically of ODFW identified habitat that may not include listed species but critical nonetheless.

Kelly Campbell – Columbia Riverkeeper

Will you be using the State Wetland Inventory (which includes National Wetland Inventory)? Due to Biological Opinion, it will also be necessary to include FEMA Floodplains.

Nolan Pleše – League of Oregon Cities

Do the models factor in potentially deconstructing the snake river dams?

Ann Vileisis – Kalmiopsis Audubon Society

I heard you mention we may end up selecting OSW in a blow-out scenario. Will you be considering marine species impacts? Seems to be underrepresented in PoP. ORESA has two options – context or analyze, don't know what that means.

Jack Southworth – Oregon Cattlemen's Association

Will we be shown a model of Regional (Western US) energy supply and demand that might better inform what we want to do in Oregon to utilize renewable resources? If there are areas where renewable energy potential greatly exceeds RE demand, then would we use that information in creating Oregon's model?

John Tokarczyk – Oregon Department of Forestry

In consideration of biomass supply how is availability balanced with threat/fire and functional retrieval. Addressing the delta between what is present, what is realizable, and realistic based on past retrieval and utilization.

Andrew Mulkey – 1000 Friends of Oregon

"PoP maps show area screened = green. Is it possible that give people more information about why a particular area is screened? Or policy considerations. Private, state, vs federal jurisdiction land mapped out?"

Developers, conservationists, all want to see how valid these assumptions are. Glad that's possible to do. ☑ asking for transparency about layers, showing maps w/ all layers"

Ann Vileisis – Kalmiopsis Audubon Society

Can PoP-West help us?

Amy Berg Pickett – Oregon Solar + Storage Industries Association

We need a grid layer as well.

Kelly Campbell – Columbia Riverkeeper

I think it would be helpful to use ORESA with the caveat that some local jurisdictions may have additional identified habitat protections, etc., that are relevant to siting

Mike Totey – Oregon Hunters Association

Some people here also on DLCD RAC. They are using ORESA as initial source. Valuable. Think we should have it on there but not sure how lines up to PoP.

Ann Vileisis – Kalmiopsis Audubon Society

We also have OROWIND for offshore wind energy --not sure if there is any overlap with ORESA

Nataliya Stranadko – Oregon Department of State Lands

Does it mean that the forestry sector will not be considered in GHG calculations and policy planning?

Amy Berg Pickett – Oregon Solar + Storage Industries Association

Work in rural communities. Hear a lot of fear around reducing vehicle use, type of vehicles that farmers and ranchers have.

Michael Eng – Rancher

Level 3 prime farm land; there's been discussions on agrivoltaics/dual use farmland.

Confused about lack of geographic specifics in reference case and request to add specifics to the scenario

Jon Jinings – Oregon Department of Land Conservation and Development

We've seen projects primarily built on private land. Could a what if scenario look at more development opportunities on public land?

Ann Vileisis – Kalmiopsis Audubon Society

I support using the Power of Place. Will there be what if scenarios?

Emily Griffith – Renewable NW

is there anything from POP we should be including?

Lauren Link – The Nature Conservancy

"Maybe more marine data. Does it need to be only PoP or only ORESA or can it be a PoP starting point and then adding in more marine data layers?"

Even at TNC, we use the PoP data more as a tool than a policy input."

Dan Serres – Columbia Riverkeeper

We saw that water isn't much of a constraint. Could we put something in the reference case about remove and fill restrictions?

Michael Eng – Rancher

it needs to be based on verifiable assumptions. Are there actual plans in place to reduce VMT?

Mike Totey – Oregon Hunters Association

If its purely aspirational, it may not be appropriate for the reference scenario.

Michael Eng – Rancher

If it's from ODOT, I don't think it would be appropriate to model VMT reduction assumptions in the reference scenario.

Are you talking about reducing all VMT, or just ICE VMT?

EJ communities should receive some sort of special consideration given the impacts they're experiencing from project siting. We need to focus on level and degree of impacts and what kind of creative compensations could be used. Insurance for communities, rate increase protections, and microgrids are some potential ideas. And EV chargers in EJ communities.

Ann Vileisis – Kalmiopsis Audubon Society

Is there a way to prioritize locations that have co-benefits for EJ communities? Co-siting of energy and existing uses, something like that.

Michael Held – Business Oregon

Another consideration would be to increase workforce development opportunities, career training, community college programs, etc. targeted to areas, particularly rural, and where energy siting is occurring.

Jon Jinings – Oregon Department of Land Conservation and Development

Reduction in VMT is an urban thing. Delivery of large scale energy projects is a rural thing. Those communities may feel as though they're being exploited, which would be unfortunate. For the transportation piece, the urban areas will hopefully be the beneficiaries of transit-friendly development. In rural areas, they feel like they're going to be sentenced to look at large scale energy development for 30 or 40 years. If we're not sensitive, rural areas may feel like they're going to be burdened by projects that benefit urban areas.

John Tokarczyk – Oregon Department of Forestry

"Biomass Consumption data

Yes, the question would be valuable. Also location of source given the nature of the biomass that would be included. This is a chicken and egg conversation. There's plenty of supply of biomass, but the question is what demand looks like to inform the acquisition of the supply, which is usually costly to acquire. And the amount of demand for that power. There's an interest in seeing better understanding of the utilization of biomass to see where those investments might be made, and at what scale. It comes down to opportunity and desirability. There's disagreement around the desirability of using biomass for power generation. "

Jon Jinings – Oregon Department of Land Conservation and Development

I find biomass intriguing. It operates like baseload and creates jobs in the woods. In sheer number of acres to be occupied, wind is the energy version of building up not out. But solar is cheaper. We've heard about agrivoltaics. How can these help save water?

what if there's more behind the meter generation, e.g. rooftop solar?

Michael Eng – Rancher

Agrivoltaics could have an impact on farmland. If there was a AV target, it could have implications.

Ann Vileisis – Kalmiopsis Audubon Society

the potential for a more ambitious GHG target is confusing to me, because the energy system is regional and other states have their own GHG reduction targets. There are limits to what we can do ourselves as a state. How does the accounting work if we develop RE and the power gets sold to CA?

Mike Totey – Oregon Hunters Association

What if we can't import clean power from out of state?

Lauren Link – The Nature Conservancy

The assumption seems to be that we're going to have a regional market. What if that's not the case?

Nolan Pleše – League of Oregon Cities

What if we remove the LSR dams? What if we include other non-emitting energy sources that Oregon currently doesn't allow? Like small modular reactors?

Andrea Kreiner – OR Association of Conservation Districts

Difference between setting a goal vs. a GHG mandate. Goals don't require the state to do anything.

Toby Kinkaid – EV Global

HB 3630, the goal is to meet our goals, which is ambiguous. The dates for HB 2021 and the CPP are so far out, we have to ask what's the point. We should be doing a best value analysis, not a least cost analysis. We need to remind ourselves that we're in an emergency. What I would like to see is modeling that shows what we can do in the next three years to achieve the intent of HB 3630.

Timothy McMahan – Stoel Rives

I am providing these comments as an Advisory Group member and Land Use and Natural Resources Working Group member. It is essential to prioritize substantial areas of land for the development of renewable energy resources, particularly wind, solar and BESS facilities. While new technology (e.g. fusion) may be available in the future, Oregon and the NW in general must be willing to make substantial compromises to address the threats of climate change. A major problem with predicting scenarios at this time is the generally unpredicted proliferation of data centers, and the legal commitment of utilities to serve these "customers," potentially compromising the ability of utilities to serve growing demands of communities (cities and towns). Scenario planning needs to account for this impact and explore ways to reasonably control this growth and demand. In terms of siting, acceptance of compromises in developing reasonably available renewable energy generation sites need to be prioritized. This will require: (1) greater and more permissive conversion of agricultural sites, in particular arable and non-arable lands, with a more balanced approach for Statewide Goal 3, to enable conversions; (2) we need to explore how best to prioritize the preservation of high value farmlands (irrigated), especially in areas like the fertile Willamette Valley; (3) added to this balancing job is a thoughtful and reasonable balance in dealing with wildlife habitat. Specifically, it will be challenging to find sufficient renewable energy sites if developable arable and non-arable lands are removed from consideration purely to "protect" heavily managed big game resource areas (for species such as mule deer that are not T&E species, but are game species.); (4) we need be very careful in designating "no go" areas, prepared to make compromises with flexible approaches, including high value farmlands and degraded habitat areas.

Kelly Campbell – Columbia Riverkeeper

What does the modeling consider to be Tribal lands? It appears that it may only include reservations. We would support a broader definition of Tribal lands that includes culturally

significant sites and will defer to comments from Tribes about how to more accurately characterize Tribal lands.

Will the reference scenario or other scenarios model a true net zero, or will they be including carbon offsets? We would encourage a true net zero model that does not place our energy burden on other communities.

"Energy systems impact water quality in a major way. How does the Oregon Energy Plan incorporate considerations of water quality?"

How are the reference model and other models taking into account seismic concerns? For instance, are you using DOGAMI data? For example, zooming in on one potential energy infrastructure location where the local community has identified obvious problems that do not appear easily recognized in the ORESA tool, Port Westward is built on unstable soil, where dikes at risk of overtopping in a 100-year flood (see figures below from DOGAMI)

Timothy McMahan – Stoel Rives

I'm supplementing my prior comments to emphasize the need to carefully balance Oregon's agricultural economy and history with the robust development of clean energy to address climate change. I would point to the recent approval of the Pine Gate Sunstone project, which deployed comprehensive and creative agricultural mitigation, focused on investments in the local agricultural economy to improve offset impacts.

Lauren Link – The Nature Conservancy

We would also like to highlight some specific areas where more recent data are available, and encourage ODOE to use best available data to inform both the reference and alternative scenarios. In particular, the offshore layers in Power of Place are limited and no longer represent best available science. Significantly more spatial data has been collected by the state, NOAA and BOEM in recent years (e.g. DOD data, updated fisheries data, etc.). We encourage the contractor and state staff to work with the DLCD, specifically Andy Lanier and others, to identify the most current data layers and utilize them. There is also more updated data available concerning big game migration corridors that would better reflect the best available science. ODFW has new big game corridor maps and new sage grouse maps (pending adoption) that would better represent these areas within the reference scenario.

What does the supply-side assumption for alternative clean fuel investment for the Climate Protection Program look like? Will the model be based on the original rules? Draft rules from ongoing rulemaking? Or will there be an opportunity to refine pending DEQ's final rulemaking anticipated later this year?

How will biomass-derived fuel carbon intensity be reflected? The supply-side assumptions state both, that they "qualify as clean" and that the "Clean Fuel Standard [is] incorporated." We would prefer consistency across sectors in reflecting the actual carbon intensity of biofuel pathways as analyzed in the Clean Fuels Program; while we recognize Oregon statute treats

biofuels as net-zero, modeling the actual emissions implications of these fuels is important for understanding the full implications of energy choices.

What if there is greater uptake of agricultural measures, e.g. nitrogen and manure management, that don't fit neatly into energy or sequestration portfolios?

Amy Berg Pickett – Oregon Solar + Storage Industries Association

Small-scale renewables have proven resilient, more easily comply with land-use constraints and offer community benefits in the form of property tax revenues, health benefits, and other benefits that communities define.

This scenario should contemplate a less restrictive land use policy landscape. Integrated agrivoltaics, renewable energy development of non-irrigated fallow farmlands and other responsible policy adaptations available to Oregon's lawmakers should be evaluated for a comprehensive understanding of the implications of land-use restrictions and possible future changes to those restrictions.

Alexis Hammer – Oregon Department of Land Conservation and Development

Acknowledge land use planning system's role in reference case, available land, more compact communities, energy siting

Cory Scott – PacifiCorp

The reference scenario assumptions states that HB 2021 sets a portfolio standard that requires "100% clean electricity." PacifiCorp recommends clarifying that the law requires an emissions reduction standard of 100% by 2040. In addition, PacifiCorp recommends the reference scenario assumptions acknowledge that the law establishes interim emission reduction targets for 2030 and 2035. ORS 469A.410.

It is a bit unclear in the material that has been shared, how the Renewable Portfolio Standard and other supply side requirements will be reflected in the model.

Ann Vileisis – Kalmiopsis Audubon Society

I strongly support a scenario that is most protective of the natural resources that Oregonians cherish—including our birds, fish and wildlife, our beautiful wild natural areas, our marine ecosystems—and that also maintains intact and functional ecosystems that can conserve biodiversity and "ecosystem services" into the future. For that reason, I am strongly supportive of an approach that favors "brownfields" for development of new, energy infrastructure. By "brownfields," I mean, areas that have already been developed for other purposes, such as existing transmission corridors, existing built structures as opposed to opening up undeveloped, unroaded [sic], or pristine ecosystems to new industrial development. (eg. rooftop solar on big box stores/ France requiring solar panels atop parking lots/ China experimenting with installation of solar pavers on some highways

I notice there is data layer identified in the Oregon Renewable Energy Siting Assessment: Natural Resources, Environment, and Development: Opportunities [sic] and Constraints (Sept. 2021) report associated with ORESA that is focused on this very element (Human modification in the Western US, 2011 data layer), but it marked to be considered only for context. I think it would be ideal to focus on these already modified ecosystems for future energy development, and so I'd like to see us consider these areas for analysis not just context. As indicated in the "Power of Place" reports, such an approach would reduce controversy and therefore be more efficient --plus it would help to sustain the values that Oregonians have been working to conserve for decades through the state's land use planning and through engagement with federal lands and wildlife planning and conservation efforts.

the "Power of Place West" analysis did not include consideration of important social and cultural values, which go hand-in-hand with effective planning for conservation. For example: in marine ecosystems, areas of fisheries use are highly important to consider, and least conflict analysis could also be very important. As you probably are aware, the legislature recently directed DLCD (together with other state agencies) to develop a Roadmap for Offshore Wind Energy in Oregon, in large part because the federal energy leasing process did such a poor job of engagement with local communities and tribes about cultural and ecological values that form the basis for local economies and ways of life. Ideally, ODOE, can work together with DLCD --or follow that agency's model-- to integrate stakeholder perspectives in its process. Given that I may be the only person on the Natural Resources Working Group representing a coastal perspective and engagement with offshore wind energy siting, it suggests to me that important other voices and interests may be missing from this process (eg. commercial fishers).

conservation efforts for Oregon's marine ecosystems remain a work in progress. The State of Oregon has just two small Marine Protected Areas and has only just recently added a few designations for Rocky Protected Areas --nothing like a network of protected areas based on identification and need for conservation. This likely owes to the difficult politics and issues related to conservation of marine areas. But that does not mean that Oregon does not have extremely high value marine conservation areas. Some high value ecosystems that the conservation community has endeavored to map as part of offshore wind energy leasing process include high value biogenic habitats, such as rocky reefs, coral forests, vents. These may be insufficiently covered by other data layers in the ORESA database. The bottom line is that --to be credible in what the ODOE report creates, there needs to be a more transparent and robust data foundation for any marine component.

We strongly support a spatial planning approach that identifies areas of conservation importance early on, such as called for on the Smart-from-the-Start renewable energy approach and The Nature Conservancy's Power of Place West report—as a way to reduce conflicts, improve process, and ensure that renewable energy development will not damage and degrade valuable ecosystems that Oregonians have spent decades aiming to conserve. We'd like to see a

scenario that considers at the highest level of conservation, eg. Tier 3 in The Nature Conservancy's Power of Place West framework.

"the data layers used to model marine ecosystems in the Power of Place West report are wholly inadequate. To improve the credibility of scenarios, marine data must be improved with additional consideration [sic] of layers as identified [sic] in the report, Oregon Renewable Energy Siting Assessment, Natural Resources, Environment, and Development: Opportunities and Constraints, September 2021, authored by the Conservation Biology Institute. Most of the identified layers are already available in Oregon DLCD's OROWIND database a short cut would be to constrain the model to current West Coast Wind Energy Areas (WEAs) as already identified by BOEM. Although BOEM's spatial assessment process was flawed, in our view --with too few natural resource and wildlife parameters incorporated to accurately assess values, using the now established WEAs could be a pragmatic and realistic stand-in for consideration of a Floating Offshore Wind Energy scenario in the current process."

SUPPORT FOR SCENARIO THAT PRIORITIZES BROWNFIELDS for ENERGY DEVELOPMENT

CONSIDER A SCENARIO THAT PRIORITIZES IMMEDIATE ACTIONS TO DECARBONIZE IN THE SHORT TERM

floating offshore wind energy development shouldn't be considered a "blow-out scenario" if there are conflicts on terrestrial ecosystems, as indicated in the first Natural Resources working group meeting [sic]. If floating [sic] offshore wind energy is considered to be feasible, then ideally there will be a comparative [sic] analysis that is based on not just energy generated per acre or solely on levelized costs of energy --but one that includes spatial consideration [sic] of values and existing [sic] uses as well as full costs associated with installation [sic], transmission feasibility, plus operations [sic] and maintenance in the ocean environment

Emily Griffith – Renewable NW

We support the inclusion of a scenario that meets net-zero emission reduction targets. Including this as an alternate scenario in addition to the others would provide an interesting pathway to compare to. We are not advocating for replacing this scenario with the HB2021 target in the reference scenario, but including it among the alternatives. If this is an option, we believe that it would be beneficial to see this pathway illustrated on an achievable timeline following the 2040 HB2021 target, such as 2050.

Renewable Northwest agrees with restricting the use of Level 1 and 2 areas as described in The Nature Conservancy's Power of Place study. We would like to see more information illustrated for the Land Use and Natural Resources section in the Draft Reference Scenario. Currently, there are not many assumptions included in the model. If the Power of Place Study will be used in more ways than mentioned, that information should be included in the document. One of the questions that has been asked of the Land Use and Natural Resources Workgroup is whether modeling for siting should look at restrictions on siting and whether siting renewable energy

projects will get harder or easier. We actively work in the siting space and know that currently, the locations for which renewable energy projects can be sited is narrowing and it will become harder to site projects. It will be important for the Energy Strategy to suggest land usage numbers - based on the latest studies for energy density for solar and current industry standards - for meeting the scenarios analyzed.

Mark Heizer – Oregon Building Code Division

Non-CO2, non-energy (land use key assumptions, EPA developed supply curves...f-gasses in industrial processes and products: LOTS of heat pumps part of goals; refrigerant rules

Mary Moerlins – NW Natural

NW Natural wonders why Carbon Capture Storage, CCS, is not permitted in Oregon under the reference scenario? CCS is supported by the Infrastructure Investment and Jobs Act and the IRA. CCS is an important component of a clean fuels pathway and by leaving it out of the reference scenario it makes it more difficult and expensive to increase the use of clean fuels. NW Natural recommends adding CCS to the reference scenario.

Alexis Hammer – Oregon Department of Land Conservation and Development

Valuable fishing areas? Another data source might be the NCCOS model analysis of suitable areas on the Outer Continental Shelf for offshore wind leasing.

Nataliya Stranadko – Oregon Department of State Lands

"I am considering how this model could be improved for future energy strategies. PRIMES and GAINS models are internationally recognized models usually used by countries for GHG inventory and policy development and suggested by the Intergovernmental Panel on Climate Change (IPCC) under the Paris Agreement—particularly consideration of GHG emission factors (international or local) and further consideration for a cap-and-trade system. The energy sector is the key sector for most countries, and emissions reduction (mitigation policy) from this sector and strategy development play a significant role in achieving GHG emission reduction targets.

Thus, it's a good idea to consider the results of incorporating our model results into those models for future policy development and decision-making.

Also, incorporating a forestry sector may be considered. Internationally, countries usually present two options for GHG inventory calculation: without land use, land use changes and forestry (LULUCF), and with LULUCF. "

Transportation Working Group

Rebecca Smith – Renewable Hydrogen Alliance

Are you also considering hydrogen as an input for producing sustainable aviation fuels?

Michael Graham – Columbia Willamette Clean Cities

How is renewable natural gas incorporated as a potential feedstock for low carbon hydrogen production?

How are infrastructure costs or constraints factored into the various clean fuels modeling pathways?

For cost inputs for renewable fuels, might consider using EPA's Renewable Fuel Standard, because RINs are an important component of the value included in biofuels and renewable natural gas. While best use for RNG might be in pipeline direct use, currently it's incentivized to be used in transportation due to value of RINs.

Lewis Lem – Port of Portland

Be sure to always stress the per capita piece when saying that VMT per capita has remained flat.

Cory Ann Wind – Clean Fuels Alliance

Does the scope of the model extend to off road, including marine, rail and aviation?

Robert Wallace – Wy'East

How about construction and farm equipment?

Michael Graham – Columbia Willamette Clean Cities

It is very likely safe to assume a 2x cost increase for electric and H2 versions of rail, aviation, and marine.

Will fuel prices be geographically specific? (i.e., west coast prices vs. national average)

Cody Meyer – Oregon Department of Land Conservation and Development

There are enough existing targets to warrant inclusion of VMT reduction in reference scenario (OTP/STS, LCDC metro rule, etc)

Kyle Whatley – TriMet

CA Advanced Clean Fleets was not specific to public transit but CARB also put out the Innovative Clean Transit Rule, a purchasing mandate ensuring all public transit agencies will have 100% ZEV fleets by 2040. Percentages ramped up over time, beginning in 2023 where 25% of procurements had to be ZEVs, up to 100% of new procurements in 2029. Can look to this program for data analytics.

American Public Transit Association (APTA)'s zero emission fleet work group committee plans to publish an extensive inventory of ZEVs deployed by agencies

Jana Jarvis – Oregon Trucking Associations

Electric load demands of all electric fleet are concerning and charging infrastructure is not in place.

Kyle Whatley – TriMet

Technology is not available; there is only one FCEV manufacturer; many electric bus manufacturers have left market, and infrastructure timelines are long.

Jana Jarvis – Oregon Trucking Associations

ODOE should revisit the definition of a zero emission vehicle. Today's newer diesel trucks running on renewable diesel have lower carbon intensity than BEV.

Juan Serpa Munoz – Eugene Water and Electric Board

Agree that MHD ZEV targets are not realistic, but if we do assume these targets, what is the modeling on grid resiliency?

Brett Morgan – Climate Solutions

There's research from RMI that analyzes the current MHD sector across all classes and concludes that in Oregon specifically, 57% of MHD vehicles can be electrified currently, based on current routes using telematics data. And this 57% electrification rate results in about a 3% increase in grid demand.

Would be really helpful to look at barriers to energization timelines, such as grid capacity for fast charging.

Kyle Whatley – TriMet

are resiliency and redundancy considered in the model?

Michael Graham - Columbia Willamette Clean Cities

does the model consider Class 1 railroads or just Class 2 and switchers? Can we segment them out to account for rail lines that typically stay in state vs. those that go out of state? Same Q for shipping.

Rebecca Smith - Renewable Hydrogen Alliance

To what degree did the development of these assumptions include WA Dept. of Commerce's recent hydrogen study?

Indi Namkoong – Verde NW

is the model assuming a particular color of hydrogen?

Would be really valuable to model a scenario with a particular target of hydrogen uptake. I have concerns about assuming hydrogen in the reference case because we are still in very early days and supply chains are not built out.

Brett Morgan – Climate Solutions

what are the assumptions around fuel cell vs. hydrogen combustion engines?.

Cory Ann Wind - Clean Fuels Alliance

The conversation today is centered on getting the transportation sector to zero emissions, but there are other ways to significantly decarbonize transportation that may not be zero.

Indi Namkoong – Verde NW

If transportation continues to produce more than our "share" of emissions in 2050, can we model what the additional decarbonization burden would be on other sectors?

Jana Jarvis – Oregon Trucking Associations

Hydrogen likely to play a larger role than suggested here. Would suggest the reverse: 80% H2, 20% electric

John Garrett – Oregon Citizens' Utility Board

What are the modeling assumptions around smart charging and V2G technology?

Lewis Lem – Port of Portland

Does the model consider interaction effects?

John Garrett – Oregon Citizens' Utility Board

Agree that V2G is much more difficult to implement so supportive of the V2G assumption.

Cody Meyer – Oregon Department of Land Conservation and Development

one scenario should be based on optimistic implementation of our policies, including VMT reduction

Sylvan Hoover – Oregon Department of Transportation

If exploring VMT reduction, are trips assumed shorter or fewer or replaced by others modes and are teh [sic] cost for developing infrastructure for other modes included?

Indi Namkoong – Verde NW

Concerns about assuming most optimistic policy implementation in reference case. Capacity expansions happening that are likely to increase VMT in aggregate, at least in Portland region. We are struggling to fund alternatives at scale, like transit, active transportation, etc. So do not think baseline should be assuming 20% reduction but do agree that it would be really useful to illustrate what happens if we don't change behaviors. This will tell us a lot about the costs to our entire system, of leaning into these policies or not.

Cory Scott – PacifiCorp

"PacifiCorp notes that sales trends are slowing, and Original Equipment Manufacturers have changed their long-term visions. PacifiCorp recommends considering a scenario that reflects these current trends for EV adoption."

"Slide 28: How are stakeholders supposed to interpret the two different medium duty rows?"

"Slide 28 (electrification/transportation) o Because ZEVs include both BEVs and PHEVs, it's going to be important to include assumptions for the share of each of these rather than just stating a percentage for ZEVs. BEVs and PHEVs will have different direct emissions (BEVs don't have any, but PHEVs do)."

Rachel Sakata – Oregon Department of Environmental Quality

DEQ is concerned with including any potential programs or assumptions in the reference scenario for the model. Specifically, for MHD vehicles, ODOE should include only policies currently in place.

DEQ is concerned that the model and choices in the reference scenario will not be supported for future policy for other state agencies.

Erin Childs – Renewable Hydrogen Alliance

RHA does not object to the portfolio wide assumption of a 75/25 split for BEV/FCEV transit buses but notes that cost considerations and operational profiles will drive the split differently for different fleets.

RHA does not believe a 75/25 BEV to FCEV split is realistic for long haul trucks and recommends additional input and engagement from truck fleet operators.

RHA requests clarity on how the model will address off-road vehicles, like forklifts, and port ground equipment, like yard tractors or rubber tired gantry cranes?

Jennifer Joly - Oregon Municipal Electric Utilities Association

What are today's statistics for car purchases in Oregon? What percentage of customers are choosing in EVs in Oregon today? How much of an annual increase would need to be achieved to reach 100% by 2035?

The 100% of new Class 2b-8 vehicle sales by 2040 is overly aggressive and we should not assume 100% of vehicles are zero emission vehicles. Some vehicles will remain powered with non-electric sources

100% BEV sales for school buses by 2036 does not seem realistic

An important consideration for modeling aggressive transportation electrification is charging infrastructure and the impacts of increased loads on local distribution grids and substation

transformers. Has ODOE factored into the model the availability of power transformers?
Currently, manufacture of these types of transformers are out five years.

Mark Heizer – Oregon Building Code Division

V2G - no V2G assumed: WHY NOT!!! Shooting for EV uptake. Incentives for installing chargers (and buying EVs) that are V2G capable! easily 5 kW demand per home (5% of homes could be participating at any time). GET PILOTS working

Spencer Moersfelder – Energy Trust of Oregon

"The residential EV Flex Load of 2/3 residential EVs participating in managed charging seems a little high given consumer anxiety about range and the desire to make sure their car is charged when they need it. Policy and rate changes could make this more realistic."

Surprising that COM participation in managed charging is assumed to be lower than RES. Fleet managers have stronger reasons to participate in managed charging.

Mark Heizer – Oregon Building Code Division

DR for residential Evs: start at 0...: GEt % at PHEV vs. EV

Kyle Whatley – TriMet

Public transit faces the following barriers as it transitions to zero emission vehicles: utility energy capacity, timeline for utility upgrades, redundancy/resiliency, etc

One of TriMet's operating/maintenance facilities will primarily house hydrogen FCEBs and TriMet is committed to using green hydrogen but there are challenges. There is no green hydrogen supply in the PNW and plans for implementing supply depots are having initial process delays. Cost per kg of hydrogen is very expensive - some transit agencies have experienced [sic] costs of \$9/kg-\$30/kg. There are concerns with the reliability of onsite hydrogen generation

Alexis Hammer – Oregon Department of Land Conservation and Development

[Maritime] Are these assumptions reflective of or coordinated with the national and international efforts that would be required to implement them? Converting half of all shipping to ammonia as a baseline assumption is very ambitious.

Is it fair to assume that the alternative scenarios will include different variations on "what if we don't meet some of our baseline assumptions?" With the reference scenario including so many aspirational assumptions, I think it would be interesting to see a sensitivity analysis of the baseline variables in the reference scenario to see which top 10 would have the greatest negative impact (measured against Oregon's goals and CO2e emissions) if we *don't* achieve them. Probably preaching to the choir here.

Cody Meyer – Oregon Department of Land Conservation and Development

The energy strategy should acknowledge land use planning's role in the reference case, when it comes to available land, more compact communities, energy siting, etc

The reference scenario should include a 20% reduction of VMT per capita assumption for the following reasons: VMT per capita has not grown for many years; ODOT's Statewide Transportation Strategy and the Oregon Transportation Plan include a 20% reduction of VMT per capita for light-duty household travel; DLCD has adopted several administrative rules requiring cities to plan for and meet reductions in VMT per capita, including OAR 660-044 and OAR 660-012; the Portland metropolitan area has been planning for VMT reductions for several decades; and recent changes in housing policies for cities over 10,000 legalize duplex through quadplex development on land previously zoned for single family development.

Tom Eckman – Lawrence Berkeley National Laboratory

I am no expert on kWh/H2 transport technology, but long-haul trucks seem better suited to H2 than batteries unless there's a significant improvement in charging time and weight/capacity ratios. Maybe best addressed in an alternative scenario because [sic] its an unknowable/uncontrollable factor.

Natalie Mims – Lawrence Berkeley National Laboratory

Re: long haul H2 targets: 75% by when? Also, what does this represent? vehicles made, operated, etc?

Tom Eckman – Lawrence Berkeley National Laboratory

Re: VMT: Is this based on current trends? the improvement in mass transit availability [sic] and use assumptions? response to the cost of electricity for vehicle charging? Just seems like a behavioral change that deserves some rationalization/supporting data.

Natalie Mims – Lawrence Berkeley National Laboratory

The CA Demand Response Potential study finds: to estimate the DR potential from EV charging in the residential sector, EV level 1 and level 2 chargers are considered. The current saturation of level 2 chargers (among homes with EVs) is estimated at 50%, which will increase to 67% by 2030. All level 2 chargers at home are expected to be networked by 2050, increasing [sic] the saturation to 100%.

Energy Efficiency and Load Flexibility Working Group

Wade Carey – Monmouth Power

Curious about the assumption on how many residential structures need more weatherization, COUs have been actively doing weatherization for many years, and there aren't that many out there that need a lot more work. Commercial previously under supported could benefit more. Not sure about how IOUs compare. 10-20% may not be realistic if many homes don't need weatherization measures.

Shelley Beaulieu – Dragonfly Consulting

What if these strategies result in increased energy burden on LMI/EJ households?

Jeff Mitchell – Resource Innovations

Federal heat pump water heating standard from 2029 - will we incorporate?

Wade Carey – Monmouth Power

Adoption goal shouldn't be overly aggressive. Really problematic for utilities to install heat pump water heaters. More efficient, but technical issues.

Anonymous

Does discussion on water heaters include insta-hots or solar thermal systems?

Claire Prihoda – Climate Solutions

Suggestion that we could incorporate 500K heat pump, space heating goal by 2030 and extend out by 5 year increments. Not a strong suggestion to "do it" but an idea to consider.

Alec Shebiel – Umatilla Electric Coop

Do we have benchmarks from other states to inform heat pump adoption number?

David Clement – Northwest Energy Efficiency Alliance

MISO reaches 10% demand response at peak. Would that be a good rule of thumb to build into reference case?

Anonymous

Question about BPA buildings data for weatherization.

Claire Prihoda – Climate Solutions

HDV electrification - certain commercial fleets do lots of managed charging - closer to 80%.

Customer-side batteries - comment around batteries for resilience, barriers for adoption, need for policies.

Tim Miller – Oregon Business for Climate

Doesn't seem like that 1% industrial efficiency assumption is consistent with CPP trajectory.

Jake Wise – Portland General Electric

PGE reps happy to engage on call with planning and programs teams to inform load flex modeling assumptions.

Tim Miller – Oregon Business for Climate

Wondering if the energy strategy work will consider bigger population shifts (i.e. climate migration from other regions in the county).

Laney Ralph – NW Natural

"NW Natural supports using weatherization as a key energy efficiency driver given the benefits regardless of fueltype, however, 95% of buildings being weatherized seems like a high percentage. Community action agencies have been doing this work for many years and should be consulted about presumed adoption for residential. Inaccurate estimates discredit meaningful steps in the right direction by minimizing weatherization updates/upgrades made by homeowners."

"NW Natural wonders what are the assumptions being used for gas energy efficiency? Commercial gas heat pumps are currently available and residential gas heat pumps are being demonstrated in Canada. Gas heat pumps would push natural gas heating efficiencies above 100% which would greatly improve gas efficiencies in the later portion of the planning horizon"

"NW Natural believes that in addition to air-source heat pumps, we should consider ground-source heat pumps too. Networked geothermal systems have a strong potential to replace central systems for campuses or neighborhoods."

"NW Natural is setting up a residential "bring your own thermostat" demand response program. There are not a lot of gas programs to point to for reference, but we anticipate being able to share our findings for future iterations of the Oregon Energy Strategy."

"NW Natural, Pacific Power, and Portland General Electric are conducting Energy Burden Assessments with the same third-party contractor. We recommend reviewing the findings from the reports for electrification considerations."

Cory Scott – PacifiCorp

"Will this assumption be updated with data from utilities' expected data center load growth based on IRP data?"

- Are the targets for energy efficiency aligned to aggressive outcomes of utilities' Conservation Potential Assessments?

PacifiCorp Assumptions:

- Expected case values are derived from optimization modeling applied to potentials studied in the Conservation Potential Assessment"

Fred Heutte – NW Energy Coalition

"The draft document sets a target of 50% of electric residential and commercial appliance installations by 2050 (linear growth from 2025). We suggest some basic disaggregation by end use....For example, grid-managed heat pump water heaters have tremendous potential for market saturation well before 2050. The technologies for both that equipment and grid management are mature and improving, and all standard electric resistance water heaters sold in Oregon today are required to have a grid interaction (CTA-2045) device. The issues with deployment are primarily on setting appropriate customer incentives and scaling up programs. Other end uses will have different saturation strategies, and within the constraints of the current modeling timeline, we encourage ODOE to consult with NEEA, the NW Council, utilities, AWHI and other initiatives, equipment suppliers and aggregators to refine basic saturation curves for the modeling"

Kelly Campbell – Columbia Riverkeeper

"Will robust energy efficiency investments be included in the reference model or other models? As discussed in the CRITFC Energy Plan, one of the benefits of this focus is that it is a fish-friendly policy. This is a critical environmental justice opportunity."

Mark Heizer – Oregon Building Code Division

DR Commercial: Added commercial cooking demand estimates of impact on grid (no demand response at a restaurant).

BTM storage adoption: Code can incentivize/pre-wire/space for storage. NEED regulatory changes (and incentivization for installation).

Flexible load parameters: CODE as well as: Regulatory, Utility/PUC, Appliance standards (state requirement for chargers)

"EE and Load Flex - BTM PV - Necessary changes in statutes to increase existing building uptake; Especially for Community solar projects.

Necessary revisions to outdated solar statutes/PUC rules, especially on (virtual) net metering. Could make demand management more cost effective and increase participation... as the building and energy codes are requiring demand responsive controls in buildings."

Ann Vileisis – Kalmiopsis Audubon Society

SUPPORT FOR SCENARIOS AND POLICIES THAT REDUCE AND MANAGE DEMAND AND INCREASE EFFICIENCY

Alexis Hammer – Oregon Department of Land Conservation and Development

Because this [BTM Storage Adoption] can presumably be influenced through government incentives, it seems like a prime opportunity to have this be a sensitivity variable to see how much it matters to other factors. If it's a key variable, we know where to focus our effort.

Erin Childs – Renewable Hydrogen Alliance

Electrolyzers [sic] and synthetic fuel production plants should be included as flexible loads in the model.

Transmission and Distribution Working Group

Jake Stephens – New Sun Energy

Will the HB 2021 be modeling the 80% and 90% milestones as binding (hard) targets? What about the community based renewables, small scale (10% < 20 MW), PURPA and other statutory policy objectives formally adopted by the State? I can list some more examples, but I am directly asking that ODOE provide a clear list of ALL the energy statutes and state policies. And address how or whether it will or will not be addressed. It shouldn't be our job to scrub the statute and EOs for ODOE. That should be up front transparency. Including to allow us to check if certain issues are or not being addressed.

Not modeling the in-Oregon transmission constraints effectively not only guts the core intention of the bill, but side-steps the core constraint to Oregon meeting Oregon's energy policies. Those are the defining problems of Oregon's electric power goals being met. And what policies (ie. what the state can do) needed to actually succeed.

Marc Patterson – Idaho Power

It seems that the gas infrastructure would need similar O&M work regardless of throughput. So less throughput raises the cost to the remaining customers in order to fund that same O&M work.

John Dietz – McMinnville Power and Light

Will you be using actual events like the January storm to help set the base case?

Lennie Ellis – International Brotherhood of Electrical Workers

IF Jake is correct in his assumptions/representations, perhaps we should be focusing on Grid Enhancement Technologies?

Eli Asher – LineVision

Question about the modeling: Either in the reference and/or scenario cases, will the model factor in grid-enhancing technologies (GETs), and specifically Dynamic Line Ratings (DLR)? DLR can immediately increase the capacity of the grid, which as Jake highlighted, is already constrained?

Sidney Villanueva – Northwest and Intermountain Power Producers Coalition

I had questions about how large load growth (from data centers, etc.) is being modeled, but I'm not sure if that will be covered in a later slide...

Nora Apter – Oregon Environmental Council

Seconding Sidney's question; also curious how various regional energy market scenarios will be considered. [sic]

Fred Heutte – NW Energy Coalition

no new pipelines in store for OR. Ruby line was Rocky gas down to CA. SES assumes reduction of gas over time. Not an issue the way Tx is. We do not have to wait 15 years. Confederated tribes a bethel line; Cascades if they can find an offtaker [sic] done in 5 years. Keep the purpose of this study and the ability to dig down very detailed Tx two separate things. Plenty more info on TX.

this study cannot give precise answers of capacity. Two modeling zones cannot give us the info. PoP did a pretty good job. BPA many many studies PATH. WECC, Northern Grid. PGE. New WestTEc. Connected West by CREPC next month. Sufficient look down to the level of Oregon. Not just within OR for use in OR also resources outside of the state. Any important point about this study. This study is not a Tx planning study. It is an overall economy wide energy strategy. Learn about the general need for Tx

Elaine Hart – Moment Energy Insights

Just to clarify, the model includes a physical representation of transmission constraints and does not represent transmission rights, who holds them, or the extent to which transmission rights are available without additional transmission expansion. Transmission expansion will be triggered in the model if there is not adequate physical transmission capacity to accommodate the flows required to meet load in each simulated hour. The intention in breaking Oregon into Western and Eastern zones is to approximate a couple of key transmission constraints at a high level: SoA and Cross Cascades South. This high level representation is not intended to reflect all of the complexity of transmission planning, to Fred's point.

Jake Stephens – New Sun Energy

Distribution: Does that mean PGE system will not just be a single point?

Fred Heutte – NW Energy Coalition

One more thought on transmission: given BOEM's announcement they are going forward on leases for the two off-south coast areas, it will be important to include assessment of OSW transmission needs and opportunities.

Hannah Dondy-Kaplan – Bonneville Power Administration

We do, as well as upgrades needed based on certain scenarios.

Brent Bischoff – Coos-Curry Electric Cooperative

Schatz Energy Research Center recently issued a transmission study to support development of N CA and S OR OSW.

Hannah Dondy-Kaplan – Bonneville Power Administration

Does PNNL have any offshore wind data they can share from their tx study?

Sidney Villanueva – Northwest and Intermountain Power Producers Coalition

I have to jump, apologies, can you remind me when comments are due?

Jake Stephens – New Sun Energy

Can you provide a statute list before then?

Hannah Dondy-Kaplan – Bonneville Power Administration

"Dear ODOE, BPA does not have access to your comment portal, therefore please accept the following comments. I know these are slim and I do apologize, but the transmission planning group is extremely resource constrained right now and cannot contribute more at this time. I did have them review the document and there were no red flags or gaps of information that were clearly evident to us.

Thank you for engaging BPA in this process.

These statements are taken from pages 10-11 on transmission and distribution of the document:

- The model is assuming no new transmission (totally new) until 2035—
- BPA has no new greenfield development coming online before 2035, correct.
- Reconductoring/Rebuilding Existing Lines – Model assumes BPA’s Big Eddy to Chemawa project and PGE’s Round Butte to Bethel project, both expanding East to West transfer capacity from 230 kV to 500 kV and both online in 2035 (conservative assumption) or 2030 (liberal assumption)
- Are there other “in-flight” projects (new lines/reconductoring/rebuilding) that should be considered to be complete before 2035?
- BPA is in the planning stages for a few substations that would come online before 2035 that may impact capacity, but, we do not have publicly available timelines or data at this time due to NEPA scoping not having occurred yet and the very early stages of planning occurring.
- Cost Assumption--Proxy value based on historic costs from Energy Information Administration (EIA)
- BPA has found that costs have increased but we not have a model to share.
- Consider talking to: Sam Kem - Senior Economic Research Analyst National Rural Utilities Cooperative Finance Corporation (CFC). She’s been speaking lately about increased costs and may have a good reference.
- Electricity transfer capacity between East and West Oregon: Using publicly available BPA data on historical path flows. Account for East to West transmission expansion projects noted above (B2H, Big Eddy to Chemawa, and Round Butte to Bethel) 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

- BPA is in the early stages of scoping and assessing plans of service for the projects, and our NEPA process has not begun, therefore we don't have additional timelines on the project."

Cory Scott – PacifiCorp

"Questions:

- Is the reference to PAC's Gateway project referring to Gateway South or to the entire Energy Gateway set of projects? YES - All Gateway segments included in Reference w/ online dates syncing with nearest 5-yr time step for Jeremy's modeling (see pg. 21-22 of PAC's 2023 Local Transmission Plan)
- Why are the B2H and Gateway assumptions significantly different from PacifiCorp's near-term planning assumptions? Most likely due to the 5-year time step, and not more granular years
- Will the model consider multijurisdictional transmission options that are outside of Oregon but that will enable Oregon-assigned resources? At a high-level yes. Model will build expanded tx capacity between states (this either accounts for costs to build tx within state to interconnect and move energy from in-state resources out to another state and/or treats these costs as a net wash compared to doing the same to get in-kind resources interconnected and ""out"" of other states).

PacifiCorp Assumptions (from the 2023 IRP Update):

- Gateway South commercial online date online in 2025 (sure, model could do GW-S in 2025)
- Energy Gateway Segment H Boardman to Hemingway online in 2026 (beyond 2025, so model captures in 2030)
- Approximately two gigawatts of additional interconnection capacity are added through 2032, in addition to the amounts directly associated with Energy Gateway South, Energy Gateway West Sub-Segment D1, and B2H. (don't know that model can/will account for this)"

"Pacific Power has a planned project to construct a new 500 kV transmission line between southern, central and northeastern Oregon with a planned in-service date of 2032. The need for this new line was identified in the Company's Local Transmission System Plan, Generation Interconnection Cluster studies and new customer load request studies. Pacific Power requests inclusion of the "Blueprint" project in the topology for the 2035 and later study scenarios. Model information and data is available and will be provided to ODOE and its technical contractor. (beyond 2030, so model could capture in 2035)"

Pat DeLaquil – DecisionWare Group/Mobilizing Climate Action Together

Like their use of the higher cost data set [Power of Place]

Emily Griffith – Renewable NW

We agree that relying on out-of-state generation too heavily creates a scenario where we rely more heavily on transmission that will likely take too long to develop. This would also not contribute greatly to the goal of maintaining reliability. Resources developed closer to energy load (or demand) increase reliability of the grid for local Oregon communities.

Shannon Souza – Oregon Coast Energy Alliance Network

The grid, economic and resilience values of rooftop, community, commercial, small qualifying facilities and utility scale renewables, storage and advanced grid technologies should be able to be reflected by the modeling framework and evaluated in Reference and Alternate scenarios and we do not believe that the proposed approach can do so.

Mary Moerlins – NW Natural

NW Natural recommends that the Pipeline Infrastructure Assumptions allow for infrastructure development beyond operations and maintenance as the gas system adapts to using clean fuels.

Fred Heutte – NW Energy Coalition

"Suggest additional consideration of potential for advanced conductors and other GETs.

Examples:

- Dynamic line rating project Sherwood-Beaverton area, PGE Consider if/how DLRs could be modeled by accounting for a seasonal proxy value that would ""boost"" interstate transfer capacity by say 10% in a what if scenario
- Setting overall potential for advanced conductors and GETS at 0 would be a significant shortcoming of the strategy. Determine how Jeremy's model does or doesn't account for rebuilds/reconducting to be done with advanced materials vs traditional materials
- Suggest inclusion of Cascade Renewable Tx Project (www.cascaderenewable.com) This ""merchant"" tx project will face cost allocation challenges and has not been selected in NorthernGrid's regional transmission plan, therefore there is no basis for inclusion in a reference case. This could be considered in a what if scenario"

For the electricity distribution cost assumption, in addition to reviewing the EIA assumptions, we encourage ODOE to confer with the Oregon PUC and utilities that have filed distribution resource plans which provide plentiful system deployment and cost information.

For transmission flows between the east and west side, we strongly encourage the modeling not to be restricted to historical path flows and instead set constraints at the rated capacity of the respective lines and paths. As the regional load shape and resource mix change, major changes continue to emerge in flow patterns. For example, on the AC and DC Interties connecting the Northwest and California through Oregon, south>north transfers were exceedingly rare until 2019; now they constitute more than half of net annual flows.

Recommendation to incorporate US DOE National Tx Study, Connected West study, WestTEC, to the extent relevant and feasible.

Mark Heizer – Oregon Building Code Division

T&D - reconductoring/rebuildings existing lines: Good. (How many other projects possible?)

Electric supply: out-of-state generation requires Tx: "storage" of CA overgeneration. lines constructed to send wind and hydro to CA can't backflow during CA duck curve?

Emily Griffith – Renewable NW

We would like to stress the importance of sufficiently capturing dynamic load growth in Oregon. There are many new and future large single load customers in the state and the numbers are projected to increase in all service territories, investor-owned utility (IOU) and consumer-owned utility (COU) territory alike. We note that load increases are noted in the Energy Efficiency and Load Flexibility supply-side assumptions, however we would like to ensure these dynamics are sufficiently captured in the demand side of the model. We also recommend reflecting these load increases in the Transmission and Distribution section, as well, as they will implicate transmission and distribution system capacity

"We appreciate the use of the Evolved Energy Research models to inform Energy Demand and agree with the sentiment that siting restrictions apply to new generation, interconnection, and transmission and out-of-state generation requires transmission. We agree that relying on out-of-state generation too heavily creates a scenario where we rely more heavily on transmission that will likely take too long to develop. This would also not contribute greatly to the goal of maintaining reliability. Resources developed closer to energy load (or demand) increase reliability of the grid for local Oregon communities."

"Renewable Northwest understands that the only new transmission lines that will be included in the reference scenario (prior to 2035) are Idaho Power Company's (IPC) Boardman to Hemmingway project and PacifiCorp's (PAC) Gateway project. There are several efforts, mentioned below, that are working to model where additional transmission capacity will be needed in future scenarios. Additionally, as much as it is possible to model the cost impacts and benefits of implementation of grid enhancing technologies or use of existing right of ways would be welcome analyses. Equally, it is our understanding that the model assumes a single market and/or RTO. It would be helpful to clarify this as arriving at this scenario in the West may take time to realize. Some additional studies we are aware of that could offer inputs and insights into transmission needs include the Connected West study by GridLab, Gridworks, and Energy Strategies - expected to be completed in the coming months. While this study is taking a west-wide approach, this is still applicable to the Oregon context as the state is increasingly connected to other states and markets, which offers the potential for efficiencies in electricity trading, but also in the need for transmission builds and connectivity. We strongly support using Bonneville Power Administration data on transmission builds. We also see IOU plans (PGE, PAC, and IPC Integrated Resource Plans, for example) as an important reference for understanding

their future plans and strategies around transmission and distribution The Western Transmission Expansion Coalition (WestTEC) effort is generating regional transmission planning scenarios. This effort is still in process and may take some time for arriving at scenarios. However, following its work, assumptions, and efforts would benefit the Energy Strategy, if even to coordinate and deconflict.

The Distribution system cost assumption should include evolving costs such as those presented by wildfire risks. Given the history of dealing with wildfire, we suggest looking at what the California Independent System Operator and Pacific Gas & Electric use as proxy values with regard to wildfire costs.

Alexis Hammer – Oregon Department of Land Conservation and Development

Do any of the projects included in the reference model support west to east transmission from the coast inland? This could affect whether and how offshore wind is built into the model.

Erin Childs – Renewable Hydrogen Alliance

Given the model's assumption of no new interzonal transmission until 2035, RHA strongly recommends that the model be permitted to consider dedicated hydrogen pipelines as an alternative or a complement to transmission upgrades to alleviate pressure on the transmission system and support timely development and devliery [sic] of renewable hydrogen.

Alexis Hammer – Oregon Department of Land Conservation and Development

Transmission Availability: The Power of Place transmission figure cited here does not include any new transmission between Bend and the coast, yet the transmission workshops I've attended, hosted by USDOE, include new potential transmission routes between the coast and the valley, modeled by NREL. From my non-expert vantage, transmission seems like one of the major bottlenecks and decisive factors in the energy mix modeling. If offshore wind is assumed to be added to the grid under the reference scenario, you should include the NREL offshore wind transmission study currently under development, and build in those costs to the model.

Eric Strid – Power Oregon

"Hi again,

[These are my personal comments, not those of the Hood River County Energy Council.]

Considering the attempt by a solar developer to derail the T&D Working Group meeting, the recent formation of the Save Oregon Solar Coalition, and the limited storage options in the 5 scenarios to be modeled, I am concerned that DERs, VPPs, and V2G will get sufficient consideration in the Oregon Energy Strategy development.

Regarding V2G, California recently passed a law that allows CEC to accelerate V2G requirements in new vehicles, which could potentially triple their grid storage from just one year of EV sales. https://www.utilitydive.com/news/california-electric-vehicle-ev-to-grid-battery-capacity/726319/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202024-

09-

11%20Utility%20Dive%20Load%20Management%20%5Bissue:65754%5D&utm_term=Utility%20Dive:%20Load%20Management

Regarding VPP's, Energy Hub's recent VPP summary notes over 500 VPPs operating in North America, serving millions of customers. RMI's recent VPP flipbook illustrates various VPP pilots, including PGE, and summarizes key takeaways (pp. 64-66). https://rmi.org/wp-content/uploads/dlm_uploads/2024/06/VP3_flipbook_v1.1.pdf

All of these trends show that rapid adoptions are available and beneficial. ODOE, Oregon IOUs, and OPUC should be carefully planning for an exponential growth in VPPs and microgrids.

Thank you, Eric Strid"

Advisory Group

Martha Dibblee – Self (former Energy Facility Siting Council member)

Recommend that Oregon Legislature consider a statutory amendment to ORS 469.300 ff to site small modular nuclear reactors (SMR) not attached to the grid.

Today 8/9/24 IAEA published support for SMR infrastructure. See

<https://www.iaea.org/newscenter/news/iaea-milestones-guidance-updated-to-include-considerations-for-smrs>

I am disappointed in this strategy group that there has been so much negativity about nuclear. Small nuclear reactors or SMRs offer much more than green power -- they eliminate the need for transmission lines. NuScale already has been approved by the NRC. Electrical transmission is seriously in deficit. By having SMRs there is no need for transmission because the power is on site. SMRs could be used for communities or businesses data centers and industry such as steelmills [sic]. The Oregon Department of energy is failing to provide Oregonians with green energy that was developed at Oregon State University. The Oregon Department of energy clearly can recommend to the legislature that SMR's be allowed to be sited in Oregon. A simple change in the statute would allow this to happen. I am extremely disappointed and the department of energies unwillingness to recommend this nuclear option.

Tucker Billman – Oregon Rural Electric Cooperative Association

"While I appreciate the effort to include a broad array of stakeholders in the various subcommittees that served as feedstock into the Draft Reference Scenario, I believe the subcommittee meetings were hastily performed with too little input from industry experts in their respective fields. ODOE and CETI utilized the overwhelming majority of meeting time to explain the modeling process rather than soliciting meaningful feedback from experts in the various topic areas being discussed."

Cory Scott – PacifiCorp

The reference scenario assumptions states that HB 2021 sets a portfolio standard that requires "100% clean electricity." PacifiCorp recommends clarifying that the law requires an emissions reduction standard of 100% by 2040.

In addition, PacifiCorp recommends the reference scenario assumptions acknowledge that the law establishes interim emission reduction targets for 2030 and 2035. ORS 469A.410.

It is a bit unclear in the material that has been shared, how the Renewable Portfolio Standard and other supply side requirements will be reflected in the model.

Elijah Cetas – Columbia River Inter-Tribal Fish Commission

To ensure the baseline OSES model does not also inadvertently overestimate hydro capacity for load-following and peaking, we recommend ODOE work directly with NPCC to ensure the model accounts for minimum flows, spill requirements, and other fish constraints detailed in fish and water management plans. If, as a result, Oregon's energy needs require additional generation, storage, grid flexibility, or efficiency measures to meet both clean energy targets and minimum fish requirements, the baseline model should reflect this fundamental reality

We urge ODOE to coordinate with PNNL and identify how the OSES model can integrate the core dataset and starting assumptions of this basinwide [sic] energy needs study.

"Finally, the USG Commitments provides funds to replace the generation losses of the LSRD through direct investment in tribal energy projects. These projects will account for 1000-3000 MW of additional clean energy generation capacity across the four CRITFC tribes, two of which are located in Oregon. The model should forecast these tribal energy contributions with the same weight as utility IRPs."

"Integrating these Commitments may require further consideration of other aspects of the OSES model. This could include forecasts for meeting peak load, reliability, and resource adequacy in recognition of the ways utility providers and regulators may adapt to changing dam operations and associated load generation capability. These considerations also figure in to questions posed by ODOE and other parties about the relative importance of, for example, emerging demand response technology, reduced transmission capacity, and changing distribution costs. Without suggesting answers, we express our appreciation for ODOE's forthright approach and thoughtful consideration of all the issues"

"What is the timeframe for the historic calculations in the model? The last 10 years, the last 20 and/or the last 5 years? The further out the timeframe, the further the assumptions are from what is actual."

"Spring operations have been altered a lot in the last two to four years; the model is likely to overestimate the capabilities or load capacity of the Columbia hydro system current operations. Appendix B in the RCBA should help clarify how the current operations match up with historic"

"The new summer operations actually have an opposite effect since spill has been reduced on August 1. If the model is using data from 2005 when summer spill was added through August 31, the current reduced summer spill operations should actually show as a net positive in hydro capacity."

"The ramp rates of 1 and 6 hours need to be clarified for where the control points are. Is this Grand Coulee ramp rates? Do the rates change daily? seasonally? The time of year plays a major role in this. Also, do they account for different flow years since it is easier to change the ramp rates in low to medium flow years than high flow years"

"The model being developed for the USG commitments considers breach of the LSRD in its longer-term forecast. Because this outcome is a real possibility for the region, the OSES model should incorporate replacement reliability needs from the Snake River dams, especially in the model's forecast of energy reliability in future decades."

"Looking ahead, ODOE should model a scenario for a low-peak, low-hydro reliance energy future that aligns with recommendation in the Energy Vision. Including: Reduced hydro capacity, increased EE, increased DSM, accelerated distributed solar coupled with storage, large-scale storage. The above are provided as initial "what if" scenario suggestions for a tribal-resource friendly scenario. Specifics of such scenario should be elaborated on and discuss in more details as alternative scenarios are defined."

Fred Heutte – NW Energy Coalition

"The introduction to the Key Data and Assumptions document takes an initial perspective that correctly states: "aggressive energy efficiency and electrification are key pillars of cost-effective decarbonization." We encourage ODOE and all involved in the Oegon [sic] energy strategy development to consider energy efficiency as a core part of "customer side resources" – also including all forms of flexible load, storage and customer generation. Recommendation to consider as combined resources."

Jennifer Joly – Oregon Municipal Electric Utilities Association

"The description does not include any links to or copies of the data sources that ODOE proposes to use for the assumptions. In the short timeframe available for comment, it was not possible to track down many of the listed sources. For example, where can we find the March 2024 Rooftop Solar projections from the NWPCC?"

"While it was democratic to allow anyone interested to have a seat at the working group tables, we are not convinced that the resulting composition of the working groups was balanced. Hopefully, ODOE will account for that by not giving undue weight to overrepresented groups, and by factoring in viewpoints that may not have been represented in this process."

Joshua Basofin – Climate Solutions

"Therefore, we recommend that in considering revisions to and iterations of the modeling, ODOE continue to receive feedback from stakeholders and review the adequacy of data sets utilized. ODOE should also make data sheets, a complete list of technologies, and relative performance measures available to the working groups"

"We recommend that ODOE identify additional data for the following areas:

1. Energy Service Demand projections, including data sources and methodology
2. Existing and New technology options with cost and performance data, and constraints (growth rates, resource limits, market share constraints, etc.). These should be categorized by sector and energy service.

3. Existing and new energy resource supply options, cost curves and resource projections for all fossil, renewable and imported resource options.
4. Existing and projected load duration curves for electricity demands
5. Methodology and assumptions (e.g., reserve margin) for determining peak loads (and capacity needs).
6. Discount rates"

"ODOE should articulate its criteria for determining when specific technologies are existing vs emerging, and the modeling should reflect the potential scaling of generation and fuel technologies accordingly. Existing: Floating OSW, geothermal, green electrolytic H2, microgrids and small-scale renewable energy facilities. Emerging: SMRs, nextgen geothermal."

Michael Colgrove – Energy Trust of Oregon

What exactly are inputs and what are outputs of the model?

Joshua Basofin – Climate Solutions

How does an alternative scenario such as electrification [sic] and transportation being lower affect existing policy goals such as EV goals?

Shannon Souza – Oregon Coast Energy Alliance Network

How will transmission cost be incorporated and at what point in the process?

Jimmy Lindsay – Portland General Electric

How is this modeling exercise thinking about costs and benefits and cost/benefit analysis?

Ivy Quach – QB Fabrication and Welding

Why does the model assume no new Tx until 2035?

Laura Tabor – The Nature Conservancy

Is there competition between inputs (i.e. electric vs. hybrid heat pumps) within the model?

Jimmy Lindsay – Portland General Electric

How does the model count demand response participation?

Jeff Hammarlund – Portland State University

Understanding the assumptions around long-term, mid-term, and short-term energy storage is important, especially getting up to date information as things are changing so rapidly (Commented this twice over the course of the meeting)

Joshua Basofin - Climate Solutions

There are individual data center load growth projections for PAC, PGE, and BPA territories. Are you confident that the NPCC forecast accurately aggregates/reflects them all?

Scott Simms – Public Power Council/Ivy Quatch – QB Fabrication and Welding

Cross-tabbing/analysis of DR uptake/participation in other states would be instructive as to assumptions that are appropriate for the model

Bryan Adams – CoEnergy Propane, LLC

Using 95 percent electric heat pump assumption for the eastern part of the state may not be appropriate due to colder climate and lack of efficiency in cold.

Tucker Billman - Oregon Rural Electric Cooperative Association

Will the model recommend increases in transmission and policy changes needed to accomplish that, or is the model assuming only existing transmission projects?

Joshua Basofin - Climate Solutions

Are GETs incorporating into the Tx inputs and if so, how?

Scott Simms – Public Power Council

ODOE should connect with BPA and find a way to make sure we're testing our scenarios and seeing if they're roughly mapping out to what they're expecting or seeing

Nate Hill – Amazon Web Services

For modeling purposes, is the focus on big Tx projects or does the model account for smaller types of projects that BPA is doing?

Tim McMahan – Stoel Rives

Does the model reflect opportunities for merchant transmission developers?

Laura Tabor – The Nature Conservancy

What assumptions is the model making in terms of connectivity to resources in other states or transmission progress outside of Oregon?

Can assumptions about what is happening out of the state be worked into the model and, if so, to what degree?

Fred Heutte - NW Energy Coalition

Tx subgroup should be reconvened to consider the implications of just-released information this fall

Scott Simms – Public Power Council/Tucker Billman - Oregon Rural Electric Cooperative Association

Model should use mid-higher load growth because of data center demand in Oregon and across the West

Patrick Mills - Confederated Tribes of the Umatilla Indian Reservation

Model should average proposed mid and mid-higher at a minimum

Nate Hill – Amazon Web Services

Is data center load in the proposed reference scenario for Oregon or whole region?

Erin Childs - Renewable Hydrogen Alliance

If east and west OR are modeled as separate regions, will all other assumptions be kept consistent between regions?

Laura Tabor – The Nature Conservancy

Can better data that is available beyond Power of Place be incorporated into the model?

Emily Griffith – Renewable NW

Will different scenarios provide a range of acres, etc. for what is needed to reach goals?

Model should use most recent study data as to solar industry energy density, as there have been improvements.

Scott Simms – Public Power Council

For alternative scenarios, more interesting exercise would be to look at less energy efficiency

Christine Golightly - Columbia River Inter-Tribal Fish Commission

For alternative scenarios, can both less and more energy efficiency be looked at?

Laura Tabor – The Nature Conservancy

Do either pipeline infrastructure or electricity distribution need cost additions given what those systems are expected to do?

Environmental Justice and Equity Working Group

Kaleb Lay – Oregon Rural Action

Is there an assumption of how effective different programs will be over time?

Christina Zamora – Klamath & Lake Community Action Services

Does the weatherization target include all homes/commercial, not just low income? What's the service delivery vehicle for non-low income?

Greer Klepacki – Community Energy Project

What about mobile homes?

Jess Grady-Benson – Rogue Climate

Scenarios that show with and without offshore wind would be really helpful

Also curious on things like hydrogen... different technologies

Robert Wallace – Wy'East

Looking into where solar can and can't be put on

Kaleb Lay – Oregon Rural Action

Scaling the VMT reduction geographically may be worth considering

Alessandra de la Torre – NW Energy Coalition

What about avoided costs that may reflect societal benefits?

John Seng – Spark Northwest

One thing I'd add as specific scenario is lots of people talking about building lines eastern to western, but can we compare to benefits if lots of folks on west get rooftop solar. Resilience benefits of that. Wonder if you can quantify the health benefits of being able to rely on backup power. Trying to visualize how might fit. Does that sound like something you could work with.

Robert Wallace – Wy'East

Are we evaluating forest health, biomass use for energy, will model help us look at opportunities there? Burning orchard waste. Biomass potential there.

Alessandra de la Torre – NW Energy Coalition

Are data centers included in the modeling and if so, what class are they under?

John Seng – Spark Northwest

Suggested what-if for the energy strategy modeling: What if all homes in Oregon had cost-effective energy efficiency (electrification and weatherization), as well as rooftop or community solar where feasible?

From the slide provided during the 8/27 meeting, our #1 priority is the second bullet: "what if there is much more energy efficiency, distributed energy resources, and load flexibility?"

Christina Zamora - Klamath & Lake Community Action Services

I would recommend ODOE find out what data is available from OHCS on the weatherization assistance program, their Justice 40 mapping and any information that the utilities report to the OPUC regarding customer engagement in DSM programs.

Kelly Campbell – Columbia Riverkeeper

"The Oregon DOE's extremely short notice and compressed timeframe for work group meetings and input has made it difficult for our staff to engage meaningfully in this process and prevented us from engaging our wider membership. We encourage you to slow down the process of creating an energy strategy to allow for meaningful input from Oregonians."

"What does the modeling consider to be Tribal lands? It appears that it may only include reservations. We would support a broader definition of Tribal lands that includes culturally significant sites and will defer to comments from Tribes about how to more accurately characterize Tribal lands."

"Is the reference and alternative modeling and the broader development of Oregon's energy strategy taking into account the Columbia River Inter-Tribal Fish Commission's Energy Vision for the Columbia River Basin? We suggest that this excellent resource be utilized in the planning."

Listening Sessions

Tracy Farwell

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Morning Session

Toby Kinkaid

Said very well done, thanks for what doing. Transportation. Touched on all different sectors, interesting to pull together into paradigm where reduced to actual infrastructure that gets the job done. Minimize bad size. In transportation, in big picture if one solution able to fuel all vehicles, is there one solution to reduce complexity, let OR be leader, self-reliant. What would satisfy all of conditions that everyone wants, low-cost, potent, available, produced in OR, lowest water consumption, sustainable, robust, nontoxic, create jobs, least impact on soil/air/water/biology. If that's standard, does anything get through? Some things meet some. I count 13 conditions. Only two things come through. For light-duty, residential, DC fast charge, no new land, no additional load. For everything else, it's clean hydrogen. Europeans championing for long time. Need to work together. One water cycle that changes. Don't have clean hydrogen in OR yet, but if set 5-year plan. We should concentrate on this decade, what we can achieve. That'd have most impact, most potency. About 40 square miles of solar; could do all without imports. Santi diagram could be redrawn, all in OR, use fuel cells to turn back to electricity. Don't take more time but there is one universal solution. Europeans going for it. If put as goal, think we could create zero emission. Don't think we could do better than that.

Brennan Gantner

thank you, great job. Preface I may have missed part of this. One thing I'd love to see in model or strategy is couple key metrics of tech advancement. Model based on where we're at, nothing changes, versus if few key tech advance, i.e., battery storage from 300 to 150 \$/kWh. At what

point a transformational change in our plants? If hydrogen 1500 down to 50-100, what change? Help that inform what the most critical breakpoint is for additional research/efforts on the state to advance those technologies. Bring those key technologies here. I'm part of consortium on DOE clean tech hub in Portland, working to bring in additional info on justifying why specific tech are useful and worth fed govt investing in NW tech hub. Bringing that in and mixing with state goals would be powerful message.

Eric Strid – Power Oregon

to brennan's comments, classic approach of a stock analyst is to look at the production learning rate of products, which is cost production fr every doubling of global output. Very useful for extrapolating 5-10 years in future for batteries, solar, wind. For cases where not limited to physical size or just not enough raw materials. But certainly a basis for th cost of techn would be something like Bloomberg uses, what expect for EV costs, solar costs, useful baseline everyone should be aware those already exist. Whereas some nascent tech, too early to tell much. Can start to triangulate. That's all

Anonymous Menti Response

Need for more transmission versus storing electricity produced more locally

Forecasting demand re heat pumps, EVs, ...

Expand the meaning of "least cost" analysis to include added value of non-toxicity, equity (universal access) and health benefits to the environment using 100% clean energy

What are the actual costs of transmission and distribution?? And what are the cost comparisons of utility vs. commercial vs residential PV with T&D included?

Blance [sic] of utility-scale clean energy, demand response CBREs to meet our goals

Looking at "least cost" options in a way that takes social and environmental impacts into account

Increased energy resilience from local solar generation and increasingly affordable storage.

Impacts from data center growth

How do we properly consider co-benefits of such public goods as healthy air, indoors and outdoors?

High, medium and low scenarios for hydropower

Line loss calculations and peak use sources.

How can Oregon become self-reliant?

How can we equitably decarbonize / move away from emitting direct use fuels?

Diesel fuel is critical for back-up energy (distributed wastewater and water pumps). Solar not an option in the winter. Solutions for this?

Concerned that biofuels are very energy intensive to produce and are not waste products

Will energy choice be eroded?

Studies showing the impact of natural gas on household environmental quality.

What end uses cannot be electrified or decarbonized with current technology?

what are the critical uses that do not have economically viable alternatives.

Cost comparisons of methane vs electrified buildings, including SCC and toxicities.

Can concrete manufacturing be decarbonized?

What are we going to do about long haul. Also, are we taking all things into consideration about electric vehicles, such as vehicle weight, tire wear, etc.

Encourage solar over parking lots and charging stations there as well.

How can urban planning (incl. implementation of statewide planning laws like CFEC) support transportation decarbonization

I see many more electric bikes and scooters for local travel

Ways to offset loss in gas tax as electric vehicles and improved mileage move forward. Mass transit is challenging for rural communities.

What a realistic [sic] pace is for making the transition?

Life cycle costs per mile. This would go deep in modeling such as road repair costs, etc.

How will implementation of CFEC state laws support transportation decarbonization

Can the batteries of idle EVs be used for storage?

How much can virtual power plants (distributed storage) practically cut the winter peak loads?

How can we use time-of-use charging and vehicle-to-grid to minimize the winter peak load?

How will implementation of CFEC state laws support transportation decarbonization

Afternoon Session

Carla McLane

Spoke to Menti question on biggest questions/concerns for direct use fuels sector by asking 'what is real cost of vehicle electrification?'

Spoke to Menti question on what want model to tell us by indicating 'also tax system, difference EV/ICE. If this is opportunity to model that, that'd be great.'

Tracy Farwell

Jevons paradox should inform our strategy. https://en.wikipedia.org/wiki/Jevons_paradox [then expanded] Suddenly economics expert late in life. If increase EE, costs go down. Paradox tells us that number of users increases. Don't reduce demand on energy by making it more efficient. Weird thing that economists discovered. If we ignore that, discover ourselves way later than we need to.

Carla McLane

Spoke to Menti question on what want model to tell us by saying: It'd be interesting to know what's truly most energy efficient home. All-electric, some mix, or additional things like solar panel. Think key component is can communities/cities actually provide the infrastructure to allow that. Get to every home, if that is most efficient model. What does that look like?

Eric Genge

Spoke to Menti question on what want model to tell us by saying: if put solar on every rooftop, would transmission losses make up for the difference? Think rooftop solar less efficient, so are those losses going to balance out? Better to do rooftop vs utility-scale.

Anonymous Menti Response

My EV costs me 3c / mi.

There are system reliability models that if conducted would expose the rickety nature of old refineries on sandy soil in WA, a 60 year old pipelines, and riveted tanks on the sandy edge of the Willamit [sic]

Seismic insecurity with WA refineries is a big deal

Salem is coordinating the demand for clean transportation with the evolution of a non-emitting power grid.

A lot of people keep their conventional gasoline cars for a long time, avoiding the manufacturing emissions that come with new cars and electric batteries. This needs acknowledgment

Distances and weather in eastern Oregon make EVs difficult. We need to be sure that ALL Oregonians have transportation that can work for them.

Need to model the proliferation of heat pumps.

Carla McLane

Menti reponse: Is there opportunity for 'mining' of fuels for this application? Carla noted this was her. There's old coal deposit. What kind of extraction might there be, relative to either

currently identified direct use fuels or future direct use fuels, opportunities for landowners. Focus on eastern Oregon.

Anonymous Menti Response

Model both small nuclear and large facilities as well.

Can we talk about nuclear again?

Yes, including nuclear in the assessment.

Tracy Farwell

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Public Comment

Kaleb Lay – Oregon Rural Action

"What if VMT increases in Eastern Oregon?

What if data center development/load growth increases?

What if prices for electricity imported from out-of-state increase?

What if H2 transmission efficiency is lower than expected?

What if western Oregon counties issue moratoriums on new residential natural gas development?"

Chas Jones – PICEA Consulting Group

If it's unclear what this form is, how I should use it, why I should use it, and what types of questions will follow on the remaining questions. The description above is inadequate. After clicking through, my comment is every more accurate. Regarding a strategy, tribes and municipalities should be offered formula grants that require little upfront effort to pursue their energy goals.

Gerard Boulanger

This is paved with good intentions, however, I'd like to see the amount of electric power from this "electrification" program to be compared to the current electric production and what has been done to match the extended power needs

Deette Miller

"Thank you for the opportunity to comment as you develop Oregon's Energy Strategy. I support a process that starts with a spatial analysis that identifies areas with the highest values for conservation of wildlife, biodiversity, and ecosystems—and eliminates them from consideration for energy development from the start. This will reduce time-consuming conflicts and help ensure that renewable energy development will not wreck ecosystems and natural values that Oregonians cherish.

I also encourage you to consider siting new energy generation in "brownfield" areas that have already been developed for other purposes—or to consider areas where renewable energy can be co-sited with other uses and create co-benefits. This will also reduce conflicts, allowing for more rapid adoption of renewable energy generation.

If you consider a Floating Offshore Wind energy scenario, I urge you to ensure the model you use accurately represents the high conservation values of marine ecosystems. The base model under current consideration is inadequate for credible comparisons to other energy generation options.

I urge you to consider energy options that reduce or manage demand and that increase energy efficiency. For example, Oregon may want to consider policy options that provide significant

incentives for energy conservation or that encourage development of sustainable industries rather than those that demand high-energy, such as data centers or crypto-currency mining operations.

I urge you to consider energy efficiency options that will help people in their everyday lives to save money and energy.

I encourage you to consider a scenario that will decarbonize most quickly.

Finally, I urge you to consider full life-cycle analysis for different energy sources to ensure that we'll not be reducing GHG emissions in energy generation while also increasing GHG emissions to manufacture the infrastructures needed. I'd like to see the least cost analysis account for all costs."

Paul Hawkins – City of Portland Bureau of Planning and Sustainability

"Thank you ODOE for the work to create an inclusive and representative process to gather input on the Oregon Energy Strategy. The Bureau of Planning & Sustainability appreciates the opportunity to participate and provide comment on the Draft Reference Scenario. There is tremendous value in a comprehensive state energy strategy in order to deliver upon the critical objectives of Executive Order 20-04, HB 2021, and the Climate Protection Program. We appreciate ODOE's commitment to reducing greenhouse gas emissions and decarbonizing our energy supply.

The Bureau of Planning & Sustainability is finalizing a cost and market impact analysis related to new construction electrification, carbon standards, and temperature standards. This study may be another useful data source for the Buildings section of the Oregon Energy Strategy. We would be happy to share those findings upon completion and look forward to being more involved in the Energy Strategy development."

Miscellaneous

Alexis Hammer – Oregon Department of Land Conservation and Development

The reference scenario also includes many assumptions about how the energy sector will change by 2050, which may or may not come to pass. There are both the projections of external pressure and the projections of decarbonization success. To what extent is the energy strategy going to include that span of time and effort required to get from now to the reference scenario's assumed advances? Will it show us how to get there and through what actions of society/government?

What is its basis for picking an energy mix to achieve the reference scenario? What are the data sources for future costs, obstacles, or confounding factors used in that energy mix searching function?

Erin Childs – Renewable Hydrogen Alliance

RHA supports the approach of modeling Oregon's energy production and consumption as part of a larger energy system but is concerned that by omitting Canada, the model will not reflect today's significant flows of natural gas and hydrogen and future imports from renewable natural gas from the provinces of British Columbia and Alberta.

The expected levelized cost of hydrogen modeled will significantly impact the modeled cost-effectiveness of hydrogen end uses and overall costs for hydrogen customers. Accordingly, it is critical that ODOE creates transparency around the assumptions used to derive any LCOH estimates used in this modeling exercise.

Are there considerations in place for updating the model if final implementation of 45V is announced during the development of the Oregon Energy Strategy?

What assumptions are being made for the percentage of hydrogne [sic] producers receiving the full tax credit versus a partial credit?

What flexibility is ODOE creating for regional cost variations in the price of hydrogen?

How is the carbon impact of the transportation of hydrogne [sic] included in the analysis?

What assumptions are being made about hydrogen transportation and production points (at customer site versus remote)?

For hydrogen storage, underground silo storage and underground hard rock caverns should be added. For geologic sequestration, include onshore rock formations. long duratino [sic]energy storage options should include hydrogen and compressed air energy storage.

"To ensure that the trade-offs between challenges and opportunities associated with hydrogen are well represented in the scenarios, RHA suggests that ODOE consider adding as many of the

scenario elements studied in WA's hydrogen study to the five scenarios it develops, with a strong preference for including:

- tighter GHG requirements (understand the impacts of stringent renewable and/or carbon requirements on local hydrogen supply and market adoption in the near term);
- flexible GHG requirements (understand the impacts of more flexible renewable and/or carbon requirements on local hydrogen supply and market adoption);
- low renewable energy deployment (understand [sic] the impacts associated with continued challenges to the deployment of renewables and other clean electricity resources on energy supply and pricing, and associated availability of electrolytic hydrogen;
- high renewable energy development (understand the impacts associated with accelerated deployment of renewables and other clean energy resources on energy supply and pricing, and associated availability
- of electrolytic hydrogen)"