WASHINGTON ENERGY STRATEGY ADVISORY COMMITTEE

Meeting Summary

August 25, 2020, 1:00 to 4:00 pm
Virtual meeting via Zoom

Meeting Participants

Advisory Committee Members

George Caan, Executive Director, Washington Public Utility Districts Association
Reuven Carlyle, Senator, Washington State Legislature
Co-Chair: Reeves Clippard, Chair, CleanTech Alliance and Chief Executive Officer, A&R Solar
Dave Danner, Chair, Washington Utilities and Transportation Commission
Kathleen Drew, Chair, Energy Facility Site Evaluation Council
Sandi Edgemon, City of Richland
Will Einstein, Director of Product Development and Growth, Puget Sound Energy
Martin Gibbins, Water Issues Chair, League of Women Voters
Deric Gruen, Program Director, Front and Centered
Matt Harris, Director of Government Affairs and Assistant Executive Director, Washington State Potato Commission
Co-Chair: Nancy Hirsh, Executive Director, NW Energy Coalition
Nicole Hughes, Executive Director, Renewable Northwest
Dan Kirschner, Executive Director, Northwest Gas Association
Kent Lopez, General Manager, Washington Rural Electric Cooperative Association
Patrick Oshie, Member, Northwest Power and Conservation Council
Clay Norris, Power Management Manager, Tacoma Power
Rebecca Ponzio, Climate & Fossil Fuel Program Director, Washington Environmental Council
Alex Ramel, Representative, Washington State Legislature
John Rothlin, Manager of Washington Government Relations, Avista Corporation
Dan Wilson, President, Local 338 United Steelworkers
Alex Ybarra, Representative, Washington State Legislature

Other Meeting Participants

Tom Beierle, Ross Strategic (facilitation support)
Aditi Bansal, Clean Energy Transition Institute (technical support)
Glenn Blackmon, Washington State Department of Commerce
Andy Chinn, Ross Strategic (facilitation support)
Marc Daudon, Caspian Group (technical support)
Jeremy Hargreaves, Evolved Energy Research (technical support)
Michael Furze, Washington State Department of Commerce
Betony Jones, Inclusive Economics (technical support)

Kate Kelly, Washington State Department of Commerce
Nicole Larson, Clean Energy Transition Institute (technical support)
Heather Martin, Ross Strategic (facilitation support)
Lauren McCloy, Office of Governor Jay Inslee
David Paolella, Clean Energy Transition Institute (technical support)
Eileen V. Quigley, Clean Energy Transition Institute (technical support)

Welcome and Agenda Overview

Tom Beierle, facilitator from Ross Strategic, reviewed meeting objectives and the day's agenda.

Glenn Blackmon, WA State Department of Commerce, provided introductory remarks. Mr. Blackmon noted that a significant level of effort will be required to meet GHG reduction targets established by the Washington State Legislature, not only over the long term but also by 2030. This is due to the amount of fossil fuels currently embedded in the state's economy, the fact that it will be challenging to replace current infrastructure as quickly as the transition requires, and the lack of progress in emissions reductions over the past decade. He noted that the Deep Decarbonization Pathways (DDP) analysis, the initial results of which will be presented during this meeting, will inform the State Energy Strategy but is not the strategy itself. The strategy development work is in front of us. We are going to need creative and bold ideas for policies and actions, and we look forward to those suggested by the Advisory Committee members and other experts involved in this process.

Deep Decarbonization Pathways Analysis and Initial Results

Eileen V. Quigley, Clean Energy Transition Institute, outlined the technical consulting work that will inform the State Energy Strategy, including the DDP analysis. She also gave an overview of the timeline for the State Energy Strategy process. In response to a question, Eileen clarified that the economic modeling will get underway once the DDP modeling is completed and will continue through October.

Jeremy Hargreaves, Evolved Energy Research, provided an overview of initial results from the DDP analysis. The presentation included how Washington State GHG reduction targets are incorporated into the model, the pathway scenarios that were modeled, demand-side results, supply side results, and key take-aways and findings. Mr. Hargreaves noted that the methodology overview and key assumptions are included in a technical appendix at the back of the presentation.

Advisory Committee Clarifying Comments and Questions on the Deep Decarbonization Pathways Presentation (and responses, in italics):

- What is the definition of "delivered to load" in the model?
  - *It is the load delivered to the state—the amount Washington (in megawatt hours) needs to bring in via transmission every hour, to meet the demand within Washington.*
- Many utilities have committed to portfolio decarbonization; have these been modeled?
  - *Specific utility commitments have not been modeled. The overall emissions reductions targets for Washington state are modeled. In other Western states without targets, the model assumes an 80% economy-wide target (assuming these states will set targets in the future.)*

- Does "Residential/Commercial/Industrial (RCI)" emissions include direct combustion related emissions only, or also indirect emissions?
    - *RCI in the 1990 inventory chart includes direct CO2 emissions from combustion. Industrial CO2 includes process-related CO2 emissions. Industrial CO_2 is included in the analysis and counted in net zero emissions accounting for energy and industry. These categorizations are slightly different from the Washington emissions inventory because non-CO2 emissions have been removed from the RCI category and included in the non-CO2 category.*
- Is the non-CO_2 emissions category mostly industrial or is it a combination of everything?
    - *Non-CO2 includes agricultural, waste management, fossil fuel industry, industrial process, and wood combustion related non-CO2 GHG emissions. The non-CO_2 portion is accounted for separately, but the measures taken to reduce that non-CO_2 portion are not yet defined. Non-CO2 emissions reduction measures are region and industry specific and require further work to identify and quantify beyond the State Energy Strategy.*
- Lower electrification is conflated with less efficiency in gas in buildings, but efficiency is independent of fuel source. More gas does not inherently mean less efficiency.
    - *It is true that it is conflated in the "Gas in Buildings" case and we did not run a gas and efficiency case. This case asks: What would happen if we had lower building and industry efficiency and lower rates of electrification by 2050? There would be further reduction in energy demand if more efficient appliances were installed. It is worth investigating a high efficiency/gas in buildings case.*
- Have you modeled the increased adoption of renewable natural gas or hydrogen in the gas and buildings scenario?
    - *The model sets up energy demands for different fuel types and then looks at how to serve those demands in the least-cost way. The model could serve that demand with synthetic gas, fossil gas, hydrogen, renewable natural gas, etc. The model determines the set of investments in new infrastructure and primary resources that will best supply fuel demands while meeting emissions targets. If primary fuel use remains in the economy, clean fuels are needed to ensure the emissions targets are met.*
- Will the model always select conventional gas because it is cheaper and thereby does not consider any beneficial contribution of renewable gaseous fuels?
    - *The model will typically decarbonize liquid fuels ahead of gas because gas is cheaper than other fossil fuels/clean fuels, so it is more cost effective to retain fossil gas in the economy for longer relative to other fossil fuels. Decarbonization of fuels is driven by the emissions target. By 2050 the target is low enough that clean gas is present in all of the decarbonization cases we modeled.*
- It might be useful to see this on a finer scale, or raw numbers? (Note: refers to results for final energy demand, slides 20-21)
    - *Yes, the CETI team will create a slide as you suggest.*
- How does electrification drive lower energy demand? Is it more efficient for uses such as transportation? Is there a conversion factor for energy demand with fuel switching from fuels to electricity?
    - *The model develops bottom-up stock rollover of all light-duty vehicles on the road. Of all individuals purchasing a new car each year, the model looks at the ICE versus EV sales. This factors into final energy demand. For each vehicle procured, there is an associated efficiency. Electric vehicles are far more efficient than ICEs.*
- Is biofuel included in the final energy demand either in the liquid fuel profile or biomass profile?

- *The model reflects demand for biomass for existing equipment and processes (e.g., pulp and paper, etc.). Demand for liquid fuels can be served by biofuels. The supply-side model will determine the most economical share of biofuels.*

- What was the package of service demand measures?
  - *Modeled service demand measures include air conditioning, heating, lighting, and water heating. The decrease in service demand depends on whether it is in residential or commercial buildings; added up, it is approximately a 7% overall reduction by 2050. Behavior changes influencing service demand could be policy-driven, or these could be natural changes in behavior that cause a drop in service demand.*
- Have we seen these supply side slides? If so, I missed them?
  - *No, these were not sent out before the meeting because the model was still running over the weekend.*
- What triggers the need for additional capacity in later years?
  - *The demand modeling shows 90% load growth, and the increased capacity is how that demand will be met. Capacity growth exceeds energy demand growth because the resources that are being built (i.e., wind and solar) have lower capacity factors. When looking at the Northwest, there is not a "Northwest Balancing Region" that is isolated from the West; Northwest investments (in wind, particularly) are influenced by investments in other areas such as Southwestern solar and those resources are highly complementary. This highlights the need to look at the entire Western region for decarbonizing the energy economy.*
- For the capacity analysis, is the model anticipating any effective regional capacity sharing?
  - *Capacity sharing is anticipated. The model is building an electricity grid that is least cost assuming a single balancing area in the West so transmission and resources are used most efficiently. This is different from the starting point in 2020 where system operations and investment decisions are more fragmented. However, the large amounts of transmission build and significantly increased energy transfers in the model out to 2050 show that policy supporting greater interregional coordination will support decarbonization at lower cost.*
- What would it take to accelerate the uptake of hydrogen and synthetic fuels?
  - *Hydrogen penetration by 2030 is already significant; in Washington there will almost be the same amount of demand for synthetic fuels in 2030 as in 2050, because of the carbon target, and will spur early development of electrolysis.*
- Are imports in 2050 assumed to be daily market purchases or longer-term commitments?
  - *The model doesn't incorporate market mechanisms or contracts. It is only looking at the least cost optimal dispatch with perfect foresight and the total cost of production rather than wholesale and retail dynamics. Markets for power are one of the tools available to achieve least cost optimal dispatch and efficient investment in new infrastructure. How these tools are adapted in the future to achieve these outcomes would be the subject of further work beyond the State Energy Strategy.*
- What kind of load factor is anticipated for electrolysis throughout the year under the DDP model?
  - *Electrolysis as a capacity investment is relatively cheap. Much of electrolysis' cost comes from inefficiencies in creating hydrogen and building out additional renewables to provide the energy for electrolysis. The tendency will be for lower load factors because electrolysis is used as a balancing resource.*
- It is interesting that in 2050 Washington has a summer peak load that is larger than the winter peak.
  - *The average load presented on slide 39 is West wide and not just for Washington. Washington remains winter peaking in 2050.*
- What assumptions does the model make around ability to permit transmission or resources?

    - *There are no assumptions about challenges of permitting beyond a 6-gigawatt limit (which is a proxy for what might be possible). In the case of constrained resources (i.e., not allowing transmission expansion into Washington), the model considers the perspective of what investments would need to be made if no new transmission were allowed into the state and how expensive that might be.*
- Does the reference case assume that existing transmission carrying coal-sourced energy will soon carry renewable energy?
    - *Yes, when coal goes off-line, it frees up space across transmission that will be used for renewable energy.*

Discussion of Key Take-Aways from the DDP Analysis

Following the presentation, Advisory Committee members discussed the key take-aways and findings from the DDP results for the energy strategy. In addition to reflecting on the take-aways and findings highlighted in the presentation, Advisory Committee members also provided their own perspectives.

Advisory Committee Comments and Questions (and responses):

- The results suggest that flexible load is a small part of the energy mix in 2050; is this because demand side is more about efficiency or does it reflect limits at the distribution level?
    - *The model assumes that 50% of new technology in buildings is flexible and can participate in the market. There are more flexible loads when they are used to balance the energy load constraint and there are more opportunities if additional policies are assumed. This can be modeled. On the distribution side, the model assumes that programs/infrastructure are in place to incentivize use or directly control loads.*
- The modeling is biased toward electrification rather than decarbonization. For example, the gas in buildings case conflates less energy efficiency with less electrification, which means more use of gas. This amplifies the amount of gas used when in reality it may be possible to reduce use of gas through efficiency improvements. Second, the model will always select as much fossil fuel as possible given constraints, and then it will go to other options that may also include electrification, renewable natural gas, or hydrogen. This will always maximize emissions from the gas system over time. I suggest we look at the gas system as a resource to decarbonize rather than an impediment. Finally, the modeling emphasizes regional coordination when in reality Washington State policies have no force in other jurisdictions.
    - *The model considers gas and clean gas resources to deploy economically. It is economically advantageous to decarbonize liquid fuels earlier than gas because gas is a cheaper fuel. So retaining fossil gas use is an economic decision rather than an input assumption. It is not undesirable to retain fossil gas (until 2050 when a portion of it is decarbonized) because it lowers overall decarbonization costs.*
    - *The Gas in Buildings case was somewhat misnamed because it was designed to reflect slower action taken in buildings overall, including electrification and efficiency. We have since changed the definition of this case to include the same high levels of efficiency gains as the Electrification case but retain gas in buildings. This will remove the confusion and make the case more useful to look at how investments change when a policy to preserve gas use in buildings is in place.*

- Electrification meets two goals, decarbonization and reducing demand significantly, so therefore it should be a deliberate choice.
- A key underpinning of the analysis that implies a policy direction is that there is a West-wide sharing of resources. It is not easy work and will take a long time; assuming there will be a regional market is a big assumption. Also, the model assumes a constraint on carbon and then determines how to get there, but we do not have a policy constraint on carbon.
- We talked about the possibility of an RPS for the gas distribution companies either through renewable natural gas or green hydrogen. That might help jumpstart the hydrogen economy. It may not be the best use of green hydrogen but would get the ball rolling.
- Is the model moving toward 9,000 mega-watts (MW) of additional natural gas for peak capacity and balancing because it is cheaper than other flexible loads? Could the economics be shifted so that by 2050 there will no longer be a need for 9,000 MW from natural gas?
    - *The 9000 MW number includes gas in the four Northwest states, not just in Washington, and also includes extensions of existing gas that retires between now and 2050. What resources are needed for peak capacity and balancing by 2050 will depend on what resources can provide dependable energy and capacity during times of need. The benefit of gas is that it is not energy constrained, whereas flexible loads and diurnal storage both shift energy within the day. By 2050, there may well be cheaper forms of storage or more flexible demand management programs that could substitute for some of the gas contribution to dependability. Resource need for reliability in 2050 will be determined through future resource adequacy assessments that account for the latest technology pricing and availability.*
- It will be important to ensure that the route to decarbonization does not solely focus on what is cheaper now but also looks at demand programs (e.g., more aggressive peak-time rebates, flexible demand tariffs) that could be used today to reduce reliance on the new 9 GW of natural gas.
- What Washington does in 2020 and over the next few years will have a significant impact on the region; Washington is considering rulemakings today that could either significantly hinder its ability to participate in regional markets – or facilitate participation. Washington should also make strong statements about interest in participating in those discussions. For example, some states have sent messages to regulators requesting they open a docket specifically on what is required for regional coordination.
- A key question for the Advisory Committee to consider is, "What does a deeply integrated, multi-disciplinary strategy look like?" On a winter day, natural gas provides two-thirds of the energy in Seattle. What does a responsible decarbonization plan look like, and how do we create the regulatory environment and governance structure to have a natural gas-oriented CETA plan that is valuing multiple strategies fairly and responsibly? How do we value gas fairly while also aligning the sector with emissions targets? My question for the group is how can this strategy capture that concept beyond the rhetorical and has an actionable element?
- Given recent volatility in energy markets, the State Energy Strategy should be thoughtful and careful about relying on assumptions (e.g., a perfectly executed CETA, ability to import electricity, and a perfectly dispatched grid and ability to build resources). Pricing is hard to model in the scenarios, as well as ability to permit different sources and transmission. The Advisory Committee has not spent much time discussing assumptions and options in other sectors, such as transportation, which are a significant emissions source.
- Could natural gas added by 2050 be replaced by hydrogen fuel cells?
    - *By 2050 there is a large amount of "clean" gas in the system, including hydrogen. Hydrogen fuel cells could replace natural gas for energy generation. Natural gas combustion turbines are cheaper, already exist, and can burn clean fuel mixes; in other words, they are a lower*

cost form of capacity. Because burning of clean fuel in electricity production happens very seldom in a highly renewable system, capital cost is very important in the economics of which fuel burning generator to build. It is hard to justify investment in newer, more expensive capital when use is low, so replacing clean turbines with hydrogen fuel cells is unlikely to make sense economically unless prices change. By 2050 the modeling includes a large fleet of fuel cells in heavy duty trucks that use hydrogen produced through electrolysis.

- How is methane accounted for in the analysis?
    - *Methane emissions are included in the non-CO_2 accounting in the inventory, with projected declining emissions over time as set under the emissions targets. There are no policies identified for how to reduce the emissions, this requires more work around industry/industrial emissions.*
- Synthetic gas seems to show up in 2050 under various scenarios, but it requires a supply of captured carbon, which requires a concentrated source. Does the model assume concentrated carbon?
    - *The model is building out the carbon stream that's supplying fuel production, and a third is from industrial capture. When scaled up to 2050, it starts to come from biofuels processes as well. Carbon captured from biofuels production can be combined with hydrogen from electrolysis to produce synthetic fuels. Movement of fuels is not anticipated to be an impediment because we have fuels transportation infrastructure in place and a national fuels market – fuel is already shipped across the country today.*
- Does the model account for occurrences such as the rolling brownouts currently occurring in California?
    - *The analysis of causes for the California brownouts is ongoing. One cause appears to be reduced imports (since other states were experiencing high temperatures simultaneously). Contingency planning is required to mitigate those types of conditions; the model captures both imports and exports across states, and the coincidence of extreme weather events (based on the historical record) that need to be accounted for when balancing the system to ensure reliability. There are other models specifically designed for near-term reliability analysis. That type of modeling would supplement the DDP model, which is for long-term planning.*
- Chelan and Douglas County pay some of the lowest electricity rates in the country, currently. How does the model integrate areas with vastly different electricity rates, as a means of ensuring equity?
    - *The model does not take different rates in different areas into account, but this is an acknowledged issue that is important to cover in the State Energy Strategy and should be considered during the policy development stage of the project.*
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Next Steps for the Technical Advisory Process and Strategy Development

Eileen noted that the next step for the DDP modeling is to produce costs associated with the results. She also noted that there are ongoing interviews and analysis with the Technical Advisory Process (TAP), and the team is working to synthesize all of the TAP information that has been gathered since late June. There are a series of working sessions scheduled for the week of 8/31 during which time the strategy building blocks will be developed, for review in advance of the September 15 Advisory Committee meeting. In addition, there will also be ongoing conversations about additional modeling and economic analysis through October.

Tom emphasized that any further thoughts or questions can be addressed through the TAP work or by emailing input to the CETI team directly (acinput@cleantransition.org) or to the Department of Commerce (energystrategy@commerce.wa.gov).

Public Comments

Members of the public were provided an opportunity to address meeting participants. Comments are summarized below:

- The model should include various scenarios, for example in the current Washington State energy code under development or if there are local ordinances preventing gas line installation for new construction. The State Energy Strategy should consider what that does for inevitable costs of using renewable gas alternatives as part of a carbon-free economy. Also, downstream impacts should be included on the appliance side; appliances have to be installed in homes in order for effective use.
- There may be other uses for hydrogen anticipated, apart from long-haul transport, to consider in the State Energy Strategy. (Rep. Ybarra noted that Microsoft is considering a hydrogen fuel source for a local data center, and hydrogen is being looked at for cars. John Rothlin also noted that hydrogen can displace a certain proportion of conventional gas in the system).
- It is important to look at technological advancement and energy efficiencies that might occur over the next 20-30 years that could provide an alternative to adding 9 mega-watts of natural gas as indicated in the model.

Next Steps and Action Items

- The next Advisory Committee meeting is scheduled for September 15. The facilitation team will provide more details on the meeting, including timing.