

**Northwest Power & Conservation Council
Generating Resources Advisory Committee
January 31, 2025**

Annika Roberts, NWPCC, began the meeting at 9:30 by greeting members and calling for introductions. Jennifer Light, NWPCC, explained the best way to engage with the Zoom platform.

The Ninth Plan Overview

Jennifer Light, NWPCC, Annika Roberts, NWPCC

Ryan Bottem, Public Gen Pool, asked about the sources for the data on cost modeling presented on [Slide 15]. He wondered how this data incorporated policy risks and potential changes. Roberts answered that she will cover the sources later in the presentation but previewed that she uses regional IRPs, national forecasts, and other public sources.

She then said policy risks will be tested as a sensitivity in the resource and transmission risk scenario.

Brian Dombeck, BPA, asked if there was “one set of reference plants to rule them all” that consistently flow through all Council models. Roberts answered yes, the reference plants discussed will be consistent through the models, plus or minus some emerging technologies.

Light added that staff will have different zones to reflect different resource shapes. She said things will be varied by the needs assessment, the market buildout, and the resource optimization for the region.

Dombeck was curious about how the maximum buildout number was developed. Roberts said this will be discussed shortly.

Scott Levy, Bluefish, asked if hydropower, particularly small hydro, was a reference plant resource [Slide 20]. Roberts said no as staff didn’t see small hydro as a huge opportunity. She said the existing system with upgrades is included.

Levy asked if upgrades in the existing system are considered. Roberts said if they are already planned, they are included.

Levy referred to end-of-life issues, pointing to the Lower Snake and turbine rewinds. Light said the Power Act directs staff to look at new resource additions to meet load, not enhancements. Levy asked if the turbine rewinds are part of the existing system. Light answered yes, offering to talk more offline.

Shannon Souza, OCEAN, asked about conversion plants. Roberts said this will be discussed in the hydrogen portion of the presentation.

David Clement, NEEA, called this reasonable asking if these resources are capped by category in the modeling. Roberts answered yes, adding that it will be further explored later in the presentation.

Landon Snyder, Snohomish PUD, also approved of the proposed reference plants. He asked if resources like small modular reactors would show up in the 2030s-2040s. Roberts said they will discuss emerging technologies later in the day.

Light addressed Souza's comment, saying there are two parts to resource conversions, and announced conversions are captured in the existing system. She said this is different than a new, potentially converted, gas plant.

Souza asked where Oregon is represented on [Slide 24]. Roberts said PGE.

Clement recalled prior talk about attempting to be more neutral around tax credits for efficiency and DR [Slide 26]. He asked if that will be discussed. Roberts said today's work focuses on supply side resources. She added that she is broadly familiar with policy and reported that staff is working to incorporate tax credits on the federal and state level into the demand side resources.

Light directed Clement to the Conservation Resources Advisory Committee and the Demand Response Advisory Committee for more.

Dombeck asked if staff plan to test if their assumptions are the most financially advantages to developers. He used the example of a solar developer mulling over options over the next 20 years, saying the answer could change over time. Roberts said these are back-of-the-envelope estimates created with the modeling team. She added that developers must choose one path at the start.

John Ollis, NWPCC, added that there will be places and times where one path looks more advantageous, but broadly, in the near term, the Production Tax Credit looks best. He said letting the model choose would create false precision without producing much difference.

Frank Brown, BPA, countered that as Production Tax Credits become less certain developers are moving to the Investment Tax Credit to avoid missing out as their projects become energized. He thought that solar and wind would move that way, using the analogy of "a bird in the hand." Ollis asked for more opinions as the underlying analysis was completed before the new federal administration.

Souza agreed with the "bird in the hand" analogy. Light said it makes sense to move wind and solar to Investment Tax Credit, asking if anyone objected.

Dombeck thought that predating IRA and other incentives, there was a PTC for wind that caused negative price bidding behavior. He wondered if there was an equivalence with modeling behavior with the PTC versus the ITC.

Ollis agreed saying the PTC caused more negative pricing. He said batteries, which would tamp negative pricing, were on a less level playing field pre-IRA. Ollis said IRA helped balance the tax credits. Dombeck said this made sense as it was the non-level playing field for batteries that caused the distortion.

Ollis said the last pricing study gave solar the ITC and wind the PTC and results didn't change much. He asked for more information and input from the group.

Snyder said it was hard to fit the PTC into his IRP model. He asked how staff plans to model co-located resources, wondering if the storage could have the ITC and the solar or wind on the PTC. Roberts said if a resource is considered one plant developers must choose one or the other.

Snyder asked which one would be better for co-located resources. Roberts said this conversation is revealing that the ITC might be better and asked for more input.

Snyder said the ITC is unusual as the numbers range widely due to adders and subtractors. He asked for Council guidance. Roberts said the models don't really know about the adders/subtractors and just applies the base tax credit.

Light reminded the room that the sensitivities are trying give enough swing to suss out how things will change if the credits go away entirely. She said the goal is not to perfectly predict the future.

Brown said most renewable energy developers choose the PTC because they make most of their net income by selling tax credits, not power. He said it will have a meaningful impact if they go away. Roberts said staff hope the sensitivities will tease that out.

BREAK

Souza wondered if the technology and manufacturing capacity of the US might trump regional costs, especially when considering the possibility of tariffs [Slide 30]. Roberts said this is a starting point and the resource and transmission scenario will test further. She said it is impossible to guess about tariffs and asked if this feels okay as a starting point.

Carla Essenberg, BPA, asked about the three zones. Roberts said the zones have similar capacity value shapes, moving to [Slide 34] for illustration.

Clement noticed a data point for Lazards levelized cost of energy. He wondered if the rest of the points are overnight capital costs. Roberts said the point represents the overnight

capital cost derived for the Lazards LCOE. Clement said overnight capital costs are not levelized. Roberts said she was aware, explaining that the report is called the Levelized Cost of Energy, but the dot is their overnight capital costs. Roberts then confirmed that all of the data points represent overnight capital costs.

Snyder agreed that moderate seems reasonable but revealed that his utility switched to the conservative line [Slide 31]. He explained that people are concerned that the big production cost will not materialize. Snyder asked what Council staff are thinking. Light said staff philosophy is informed by GRAC members.

Alexandra Karpoff, PSE, said her utility is also leaning towards the conservative curve, informed by their recent RFPs.

Max Buildout & Timing

Snyder said that, for his utility, most of the availability and timing is for the emerging technologies. He said they don't want to make a plant that relies on emerging tech, but they want to recognize that things like SMRs are a possibility. Snyder said the two years for conventional resources feels reasonable.

Light said that aside from a scenario which delays timing, staff haven't figured how to best incorporate the constraints to the maximum buildout. She asked the GRAC for guidance.

Snyder pointed to transmission, asking if staff assume it would be built alongside resources and priced in or if it would be fit into existing corridors. Light explained that there will be three transmission options: existing transmission plus projects close to completion, additional transmission guided by proposals from WestTEC, and one with more transmission.

Ollis added that the current modeling acknowledges load in different zones and how much can be transferred. He said adding resources that store power and shift load and limiting max buildout skewed results [Slide 23]. Ollis said, because of this, staff are returning focus to supply chain and other factors that the model couldn't understand.

Clement clarified that the two-year delivery expectation could be constrained or removed by the transmission queue. Roberts thought that the transmission needs to be there, or it can't be built. Ollis said contractual limitations have not been modeled, acknowledging that there have been challenges.

Clement asked if the two years applies but the total is somehow constrained by the transmission capacity. Roberts and Ollis agreed. Clement said an IPP would be happy with two years, but transmission and public input are big barriers.

Brown said BPA has three queues, two of which are requests for renewable contracts adding up to over 150,000MW. He was puzzling over integrating the Council's two-year timetable with how BPA works through their queues, which are a five-year process. Ollis said the interconnection queues are contractual, with requirements and RFPs that may require interconnection. He pointed to the good fit between hydro and wind in the Columbia Gorge. Ollis ended by saying it's staff's job to show what could be done if contracts were put into place. He said this is a good forum to explore this risk via sensitivity.

Karpoff said her utility addresses max buildouts and constraints in the same way, agreeing that transmission is the biggest constraint. She then asked how siting constraints are determined. Roberts said staff know they exist but are hard to represent. Light said OptGen allows a max limit in a zone if appropriate but were still not sure what that would look like. Ollis added that staff can limit by zone, timing, or total amount of resources in an area.

Approach to Modeling Operational Risks from Wildfires **Dor Hirsh Bar Gai, NWPCC**

There was no discussion.

Snyder approved of [Slide 43]. He asked about the 1.4:1 Inverter Loading Ratio. Roberts said this is what was used last time but is open to a different recommendation. Snyder had none, saying panels are cheap but the components are not.

Clement asked if there could be a look at the length of time between a plant announcement and when it actually comes online. He thought the two-year timeline was optimistic due to transmission constraints and public input. Roberts said the delays are represented in a sensitivity test and this is a baseline.

Clement thought the baseline should be different. Roberts said there is no reference case. Light said they are trying not to run a reference case because staff do not have all the assumptions. She said they are looking for a solid, realistic, starting point.

Ollis asked if just solar PV should have a longer lead time or if others should as well. Clement didn't know but sensed that the transmission queue and public input should affect all the resources but not uniformly.

Brown reiterated his concern with timing, saying he would add a third bullet that says five years to energization. He said two years for development and construction is reasonable but that doesn't mean there will be a way to feed the power into the grid. Brown said there are places on the grid where capacity is available, like near a decommissioned coal plant, but other places need new lines and substations and that will take more time.

Light reminded the room that not everything will be perfectly modeled. She said they will consider what Brown is saying and perhaps address it in the narrative.

Clement mentioned that costs are incurred during development and construction. Roberts said that will be discussed by staff as well.

Brown asked why the economic life on [Slide 45] is less. Roberts said that is life of the battery versus solar panels but said it was up for discussion. Snyder said you do replace the battery before replacing the panel, so his utility builds that replacement cost into the model. Ollis said different component lives have always been a piece of this.

Souza brought up Solar for All [Slide 50], noting that Oregon has pending legislation to increase or remove the cap and take advantage of economies of scale. She said ODOE is feeling confident and drawing down funds.

Snyder pointed to WA's Clean Energy Fund that could provide grants. He said there are also changes in how BPA treats solar under 5 or even 1 MW that will make them more cost effective. Roberts said policy might make these more attractive. Snyder offered to talk more offline.

Brown thought community solar should be included in the other two solar zones, pointing to various BPA projects. He said solar is better on the east side and the community solar economics are better there too.

Nora Hawkins, WA Energy Office, emphasized the importance of creating a definition of community solar. She thought this would be challenging as some definitions are complex and include net energy metered systems.

Hawkins then stated that WA community solar has to be on the distribution grid of the serving utility. She wondered where community solar fits between behind the meter and utility scale. Roberts said the behind the meter, commercial solar, and reference plant is trying to reach that smaller scale solar resource on the supply side.

Snyder said community solar is hard to define and thought it should be added to other regions. He said there is a level of community solar that is really cost effective up to a certain amount but becomes less so in increments .

Souza brought up the topic of resilience, saying some community solar users on the east side don't have access to power during safety outages. She said this has led to increased organization and interest in 5 to 100MW projects.

LUNCH

Levy pointed to the large jump in Montana wind from December to January [Slide 57]. Hirsh Bar Gai said staff are still fine tuning the shapes and asked for more feedback.

Diffely noted that Gorge wind seems flat while BPA sees more spring peaking. Hirsh Bar Gai said taking an average dampens things but offered to follow up.

Levy asked if the \$3000 carbon capture on [Slide 65] goes to all the plants or just to combined cycle. Roberts answered it just goes to the combined cycle, not smaller plants.

Ollis noted that these plants are all on the Eastside and asked for input about availability on the west side.

Essenberg asked about limiting pipeline capacity based on high availability in the model [Slide 64]. Ollis said staff do not directly model fuel fundamentals of the gas system but assume the fuel is broadly available. He said it's controlled by prices and availability and further explained the process.

Essenberg confirmed that staff are not limiting east side capacity. Ollis did not think so, but said in past market price forecasts, the Systems Analysis Advisory Committee pointed to some jurisdictions, like Oregon, where gas is unlikely to be built. He said there is room for more conversations.

Karpoff wondered about thermal unit pricing and turbine types. She said it doesn't make sense for her utility to purchase a unit that cannot fuel switch in the future adding that this technology costs more. Roberts said this will be discussed later in the presentation.

Ollis asked what is holding technologies like a non-convertible frame unit back. He asked if it is the initial investment or the additional cost of conversion. Karpoff said it's the initial investment while the added costs were minimal.

Levy asked when these enter the queue [Slide 68]. Roberts said they entered in 2023.

Roberts asked if 15 or 20 years made more sense [Slide 70]. Souza said it depends on what demand cycling you are modeling.

Levy pointed to the two-year development period for batteries saying BPA considers them a generator with a different construction timetable and queue. Roberts said this will require more talk about interconnection queues adding that the two years is not only about construction.

Levy said the Tesla Megapack is available in three to six months, so two years seems long. Light said this timeline discussion should not include the interconnection piece.

Graessley said BPA assumed a year for development time. He then pointed to the relationship between fixed O&M and assumed plant life.

Levy suggested taking a closer look at round trip efficiency as well. Snyder agreed that developers like to highball this number but said something in the 80s made sense to him. He added that the two-year timeline also made sense.

Light asked if 88% is okay. Snyder said you can never know, and Tesla will tell you about a number in the 90s. He thought anything between 85-90% is good.

Bottem noted that all the reference plants are available 2024. He asked if that is for all the reference plants or if that number is for the planning process. Roberts explained that it means the resource is available at the beginning of our study and the first year will actually be 2027. She added that emerging tech and limited availability tech will be available later.

Snyder pointed to a lifespan of 20 years saying the technology can last that long but doesn't age well. He asked how this degradation is incorporated. Roberts pointed to the relationship between economic life and fixed cost.

Brown said BPA has poor business rules for batteries on the grid, meaning other utilities can integrate a battery faster. He said the two, five-year queues he spoke about earlier have a lot of battery. Brown said interconnection issues overwhelm the construction process. Light understood and asked to discuss this more deeply at a later date.

Bottem asked if lithium-ion batteries were included in the 2021 Power Plan. Light answered yes but they were not picked.

Souza thought the numbers on [Slide 78] looked reasonable, or perhaps aggressive. Light pointed to a place in the modeling where timing is delayed and asked if offshore wind should be included. Members said they would mull on it.

Snyder didn't understand how conventional geothermal could exist or be developed [Slide 82]. He asked what the Council thought. Roberts pointed to some in Idaho, admitting that it doesn't appear economical, but it might change as loads grow. Snyder confirmed that this is not EGS but normal geothermal. Roberts said yes.

Snyder then commented that a lot of these opportunities are on national or state parkland, making them hard to be considered feasible. Roberts called that fair. Light said this could be further limited, like offshore wind.

BREAK

Levy asked about the 200 MWh/acreage for an Iron Air Battery wondering if it should be 200MW/acre [Slide 86]. Roberts offered to double check and report back.

Snyder thought it was 200MWh/acre. He thought the technology presented challenges but it made sense to include them. Roberts agreed it's important to build in a sensible way. Snyder said the cost is the crystal ball.

Snyder thought the two-year development period might be too fast as this is new tech and takes up a lot of land. Roberts thought that made sense.

Souza said some of her tribal clients are very interested in this technology as it avoids fire risks and doesn't require lithium mining.

Levy pointed to Form Energy reporting 47% round trip efficiency. Roberts said they are trying to be conservative. Ollis said they got their expectations from their IRPs and white papers, and this is a first-generation product.

Levy said Form suggested siting a short-duration battery nearby (he was very garbled). He agreed with Souza's comments about tribal communities, adding that the economics for this group are very different. Roberts thanked him saying they are not trying to get too deep into these details for this work.

Bottem agreed that the buildout time should be longer than two-years.

Snyder called SMR's weird as people are dedicating resources to get them, and they are being selected in IRPs [Slide 91]. He was concerned about scalability and the Pacific Northwest's aversion to nuclear power. Snyder was glad the Council is considering them but thought staff should limit their scale.

Roberts said the constrained resource sensitivity pushes availability out to 2045 and they are limited to five units. Light asked if the five units should be limited further.

Ollis asked if Snyder is proposing a limit like one a year. Snyder said yes, saying this should be conservative but it depends on what the model picks.

Graessley asked how the 40-year economic life was chosen. Roberts pointed to literature reviews that put the number between 35 to 60 years. Light added that the last Plan put them at 40.

Hawkins wrote, Can you repeat why onsite hydrogen production is required? I think Anneka covered it, but I missed it, in the question pane. Roberts answered that pipeline hydrogen is not yet available. Light added that the forecast is looking at hydrogen for non-power usage as well.

Souza asked where pyrolysis (converting an existing natural gas turbine) shows up. Roberts said this has been a struggle as pyrolysis is not as clean as the other emerging

technologies. Souza encouraged staff to think about that more deeply, offering to provide more information.

Souza then asked about gasification of biomass. Roberts answered that biomass is not being considered. Souza countered that Oregon is a timber basket that ships tons of biomass to Asia to be turned into energy. Roberts said she will reach out but cautioned that staff can't look into every emerging technology and must make some choices.

Souza said her concern with electrolytic hydrogen is the load it places on an already burdened system.

Ollis explained why staff are only looking at clean emerging resources, saying the last Plan showed some missing attributes like the need for capacity-rich resources and the need for energy that qualifies as clean under the policies. He said putting costs behind resources would help but things remain fuzzy. Ollis said having more options might detract from scope and add to modeling time. He said this could fit into the narrative.

Graessley asked about the progression of costs for hydrogen and SMRs, wondering if there are different costs for different start times. Roberts said hydrogen costs apply to 2040, adding that these numbers are in 2024 dollars.

Graessley wondered if something could be available sooner. Roberts said the literature says hydrogen for power shows up at 2040, but hydrogen for other uses shows up earlier. Light said staff are trying to be conservative but asked for more feedback.

Graessley thought it could be a little earlier.

Brown asked about advanced geothermal, saying that could be built quickly and is competitive. He said he thought they might show up in regular resources and couldn't understand why they were not at least represented in emerging. Roberts answered that staff had to make choices and this was not showing up in region.

Brown pointed to potential sites in southern Idaho and south-central Oregon. He suggested keeping an open mind about this technology, betting these will come to fruition faster than offshore wind. Light pointed to [Slide 19] which covers all the different resource options including advanced geothermal that will be discussed in the Plan. She asked other GRAC members to weigh in about advanced geothermal.

Light and Roberts asked that GRAC members provide feedback soon as they are trying to wrap this up by the end of March.

Roberts ended at 3:00.

Attendees in person and via Zoom

Jennifer Light	NWPCC	Lori Hermanson	Avista
Annika Roberts	NWPCC	Bayo Ware	Energy Trust of Oregon
Steven Simmons	NWPCC	John Fernandes	Ulteig
Dor Hirsh Bar Gai	NWPCC	Nathan Critchfield	PSE
Joe Walderman	NWPCC	Bryan Neff	CA Dept of Energy
Chad Madron	NPWCC	Brad Westmoreland	PNGC
Shannon Souza	OCEAN	Tomás Morrissey	NWPCC
Eric Graessley	BPA	Robert Diffely	BPA
Lisa Stites	GC PUD	Carla Essenberg	BPA
Leah Tucker	BAU OR	John Lyons	Avista
Frank Brown	BPA	Alexandra Karpoff	PSE
Justin Allegro	TNC	Paul Barrager	WA UTC
John Purvis	Clallam PUD	David Clement	NEEA
Landon Snyder	Snohomish PUD	Rick Williams	PSU
Brian Dombeck	BPA	Scott Levy	Bluefish
Heather Nicholson	Orcas Power & Light	John Ollis	NWPCC
Kaitryn Olson	PSE	Garth Beavon	UMICH
Patricia Levi	Form Energy	Andrea Talty	PSE
Sarah Harper	Fervo Energy	Elizabeth Osborne	NWPCC
Roberto Noguera	CA Dept of Energy	Nora Hawkins	WA Dept of Com
Ryan Bottem	Public Gen Pool	Chase Morgan	IF Power
Mary Kulas	consultant	Jenna Milander	Boise State U