Northwest Power and Conservation Council Generating Resources Advisory Committee September 12, 2024

Annika Roberts, NWPCC, began the meeting 9:30 by introducing Joe Walderman, NWPCC, to the group. Walderman then called for attendance

Big GRAC Summer: Storage Annika Roberts, NWPCC

Alexandra Karpoff, PSE, asked if the numbers on [Slide 10] are in 2016 dollars. Roberts answered yes but assured her they will be updated to 2024 dollars for the Ninth Plan. Karpoff said her group is seeing much higher costs. She noted that her 2025 IRP has been switched to a 2027 ISP and are seeing much higher costs across all technologies, adding that they are currently modeling lithium-ion batteries at \$2600 per KW in 2020 dollars for 2025 vintage.

Roberts thanked her for the flag, saying she will be checking trends as more IRPs become available. Karpoff said she is using NREL ATB as a general guide, following the mid-price and trending towards the conservative cost estimates.

Smit converted \$2100 2016 dollars to 2024 dollars and reported that it comes to \$2600, while \$1350 converts to \$1680 in 2024 dollars.

Patricia Levi, Form Energy, was pleased to see iron-air technology represented on [Slide 17]. She wanted to discuss the 2028 limit on technology, saying they are actively signing contracts for 2026/2027. Roberts said she will bring this to the modeling team.

Levi asked how the availability of LDES will be included in the study. Tomás Morrissey, NWPCC, said it would be used to create a ramping limit of how much resource could be brought online on a yearly basis based on manufacturing capability. Levi said she was talking about the percentage of hours. Morrissey said he will check with the modeling team.

Levi concluded by saying Form Energy is up, running, and making batteries in West Virginia.

Nicolas Garcia, WPUDA, said he was new to this technology but recalled hearing about a round-trip efficiency of 30-35%, while the slide shows 40%. He called this difference significant, wondering if that is what is currently being achieved or represents a projection of future development. Roberts replied that this is what she is hearing from Form.

Levi confirmed that these are the modeling specs for the battery in 2030, while a 2026 battery would have different specs. Roberts said the 40% is appropriate as they are allowing the batteries to show up in 2030 but will confirm and revisit.

Paul Barrager, WA UTC, asked if the model includes other market entrants besides Form Energy. Roberts said Form is currently the only company and competitors or other technologies could be explored in the emerging technology category. She asked the group to send other options to her.

Charlie Inman, WA UTC, asked about gravitational storage [Slide 20]. Roberts said she had seen a few things about gravitational storage but nothing specific. She asked members to send information if they had any.

Garcia asked about the 13% on [Slide 24] wondering if it represents reduced T&D, reduced operational stress, or something else. Roberts said she thought the savings come from the storage component. She referenced the shared inverter technology plus shared location/interconnection costs, with a little bit of T&D. She summarized that it's from the shared costs of having two resources in one place.

Garcia was still confused, asking if co-locating reduces the amount of permitting and other requirements as opposed to a stand-alone resource. Roberts agreed, saying she will come back with more specifics at the next meeting.

Inman asked about wind and battery, wondering if this configuration works as well. Roberts said the main difference is inverter costs and solar's advantage to capture more energy because of reduced inverter clipping. Because of this, Roberts thought wind + battery doesn't give enough benefit.

Shannon Souza, Solcoast, called for more flexibility when thinking about this, noting that co-location has added value in places where there isn't firm transmission, especially as the region steps into day-ahead markets and the Western Region Adequacy Program (WRAP). She said some of the price signals she is seeing support that logic as the region evolves towards a more dynamic and active management of the transmission system.

Roberts noted that the modeling will have more granularity to look at this issue for this Plan.

Karpoff echoed that PSE's preliminary modeling is picking up wind + battery. She said this is driven by limited transmission. Karpoff said wind generally follows load shapes for the Pacific Northwest region, and co-located wind + storage would fill a different need.

Souza wrote: Here is another example of co-location of lithium ion, H2 fuel cell & electrolysis for 48 hours of storage under construction in Calistoga <u>https://www.energyvault.com/projects/calistoga</u> in the Q&A panel. She said this could

come to our region if we come up with a super strategy with intermittent renewables while waiting for transmission upgrades. She agreed that these resources are emergent but on the cusp of being commercial and just south of our border. Roberts said the group will talk about hydrogen at the next meeting.

Karpoff asked how the renewable + storage configuration was developed. Roberts referenced literature reviews. Smit asked if Karpoff is using a different configuration. Karpoff answered that they are using 100 renewable to 50mw battery along with a triple hybrid with solar, wind, and storage with that configuration.

Karpoff said they generally made that up after consulting the ATB as it's nice to use round numbers to simplify the modeling. She said they are interested in finding the optimal sizing, as they have inconclusive ideas. Karpoff said they are seeing some benefit to a 50/50 split with solar storage while having more wind to storage capacity is more beneficial. Ultimately, she was curious to hear what others are doing.

Roberts referenced the PGE IRP showing two locations, one 100/100 and one 100/50.

Garcia said this raises the issue of creating a regional plan with specific solar/battery ratios as what's appropriate in western WA would be different than eastern OR or northern ID. He said it's important to figure out appropriate ratios while being willing to consider regional differences. Roberts agreed, pointing to more locational granularity in this Plan and more solar locations as well.

Souza noted a possible meeting conflict on October 17th [Slide 25]. Roberts thanked her for the flag.

Garcia brought up a challenge he sees for storage resources in the Plan. He said they could be used very differently depending on the entity that owns and operates the plant. He said using them to meet capacity and other requirements might lead to a very different charge/recharge schedule than using them to maximize revenue. Garcia agreed these resources are important but representing them in the model accurately will be challenging in the first couple of tries because people have different risk tolerances.

Garcia concluded by saying it's one thing to have these resources but a very different thing to know how to use them and how to represent that use. Roberts agreed, saying staff is thinking about this now.

Smit added that testing these ideas will start in October to discover constraints and needs. He said staff have the same questions around demand response and other distributed resources, agreeing that individual utilities have different needs and constraints than an entire region. Smit said the goal is to find the greatest need and show how some of these technologies can meet them. Smit stated that to better accomplish this specificity there will be a lot more data inputs including 17 zones and an hourly model. Garcia countered that storage resources are probably the most unique option out there because, unlike demand response, once you use them, they are gone. Smit agreed. Garcia called this another level of complication and challenge. Garcia said that he understands the Council puts out a regional plan but an IOU or even a BA is worried about serving load the day after tomorrow and not maximizing profits. Smit and Roberts agreed.

Joni Slinger, ODOE, moved back to the October 17th meeting saying their meeting is in the morning. Roberts said she will send out an email to find the right time.

Smit asked the group to share more specific inputs, like the cost difference PSE is seeing versus what staff has. He said these specific numbers are very helpful.

Souza wrote: Regarding the treatment of storage and co-location and how we might use them : here is a model that was published in 2020 with an update scheduled for publication next month from RethinkX <u>https://23227526.fs1.hubspotusercontent-na1.net/hubfs/23227526/Energy%2BReports%2B-%2BMethodology-1.pdf</u> in the question pane.

Roberts thanked the group and ended the meeting at 10:45.

Attendees via Zoom Webinar

Annika Roberts NWPCC Joe Walderman NWPCC Kevin Smit NWPCC Chad Madron NWPCC Frank Brown BPA Sofya Atitsogbe WA UTC Carol Loughlin Lakeridge Resources Eugene Rosolie **NWEA** Haley Ellett Hood River Katie Chamberlain Renewable NW Karma Hara BPA Landon Snyder Snohomish PUD Judi Haugness The Devin House Charlie Inman WA UTC Patricia Levi Form Energy Ben Luxenberg Galehead Dev Craig Patterson independent Kaitryn Olson PSE Joni Slinger ODOE Nicolas Garcia **WPUDA** Paul Barrager WA UTC John Goroski **Flathead Electric** WA UTC Jaclynn Simmons Shannon Souza Solcoast John Lyons Avista Corp

Alexandra Karpoff Michael Brutocao Terry Toland Tomás Morrissey Paul Lee Eric Graessley Rob Del Mar Gillian Charles

PSE Avista Corp Clark PUD NWPCC US DOE BPA ODOE Red Kite Consulting