

**Northwest Power and Conservation Council
Generating Resources Advisory Committee
May 14, 2019**

Gillian Charles, NWPCC, began the meeting at 9:00 with introductions and a review of the agenda.

2021 Power Plan

Gillian Charles, NWPCC

Charlie Black, CJB Energy, asked if the BPA demand forecast on [Proposed 2021 Plan Table of Contents] relates to the portion of customers that Bonneville serve or all of BPA's loads. Charles answered that it's their customers' load serving region. Black then asked how the 2021 Plan will address contract renewals coming in 2028. Charles called that something to be addressed as the process goes on. Black inquired why the 2021 Plan's Action Plan has been slimmed down and moved to a higher level. Charles noted that some past action items were business-as-usual for staff and this approach will be more focused and elevated. Black asked if this means it will be more externally focused. Mike Starrett, NWPCC, called it more action focused.

Shamus Gamache, Central Lincoln PUD, asked if the BPA demand forecast is just for the Northwest. Starrett explained that in that past there has only been a regional plan and this time there will be a specific carveout of BPA loads as a tool to help examine a method to buy and sell energy.

James Vanden Bos, BPA, noted that he hasn't seen a forum for providing BPA-specific assumptions and wondered if there were plans to create one. Starrett pointed to ongoing work that examines what BPA-specific studies would look like and how they would be unique. Charles noted that there are ongoing staff-to-staff meetings as well.

Henry Tilghman, Tilghman Associates (National Grid), asked how BPA's required flexible reserves will be considered when looking into Bonneville's entry into the Energy Imbalance Market. Charles called reflecting and capturing the EIM an ongoing conversation. Starrett added that they will examine how other utilities used the EIM as a balancing resource and use it as a guide.

Tilghman noted that Bonneville might not make a decision before Council work is complete. Charles agreed, saying the approach may look similar to how Staff incorporated the Federal Clean Power Act work that was being developed simultaneously during Seventh Plan.

Developing A Reference Plant

Tilghman asked about environmental methodology [Slide 16.] Charles pointed to a direct provision of the Power Act that requires the Council include the environmental costs and benefits of generating and conservation resources.

Vanden Bos asked if MicroFin will be updated. Starrett said he's working on it and will be done soon. Rebecca Smith, ODOE, asked for an explanation of Microfin. Charles called it a revenue requirements model that can be used to evaluate a traditional levelized cost of energy (LCOE). In addition, Starrett explained that staff primarily uses it to calculate the fixed cost in KW/y, which flows out of Microfin into other planning models. Smith inquired if the whole model will be updated or just the assumptions. Charles answered the whole model will be updated with a goal to make it easier for public use.

Tilghman confirmed that the LCOE process is used for a storage project and asked if fuel price is used for the electricity price forecast. Charles noted that analyzing storage is new for this Plan. Starrett added that staff is de-emphasizing the levelized cost as an output as it is less useful than a fixed cost. Tilghman agreed, asking how storage projects will be modeled. Charles likened storage to a generating resource saying that the Systems Analysis Advisory Committee will be looking at the issue too. Tilghman asked to be updated on SAAC work and meetings.

Vanden Bos asked for a definition of constructability [Slide 17.] Charles defined the term, adding that determining constructability for a high-risk resource like geothermal is difficult. Vanden Bos asked if methods capture political or regional preferences. Charles said yes, pointing to an upcoming slide with more information.

Scott Levy, Blue Fish, asked for more explanation of fixed and variable O&M [Slide 18.] Starrett called it common for all plant types to have a fixed cost for maintenance and variable costs represent the small costs associated with each MWh of operation. Levy noted that the lower Snake River dams have a \$33.5 million per year cost for a hatchery kept in a different column but should go into fixed costs. Charles emphasized that this analysis is specifically for *new* resources, but noted and thanked him for his comment.

Bill Henry, dJoule, LLC, asked if a resource's annual limitation is adequately captured through the capacity factor and used the greenhouse gas limitation on a fossil fuel plant as an example. Starrett noted that capacity factor is not important to the models and compliance limits are captured in AURORA. Starrett asked Henry to email specific examples for him to double check. Henry suggested adding an annual use limitation. Charles suspected that a forced outage rate might meet this. Starrett again offered to double check.

Tilghman stated that operating characteristics don't completely apply to storage. Starrett called this slide a small sample of characteristics and the larger list includes minimum generation, ramp rate and more.

Vanden Bos asked for further explanation on how and which resources were picked in the Seventh Plan and the role of computing time [Slide 21.] Charles said she will look into that and added that limiting resource options helps reduce and optimize computing time.

David Nightingale, WA UTC, asked what is meant by "breaking up wind and solar" [Slide 22] Charles pointed to separating Montana wind from Gorge wind. Starrett noted that WA's

possible new bill might make a low capacity factor but deliverable 15 solar plant feasible. Nightingale said this sounds location specific and asked that offshore wind not be ignored.

Tilghman cautioned against too-restrictive parameters around transmission access, calling it a shame to zero out a solar resource co-located with a winter and evening-peaking wind resource. Starrett responded that, at present, the models presume energy flows on a physical basis and contractual barriers are not taken into account, adding that perhaps they should. Tilman said he spends a lot of his time on overly restrictive transmission access parameters.

Nightingale asked if a combined wind and solar resource gives combined resource availability. Starrett answered that, as of today, if wind and solar are interconnecting in the same place they might be in competition with each other. Nightingale imagined a developer connecting wind and solar to one substation and offering a combined profile. Starrett said the model would not presume a package deal and didn't presume that wind and solar would be packaged together on anything but their relative merits. Nightingale doubted this, saying that packaging delivers a different profile with a higher capacity value and suggested rethinking the approach.

Tom Kaiserski, Montana Dept of Commerce, said the breaking up of wind and solar draws attention to the Montana Renewables Development Action Plan, calling it a good resource to look to in the future.

Vanden Bos expressed support for the division but cautioned against getting too granular.

Gamache pointed to his work, which serves 1/3 of the Oregon coast, and offered information about capacity on transmission that could be beneficial, especially for offshore wind.

BREAK

Tilghman asked what "commercially available" means [What is in scope?] Charles answered a resource that is available, cost effective and ready for purchase. Tilghman argued that this excludes long-term development projects. Charles countered that a plant with a longer construction period is not excluded as it is commercially available today but will take longer to get.

Nightingale asked if nuclear power is off the table because it isn't cost effective. Charles asked him to hold that question until the next slide.

Ken Dragoon, Flink Energy Consulting, asked about the thinking around putting power-to-gas in the Secondary category on [Slide 26] or even considering it generating in the first place. Starrett said [Slide 27] specifically talks about power-to-gas, noting modeling difficulties. Dragoon asked if there will be any carbon-constrained models as he can see power-to-gas counting towards reducing the carbon footprint of a portfolio. Starrett answered yes, noting that the base case is going to be substantially carbon constrained. He continued, saying he still doesn't have tools to model power-to-gas and called for feedback.

Dragoon asked why the 200-year-old technology is in the secondary category. Starrett said it comes down to modeling techniques adding that it might have to be described qualitatively. Dragoon wasn't sure why modeling was so daunting and offered to further think through the problem.

Nightingale stated that in response to its RFP, PSE received proposals for offshore wind, making it legitimate and commercially available, admitting that it is not yet cost competitive but might be within the lifetime of the Plan. He suggested moving it from Emerging/Long-term to Primary. He then asked why nuclear is not on the list. Charles stated that Small Modular Reactors are on the Secondary list but Advanced nuclear is specifically omitted. Nightingale agreed, saying he doesn't see nuclear becoming cost effective any time soon.

Starrett read a comment from Fred Heutte, NW Energy Coalition, that said, "SMRs do not meet the definition of Secondary..." and inferred they should be moved to emerging. Starrett said staff thought that as there is a SMR plant for UAMPS it should be on the list but was open for discussion.

Tilghman asked why pumped storage is listed as a secondary resource. Charles stated that pumped storage, like large hydro, is very site-specific making it hard to create a generic plant for modeling. Starrett moved to [Slide 25] saying it's more about the limited development potential in the Northwest. Tilghman argued that 1400 MW doesn't seem secondary. He agreed that there are limited number of sites but said the sites are very big and PGE has pumped storage in their preferred portfolio. Tilghman noted that while there is nothing signed with a utility yet, there is FERC licensing and concluded that Secondary is not the right category.

Starrett asked if secondary resources were modeled in past Plans. Charles stated that secondary resources don't automatically get modeled but some have. She said over the next six months there will be continuing conversation that may pull resources from secondary to primary, adding that smaller, site-specific resources make sense but may not rise to primary for regional planning. Tilghman agreed that small hydro is site specific but called pumped storage different because of its place in the development cycle, financial backing and regional interest.

Gamache asked if rooftop solar and home battery storage is distributed generation. Charles said yes, adding that a cost curve will be included in the load forecast. She added that it's here because it may work for very carbon constrained scenarios. Gamache pointed to 50-200kw community solar projects, asking if that is considered distributed or utility scale. Starrett said that is too small to be considered utility scale but may be aggregated with other DG projects or incorporated into the load forecast..

Dhruv Bhatnagar, PNNL, said there might be more PV and storage coming on in 20 years as net metering goes away since the value of selling energy back (instead of storing it) will be decreasing.

Nightingale said it would be appropriate to move pumped storage to primary and suggested looking at operation parameters of other projects around the country for more information.

Tomás Morrissey, PNUCC, asked if the model can differentiate between characteristics utilities might be seeking when choosing between gas resources [Slide 27.] John Ollis, NWPC, answered no, adding that there is no time to get the RPM dispatch to that level. Morrissey thought creating a generic gas peaking unit might make sense to avoid unintentionally a level of precision not actually captured by the model.

Rebecca Smith, ODOE, spoke to the future of new-build CCCT gas resources in the region, saying it feels premature to kick it out as there's still debate over its ability to get the region to long term goals. She agreed that gas is getting harder to build but suggested exploring how the numbers pan out over a 20-year look.

Dragoon echoed that thought, wondering how it's possible to get rid of all fossil fuel plants and still keep the lights on. He agreed that batteries and pumped storage can replace peakers but said there's no technology to serve base load yet. He stated that the goal of the Renewable Hydrogen Alliances is to create and promote climate neutral fuels to burn in gas plants, saying that the problem isn't the plants but the fuel.

Vanden Bos agreed that it seems hard to build a gas plant in this environment but called it premature to take them out of the model entirely.

Henry said this discussion leads back to his earlier comment about use limitations and suggested limiting the number of hours for gas. Starrett emphasized that existing state policy will be incorporated and he will check for unit-level information too.

Levy asked about relying on the market. Starrett said they plan to have good assumptions about market availability. Charles agreed and noted that a lot of entities are assuming future market reliance that may not be available. Starrett reviewed AURORA and RPM, pointing to the non-infinite ability to rely on the market for regional load. Levy noted the projected surplus of CA solar.

Vanden Bos asked if power-to-gas means power-to-hydrogen. Dragoon preferred the term power-to-fuels and explained the different fuels the process can yield. He stated that in a 100% decarbonated system, power-to-fuels will be vital. Dragoon added that the "next big thing" will be cheaper and cheaper wind and solar that can also be used to make fuels, pointing to such work in Europe. He hoped the Plan would take a serious look at the option this time around.

Smith asked if biogas includes renewable natural gas. Charles was not sure about renewable natural gas, saying biogas would be animal waste or municipal waste systems. Starrett stated that the Natural Gas team is presently exploring the renewable natural gas supply curve.

Charles agreed to send out an updated version of [Slide 26] for discussion and asked for feedback in a week. She stated that there seems to be consensus around:

- Leaving a Combined Cycle Combustion Turbine in
- Use a frame SCCT as a proxy for gas peakers and provide cost estimates for recip and aeros
- Consider moving pumped storage from secondary to primary
- Consider moving SMR from secondary to emerging
- Consider moving offshore wind to secondary or primary

Tilghman asked if there's consensus around moving pumped storage to primary. Charles answered that she heard the comments and may make the adjustment after staff discussion. Tilghman asked about a timeline for written comments. Charles said the new draft will come out in the next few days. Kaiserski echoed Tilghman's comments about pumped storage.

Impact of Climate Change on Generating Resources

Nightingale noted that [Slide 5] showed a +/- of 3 to 5 degrees Fahrenheit while the target of interest is 2 degrees Celsius. Starrett said the climate models are not meant to be precise but to show the physics of the climate.

Gamache asked if samples were run both west and east of the Cascades [Slide 8.] Starrett answered yes.

[White Board Slide 17]

Tilghman addressed solar efficiency, saying a 10% loss of efficiency may not impact the output of an entire plant because they usually have a higher DC than AC rating Starrett called that a good point, noting that it's typical for a solar developer to install 20-30% more solar panels than their inverter can handle to boost the shoulder hours and curtail the middle of the day.

Tilghman theorized that the biggest risk to the region would be the potential variability of expected hydro conditions. Starrett stated that the Council is taking that on as the models are forecasting a definite shift in availability.

Vanden Bos asked about plans to codify or formalize a threshold of evidence to avoid speculation. Starrett called that a good point, saying they reach out for feedback from Advisory Groups. Charles added that staff will summarize and clarify its approach to incorporating climate change in power plan analysis after presenting best available information to various Advisory Committee meetings and waiting for feedback.

Levy pointed to more extreme events where he lives in the mountains of Idaho.

Morrissey said he was comfortable with many of the adjustments to the 2021 Plan but was hesitant about changes in the jet stream. He asked if there was a plan to reach out to climate scientists along with Advisory Committees. Charles answered yes – staff is working with climate scientists (see SIF meeting on climate change on 5/1).

Consistent Treatment of Quantifiable Resource Costs

There were no comments.

Charles said she would send out save the date emails for future GRAC meetings and ended the session at 12.

Attendees

James Vanden Bos	BPA
Shamus Gamache	Central Lincoln PUD
Rich Flanigan	Grant PUD
Henry Tilghman	Tilghman Associates (National Grid)
Dhruv Bhatnagar	PNNL
Bill Henry	dJoule, LLC
Rebecca Smith	ODOE
Mike Starrett	NWPCC
Gillian Charles	NWPCC

Attendees via Webinar

Andrea Goodwin	NWPCC
Brenna Vaughn	NW Hydroelectric Association
Bryan Neff	California Energy Commission
Cameron Yourkowski	Renewable NW
Charlie Black	CJB Energy
Cindy Wright	SCL
Dave Moldal	Energy Trust
Dave LeVee	PwrCast
David Howarth	MRW Associates (National Grid)
David Nightingale	WA UTC
Elizabeth Osborne	NWPCC
Fred Heutte	NW Energy Coalition
Greg Nothstein	WA Energy Office
Clint E. Gerkenmeyer	Energy Northwest
Glen Best	Inland Power and Light
Ian Bledsoe	Clatskanie PUD
Jan Lee	Oregon Energy Resource Services
John Foroski	
John Lyons	Avista
Ken Dragoon	Flink Energy Consulting
Torsten Kieper	BPA
Kurt Conger	N. Wasco PUD
Leann Bleakney	NWPCC
Jennifer Magat	Puget Sound Energy

Garrison Marr
Mike Louis
Mike Hoffman
Paul Nissley
Phil DeVol
Scott Levy
Shirley Lindstrom
John David Stalnaker Jr
Tom Kaiserski
Tomás Morrissey
Alaine Ginocchio
Brian Dekiep

Snohomish PUD
Idaho Public Utilities Commission
PNNL
SCL
Idaho Power
Blue Fish
NWPPC
BPA
Montana Dept of Commerce
PNUCC
Western Interstate Energy Board
NPWCC