Northwest Power and Conservation Council
Systems Analysis Advisory Committee
March 4, 2020

John Ollis, NWPCC, began the meeting at 9:30 am with introductions and a review of the agenda.

Fred Heutte, NW Energy Coalition, asked if the RMJOC is on track to deliver all the data necessary for the modeling. Dan Hua, NWPCC, answered that data relevant to the scenarios is available today.

Climate Scenario Selection for the 2021 Power Plan
Dan Hua, NPWCC
Heutte noted that RCP8.5 represents the long end of the tail [Slide 4] and asked for staff thoughts. Dan Hua, NWPCC, answered that RCP8.5 represents the current, worldwide trajectory and is what the RMJOC has supplied. Heutte observed that concentrated pathways are not emission levels and the relationship is complicated. Hua stated that RCP8.5 represents conditions in year 2100 while the pathway is still indeterminant.

Heutte asked what VIC and PRMS on [Slide 10] stand for. Hua answered that VIC is Variable Infiltration Capacity. Ollis added that PRMS is Precipitation Runoff Modeling System.

Tomás Morrissey, PNUCC, asked if the changes in summer/winter hydro generation depicted on [Slide 45] show monthly energy values or sustained peaking values. Hua said he hasn't calculated peaking capabilities but acknowledged that the real study will have their own loads and may be different.

Climate Change Methodology in AURORA, GENESYS and RPM
John Ollis, NWPCC
Garrison Marr, Snohomish PUD, asked if climate change assumptions are in the ARORA model [Slide 3.] Ollis said there is a proposed approach to incorporate them that he will present later in the day.

Marr asked if the climate change data is specific to the Pacific Northwest [Slide 6.] Ollis answered that is mostly correct, pointing to California and British Columbia incorporating climate change data into their load forecast. Marr understood that staff faces limitations when using public data sources.

BREAK
Marr asked how the Monte Carlo framework will be affected [Slide 8.] Ollis answered that there will be ten different games per Climate Change study which means 40 games instead of 80. He added that this makes the hydro data set a bit less rich, but doesn't limit any other variables, like the economic trajectories of seasonal load. Marr thought this approach made sense.

Tom Chisholm, Army Corps of Engineers, confirmed that staff previously used modified flows [Slide 10.] Hua clarified that modified flows are still being used but they are modified by climate change. Chisholm asked if the 80 historical years are still being used. Hua answered no, explaining that the water and temperature years will be in lockstep and no longer mixed.

Chisholm asked if the old and new results have been compared. Ollis answered yes. Hua added that he ignores the temperature for hydro and is examining the differences in hydro generation due to differences in stream flows.

Phillip Popoff, PSE, clarified that the plan is to use fewer combinations of hydro and temperature data to run the adequacy analysis for the Plan. Hua confirmed that the same hydro and temperature year will be run. Ollis explained that the past approach accounted for not knowing the relationship between hydro and temperature.

Popoff voiced discomfort with this approach's level of certainty and suggested sampling temperature years from within a ten-year block. Hua countered that the climate model evolved to have hydro and temperature the same within a single year. He said if the model picks a cold temperature year and a hot year for hydro it will show more water than what will actually be available.

Popoff agreed with that point, but was still uncomfortable around the lack of weather variability. Hua said he might use a five-year range around a particular year which would generate 10 years of possible patterns. Popoff still disagreed with locking into a hydro year and not having any possibility of temperature variation withing that year. Popoff pointed to a cold snap within a warm year to illustrate his concern. Hua said the climate model is designed to take care of inconsistencies like that.

Heutte agreed with Popoff's point, saying that there are different seasonal and monthly shapes within a particular year. Heutte thought this could matter to resource adequacy, particularly in mid and late winter, and asked how staff plans to reflect this without bias.

Ollis clarified that they are picking 40 games, ten from four different climate change models, which should reflect a lot of variability. Ollis said this might reflect a better connection between hydro and load and incorporating wind may add up to more variation. He said modifications can be made after results come in but this proposal seems reasonable apriori.

Popoff was still not convinced, agreeing that the classic approach probably overstated variability but thought this method shrinks the connection between hydro and temperature down to zero. Ollis disagreed, saying that there will be more variability in some ways as the data set is more volatile.

Popoff asked if forced outage rates will be repeated on just one combination of hydro and temperature year. Hua said no, explaining that one year can have ten possible climate years per

data set equaling 40. Hua added that temperature and hydro must be in lock step within the 40 years.

Popoff had more questions. Ollis pointed to the agenda and asked that Popoff hold them for the afternoon session. Popoff agreed.

Snohomish PUD Long-Term Planning and Climate Change
Garrison Marr, Snohomish PUD
Ollis thanked Marr for sharing how Snohomish PUD uses climate change data and asked if there is any plan to change the RCP from 4.5 to 8.5. He then said [Slide 2017 IRP Highlights….] is a good illustration of what Council staff sees and asked about the effect of using composite versus individual data sets.

Marr answered that using a different RCP is being discussed as they develop their 2022 IRP. He then talked about available data, anticipating that BPA's work will add significant value. Marr conceded that there are tradeoffs between using composite versus individual GCMs. He explained that using a composite approach means that tail events are based on observable events plus a measured amount of climate change influence while an individual GCM might create a forecast-induced tail event.

Ollis said he wasn't comfortable picking just one because he wanted a broader understanding of the risk in the entire set of climate change data. Marr stressed that there are many reasonable approaches to this question and what works for one utility may not reflect the needs of others.

Ollis then moved back Popoff's earlier question, reminding the room that this approach is taken from a regional adequacy perspective and may not be appropriate for every utility. Ollis then reiterated the case for this approach.

Popoff thanked Ollis for the explanation and emailed further questions as he had to leave the webinar. Ollis promised to follow up and publicly post the response.

Morrissey asked if there is a correlation between the historical temperature year and water year record. Hua answered yes, referencing a chart that John Fazio, NWPCC, created. Morrissey asked if it's a weak correlation. Hua said it's hard to say and offered to post the chart as a supplement to the meeting.

Heutte thought the legacy method might overrepresent system variability a bit but was more concerned with seasonal and monthly variability. He said this approach, which relies on downscaled global models, creates two potential wells of bias: underrepresenting potential variability or over correlating the relationship. Heutte thought that water, wildfire and agricultural managers might have valuable insight on the problem and suggested reaching out.

Ollis thought these were good points and asked for contacts for follow up. Ollis then restated the high-level message: warmer summers with less water. He addressed load effects, emphasizing that temperature sensitive components are only a small part of the overall, regional load.

Ollis agreed that hydro generation and timing might have an effect on resource adequacy, but countered that Fazio's approach of using high/medium/low loads will generate enough data to fully examine regional risks. Ollis predicted that the RPM will reveal results close to Snohomish PUD's: hotter, drier summers and more moderate, rainier winters.

LUNCH

Redeveloped GENESYS Demo and Updates
John Ollis, NWPCC
Heutte asked for a deeper discussion on HYDSIM/GENESYS priority versus penalty approach [Slide 6.] Ollis said he will show a stress test graph later.

Fazio then spoke about target storage representation and the step-by-step vetting of the new GENESYS model. Heutte asked if system operators can deviate inside the month. Fazio answered that HYDSIM doesn't know hourly ramps rates or operating constraints. Ollis said GENESYS does run into issues because it looks at hourly representations, which requires fine tuning.

Heutte called this helpful background.

Exploring the Model
Nora Xu, PGE, asked about the granularity of modeled reserves. Ollis answered that load following and regulation reserves are modeled at the hourly level but the tool can model any type of reserve. He added that there were changes to the "up and down, balancing reserves" per individual utility interaction.

Xu confirmed that the EIM efforts are the inputs calculated for the PLEXOS studies and asked if they were updated. Ollis said he wishes they were updated and dynamic, but they are not. Ollis said there is no sharing of reserves in the tool which leads to conservative modeling, adding that the model doesn't assume the same risk positions that an individual BA might.

Heutte asked if reserves reference reliability, economic or both. Ollis said it's from an adequacy perspective and can model forced outages but can't yet model transmission outages. Heutte asked what it means to have lines de-rated seasonally.

Eric Graessley, BPA, said he sent ten years of actual operations so it's a combination of known and unknown maintenance operations. Heutte countered that this is changing significantly, pointing to monthly south-to-north intertie flows which used to be unusual.

Ollis said the model picks up those operations and depends on capability, adding that de-rate may be due to non-economic factors like de-rating lines because of summer heat.

Heutte said he is thinking about contingency-based forced transmission outages, like fire. He thought this discussion was helpful and voiced concern about constraining the system based on historical data. Ollis said he is not seeing that and the hydro system is providing the most binding constraint.

Morrissey thought it would be helpful to see how this model differs from the other. Ollis said staff needs to find the right number for out-of-region resources first. Morrissey asked if it's possible to limit market resources in the new model. Fazio said that's what this method does. Ollis added that the model may be more restrictive as it knows the transmission system.

Morrissey suggested running without limitations to make the comparison more apples to apples. Ollis agreed that that's a good idea but said no, explaining that this is not the same model and is fact more constrained on the hourly level. He also cited project management constraints.

Heutte stated that the previous model view had more than 52 points. Ollis said there are three blocks a day, 21 a week and not all are the same length.

Chisholm asked if this is an off-the-shelf model with modifications. Fazio answered that the hydro part is off the shelf and adapted for our system while the hydro pricing uses an in-model forecast.

Chisholm asked how similar this model is to the Brazilian model. Fazio answered that the NCP is the same with a different configuration. Ollis listed all the river systems the group previously modeled, acknowledging their skill, experience and excitement to work on the heavily-constrained Columbia system.

Morrissey asked how much hydro 2001 water conditions and 1950 temperatures yields. Ollis said it's over 20, adding that the results are similar because of summer water conditions. He showed other combinations to illustrate differences during other conditions.

Morrissey noted that he's seeing slices of years and asked if a full study was run yet. Ollis answered yes, explaining that smaller studies are better for the de-bugging process.

Ollis adjourned the meeting at 3:00.

Attendees

John Ollis	NWPCC
John Fazio	NWPCC
Dan Hua	NWPCC
Fred Heutte	NW Energy Coalition

Tom Chisholm	Army Corps of Engineers
Eric Graessley	BPA

Attendees via Webinar

Andrea Goodwin	NWPCC
Adam Schultz	ODOE
Allison Jacobs	PSE
Ben Kujala	NWPCC
Bill Henry	dJoule LLC
Bill Saporito	Umatilla Electric
Elizabeth Osborne	NWPCC
Ben Fitch-Fleischmann	NorthWestern Energy
Frank Brown	BPA
Garrison Marr	Snohomish PUD
Ian Bledsoe	Clatskanie PUD
Jim Litchfield	Idaho Council Office
Kathi Scanlan	WA UTC
John Lyons	Avista Corp
Jennifer Magat	PSE
Nora Xu	PGE
Tomás Morrissey	PNUCC
Patrick Oshie	NWPCC
Phillip Popoff	PSE
Rob Diffely	BPA
Robert Brown	PGE
Seth Wiggins	PGE
Villamor Gamponia	SCL
Zhi Chen	PSE