

**Northwest Power & Conservation Council
Climate and Weather Advisory Committee
July 15, 2024**

Dan Hua, NWPCC, began the meeting at 1:00. Chad Madron, NWPCC, reviewed how to best interact with the Go-to-Webinar platform. Christian Douglass, NWPCC, asked members to introduce themselves.

Rick Williams, PSU, noted that the US/Canada agreement on the Columbia River Treaty has just been finalized, asking if that information will be included in the modeling [Slide 10]. Jennifer Light, NWPCC, answered that treaty updates will be folded into the analysis, adding that Council staff have until Spring 2025.

Guillaume Mauger, Washington State University, asked for more resources available to help him better understand the Council's role. Mauger was directed to appropriate sources.

Fred Heutte, NW Energy Coalition, noted that the GCM encompasses anywhere between 46 to 186 miles, calling that a large distance that grows even larger in two dimensions [Slide 18]. He asked how this was assessed and how it plays a role in selecting the models. Hua said this should be smoothed out, using the GCM performance quilt on [Slide 16] as illustration.

Heutte asked if there is any relationship between outcome and the spatial scale. Mauger answered that there is not a strong relationship between resolution and performance, noting that models have improved in resolution over time.

Heutte then inquired about vertical stratification and downscaling impacts. Mauger agreed that it could be a factor but not a major one. Erik Pytlak, BPA, called this a good question but noted that this is a review of past work, and things will be different going forward. He stated that the 2021 Power Plan used RMJOC, but the science has since advanced. Pytlak voiced curiosity about Council plans moving forward.

Heutte noted that CMIP6 been going on for a while, wondering if it will be ready for Council work. Pytlak assured him that it is available and in use adding that there is still a lot of work that needs to be done. Pytlak said IPCC7 is still underway, and data will probably not be available until 2029-ish. Heutte said his own concern was about the amount of data and not knowing the risks. He was confident in the Council's careful approach, adding that models are not predictions but ways to organize thinking and providing context.

Nathalie Voisin, PNNL, noted that past scenario selections focused on water availability, but the Power Plan analyzes all kinds of energy availability [Slide 31]. She wondered if the distribution takes other factors, like relative humidity and overall temperature into

consideration. Hua answered that the RMJOC focuses on stream flow characteristics, but the Council also considers other factors in their work. Voisin asked how the Council can best provide feedback to the RMJOC.

Pytlak said that ship has sailed. He understood that PNNL wants metrics beyond stream flow characteristics but in 2017 the main focus concentrated on hydro power. He added that the 19 scenarios included a broad range of temperature and precipitation outcomes that allowed Council staff to go to an even higher level. Pytlak stated that the upcoming Plan could have very different priorities.

Heutte asked what SVN represents. Hua answered Sullivan. Heutte asked why there are no facilities between Grand Coolie and The Dalles. Pytlak said this slide only shows Federal projects. Heutte asked if there will be an RMJOC 3. Pytlak answered no. Heutte expressed disappointment and hoped that there will be something to take its place.

Mauger asked, Is the scenario selection all based on results for the 2040s relative the 1980s? In the chat [Slide 51], Hua said [Slide 50] represents the climate scenario temperatures from 2020 to 2049 while [Slide 41] represents hydro generation from 2020 to 2049, saying they are climate scenario modified stream flows.

Allison Jacobs, Puget Sound Energy, asked if staff considered looking at HDDs/CDDs other than 65°F [Slide 56]. She said PSE finds that HDD 55°F or 60°F is better for forecasting electric loads. Hua answered no, as 65°F is what the low model uses. Steve Simmons, NWPPCC, added that upcoming work will use multiple cut points for HDD/CDD.

Ted Light, Lighthouse Energy, asked about the correlation between winter and summer generation with respect to degree days [Slide 58]. He asked if the selected scenarios were examined to see if they correlated in a way that makes sense and not pick scenarios with both high winter generation and high HDDs as that would not be the stress case.

Hua said he has not looked at correlations, adding that he and climate scientists could examine the question.

Ronda Strauch, Seattle City Light, asked if the Council already decided about using RMJOC 2 again and this is about adding a fourth scenario, or if staff are thinking about new stream flows. Hua said the modified stream flow is the only kind of stream flow that can be used in the models and that information only exists for CMIP5. He said if a modified stream flow exists for CMIP6 he would happily use it too.

Justin Sharp, EPRI, voiced concern over excluding the J scenario as it would be analogous to ignoring risk because we don't understand what it is. Hua thanked him for his opinion, saying it depends on the amount of time this would add to the planning process.

John Ollis, NWPCC, pointed to the performance quilt adding that there was concern that J didn't meet performance standards. He said staff could add J if people feel okay about the model now. Sharp said he would have to look at the performance criteria.

Douglass addressed Strauch's question saying that no decisions have been made yet. He cautioned that limitations exist, but said staff are open to learning more.

Greg Brunkhorst, Tacoma Power, said his models run a bit faster than the Council's allowing for more climate simulations. He thought there would be more options than what is shown on [Slide 55]. He asked about RCP 4.5 or including 10 runs instead of four. Brunkhorst wondered if the issue was staying consistent with the 2021 Plan or if he is missing something. Hua said the tools take a long time to run which is why they reduced from eight to three or four. He agreed running more scenarios would be good.

Ollis appreciated the question, saying today doesn't have to be the decision point but it is coming soon. Ollis said run time is just one factor, pointing to the significant process associated with choosing scenarios for other parts of the Council's work. He was open to considering more but said there has to be a balance with data and time management. Ollis said they don't have to maintain a level of consistency between Plans, but it is nice to use vetted, embedded data.

Brunkhorst wondered if any climate scientists had opinions about RCP 4.5 versus 8.5, saying that 8.5 shows more risk but its warmer, wetter winters actually paint a rosier picture for Tacoma Power.

Williams said these issues are easily national security scenarios, pointing to the Department of Defense's Energy Resilience requirements. He asked if staff tapped into the defense research and engineering network at PNNL or other national labs. Ollis said staff use cloud computing, pointing to some algorithmic challenges. He said he is open to cheaper or faster ways to do the modeling but thought the SAAC would be a better venue for that discussion.

Voisin addressed RCP 4.5 versus 8.5, saying all the EIA projections show that we are not doing enough to reach the 4.5, however the 8.5 is seen as too warm. She said this suggests we might need both. Voisin then spoke about offering help with computing time, saying long simulations are okay when talking about climate. She pointed to the wide number of available climate data sets that are not as vetted by RMJOC, pointing to hot bias in CMIP6. Because of this Voisin thought CMIP5 is still relevant for the upcoming Plan.

Pytlak agreed with Voisin, adding that they are tracking RCP 8.5 for the emissions scenario along with temperature and precipitation signals. He added that RMJOC2 had much weaker precipitation signals.

Mauger thought what we are presently tracking is not a good indication of what we can expect in the future. He thought the RCP 8.5 would be a good, mid-century indicator of what to expect from RCP4.5 in the late century. Mauger said research shows that RCP 8.5 is not plausible but to expect something between 8.5 and 4.5.

Mauger then said it would be important to understand the sensitivities of the system and the power generation models. He wondered if there could be a complementary sensitivity analysis that could reveal a bottom-up perspective that shows pinch points. Douglass said energy efficiency staff runs a lot of sensitivities

Casey Burleyson, PNNL, wrote that the climate signal and the sociotechnological signals in the RCPs shouldn't be decoupled. Getting to a RCP4.5 scenario would require pretty extensive electrification which would drive loads higher, in the chat.

Pytlak called the question on [Slide 60] much more complicated than presented. He said climate change is underway, as evidenced in streamflow records, so they use the last 30 years of records. He said this allows them to use just one scenario with no doubts as it already happened. Pytlak said going out farther than 10 years gets trickier as RMJOC2 used snapshots and rule curves. He said going out to the 2040s is even harder and might require a different set of scenarios from CMIP6 that don't look at all like modified flows.

Pytlak did not think there was a straightforward answer to the question even though he was the project manager for RMJOC2. He said there are other data sets available and the Council needs to examine a wide variety of factors that were outside his project's scope.

Douglass asked if Pytlak was aware of CMIP6 or other non RMJOC resources that have the modified flows needed to model hydro. Pytlak said no.

Voisin suggested putting in an official request to the DOE. She then commented on the timeline of 2020 to 2050, saying PNNL is looking at when different social/economic scenarios matter. She pointed to the next 10 years, agreeing with Pytlak that the divergence in the scenarios will be based on different policies. She suggested a combination of climate and policy information for the next 25 to 30 years with a shift to mostly climate after 50.

Douglass confirmed that staff have access to data up to 2099. Hua answered yes but said rule curves and controls only go to 2050.

Mauger addressed the start year for the GCM projections, saying it was 2015 for CMIP5 but was not sure for CMIP6. He then noted that the RMJOC-II dataset has a cold bias (Nathalie Voisin referenced this earlier). Bias-correcting the flows may not always be an adequate correction for this, because if there's too much snow historically, the change in snowpack (and implications for streamflow) might be biased as well, in the chat.

Mauger then said the Army Corp of Engineers and MCAR are working on another SUMA model. He said it's not yet complete but could be considered.

Brunkhorst asked if staff use historical data, noting that more recent historical data can mitigate some of the climate bias. Hua answered that they have historic data to run. Ollis added that staff used historic data in the past, but the advisory committees and climate scientists thought that data set would under bias the climate effect for the entire region. He said they might be able to use both sets, depending on what that does to workflow.

Mauger wrote It's a good idea to use historical data, but there is a trade-off, which is that we only have one realization of the past. In contrast, we have multiple projections of the future. This is useful for spanning the range of variability. The risk, of course, is that the models have biases, and those may outweigh their advantages, in the chat.

Strauch wrote I think the sensitivity test that Mauger is suggesting is important...how sensitive is the modeling train to changes in streamflow and temp, in the chat. Douglass agreed.

Hua thanked members for attending, pointing to upcoming meetings. He asked that further comments be sent to him and ended at 3:00pm.

Attendees via Go-to-Webinar

Christian Douglas	NWPCC	Justin Sharp	EPRI
Dan Hua	NWPCC	Steve Simmons	NWPCC
Jennifer Light	NWPCC	Kevin Smit	NWPCC
Chad Madron	NWPCC	Ronda Strauch	Seattle City Light
Dianne Barton	CRITFC	Cindy Strecker	CLEAResult
Greg Brunkhorst	Tacoma Power	Nathalie Voisin	PNNL
Casey Burleyson	PNNL	Rick Williams	Portland State Univ
Nathaniel Clayville	NWPCC	Konstantine Geranios	WA UTC
Corey Crowley-Hall	WA SAO	Jinhee Noh	WA SAO
Robert Evashenk	WA SAO	Brian Dekiep	NWPCC
Laura Gephart	CRITFC	Joshua Dennis	WA UTC
David Graves	CRITFC	Devin Mounts	PGE
Fred Heutte	NW Energy Coalition	Landon Snyder	Snohomish PUD
Dor Hirsh Bar Gai	NWPCC		
Allison Jacobs	Puget Sound Energy		
Sanjeev Joshi	CRITFC		
Mary Kulas	consultant		
Ted Light	Lighthouse Energy		
Guillaume Mauger	University of WA		
Tomás Morrissey	NWPCC		
John Ollis	NWPCC		
Craig Patterson	independent		
Stephanie Price	Puget Sound Energy		
Erik Pytlak	BPA		
Amber Riter	PGE		
Annika Roberts	NWPCC		