

**Northwest Power & Conservation Council  
Systems Analysis Advisory Committee  
August 4-6, 2021**

**Day One**

*Ollis reviewed Agenda Topics including the Purpose of the GENESYS Redevelopment, a review of the model setup, a look at the Columbia and major tributaries, exploration of other questions, and a place for comments about next steps.*

John Ollis, NWPCC, began the meeting at 9:00 by welcoming the group. Chad Madron, NWPCC, explained how to best use the Go-to-Webinar platform.

Scott Levy, Bluefish asked about "Improve Model Usability" on [Slide 10], saying that at one point in time, it was thought that anyone might be able to use the redeveloped model, perhaps on their cell phone. He wondered if this might someday be possible. Ollis did not know if all the model's capability will be available to stakeholders and staff is still working on the details. Ollis added that a local version will be available.

Jim Waddell, Clallam County PUD commissioner, asked how value is defined. John Fazio, NWPCC, answered that value, in the context of the GENESYS simulation, is the operating cost for hydro and is assigned by hydro block in the Classic GENESYS while the new model explicitly calculates the value of hydro based on a forecast of future conditions. Fazio added that this is more in-line with real-world operations.

Nicholas Garcia, WPUDA, asked if different river basins are looked at when modeling individual projects [Slide 11]. Fazio said that historical modified stream flows, which were used at first, include data for each hydro project simulated in the model. Climate change data, which were used for power plan analyses, use synthetic modified stream flows at the same locations.

James Adcock, NW Energy Coalition, asked what region holds the modeled wind and solar resources [Slide 13]. Ollis answered that the resources are modeled within the region because that is where staff has climate change data. Ollis added that he hopes to expand that to outside the region in the future if there is data. Adcock asked if region meant the Columbia River Basin. Ollis clarified that the climate change data is the source for temperatures, hydro runoff, and windspeed and that data comes from a collaboration with BPA and the RMJOC. He identified that stochastic data for the four-state area is resource (and site) specific while resource data for outside the region is represented in a supply curve.

Adcock then asked about import assumptions. Ollis said transmission is the limiting factor along with firm dedicated resources, but the numbers commonly referenced are 2500 MW/hour maximum net import in the winter and 1250 MW/hour maximum net import in the summer. Fazio confirmed these numbers.

Dan Catchpoir, Newsdata, asked (in the question pane), is it fair to say that many of the changes just covered all aim to more accurately model the effects of fuel constraints (for hydro, natural gas, renewables, etc.) on resource dispatch, adding for example economics, BiOp constraints, logistical (ordering gas ahead of time), etc. He said these are all constraints that affect dispatch in the real world and the new GENESYS attempts to model these real-world constraints more dynamically and with much more granularity. Ollis heartily agreed.

## **BREAK 15 min**

### **River Operations on the Columbia and Tributaries**

#### **Dan Hua, NWPCC**

*A review of river operations with climate change data and how this data compares to historical. Hua compared four types of data: total outflow, generation, elevation, and spill*

Levy asked how many of these hydro projects fail to correspond with HYDSIM, in the question pane. He continued asking, for instance, if the redeveloped GENESYS, (not classic) considers Lower Snake as storage projects and guessed that the same changes also apply to Lower Columbia. Levy then asked if there are any others [Slide 21].

Hua answered that both the classic and redeveloped GENESYS consider the lower Snake and lower Columbia projects to be reservoirs, but simulate their operation differently. Hua said the differences will become clearer when results are shown later in the presentation.

Levy noted that Hua said that the Lower Snake dams are modeled as reservoirs in the classic GENESYS, but he was not so sure about that and voiced surprise to hear it, in the question pane. Ollis responded that his understanding was that it is but noted that there definitely are differences in the way those are modeled. Ollis wrote that some of the confusion may be due to some vernacular that seems to pervade the industry. He clarified that when we say "run-of-river" we mean no usable storage modeled. When others say run-of-river they often mean minimal usable storage compared to larger dams like Coulee.

Sanjeev Joshi, Critfc, asked which part of the river the temperature data refers to. He wrote that he noticed that the streamflow data was for the Dalles Dam but wondered if the temperature data is specific to a location [Slide 42.] Hua answered that he did not specifically define the regional temperatures but used a weighted average from four cities (Seattle, Portland, Boise, and Spokane), not related to hydroelectric project sites.

Dianne Barton, Critfc, noted that the previous section described how Classic GENESYS aggregated projects. She stated that Hua's presentation showed all the projects individually and wondered if there is an easy way to show how the projects were aggregated in the Classic version. Ollis said they were all aggregated. Fazio explained how the Classic model aggregated the information as compared to the new model.

Levy pointed to using the 10 years of Corp data saying he is using just the last 2.5 years in his work to represent flex spill. He thought that the redeveloped model also uses that and wondered if it would be confusing to go all the way back to 2009. He also thought that it might be interesting to use all the 10 years.

Fazio acknowledged that operations have changed, along with the water flows. He said the goal was to capture a range of operations. Levy added that he thought 10 years for Dworshak was right.

### **Plant by Plant Presentation and Notes**

*Ollis reviewed each hydro plant and captured stakeholder input in real time.*

### **Mica**

Catchpole noted some issues with looking at the model. Fazio informed the group that using the prepared spreadsheets that show simulated vs. historical operations requires a newer version of Excel to work properly.

Mike Frantz, GC PUD, asked if the mismatch in 2029 accounts for the spike in spill for the new model in Apr 1 to "catch up" the discharge. Ollis wasn't sure but thought there was more spill in the new model due to economics. Fazio agreed that sometimes the new model finds it cost effective to spill water (e.g., perhaps to pass more water through all the projects downstream to increase revenue).

### **LUNCH 45 min**

Ollis went back to Frantz's earlier question and showed a graph of the spill that showed that the spill was in fact for "catch up." Frantz wrote that the reason it needed to catch up (less generation in March) may have been economically driven, saying that it's likely that we are both right. Ollis agreed.

Adcock asked if the 2500 MW California South-to-North is a soft constraint. Ollis said it is a hard constraint. Adcock wrote that he did not understand that decision. Ollis explained the reasoning around the market reliance constraint and the model's limitations.

Levy observed that Climate Change Scenarios are suggesting that Mica Dam does not refill. Consequently, in preparation for less to store, the elevations do not drop as much. Ollis agreed that the refill is not as drastic and has to do with runoff timing and more precipitation coming down as rain. Fazio added that the elevations are close to the Classic model simulated results. Hua added that there is a conversion issue with the elevation tables (converting classic model end of month elevations into new model end of week target elevations).

Frantz wrote that Historical Ops (drawdown) is driven by runoff forecasts and asked to what extent are forecasts driving the drawdown in model. Fazio pointed to flood control curves from the climate change data, which are based on forecasted runoff volumes. Ollis said flood control

limits were removed due to fidelity issues in the new model but that flood control was not being violated as long as the new model achieves the target end of week elevations derived from the classic model. Hua said the lower part of the envelope may be from different water years.

Levy observed that the historical data goes above in all three cases which means the top of the dam is higher. Fazio called it a conversion issue (i.e., interpolating end of month elevations into end of week elevations) that will be corrected. Levy thanked him.

### **Revelstoke**

Rob Diffely, BPA, noted that there is no storage operation as BC keeps this flat. Ollis said he would have to match it up with Mica as they pass it through but added that it is the same in the Classic GENESYS.

Ollis explored the model. Diffely offered to follow up offline. Ollis noted that on [Slide 56.] Frantz sent some information via chat

[http://wateroffice.ec.gc.ca/report/historical\\_e.html?stn=08ND026](http://wateroffice.ec.gc.ca/report/historical_e.html?stn=08ND026) He wondered if there was a capacity mismatch. Ollis thought that could be right and added more notes on [Slide 56.]

Levy wrote: Especially because of the 12-hour delay, it seems that Frantz's suggestion is correct. Prices at 5pm are much different from prices at 5am. Ollis added another bullet to [Slide 56.]

Frantz noted that an optimization solution puts us in a weird operational world and asked what the strategy will be for true up. Ollis said the Council is asking for stakeholder support to provide operating data and to aid in "the art of modeling." Ollis said the more constraints they can add the more trustworthy the model will be.

### **BREAK 10 min**

#### **Arrow**

Frantz asked to look at the storage elevation table. Ollis thought there would be advantages for the jump. Frantz asked to look at outflow x tailwater table data.

Ollis captured notes on Arrow [Slide 61]

#### **Duncan**

There were no concerns.

#### **Libby**

Frantz wondered if there should be a constraint as the flows never goes to zero. Ollis agreed, noting that Libby is hard to model, showing the constraints.

Libby's Question/Notes slide [Slide 71] was turned yellow with the promise of starting again in the morning. He asked for questions to be sent via email for preparation.

Ollis ended the meeting at 3:30

## **Day Two**

Ollis began at 9:00, explaining that the schedule will remain similar to Day One. Madron explained how to best engage with the Go-to-Webinar platform. Ollis reviewed the agenda and explained difficulties resolving the issues at Arrow.

### **Libby (continued)**

D. Barton wrote, some of the graphics that were produced in the GENESYS interface but are not in the slide set. For example, the ones you just showed for Arrow. She asked if these are graphics available anywhere. Ollis said anything of interest can be downloaded and made available.

Barton asked for a reminder of what future years the GENESYS models are simulating. Ollis answered that the operating year results being shown today cover months from October 2024 to September 2025. He said the “2020-2029” label seen on many slides refers to climate change stream flow and temperature records projected for those years. He added that due to climate change trends inherent in the data, only decadal data is used for any operating year. For example, for the 2025 operating year only climate change data for the 2020 to 2029 decade is used.

Levy asked for an explanation between week ahead and true up. Ollis moved to [Slide 244] to explain how the redeveloped model simulates hourly operations. Levy asked if Ollis’s explanation includes balancing reserves. Ollis said yes, explaining that staff’s definition is more general to include balancing and load following but not contingency reserves.

Levy moved back to the outflows, generation, elevation and spill flow charts to ask about the increase in flow. Ollis said it is not due to climate change data but about economic spill.

Levy then asked about classic versus historic saying the ending elevation chart shows a 100-foot drop. He wondered if the Corps is hesitant to have Libby go that low, noting that the model is not matching historic. Fazio explained that the blue lines should be close to BPA’s HYDSIM model, and all the information and constraints came from BPA as well. He added that the apparent mismatch may just be due to the interpolation of end of month elevations into end of week target elevations. John Ollis showed an example where the end-of-week day in the new model did not coincide with the end-of-month day from the classic model. Levy clarified, asking if climate change starts matching the models, then people around Libby should expect the reservoir to drop 100 feet. Fazio said the new data came to us quickly and perhaps some constraints might not be as fine-tuned as historical. Fazio also thought that the lines were for flood control.

Levy asked to see a comparison by price. Ollis explained the difficulties with presenting the information that way while showing them. Levy felt the results did not validate the explanation of economic spill. Ollis theorized that it had to do with downriver operations. Levy asked why power was not generated at Libby. Ollis thought it might have to do with local prices at Libby and added it to the questions slide [Slide 71.]

Frantz called the stacking of spill on top of generation weird, agreeing that spill on top of generation (head loss) was probably due to downstream concerns. Ollis said it might be good to explore as they move downstream.

Erin Riley, BPA wrote that Libby's hydraulic capacity (maximum turbine flow) is 25kcfs.

Frantz agreed that the issue had to do with hydraulic capacity but still called it interesting that spill is on top of the generation. Ollis resolved questions on [Slide 71.] Tom Haymaker, Clark PUD, wrote that sturgeon pulsing used to be a thing. Hua said that HYDSIM includes that constraint. Riley wrote that sturgeon pulsing is in May and June.

### **Bonner's Ferry**

There were no questions or comments.

### **Cora Linn**

Fazio explains that operations at Cora Linn are historically difficult to model. Levy posted a Wikipedia article that confirms this: Wikipedia teaches the interesting history of Cora Linn and thought to share: [https://en.wikipedia.org/wiki/Corra\\_Linn\\_Dam](https://en.wikipedia.org/wiki/Corra_Linn_Dam)

There were no questions or comments.

### **BREAK 10 min**

### **Kootenay Canal**

There were no questions or comments.

### **Upper Bonnington**

There were no questions or comments.

### **Lower Bonnington**

Diffely sent a photo of Kootenay Canal. Ollis said it the model closely approximates the river.

Levy noted that the Canal usually does about 42 MW at the top and wondered about the output of the following three. Ollis showed an average coefficient (MS/kcfs) of 20

### **Brilliant**

Frantz asked to look at smaller timesteps. Ollis showed some examples. Frantz didn't think the examples were realistic operations but didn't know how to dig into the issue. Ollis agreed the

Canadian projects are “full of mystery.” Frantz thought if the spikey operations are solving a problem but are not realistic, he wondered how that resolves anything. Ollis said there are no constraints on Brilliant and thought the spikes were due to trying to match challenging inflows combined with downstream constraints.

Ollis added the question to the notes slide [Slide 88.] Frantz agreed to turn the slide green, stressing that concerns will be around flexibility.

Garcia wondered if the new model assesses resource needs on an hourly or daily basis. Ollis said that was part of the model redesign [Slide 244] noting that the redeveloped GENESYS has a True-up section.

Diffely wrote that it appears that there is a lot more spill at projects using the new GENESYS versus the classic. He asked to see a graph of the monthly average MW imports between the new and classic model at some point. Ollis said yes and made a note to explore that on the General Notes/Requests slide [Slide 250.] He then explored the issue.

Garcia stated that discussions at the NW Power Pool Meeting on resource adequacy noted that derates of transmission due to wildfires should be consideration in resource planning. Garcia wondered about transmission constraints. Ollis showed the transmission topology, adding that people are concerned with wildfire but that it will take a while to incorporate stochastic transmission modeling and they are just starting to get the data to model the effect in detail.

Ollis said putting a limit on net imports could be a good proxy for this Plan.

Garcia asked to see a scenario where lines are reduced or taken out. Ollis made a note on [Slide 250]. Egerdahl wrote that Garcia has a good question and offered to help with some BPA Transmission planners/operators on this.

Levy noted that the model has a hard time with higher flows and said it would be interesting to talk about where the model is strained in a Plan narrative. Levy then asked about imports and wondered which scenarios are the most profitable. Ollis explained that the model is tuned to answer adequacy questions and has some limitations, moving to [Slide 13] for further illustration.

Garcia confirmed that the model does not estimate prices. Ollis explained the process. Garcia thought it would be a good idea to look at low/high water and not just use a constant price forecast. Ollis agreed that a rainy year would show lower prices, saying the model has enough interaction and the purpose of the model is resource adequacy.

**LUNCH 45 min**

**Hungry Horse**

There were no questions but Ollis wanted to explore why historical generation seems to peak higher than simulated generation and to investigate H/K tables compared to the classic GENESYS data [Slide 93]

### **Columbia Falls**

There were no questions/comments.

### **SEŁLIŠ KSANKA QLISPEŁ (SKQ)**

Levy was curious to know the ramping rate of Sėliš Ksanka Ql'ispė hydro project. Ollis didn't know if there was a discharge rate limit on the model and asked if any stakeholders knew. Ollis thought a reasonable discharge rate might help with the peakiness. Ollis agreed it is not regular operations but said the targets are at the end and would be smoothed out when there are constraints.

Riley wrote seeing flow limits of 15 kcfs in March. Ollis asked for a reference. Riley said it was from PNCA. Ollis said that was not public data and asked for a public source. Riley was not sure. Ollis added the question to [Slide 97]

### **Thompson Falls**

There were no questions/comments.

### **Noxon**

Ahlmahz Negash, Tacoma Power, wrote that she actually really appreciated this method of stepping through the river project by project in an ordered fashion!

Ollis wrote to investigate the H/K table [Slide 104]. He also wrote to investigate forebay elevation ramp limitation modeled as a discharge rate.

Levy wrote that he is curious to know the ramping rate of Thompson Falls and Noxon hydro projects. Ollis didn't know the ramp rate at Thompson Falls as it's treated as run of river while Noxon has a tight discharge range with a high penalty. Ollis said the first bullet on [Slide 104] addresses the issue. Levy was satisfied with the answer.

Frantz suggested looking at inflows to see if they are highly variable. Ollis captured the comment on [Slide 104.]

### **Cabinet Gorge**

Adcock wondered if it is possible to implement a seven-day boxplot averaging display option or something to clean up some of the modeling noise. Ollis said the general idea was to show overall range but agreed the weekly seam issues to get to target storage constraints creates a lot of noise. Ollis said he will work on creating that as it is hard to do live on the model.

Ollis copied notes from Noxon to Cabinet Gorge on [Slide 109] about modeling as run of river in the old model versus storage on the new GENESYS. Levy voiced curiosity over the ramping rate. Ollis said staff doesn't know the ramping rate.

### **Priest Lake**

There were no questions or comments.

### **Albeni Falls**

After noting some discrepancies, Ollis wrote Check Corp Data on the Questions/Notes slide for Albeni Falls [Slide 115]. He also wrote a note to check the H/K table. Hua noted that there is probably something wrong with the Excel sheet and not the Corps data. Ollis changed the notes.

Levy asked if he was hearing that current (historic) operations are not operating to HYDSIM on a monthly basis. Ollis said that is not what he heard but that it was that the climate change regulation does not necessarily match to historic operations.

### **BREAK 10 min**

### **Box Canyon**

Fazio wanted to investigate why the generation is lower in the Classic model during the spring. Ollis noted it on [Slide 121.]

### **Boundary**

Levy asked for a ramp rate. Ollis said he didn't think there was one.

### **7-Mile & Waneta**

There were no questions or comments

### **Coeur D'Alene, Post Falls, Upper Falls, Monroe Street, Nine Mile, Long Lake, Little Falls**

There was discussion about investigating H/K tables. Ollis noted the concern on [Slide 139.]

### **Grand Coulee**

Fazio noted some irregularities and added Check minimum flow constraints at downstream projects in low water years to see how it effects operations [Slide 146.] Frantz noted that the 65 Kcfs constraint should be dynamically set and is not always at 65 Kcfs. Fazio agreed that it should be a dynamically set value.

### **Chief Joseph**

Ollis discussed the need to check H/K tables

Frantz stated that the new model's use of storage has ramifications. Ollis stated that [Slide 151] already had a note to investigate whether updated operating ranges on Lower Snake and Columbia plants effects operating range on Chief Joe before changing constraints.

Ollis added Check max pool and full pool at Chief Joseph. Ollis also colored the slide yellow to indicate that more investigation is needed.

Levy thought that the issues might have to do with economics as opposed to minimum operating pools.

### **Wells**

Ollis noted that traditionally this plant has been operated at a higher head to prioritize generation on [Slice 156.]

Garcia returned to an earlier comment about economics driving dam flexibility. He asked what those economic drivers would be for someone who owns a dam. Ollis said it comes from the future value of water and is incorporated throughout the model. (The model is designed to minimize regional – and not local utility – cost).

Garcia asked for an offline conversation about how owners might operate their dams and monetize that value. Ollis worked through the question by pulling up prices including large, extra-regional players.

Frantz said for Wells to operate like this it would use more of its storage capability than it has ever used. He thought that if it could do that this would be a representative answer. Frantz thought the real question is if the full 10 feet of storage is available on a daily, cyclical basis.

Ollis ended day two at 3:30.

### **Day Three**

Ollis opened the meeting at 9:00 by reviewing the agenda and rules/goals for the work sessions [Slide 4.] He also presented a slide about learning so far [Slide 13.]

Levy noted the assumption about using HYDSIM end of month elevations as targets in the new model and asked about alternative underlying assumptions that might replace that assumption. Ollis answered that another option would be to input all the constraints in HYDSIM as opposed to using it as a guide. He explained that stakeholders felt confident about HYDSIM constraints.

### **Wells (continued)**

Diffely asked if encroachment for the Mid-Cs is included, what the H/Ks for Wells are, and a comment that there is a fish collection facility on the reservoir so it may not be able to go down too much. Ollis answered that a direct water balance for the forebay elevation takes care of encroachment, which also goes into the H/K calculation. Ollis showed the mean H/K, adding that if they used a table, it would have a slightly different operation.

Diffely stated that this is a low head project so the H/K could be close to zero. Fazio noted that we don't have a table as it is operated as run of river. Ollis said we don't have enough detailed data and added the comment to [Slide 156].

Frantz asked if the model sees no penalty to head losses in TW or forebay. Ollis added a note to look at more detailed H/K tables. Frantz added that Wells operates at around 70 ft of head, so 10 feet of forebay fluctuations is a pretty substantial percentage and the tailwater hit is not trivial either for capacity level flows.

Ollis said he could add that note to all of the mid-Cs and asked for good, public data. Frantz wrote that head impact on H/K isn't really a data thing, and you have all you need. Ollis said all they have is storage versus elevation and everything else is blank. Frantz said that probably overstates when the reservoir is at the bottom and understating when it is at the top. Frantz agreed that an H/K value 4.7 is probably near the middle.

Frantz noted that the model sees no penalty for drawing down the reservoir except for future ability to generate. He called this a big deal for the mid-Cs. Ollis agreed that staff may have to take the computational time hit but said most of the flexibility is to manage forecast errors.

Levy asked if the model holds reserves as a region, or if individually as utilities. Ollis said they started out holding individually but ran into an issue that will have to be fixed in the future. He added that when utilities enter the EIM they will have to come in sufficient and the model can assign reserves where needed.

### **Chelan**

Ollis asked if encroachment is an issue [Slide 158.] Levy asked to look at the fourth quarter of 2023. Ollis said they only have 2025 and they have a way to look at a stressed year set up later in the presentation.

### **Rocky Reach**

Ollis noted to look at using/developing a more detailed H/K table to better capture encroachment. Frantz thought that encroachment was less of an issue than making sure the H/K table includes a penalty for drawing down. Ollis changed the note to better capture head.

Fazio asked if modeling could be adjusted if there is better supporting documentation about pool size operations. Ollis thought that actual constraints need to be included but constraints driven by flexibility and reserve economics would complicate the model's work. Frantz agreed with Ollis adding that there is an operational buffer to handle uncertainties. Ollis reviewed ideas for model adjustments.

Ollis added another bullet to [Slide 163] about operating within full range of the plant's storage.

### **Rock Island**

Ollis copied mid-c phenomenon notes and question to the Rock Island slide [Slide 168].

Frantz noted the tendency of the new GENESYS to spill and wondered about gate limits to handle dissolved gas due to spills. Ollis thought the total dissolved gas would be a max spill issue and asked for guidance. Frantz said he would look but suspected the recommendations would be pretty broad and the viability of using spill will differ from plant to plant. Frantz noted that if spill was used in this way other entities would have some concerns.

### **Wanapum**

Ollis copied and pasted the same mid-C notes to [Slide 173] adding another bullet about researching issues around total dissolved gas limits.

Frantz noted that the envelop charts for some of the generation for Wanapum looked low. Ollis thought there could be some pre-upgrade information and made a note on [Slide 173.] Frantz added that there is a seasonal max as well and offered to discuss more offline. Ollis added bullets about max generation and seasonal reductions in turbined flow.

### **BREAK 15 min**

### **Priest Rapids**

Ollis copied and pasted the mid-C notes to [Slide 178]. Frantz thought getting close to 0 outflow is weird for Priest Rapids. He then talked about some weird operating regimes that restrict flexibility. Ollis thought there may be a workaround for those penalties but made a note on the slide about October/November max discharge.

After discussion, Ollis added another bullet about stranding bands and TDG% issues with a sub-bullet about finding a better modeling option with less upstream effects. Ollis asked for more discussion offline about this.

Frantz said his major worries are about the model finding and using every bit of flexibility it can find. He wasn't sure what the outcome would be when all the little changes throughout the entire system were added up. But even if adding in more restrictive constraints lowers hydro generation, at least Ollis was comforted by the fact that in 2025 there are thermals that are not yet committed in the simulation – meaning that thermal generating capability could make up the difference.

### **Brownlee**

Ollis copied and pasted notes from Mica about investigating whether storage versus elevation table needs more or different data points to [Slide 183].

Frantz asked for another bullet about checking outflows.

### **Oxbow**

Ollis added a bullet about H/K table versus average [Slide 185] along with a question about HYDSIM modeling it as run of river even though there is usable storage in the redeveloped model.

Levy stated that Brownlee spikes up to 320 kcfs look to be weekly which implies they may have to do with meeting the weekly interpolation of the HYDSIM monthly curve. Ollis suspected that was true for a lot of cases and most are associated with meeting target storage. He thought most would go away.

### **Hells Canyon**

Ollis copied and pasted bullets about modeling as run of river versus a project with usable storage and investigating H/K tables vs average H/K on [Slide 190].

Ollis added another bullet asking to investigate if the project normally uses all of its usable storage or if there is a buffer for inflow uncertainty.

Levy asked for the discharge rate limit of Hells Canyon. Ollis answered 7 CSF per minute.

### **Dworshak**

Ollis added a bullet about investigating storage versus elevation table needs to [Slide 195.]

### **Lower Granite**

There was a note on [Slide 200] about operating ranges on the Lower Grate and a need to explore modifying MOP range by floor.

Levy mentioned sediment building at the top of the project and other constraints that might be helped by moving MOPs.

Egerdahl agreed with Levy's points and referenced a variable MOP he sent to staff. Ollis said that it is his intent to use that to adjust the modeling, pointing out some difficulties.

Levy cautioned to watch how this changes Little Goose. Ollis added another bullet about it.

Waddell asked about accounting for temperature control and mitigation at Granite and Dworshak. Fazio thought the new model has the same constraints as the classic. Waddell said he was still struggling with the amount of flexibility found in the three Lower Snake River dams and if the model is picking up all the constraints.

Fazio said there is no water temperature simulation in either the classic or redeveloped model. Ollis added a note to follow up with the BPA technical management team. Egerdahl agreed that this is daily operations, and the TMT would be the best source. Levy suggested using this year's data as it would be representative of climate change.

### **Lunch 45 min**

## **Little Goose**

Levy asked to see Classic vs. Historic generation results saying that it looks like more power is being generated (in the winter) and wondered about that result. Fazio said there could be the same precipitation but coming down as rain instead of snow. Hua added that the climate change information has more precipitation overall.

Waddell asked to see some charts to ask how the big elevation swings are generated in the new model. Ollis showed actuals to explain. Fazio also pointed to an artifact of optimization. Ollis thought it was an up or downstream effect.

Levy thought using the full pool during fish season seemed suspect. Ollis said it didn't look like the full pool to him.

Ollis added check 2022 bypass spill constraints to [Slide 205].

Levy said he's concerned about the bathtub effect while others want to ignore it. Ollis said we can model current operations. Levy understood.

## **Lower Monumental**

Levy asked about discharge rate. Ollis said it was the same issue as Granite.

## **Ice Harbor**

Waddell asked about the ending elevation in December, asking if this is an example of dropping from max to min to meet a power deficit somewhere else. Fazio said this chart is from period to period and you need to see hourly.

Ollis said the drops do not necessarily have to do with meeting a deficit and hoped to talk about system flexibility tradeoffs later in the day.

Levy stressed that a foot and a half fluctuation on a 40-foot reservoir twice a day doesn't speed the fish and CRITFC comments reflect that. Levy said this model run kills fish. Ollis thanked him for his comment and this model provides the best information it can within the realm of existing policy.

Egerdahl agreed with Levy in concept but said long term planning, like the Columbia Treaty, has difficulties with every assumption. Levy agreed with the point but said the flex spill is called an experiment while the other is a treaty. Ollis said he is trying to create an analytical tool to help evaluate this in the future, but it is still in development.

## **McNary**

Fazio admitted to an early mistake about MOP operations and said he will fix it.

Levy noted that climate change scenario A showed high generation on the Snake compared to historic but did not see that at McNary and would like to see some comparison. Fazio noted that the volume that comes down the Columbia is much higher than the Snake which could account for the effect. Levy agreed but thought there should be at least a blip of more generation.

Ollis asked about the increase in generation in the Snake basin saying the outflow is higher. Levy agreed.

Levy appreciated that there were no reserves set on the Lower Snake. Ollis clarified that he's talking about balancing reserves.

Ollis wrote two bullets on [Slide 220] about target storages and removing MOP constraints.

Egerdahl asked if any of the actual data shows what reserves were actually held. Ollis said that data is from the Army Corps. Egerdahl disagreed. Ollis said there is a data point for spinning reserves.

Waddell asked for a definition of spinning reserves. Ollis said he uses it to mean contingency reserves.

### **John Day**

Ollis noted to use only seasonal operating pool constraints, retain MOP constraints in the summer and check the H/K table [Slide 225.] Waddell suggested looking at negative pricing. Ollis was not convinced explaining how the interpellation of the H/K table might be the cause.

### **BREAK 10 min**

Garcia asked if additional facility wear and tear was considered when looking at flexibility. Ollis answered that the model has a place for wear and tear costs.

### **Round Butte**

Diffely stated that there is now a fish collection facility on top of the reservoir which means the reservoir cannot vary very much. Ollis said he was aware, adding that he modeled public information but said he will follow up [Slide 227.]

### **Pelton**

There were no questions.

### **Reregulating Dam**

There were no questions.

### **The Dalles**

Levy asked to see a couple of days during fish season. Ollis said there will be lots of movement as the dam holds lots of reserves.

Ollis wrote notes on [Slide 236] about target storage and removing MOP constraints.

Levy said scenario A shows more precipitation in the Snake as total outflow is higher. Ollis cautioned that fixing the elevations may result in more spring/summer flexibility.

### **Bonneville**

Levy said the flex spill is more of an issue on the Lower Snake and not on the lower Columbia

### **System Flexibility and Market**

Levy asked to see how much was coming out of the Snake. Ollis showed him the dams.

Adcock asked for information about the 2500 MW winter import limit. Ollis explained that the Resource Adequacy Advisory Committee was comfortable with that number. Fazio added more information about stochastic modeling, forced outages and the desire to not assume expected market supply.

Adcock said he's heard that the 2500 MW limit is there so utilities can build a bunch of peakers and was hoping for a better way to explain the limit and find the right amount of peakers.

Fazio said the best way would be to model the WECC stochastically, but we don't have the data yet. Adcock asked for more information to be pushed out on this.

Adcock then said he's seeing more spill than common operations and said it's showing a bias and suggested adding penalties to spill. Ollis said there are penalties, and the challenge is tuning today's operations to future operations.

Waddell called some operations hard to imagine. Ollis said the regional exports are probably low priced. Waddell said the individual dam flexibility has a lot of variables that the model could not possibly account for.

Ollis said the model will probably miss something because of the scope of the project. He said he hopes that there are more questions that the model can answer. Waddell says the process will take some digestion, particularly when climate change is incorporated.

Frantz thought the model was exercising flexibility in an aggressively ahistorical manner and we won't know how the tools can be exercised until we start doing that. Ollis agreed that there are things to tighten up but said the model is about adequacy and there is (at least in 2025) enough

regional thermal to cover potential reductions in hydro generation due to adding more restrictive constraints. Frantz thought the work was complicated and good.

Levy called the model fantastic and was frustrated with the political process. Ollis said this model will be able to answer nuanced questions in the future and thanked Levy for his participation.

Egerdahl encouraged more regional conversation sooner rather than later.

Ollis thanked the group and asked for further input via email. He ended the meeting at 4:05.

#### **Attendees via Go-to-Webinar**

John Ollis	NWPCC
John Fazio	NWPCC
James Adcock	NW Energy Coalition
Robin Arnold	Renewable NW
Patrick Barton	
Dianne Barton	Critic
Vasanth Baskeran	Energy Exemplar
Leann Bleakney	NWPCC
Aaron Bush	PPC
Pat Byrne	BPA
Dan Catchpoir	Newsdata
John Chatburn	ID OER
Zhi Chen	PSE
Rachel Clark	Tacoma Power
Peter Cogswell	BPA
Robert Diffely	BPA
Ted Drennan	NW Natural
Ryan Egerdahl	BPA
Erin Erben	PNGC Power
Willard Fields	Chelan PUD
Mike Frantz	GC PUD
Villamor Gamponia	SCL
Nicholas Garcia	WPUDA
Laura Gephart	Critic
Kelly Goodman	
Andrea Goodwin	NWPCC
Sharon Grace	Rock Island
Eric Graessley	BPA
Max Greene	Renewable NW
Jared Hansen	Idaho Power
Randall Hardy	Hardy Energy
Elaine Hart	Momentum Insights

Tom Haymaker	Clark PUD
Bill Henry	d’Joule
Fred Heutte	NW Energy Coalition
John Hildreth	Idaho Power
Dan Hua	NWPCC
Charlie Inman	PSE
Anthony Jones	RMecon
Sanjeev Joshi	Critfc
Massoud Jourabchi	NWPCC
Jeff Kugel	PNGC Power
William Lamanna	NERC
Scott Levy	Bluefish
Douglas Logan	
John Lyons	Avista
Verene Martin	SCL
Ian McGetrick	Idaho Power
Matt Muldoon	Oregon PUC
Heather Nicholson	independent
Elizabeth Osborne	NWPCC
Mohamed Osman	NERC
Criag Patterson	independent
Rob Petty	BPA
Chris Pinney	
Krestine Reed	NOP Broads
Erin Riley	BPA
Selisa Rollins	BPA
Sashwat Roy	Renewable NW
Rick Rupp	
Bill Saporito	Umatilla Electric
Adam Schultz	ODOE
Aliza Seelig	SCL
John Shurts	NWPCC
Jason Sierman	Oregon
Steven Simmons	NWPCC
Tom Skiles	Critfc
Shawn Smith	Chelan PUD
Danielle Szigeti	Tacoma
Allyson Tom	Energy Exemplar
James Vanden Bos	BPA
Jim Waddell	
Marissa Warren	Idaho OER
John Wasniewski	Chelan PUD
Jim Woodward	WA UTC
Cindy Wright	SCL

Barbara Miller  
Ahlmahz Negash  
Malcolm Ainspan  
Kieran Sprague  
Jaime Stamatson  
Brian Dekeip

US Army Corp  
Tacoma Power  
NRG  
Idaho OER  
Montana  
NWPPC