EXAMPLE:

Commercial Powerflow Study

For Evaluation of Long-Term Transmission Service Requests and Network Integrated Transmission Service Forecasts

April 2022

Methodology

BPA has developed scenarios based on groupings of TSRs in the Long-Term Pending Queue with similarly situated Point of Receipt (POR) location and/or expected resource type, and by considering which market and weather conditions may induce the greatest firm transmission utilization on network flowgates.

Northwest (Area 40) load was 33,719 MW in winter peak, 19,017 MW in light spring, and 29,307 MW in summer peak scenarios.

Reference cases were developed by modifying loads according to the scenario descriptions. NT loads were modified if forecasts within the starting cases were lower than levels accepted through the NT Dialogue process. New requests granted since the previous commercial assessment were also modeled. As TSRs were modeled, a pre-determined and unique resource displacement approach was implemented for each scenario.

For thermal units in the Pacific Northwest, an approximate economic merit order was implemented using analysis of historical yearly capacity factors and PCM yearly average capacity factors to determine the frequency of thermal generation contributing to the grid. The thermal heat rates and costs of running the plants were then used to further group the generation. The thermal generators were grouped into the categories of: peaking/inefficient units, base load generation, and a generic group with the remaining thermal generators. Only the peakers/inefficient plants and generic group were considered flexible enough to be used within the thermal merit order groupings. Peakers and inefficient plants were assumed to be turned off first. Puget Sound area generation (SCL, PSE, and Snohomish) in Northwest Washington was not reduced to below 680 MW during the winter scenarios, as agreed upon by BPA and PSANI Transmission Planners and documented in various regional studies. For FCRPS hydro merit order estimation, resource displacement categorized "flexible hydro" resources based on input from BPA Long-Term Power Planning staff and existing minimum generation requirements. Economic merit order grouping is provided with more detail in each scenario description below.

General Description of New TSRs

The Long-Term Pending Queue has several clusters of requests that were grouped together for analysis, based on the POR location and the expected resource fuel type. BPA staff have tried to identify conditions in which new modeled resources would have the largest effect on network flowgates. These requests and potential new resources informed the scenarios described in this document.

The tables below show the resource and delivery clusters of all previously unstudied requests. Table 1 shows the total requested demand for this commercial assessment is 480 MW.

Table 1

	Delivery Point Cluster		
Resource Cluster	**Central OR**	**PDX**	**Grand Total**
Lapine 115		20	20
NEWPOINT	400		400
Ponderosa 230	60		60
Grand Total	**460**	**20**	**480**

Depending on which scenario is being analyzed, unstudied requests may not be assumed to operate simultaneously in each of the basecases. This approach assumes that new wind and solar requests are only modeled in the scenarios that specify wind on and/or solar on. In addition, TSRs are not modeled in scenarios where the POR/POD combination is in the opposite direction of the prevailing flows in the basecase since we do not expect those rights to be exercised. For scenarios where all thermal generation in the merit order stack has been completely displaced, unstudied thermal TSRs are not modeled in the basecases because it is expected that those resources would also not be utilized. Energy storage is assumed to be discharging during the summer sunset hour and is otherwise discharging as a sensitivity, but only if the co-located generation is not online.

Scenarios and Descriptions

The following is a brief description of each scenario, and the flowgates that we expected it to heavily load.

Summer Sunset Hour with No Wind

This scenario reflects an hour near sunset (around 7:00 pm) with high North-to-South flows across the BPA Network. When the sun is going down and wind is not generating, the gas fleet and flexible hydro chase high spot power prices. This aligns with an observed pattern from recent summers where the peak South of Allston flow has shifted to a later hour in the day, due to increasing solar buildout in California. Pacific Northwest load in this scenario was adjusted to 80% of the original peak value, scaling only non-fixed loads, which freed up enough spare resources to export to California but also reduced counter flow from serving Puget Sound area loads. The magnitude of the CA solar ramp is projected to get steeper each year for the foreseeable future. Lower Snake and Lower Columbia hydro typically have less flexibility than Upper Columbia hydro due to non-power constraints. The COI and PDCI could be modeled up to their full N>S path capacities as resource levels allowed, and we would expect higher flows on North of Hanford due to this.

The 20% reduction in Pacific Northwest loads also affected NT load values and the obligation to serve them from the FCRPS. A pro-rata reduction in the Big 10 generation equal to the decrease in NT load forecasts was performed and balanced through decreased flows to California.

This would potentially stress West of Slatt, North of Hanford, and the I-5 corridor.

For this scenario, the case was balanced by:

- First increasing COI and PDCI flows to maximum export capability, set by the TTC of the Southern Intertie.
- Reducing thermal generation based on economic merit order dispatch.

Summer Sunset Hour with Wind

This scenario also reflects an hour near sunset (around 7:00 pm) at 80% of peak load, but with North-to-South exports to California potentially driven higher by Northwest wind generation at full contract rights. Historical analysis points to a regular occurrence of summer sunset conditions with wind generation operating over a wide range of outputs.

This would potentially stress West of Slatt, West of McNary, West of John Day, and the I-5 corridor, particularly Raver - Paul.

For this scenario, the case was balanced by: …

Summer Off-Peak Hour with Extra Light Load and No Renewables

This scenario represents an evening hour in early summer with no/low renewable generation online. The Northwest is buying considerable power from BC Hydro rather than using thermal generation, and is storing water when able. Exports to California are low to moderate. This scenario was built to use low loads and imports on the BC intertie as a N>S stressor and was identified using PCM analysis of peak flow hours on South of Custer.

This would potentially stress South of Custer and Raver-Paul.

For this scenario, the case was balanced by: …

Summer Peak Hour with No Wind

This scenario represents a traditional peak summer afternoon when Northwest end-use demand peaks, but additional solar generation coming online serves local load and surplus power is sent to California. Solar and dispatchable resources should both be high because of peak loading and the time of day. Exports to California are more moderate. This scenario was traditionally the most limiting on the I-5 corridor prior to the recent solar buildout, where peak flow hours occurred in the afternoon rather than sunset hours.

This would potentially stress the West of Slatt, West of McNary, West of John Day, and the I-5 corridor.

For this scenario, the case was balanced by: …

Summer Peak Hour with High Renewable Availability

This scenario assumes availability of both wind and solar generation during peak summer hours, offsetting the use of dispatchable resources. This would represent aggressive carbon policies and/or Renewable Portfolio Standard (RPS) requirements. Exports to California would be at moderate or high levels, as California power prices could still exceed Northwest prices during this condition.

This would potentially stress West of Slatt, West of McNary, West of John Day, and the I-5 corridor.

For this scenario, the case was balanced by: …

Spring Night Hour with Runoff and NW Wind OFF and MT Wind ON

In this scenario, the Northwest has surplus energy and very low spot market prices, which leads to high exports on the Northern and Southern Interties. The sun may have gone down but we have hydro oversupply and high wind generation imports from Montana. The Northwest is sending power to BC on the Western interconnection of the Northern Intertie so they can store additional water, and sending low or zero cost power to California so they can capitalize on the Northwest runoff instead of utilizing thermals after the sunset.

This would potentially stress North of Hanford, West of Hatwai, West of Garrison, North of Echo Lake, West of Lower Monumental, and West of Slatt.

For this scenario, the case was balanced by: …

Winter Mid-Day Hour with High Renewable Availability

This scenario reflects a sunny mid-day hour during a cold snap (around 11:00 am) with exports to BC Hydro. This scenario assumes British Columbia will be even colder than the Northwest and also experiencing near-peak loads. High availability of renewable resources within the Northwest provides BC with the opportunity to save water for later peak hours. Pacific Northwest load in this scenario was adjusted to 90% of the original peak value. Montana is assumed to be consuming the available power from its local resources, as their winter weather is often more extreme. Imports from California are modeled until an oversupply within the Northwest occurs. This scenario aligns with peak North of Echo Lake S>N flows in Production Cost Model analysis.

The 10% reduction in Pacific Northwest loads also affected NT load values and the obligation to serve them from the FCRPS. A pro-rata reduction in the Big 10 generation equal to the decrease in NT load forecasts was performed and balanced through increased production at lowest-cost thermal resources.

This would be expected to stress North of Echo Lake, Cross Cascades North, and Cross Cascades South.

For this scenario, the case was balanced by: …

Winter Peak Hour with Wind (No Solar)

This is a high Northwest and Montana wind scenario with peak winter loads. Northwest generation is serving load centers west of the Cascades. Dispatchables are running high, and solar is not available.

This would potentially stress Cross Cascades South, Cross Cascades North, West of Lower Monumental and North of Echo Lake.

For this scenario, the case was balanced by: …

Sensitivity Descriptions

The following is a description of some of the sensitivities run on top of the base scenario cases.

Montana & M2W

Additional sensitivity analysis cases were created for each **wind on** scenario to isolate the flow impacts on Network flowgates for proposed wind generation resources in Montana and North Idaho.

The sensitivities include Point-to-Point (PTP) requests for Montana wind projects with a Point of Receipt at Garrison that have previously been identified as needing the Montana to Washington (M2W) project, modeled in addition to the M2W project. Generation was displaced according to the merit order for each scenario.

Battery Discharge

In scenarios where resources with co-located energy storage are considered to be offline due to lack of wind or sunlight, a sensitivity was run to consider the impact of the batteries at a full discharge output.

Boardman – Hemingway (B2H) Project

There is a 500 MW long-term firm request from the Mid-Columbia area to a Newpoint of Longhorn 500 kV substation. Since the Boardman – Hemingway (B2H)

project would be a new 500 kV line that terminates into the proposed Longhorn substation, enabling delivery of power to Idaho native load, the 500 MW TSR was included in all sensitivities where the B2H project was modeled. Sensitivities were performed for the spring and summer seasons.

Columbia Generating Station (CGS) Off

This sensitivity simulates the 1,182 MW generation at CGS being offline, due to refueling outages which occur every other year in the spring and typically last for several weeks. This sensitivity was therefore run in the spring scenario, and is most likely to stress the West of Lower Monumental (WOLM) path.

Intalco Load

In the extra light load off-peak summer case, the Intalco load with firm transmission service was turned offline to consider the impacts of this potential future on the South of Custer N>S path. The 403 MW of load directly interconnecting to Custer substation was disconnected and offset using the scenario's merit order resource stack.

Scenario Analysis Results

First Customer					1 TSR	10 MW	
999999991	LTF-YEARLY PTP	02/01/20	02/01/25	LAPINE115	BETHEL230	10	Unawardable at this time
Second Customer					2 TSRs	410 MW	
99999992	LTF-YEARLY PTP	10/01/23	10/01/28	NEWPOINT	PONDEROSA230	400	Unawardable at this time
99999993	LTF-YEARLY PTP	02/01/20	02/01/25	LAPINE115	BETHEL230	10	Unawardable at this time
Third Customer					9 TSRs	220 MW	
99999994	LTF-YEARLY PTP	01/01/25	01/01/30	PONDROSA230BPA	PILOTBUTTE230	20	Awardable Without Upgrades
99999995	LTF-YEARLY PTP	01/01/25	01/01/30	PONDROSA230BPA	PILOTBUTTE230	20	Awardable Without Upgrades
99999996	LTF-YEARLY PTP	01/01/25	01/01/30	PONDROSA230BPA	PILOTBUTTE230	20	Awardable Without Upgrades