PSE IRP Consultation Update
Webinar 9: CETA Assumptions, Demand Forecast, Resource Adequacy, Resource Need
October 20, 2020

11/10/2020

The following consultation update is the result of stakeholder suggestions gathered through an online Feedback Form, collected between October 13 and October 27, 2020 and summarized in the November 3 Feedback Report. The report themes have been summarized and along with a response to the suggestions that have been implemented. If a suggestion was not implemented, the reason is provided.

PSE thanks Kare Ware and Sashwat Roy (Renewable Northwest) for follow-up discussions concerning the loss of load probability question on November 6, 2020.

Temperature trends and temperature sensitivity

PSE received feedback from James Adcock, Katie Ware (Renewable Northwest), Kyle Frankiewich (WUTC Staff) and Don Marsh (CENSE) regarding the temperature years used to model PSE's load forecast and in the resource adequacy model. Stakeholders suggest that more recent temperature data (i.e. most recent 20 years) should be used to inform PSE models to limit the impact of colder weather observed in older records and accentuate warming trends present in more recent records.

PSE has committed to completing a temperature sensitivity for the 2021 IRP which will address the concerns raised by stakeholders. PSE has proposed three options for modeling temperature data for the temperature sensitivity:

1. Trended normal based on historical observed trends (trended normal analysis completed by Itron Inc.)
2. Temperature normal based on most recent 15 years of temperature data
3. Northwest Power and Conservation Council's climate model temperature assumption

More information on these options is available for review in the October 20 Webinar presentation. A stakeholder survey was conducted between October 19 and October 27 to collect feedback on which temperature option was of greatest interest. The results of the survey indicate the stakeholders suggest using the Northwest Power and Conservation Council ("NPCC" or "the Council") climate model temperature assumption (option 3). The full results of the survey are presented below.

Don Marsh and a group of stakeholders also prepared and presented an additional temperature sensitivity methodology as part of the feedback process. During this IRP process, many stakeholders provided recommendations in IRP meetings, feedback forms and e-mails to IRP staff requesting that PSE use the most recent 15 or 20-years of temperature data. PSE listened to stakeholders and included the most recent 15 years of temperature data as one of the options for stakeholder consideration. In addition to this stakeholder request, PSE has hired a consulting firm, Itron, to perform a separate temperature analysis and PSE also researched the work done by the Council on climate change modeling. Both of these analyses were included as additional options for temperature sensitivity analysis during the October 20 Webinar and in the sensitivity survey. Over 140 stakeholders responded to the sensitivity survey and 93 stakeholders selected the Council's climate change model temperature assumptions. PSE will follow the stakeholders' recommendation to use the Council's climate change model tempertuare assumptions and will consider the materials presented by Don Marsh et al for future IRP cycles.

The Northwest Power Conservation Council (the "Council") is using global climate models that are downscaled to forecast temperatures for many locations within the Pacific Northwest. PSE has chosen to look at one of these models. The Council weighs temperatures by population from metropolitan regions throughout the Northwest. However, PSE received data from the Council that is representative of SeaTac airport. This data is, therefore, consistent with how PSE plans for its service area and this data is not mixed with temperatures from Idaho, Oregon or Eastern Washington. The climate model data provided by the Council is hourly data from 2020 through 2049. This data resembles a weather pattern where the temperatures fluctuate over time, but generally trend upward. For the load forecast portion of the temperature sensitivity, PSE proposes to smooth out the fluctuations in the temperatures and increase the heating degree days (HDDs) and cooling degree days (CDDs) over time at 0.9 degrees/decade, which is the rate of temperature increase found in the Council's climate model.

Montana transmission capacity

PSE received feedback from Willard Westre (Union of Concerned Scientists), Kyle Frankiewich (WUTC Staff) and Brian Fadie (Northwest Energy Coalition) concerning the transmission capacity between PSE service territory and the Colstrip region of Montana. In the June 30 Webinar, and again in the October 20 Webinar, PSE presented an upper transmission capacity limit of 565 MW to Montana. At the time these values represented the most-likely transmission capacity available to PSE in the region. Since the presentation of these materials, negotiations for sale of PSE's portion of Colstrip Unit 4 have ceased. Therefore, PSE will model 750 MW of available transmission capacity to Montana for the 2021 IRP process as the base assumption.

PSE has also proposed modeling of several transmission constrained sensitivities for the 2021 IRP process. These sensitivities are structured around transmission tiers, which represent uncertainty of availability of transmission capacity. The change in Montana transmission capacity will influence BPA transmission redirect assumptions for the Eastern Washington region. These changes are summarized in the table below.

Resource Group Region	Added Transmission (MW) Tier 0	Tier 1	Tier 2	Tier 3
PSE territory (a)	(b)	(b)	(b)	(b)
Eastern Washington	Unconstrained	300	675	~~1,515~~ 1,330
Central Washington	Unconstrained	250	625	875
Western Washington	Unconstrained	0	100	635
Southern Washington/Gorge	Unconstrained	150	705	1,015
Montana	~~565~~ 750	350	565	~~565~~ 750
Idaho / Wyoming	600	0	400	600
TOTAL	generally unconstrained	1,050	3,070	5,205

(a) Not including the PSE IP Line (cross Cascades) or Kittitas area transmission which is fully subscribed
(b) Not constrained in resource model, assumes adequate PSE transmission capacity to serve future load

Sensitivity survey and selection

PSE received questions from Virginia Lohr (Vashon Climate Action Group), Kyle Frankiewich (WUTC Staff) and Nate Sandvig (Rye Development) concerning how the sensitivity prioritization survey would be used. PSE considers the sensitivity survey a tool to help collect stakeholder sentiment on each of the many sensitivities purposed over the course of the 2021 IRP process. PSE intends to use the results as a guideline for prioritizing which sensitivities to run as part of the IRP modeling process. Other factors such as difficulty, length of time and value to the entire IRP process will also be considered as sensitivities are processed.

The full results of the survey are provided below.

ELCC values

PSE received feedback from Willard Westre (Union of Concerned Scientists), Katie Ware (Renewable Northwest), Kyle Frankiewich (WUTC Staff) and Nate Sandvig (Rye Development) concerning the ELCC values presented in the October 20 Webinar. As PSE indicated during the webinar, the ELCC values presented are draft and subject to change over the course of the IRP modeling process. Furthermore, more refined values, including saturation curves, will be provided at a later date.

Specific concerns on the relative value of battery energy storage systems to pumped hydroelectric storage will be addressed with publication of ELCC values for both resources at a nameplate of 100 MW at a later date.

Summer loss of load events

PSE received feedback from Katie Ware (Renewable Northwest), Kyle Frankiewich (WUTC Staff) and Don Marsh (CENSE) concerning summer loss of load events. PSE would like to clarify that the demand forecast for the 2021 IRP process has not changed since its presentation during the September 1 Webinar. However, an inconsistency with the demand forecast dataset used for Resource Adequacy modeling was identified and aligned. PSE regrets that our comments in the meeting, which only related to the Resource Adequacy dataset, gave the appearance that the demand forecast was changed.

The summer-time loss of load events discussed during the meeting represent a very small fraction of the total loss of load events encountered over the course of a full year as shown in the tables below for the two test case years 2027 and 2031. A loss of load event can be caused by many factors which include temperature, demand, hydro conditions, plant forced outages, and variation in wind and solar generation. All of the factors are modeled as stochastic inputs simulated for 7,040 iterations. As mentioned previously, the data shared at the October 20 webinar are draft. PSE has been reviewing the data used for the resource adequacy model and found an inconsistency with the correlations for wind and solar data. PSE has fixed the correlations and is working on updating the peak capacity need and effective load carrying capability (ELCC) values. The table below has been updated since the November 3 feedback report to include the updates to the wind and solar correlations.

2027 Case			2031 Case		
Month	**Loss of Load (h) base**	**Loss of Load (h) at 5% LOLP**	**Month**	**Loss of Load (h) base**	**Loss of Load (h) at 5% LOLP**
1	4846	2893	1	3860	2387
2	3296	2553	2	4267	3365
3	10	5	3	40	14
4	0	0	4	0	0
5	0	0	5	0	0
6	10	0	6	12	5
7	3	2	7	4	2
8	0	0	8	4	0
9	0	0	9	0	0
10	0	0	10	0	0
11	5	1	11	9	1
12	474	275	12	325	160

Notes: Tables represent the results of 7,040 simulations where each simulation is composed of 8760 operating hours. Tables do not describe the magnitude of any loss of load event, just that the event occurred.

Katie Ware (Renewable Northwest) had also requested a 12x24 of the loss of load probability as part of this feedback cycle. Given the methodology of the Resource Adequacy Model, PSE is not able to produce hour by hour probabilities, so instead these plots represent a relative heat map of the number hours of lost load binned by month and hour of day.

2027 Case

Hour Ending	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1:00												
2:00												
3:00												
4:00												
5:00												
6:00												
7:00												
8:00												
9:00												
10:00												
11:00												
12:00												
13:00												
14:00												
15:00												
16:00												
17:00												
18:00												
19:00												
20:00												
21:00												
22:00												
23:00												
24:00												

2031 Case

Hour Ending	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1:00												
2:00												
3:00												
4:00												
5:00												
6:00												
7:00												
8:00												
9:00												
10:00												
11:00												
12:00												
13:00												
14:00												
15:00												
16:00												
17:00												
18:00												
19:00												
20:00												
21:00												
22:00												
23:00												
24:00												

Sensitivity prioritization survey results

Thank you for your active engagement in the IRP process, PSE collected results from over 140 individual respondents with this survey.

Sensitivity Selection Results

Rank	Sensitivity Number and Description	Number of Responses
1	35 - EV battery to grid – stakeholder requested, webinar - models inclusion of an electric vehicle-to-grid resource as a generic resource	132
2	21 - Use AR5 to model upstream emissions – social cost of greenhouse gases / CO2 price – upstream emissions will be quantified using the AR5 methodology rather than the AR4 methodology	129
3	14 - 6-yr ramp rate – conservation – reduces the conservation measures ramp from 10 years to 6 years	126
4	32 - Add 185 MW Colstrip Transmission – stakeholder requested, webinar - models additional transmission from the Colstrip substation to PSE service territory	126
5	17 - Social discount rate for DSR – conservation – reduces the discount rate of demand side resources from 6.8% to 2.5%	124
6	39 - SCGHG only (dispatch cost) – stakeholder requested, webinar - models the social cost of greenhouse gases as a dispatch cost in the absence of other CETA targets	122
7	36 - Time of use pricing – stakeholder requested, webinar - models inclusion of time of use pricing for conservation and demand response programs	121
8	41 - Private solar input testing – stakeholder requested, feedback form – models inclusion of subsidy for solar and electric storage resources	121
9	42 - Equity-focused portfolio - stakeholder requested, feedback form – a minimum of 50% of new resources must be located in WA State and expansion of community solar programs	120
10	46 - Virtual Power Plants (VPP) – stakeholder requested, feedback form – VPPs are used to manage distributed energy resources	116
11	26 - 100% renewable resources by 2030, no gas generation – emissions reduction – models more aggressive renewable resource adoption and all gas plants would be retired by 2030	24
12	28 - Carbon reduction – emissions reduction – all natural gas plants retired by 2045 and run-time limits imposed to meet carbon emission targets	22
13	18 - High SCGHG – social cost of greenhouse gasesgreen house gases / CO2 price – models a higher social cost of greenhouse gases than specified by CETA	18
14	9 - "Highly Distributed" Transmission/build constraints, Tier 1 – transmission constraints / build limits - models a significantly transmission constrained system	17
15	11 - "Highly Centralized" Transmission/build constraints, Tier 3 – transmission constraints / build limits - models a lightly transmission constrained system	13
16	12 - Transmission/build constraints - time delayed (option 2) – transmission constraints / build limits - models an expanding transmission system over time	13
17	47 - Alternative fuel #2 for peakers – stakeholder requested, feedback form – a must-run sensitivity of either biodiesel OR hydrogen as an alternative fuel for peaker plants will be modeled, this sensitivity is a vote to model BOTH biodiesel and hydrogen as sensitivities	13
18	20 - Mid economic conditions with SCGHG as dispatch cost in electric prices and portfolio model – social cost of greenhouse gases / CO2 price – models the social cost of greenhouse gases as dispatch cost in both the power price and portfolio models	12
19	33 - Fuel switching from electric to gas – stakeholder requested, webinar - decreases demand in electric portfolio and increases demand in gas portfolio	12
20	5 - Mid economic conditions plus Increased Renewable Build – economic conditions - power price forecast adjusted to model 100% renewable energy goal in Oregon	11
21	16 - Non-Energy Impacts (NEI) – conservation – increases the value of non-energy impacts from adoption of conservation and demand response measures	11
22	24 - SCGHG as a tax in WA, OR, CA – social cost of greenhouse gases / CO2 price – models the social cost of greenhouse gases plus a regional CO2 tax of $15/ton (adjusted for inflation over time) in WA, OR and CA	10
23	37 - Holistic conservation approach – stakeholder requested, webinar - additional information needed to complete this sensitivity	10
24	22 - Mid economic conditions with SCGHG as a fixed cost plus a federal CO2 tax – social cost of greenhouse gases / CO2 price – models the social cost of greenhouse gases plus a federal CO2 tax	8
25	6 - Low demand with mid gas prices – economic conditions – low demand in both power price and demand forecasts and “most-likely” gas price forecast	6
26	15 - 8-yr ramp rate – conservation – reduces the conservation measures ramp from 10 years to 8 years	6
27	44 - 2% Cost threshold - stakeholder requested, feedback form – must take DR and Battery storage first, then optimized other builds – other stakeholder requested - resource additions are constrained to the CETA 2% cost cap, must build demand response and battery storage before gas plants	6
28	4 - Low Demand with a Very High Gas price – economic conditions – mix of low demand and very high gas price forecasts	5
29	45 - 2% cost threshold, renewable Over-generation Test – stakeholder requested, feedback form – resource additions are constrained to the CETA 2% cost cap, PSE market sales are prohibited	5
30	23 - High economic conditions with SCGHG as dispatch cost in electric prices and portfolio model – social cost of greenhouse gases / CO2 price – models the social cost of greenhouse gases as dispatch cost with higher than expected power price, demand and gas price forecasts	2
31	34 - High economic conditions with SCGHG as dispatch cost in portfolio model only – stakeholder requested, webinar - models social cost of greenhouse gases as a dispatch cost under higher than expected power price, demand and gas price	2
32	40 - Tweaks to resource cost assumptions – stakeholder requested, feedback form – models altered resource cost assumptions on generic resources (further detail forthcoming from WUTC staff)	2

Sensitivity #25 Alternative fuel #1, fuel selection

Rank	Alternate Fuel	Number of Responses
1	Hydrogen	140
2	Biodiesel	16

Sensitivity #31 Temperature sensitivity, temperature methodology

Rank	Temperature Methodology	Number of Responses
1	3. Northwest Power and Conservation Council’s climate model temperature assumption	93
2	2. Temperature normal based on most recent 15 years of temerpature data	43
3	1. Trended normal based on historical observed trends (trended normal analysis completed by Itron Inc.)	20

Summary of all updates

PSE appreciates the feedback provided by stakeholders. In summary, the following changes will be implemented:

- The temperature sensitivity will be modeled using the Council's methodology.
- The Montana transmission capacity will be set to 750 MW.
- Sensitivity prioritization has been informed by the stakeholder survey results, as shown above.
- Hydrogen will be included as an alternate fuel choice in the Alternative Fuel #1 sensitivity (sensitivity #25, must-run).