Dear IRP Team and Commission Staff,

We, the undersigned stakeholders and participants in the development of PSE's 2021 IRP, strongly object to PSE's "Sensitivity Prioritization Survey," which forces participants to choose among three temperature sensitivity options:

1. Itron's trended normal temperature based on historical trends
2. Normal temperature based on the most recent 15 years of temperature data
3. Northwest Power and Conservation Council's climate model temperature assumption

Participants are not allowed to submit the survey without choosing one of these options, but each option has significant drawbacks.

The first choice, Itron's trended normal analysis, is based on average Heating/Cooling Degree Days. This shortcut may miss peak demand issues that could lead to loss of load. We prefer a thorough stochastic analysis of hourly demand and generation to identify vulnerabilities.

The second option would use the most recent 15 years of temperature data to perform weather normalization. However, this method was shown to produce somewhat unstable and counterintuitive results. Fixing the temperature for the next 25 years is not realistic, since the trends show that temperatures are gradually rising.

The third choice, based on NWPCC's climate models, may overstate temperature changes in the Puget Sound region. Itron showed that temperature changes have been moderate for coastal communities due to the stabilizing thermal effects of the nearby ocean. A generic model that applies to all Pacific Northwest states may require PSE to build costly infrastructure in anticipation of temperatures that will never occur.

We request a temperature sensitivity that seeks to model reality more accurately:

1. To identify peak demand issues, perform a full stochastic analysis using Aurora and/or Plexos rather than average Heating/Cooling Degree Days.
2. Model winter temperatures rising at 0.0193 degrees per year (based on 1970-2016 trends).
3. Model summer temperatures rising at 0.0468 degrees per year (based on 1970-2016 trends).
4. If PSE would prefer to use the last 30 years to calculate the temperature increase, we would support that. Please report the annual temperature adjustment and how PSE determined it.
5. To model climate impacts on hydro availability, use hydro capacity values from the most recent "climate change and operational corrected" historical models from BPA (published about a month ago).

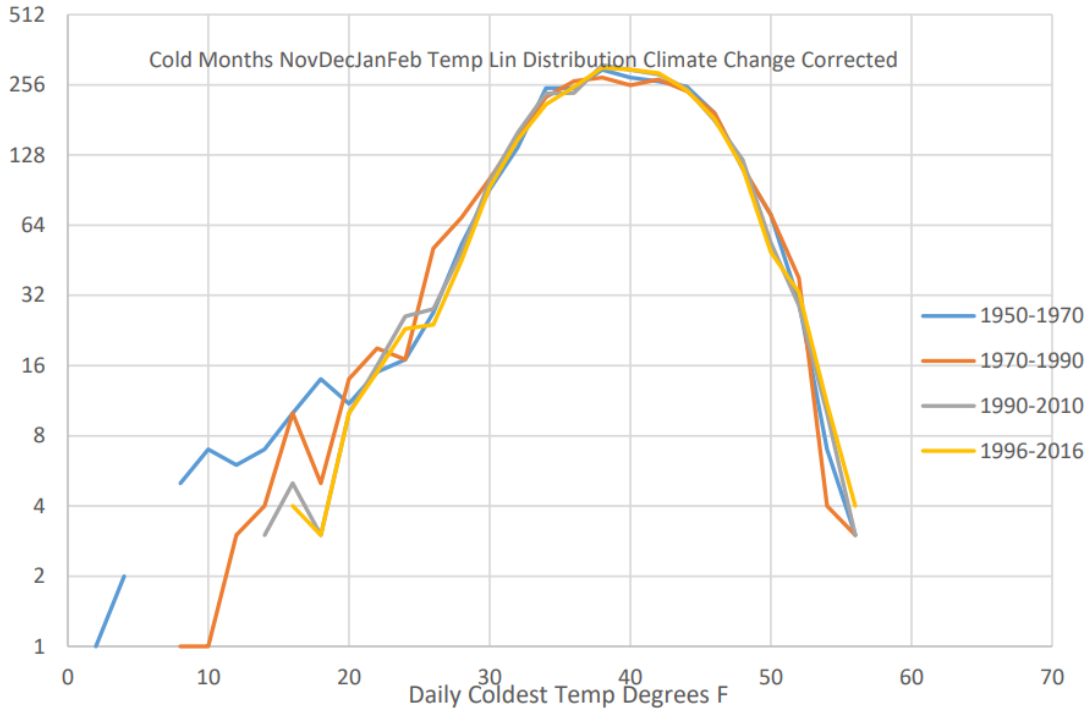
The temperature sensitivity study should produce forecasts for energy consumption and peak demand, for both winter and summer. If any forecast finds capacity deficiencies, please specify the size of the deficiency and when it first appears in the forecast. The model should indicate which resources would be used to resolve the deficiency in a cost-effective manner.

Methodology

To replicate (or improve) our proposed annual temperature adjustments, we describe the method we used to calculate the summer and winter adjustments above.

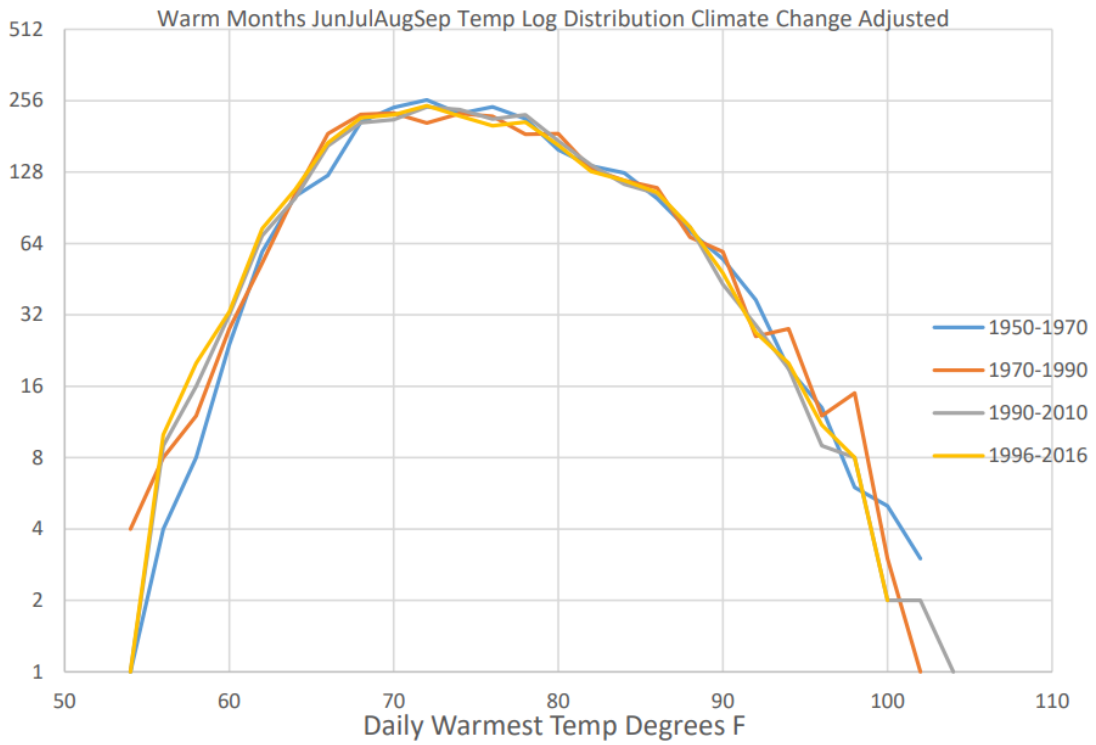
For winter, we produced log histograms of minimum temperatures for all the days of November-February for the following time periods: 1950-1970, 1970-1990, 1990-2010, 1996-2016. The later curves move gradually to the right, indicating increasing temperature. Using a linear least squares metric, we aligned the curves using an increase of 0.0.193 degrees per year.

The aligned curves look like this:



As you can see, the coldest temperatures of the blue 1950-1970 curve cannot be aligned using a simple linear adjustment, because climate change has practically eliminated temperatures colder than 13 degrees in recent decades. **Please assure us that modeling for this sensitivity uses no temperature data from before 1970.**

The same calculation was performed for warm temperatures during the days of June-September. To align the histogram curves, an adjustment of 0.0468 degrees per year produced the best alignment:



If PSE has a better method of determining an annual temperature adjustment, we are willing to consider a well-reasoned alternative. Some adjustment is needed. In some cases, the adjustment must be applied to historical data as well as forecasts.

Conclusion

For many years, stakeholders have criticized PSE's use of old temperature data in resource analysis, leading to a "cold bias" that has contributed to inaccurate demand forecasts. PSE has offered to perform a temperature sensitivity to address the problem. A reasonable and transparent sensitivity will help everyone understand the 2021 forecast and anticipate future changes in electric demand.

We ask PSE to perform the sensitivity we describe here, or at least conduct another survey to allow stakeholders to express a preference between our sensitivity and the winning sensitivity in the current survey.

Sincerely,

Don Marsh, CENSE
David Perk, 350 Seattle
Court Olson, Optimum Building Consultants
Sue Stronk, Ratepayer
Michael Laurie, Watershed LLC
Curt Allred, Ratepayer
Janis Medley, Ratepayer
Kevin Jones, Vashon Climate Action Group
James Adcock, Citizen At Large
Kate Maracas, Sound Energy Group
Rob Briggs, Vashon Climate Action Group
Fran Korten, Climate Action Bainbridge
Norm Hansen, Bridle Trails
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Valerie Costa, 350 Seattle
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