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Response to Question 1 of WUTC's August 13, 2020 **NOTICE OF OPPORTUNITY TO FILE WRITTEN COMMENTS**

8/18/20

Question 1: "Do you agree with Staff's interpretation of RCW 19.405.060(1)(c) that Commission approval is contingent upon the utility justifying and supporting each specific action it takes or intends to take, including providing the business cases supporting each specific action identified in the CEIP? Please explain your response."

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I believe that Staff's interpretation is essential to protect the ratepayers and achieve CETA goals. Utilities lack experience in developing clean-power-resource portfolios capable of economically meeting their load demand on a month-by-month basis. Beyond that, CETA and the implementing regulations in the current draft require utilities to become technology companies, which are capable of rapidly evaluating rapidly evolving technologies to integrate them into new systems. These systems must simultaneously meet the parallel standards CETA requires the Commission to set. I believe utilities will need a lot of help to make this transition.

The clean-energy business environment is particularly difficult in Washington because 1) the seasonality of the available clean energy resources is mismatched to the utilities' demand requirements, and 2) existing power transmission is inadequate to deliver the ideal clean power from point of availability to point of use. FERC just advised Congress this is a problem common all over the US.

The Staff has the opportunity to use public input to frame a business-case discipline that makes these inherent technical/business problems explicit and provides a solution structure in the utilities' energy procurement/contract efforts. The "address overgeneration events" required in IRP's is likely to be the biggest section, where everyone will have to pitch in.

Overgeneration Unavoidable

1) The seasonal overgeneration problem arises from the ongoing retirement of 5000 MW of coal plant generation, which has been providing **winter** base-load capacity. All Solar and Northwest Wind power sources, which include all solar and wind west of the continental divide, peak in the **summer** and operate at less than 50% of peak in January. The only time of year that the utilities need Clean Power to replace coal is when Clean Power is at low ebb west of the Rockies.

The US Energy Information Administration (EIA) shows the Upper Planes wind from Alberta Canada, eastern Montana, and the Dakotas as winter peaking and by far the best Clean Energy resource for replacing NW winter coal generation with the least overgeneration and the lowest development cost per kwh.

In order to contract for winter/solar power, a utility currently has to also take all 12 months each year on a 12-year contract, so even Upper Plains wind will have very significant overgeneration in April through October. BPA has already been bypassing water without generating power in the summer due to lack of demand. California wind and solar are also summer peaking, so their growth is already devaluing and displacing part of the 3000 MW overgeneration BPA has been sending down the Pacific DC Intertie in the summer. In a few years, CA will probably also have a summer power overgeneration for the same reasons the NW will, so will not be taking any overgeneration from the NW.

The solution in Europe and now planned in Florida is to convert overgeneration of clean power to green hydrogen, which is on a fast track in Europe. With carbon at $81/ton, green hydrogen will be highly competitive with natural gas for utility and industrial high-temperature combustion, which accounts for 20% of US carbon emissions. For example, California is planning to convert the 1900 MW Intermountain coal plant in Delta, Utah first to natural gas turbines by 2025, then progressively adding green hydrogen to the natural gas, until they have 100% green hydrogen turbines for winter base-load generation and year-around peaking by 2045. This project makes use of the existing HVDC line from Delta UT to northeast of LA.

Here is latest article on green hydrogen in the US:

https://www.utilitydive.com/news/propelling-the-transition-green-hydrogen-could-be-the-final-piece-in-a-zer/581025/

Note that in 2025 to 2030, this article has electrolyzer (water to hydrogen and oxygen converter) capacity above $500/kw, so 2000 MW of electrolyzer would cost over $1 Billion. Germany has just made a huge commitment to green hydrogen and to drive electrolyzer prices down.

In Washington, part of the overgeneration could be used by the five WA refineries to produce green hydrogen on site for their internal requirements, if the existing power transmission will support it.

Other options for clean power overgeneration are becoming available. Argonne National Lab recently announced a scalable electro catalytic process for using clean power to convert water and carbon dioxide to ethanol. RMIT University In Australia has demonstrated an efficient lab-scale electro catalytic process for converting carbon dioxide and water to oxygen and pure elemental carbon.

2) Additional power transmission capacity is necessary in the NW to deliver clean power from points of availability to points of use, per FERC.
https://www.utilitydive.com/news/ferc-staff-to-congress-hv-transmission-essential-to-reducing-carbon-deplo/583177/.

As noted above, summer overgeneration of clean power would be lowest with Upper Plains power. The shortest path to Washington is the construction of a high voltage direct current (HVDC) line from Alberta, Canada, which could deliver winter-peaking Upper

Plains wind power to Washington. This has previously been proposed separately by both Portland General Electric to Portland and by Pacific Gas and Electric to San Francisco. Both of these proposed routes passed close to Grand Coulee, so both PGEand PG&E are potential partners. One set of towers might be designed to carry three independent HVDC circuits.

The Colstrip Transmission System

Early this year, I suggested to the NWPPC that the Colstrip Transmission System and the continuing BPA transmission lines could be converted to an HVDC transmission system to deliver 5000 MW of Montana/Dakota wind to Grand Coulee Dam, which has surplus existing winter transmission capacity to distribute 5000 MW to Washington utilities, including PSE. This HVDC conversion is an ever more essential part of wind power to replace-retiring-coal/CETA solution, given that everybody wants clean power, but nobody wants new power lines.

For perspective, the rated capacity of the Colstrip Transmission System now is 2 x 750 MW = 1500 MW. The rated capacity of the HVDC conversion could be 7000 MW at its thermal limit with 5000 MW nominal efficient operating capacity. This would be ideal for delivering on average 3500 MW. 50% capacity factor, of Upper Plains wind in the winter.

The Colstrip HVDC option has become even more interesting with the May 2020 announcement of the Form Energy 1000 MW Pilot Project with Great River Energy to repurpose an existing 1100 MW HVDC system from coal power to wind power. This project includes Form batteries capable of maintaining 1000 MW output for 150 hours. The

western end of the pilot system is at Underwood ND, which is 275 miles from Colstrip MT. Both share the Upper wind resource with Alberta. The Colstrip HVDC wind system could be a 5x scale-up of the Underwood pilot. **https://formenergy.com/press/**

In this business/technical environment, I believe both utilities and the UTC would benefit if each specific energy acquisition identified in the CEIP included the following basic analysis of overgeneration by month:

(Mwh)

Month	J	F	M	A	M	J	J	A	S	O	N	D	Year
Production	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxxx
Demand	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxxx
Overgen.	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxxxx

(Curtailments due to lack of transmission capacity reduce the energy Production.)

- The Overgeneration Marketing/Disposition Plan
- Revenue Consequences of the Overgeneration Disposition
- Adjustment to Retail Energy Acquisition Cost based on Surplus Disposition Gain or Loss.

These items will also give WUTC and NWPPC some pieces of the puzzle to work with for planning HVDC transmission to deliver clean power from points of availability to points of use, like the Pacific DC Intertie did in 1970 and is still doing today. This also must be considered along with BPA alternative disposition of overgeneration.

The above incorporates the assumptions that overgeneration of Clean Power is too valuable to waste and that no wind farm developers would be interested in a PPA deal where 80% of their power would likely be curtailed.

Evidence in the moment suggests some government entity will have to underwrite a market for year-around NW wind-energy consumption/green-hydrogen market, if wind farm developers are to motivated to provide wind energy to fill the wintertime hole being left by coal. In any event, North Plains wind will be much less risky to underwrite than any wind west of the Rockies.

Solutions to all these problems are already operating in other parts of the world, but the NW is in for a steep learning curve to integrate them here on the schedule set by CETA.

In this difficult environment, I believe the Commission and Staff should be intimately involved with utility planning and execution to meet the CETA requirements.