BEFORE THE WASHINGTON
UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION,	**DOCKETS UE-170033 and UG-170034 (*Consolidated*)**
Complainant,	
v.	
PUGET SOUND ENERGY,	
Respondent.	

EXHIBIT TO
TESTIMONY OF

Kyle A. Frankiewich

STAFF OF
WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION

PSE's Response to UTC Staff Data Request No. 419

June 30, 2017

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

Dockets UE-170033 and UG-170034
Puget Sound Energy
2017 General Rate Case

WUTC STAFF DATA REQUEST NO. 419

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In response to WUTC Staff Data Request No. 332, PSE describes the few changes it made to its AURORA power costs model in an effort to emulate the Clean Air Rule's (CAR) impact on power costs. In its response to sub-question (d), PSE states:

> ...additional toggles were selected in the 'Dispatch Settings' located in the 'Run Setup' screen in Aurora in order to execute the CAR model:
>> a. Include emissions costs in dispatch: With this option, the emissions are considered in the dispatch decision for resources;
>> b. Remove penalty adders from zone pricing: This setting is recommended when running constrained dispatch runs before setting the zone price."

a. What is meant by "Remove penalty adders from zone pricing?" How does this setting influence the CAR model?

b. Please confirm that AURORA determines the "emissions costs" described above through the following sequence:
   - PSE inputs estimated emissions caps into AURORA as shown in the Prefiled Direct Testimony of Paul K. Wetherbee, Exh. No. PKW-5.
   - AURORA calculates an 'emissions cap shadow price' for each generator. This shadow price for each generator is calculated and implemented within AURORA's model run such that, over the course of the test year, the sum of economic dispatch hours determined by AURORA will result in total emissions for that generator at or under the emissions limit specified.
   - AURORA models the rate year with the shadow prices included to each CAR-impacted generator. The shadow price adjusts a generator's the price point AURORA contemplates in determining a generator's economic dispatch.

Response:

a. The AURORA Help section describes the function of the "Remove Penalty Adders from Zone Pricing" setting. It says "when the switch is selected the model will adjust the zonal pricing by removing the effect of the non-commitment penalty on uncommitted resources as well as the minimum generation back down penalty on committed or must run resources. These penalty adders are used in the LP dispatch to honor commitment and must run parameters; if this switch is selected the model fixes resources' output at the solved level before deriving zonal pricing without the effect of the adders."

   In Puget Sound Energy's ("PSE") Clean Air Rule ("CAR") model the simulation enforces both resource operational constraints (commitment) and emissions constraints. Generating units that cannot cycle on and off hourly are commitment units. These resources commit to operate at minimum capacity or above for a specific number of hours. The operation of these units is dependent on the value created over the minimum runtime. Commitment resources that are not selected to run are assigned a non-commitment penalty (bidding adder), which makes these units more expensive to operate. This is a financial lever to ensure they meet their operating requirements. When emission constraints are added to a simulation, changes in the commitment and dispatch of resources are required to remain under the limits. Resources that would typically commit and dispatch to serve load are held back in order to remain under the emission limits specified and thus could incur penalties. The switch "Remove Penalty Adders from Zone Pricing" removes the penalty adder from commitment units before deriving the zone price, because the penalties are not true production costs.

b. Yes, the modeling sequence described above is correct except for the reference to "test year" in bullet 2, which should be "rate year." Below is the same modeling sequence with additional details.

   -   PSE inputs estimated emissions caps into AURORA as shown in the Prefiled Direct Testimony of Paul K. Wetherbee, Exhibit No. ___(PKW-5).

   -   To determine the cost of enforcing the CAR emission limit, AURORA calculates a shadow price for the system annual emissions constraint. The value is taken directly from the constrained dispatch for the emissions constraint specified. In general the shadow price for the constraint can be thought of as the estimated reduction in total system cost by relaxing the constraint by one unit.

   -   Then, a shadow price is assigned to each resource in the constraint set as a function of emission rate and heat rate of the unit. The shadow price is a cumulative addition to the dispatch cost for individual resources associated with the constraint item. AURORA models the rate year with the shadow prices

included in the dispatch decision of each CAR-impacted generator to ensure that the commitment and dispatch of these resources remain under the specified limit.

In addition, PSE looks at the overall PSE portfolio cost with the CAR model and compares it to PSE's portfolio cost without the CAR model. The difference in portfolio costs between the two models is what PSE reports as the impact of compliance with CAR to rate year power costs.