

**EXH. PJP-__X
DOCKET UE-210795
2022 PSE CEIP
WITNESS: PHILLIP J. POPOFF**

**BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION**

In the Matter of
PUGET SOUND ENERGY, INC.
2021 Clean Energy Implementation Plan

Docket UE-210795

**EXHIBIT TO THE CROSS-EXAMINATION OF
PHILLIP J. POPOFF
ON BEHALF OF NW ENERGY COALITION AND FRONT AND CENTERED**

JANUARY 24, 2023

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

**Docket UE-210795
Puget Sound Energy
PSE 2021 Clean Energy Implementation Plan**

FRONT AND CENTERED AND NW ENERGY COALITION DATA REQUEST NO. 205:

Topic: Popoff Testimony (SCGHG Modeling)

The Rebuttal Testimony of Phillip J. Popoff states that “[a]pplying the social cost of greenhouse gases as an externality cost is more consistent with economic price signals that will drive dispatch decisions” (Exh. PJP-1T, Page 11, lines 17–18).

- a. Figure G-13 in PSE’s 2021 IRP indicates that in PSE’s long term capacity expansion AURORA modeling, the “[s]ocial cost of carbon [is] added to existing and new thermal resources and market purchases as a cost adder.” Is this an accurate description of PSE’s methodology?
- b. Within PSE’s long-term capacity expansion optimization, is the social cost of carbon applied dynamically to market purchases and not applied dynamically to the dispatch of emitting resources? Here the term “dynamically” refers to application of a cost to an optimization variable, as opposed to the application of a cost to a fixed value within the optimization.
- c. Figure G-33 in PSE’s 2021 IRP lists the “SCGHG Cost Adder” in \$/MWh. For context, the values range from \$36.10/MWh in 2022 to \$88.58/MWh in 2045. Are the cost adders listed in Figure G-33 (or values close to these per any updated calculations since the filing of the IRP) applied dynamically to market purchases in PSE’s long term capacity expansion methodology?
- d. In economic dispatch, does adding ~\$36/MWh to ~\$89/MWh to the cost of market purchases, but not adding it to the cost of dispatching emitting resources, create an incentive to run emitting resources more than they would if they were dispatched economically to the underlying market prices?
- e. Is a methodology that adds ~\$36/MWh to ~\$89/MWh to the cost of market purchases, but not to the cost of dispatching emitting resources, reflective of economic price signals that will drive dispatch decisions?

Response:

- a. Yes, the social cost of carbon is added to existing and new thermal resources and market purchases as a cost adder in Puget Sound Energy’s (“PSE”) AURORA models.

- b. Yes, in PSE's long-term capacity expansion ("LTCE") model, the social cost of greenhouse gases ("SCGHG") is applied dynamically to the market purchases and not applied dynamically to the dispatch of emitting resources. This is the closest PSE could come to modeling SCGHG completely as an externality cost in the 2021 Integrated Resource Plan ("IRP"). Note that the 2021 IRP did not add new emitting resources and as such, this modeling imperfection did not result in adding new emitting resources at the expense of renewable or non-emitting resources.
- c. The values in Figure G-33 in PSE's 2021 IRP were applied to market purchases in the LTCE model in the 2021 IRP. As noted above in PSE's Response to Front and Centered and NW Energy Coalition Data Request No. 205(b), applying the SCGHG dynamically in the LTCE for market purchases was the closest PSE could come to fully modeling SCGHG as an externality with that version of AURORA.
- d. Yes, in the LTCE model, applying the SCGHG as a dynamic adder to market and an externality cost in existing emitting resources would tend to increase the dispatch of existing emitting resources. This modeling imperfection did not impact new emitting resources, as the 2021 IRP did not include new emitting resources and the Clean Energy Transformation Act ("CETA") requirements drive the need to add renewable energy without regard to dispatch of existing plants.
- e. The modeling of SCGHG as an externality cost (a fixed cost adder) to existing emitting resources is consistent with the dispatch logic for how such resources would run. Modeling the SCGHG as dynamically applied to the cost of market purchases is not consistent with the economic price signals of how resources would dispatch. The result of this modeling imperfection is to dispatch existing gas resources in the LTCE run more than they would dispatch in reality. However, AURORA lacks functionality to add a fixed cost adder to market purchases in a similar manner to emitting resources. This modeling limitation, however, is resolved in the all-hours dispatch simulation in which no SCGHG is applied to any resources and market purchases are dispatched without a cost adjustment, explained in Appendix G, starting at page G-30, of the 2021 IRP. As noted above, this modeling limitation in the LTCE run had no impact on new resources, as PSE did not add new emitting resources in the 2021 IRP. PSE continues to work on improving its modeling to better reflect SCGHG as an externality cost, consistent with CETA.