Appendix A

From: Kvam, Michele
Sent: Friday, December 28, 2018 10:57 AM
To: Popoff, Phillip; Netik, Irena ***(bcc to TAG membership list)***
Subject: PSE 2019 IRP TAG 3 follow-up: gas emission rate as a percentage

At the TAG meeting #3 on December 6, 2018, PSE agreed to provide the gas emission rate as a percentage by 12/31/2018. PSE is providing the rate as a percentage of the upstream or non-combustion related CO_2e (carbon dioxide equivalent) of the CO_2 from combustion of natural gas. This calculation is shown below:

A - Emissions from End Use Combustion:	0.0544 Tonne CO_2/MMBtu
B - Added Emissions (CO_2e) lifecycle production/transmission:	0.00948 Tonne CO_2/MMBtu
Rate - Ratio of Added Emissions to Combustion (B/A):	0.00948/.0544 = 17.4%

1. PSE determined emissions for natural gas production in British Columbia based on Province-specific data from the Canadian National Inventory Report (NIR) and British Columbia natural gas production data as reported by the Province in its Natural Gas & Oil Statistics data series.
2. Heating value of natural gas delivered to consumers in are Washington and taken from the U.S. Energy Information Administration Natural Gas Annual Report 2015, Table 16 (DOE/EIA 2015)
3. Methane characteristics : 95% in natural gas, density = 0.6785 kg/m^3

Sent on behalf of Resource Planning and Analysis,

Michele

Michele Kvam

Resource Planning & Analysis

Puget Sound Energy, Inc.

Appendix B

2019 INTEGRATED RESOURCE PLAN

IRP Stakeholder Meeting Schedule

Updated December 18, 2018

Group	Meeting No.	Date	Topic	Location
IRPAG	1	May 30, 2018	IRP general process awareness	Olympia
TAG	1	July 26, 2018	Electric resource costs	Meydenbauer (Bellevue)
IRPAG	2	August 28, 2018	IRP Overview Electric resource costs Load forecasts and initial resource needs	Meydenbauer (Bellevue)
TAG	2	October 11, 2018	Scenarios including carbon prices, gas prices, power prices, portfolio sensitivities Gas resource alternatives	Meydenbauer (Bellevue)
TAG	3	December 6, 2019	Draft Conservation Resource Potential Assessment	Bellevue Hilton (Bellevue)
TAG	4	January 9, 2019	System planning (transmission and distribution) Portfolio sensitivities Load forecast	Bellevue Hilton (Bellevue)
TAG	5	February 7, 2019	Electric resource needs Effective peak capacity of intermittent resources Electric and gas planning standards	Bellevue Hilton (Bellevue)
IRPAG	3	March 18, 2019	Process update	Bellevue Hilton (Bellevue)
TAG	6	April 18, 2019	Overview of electric and gas portfolio model Results of electric and gas portfolio modeling	Bellevue Hilton (Bellevue)
Draft 2019 IRP available on pse.com May 15, 2019				
IRPAG	4	May 24, 2019	Draft 2019 IRP	Bellevue Hilton (Bellevue)
TAG	7	May 29, 2019	Draft 2019 IRP	Bellevue Hilton (Bellevue)
Final 2019 IRP available on pse.com July 15, 2019				

Appendix C

Questions provided by the December 20, 2018 deadline concerning the conversion potential assessment, and PSE response.

TAG questions in bold, *PSE responses in italics*

Daren Anderson, The NESCO Group:

Q1 from Daren Anderson: **Slide 70 regarding Distribution Efficiency Savings: In the CAISO market, "Regulation Up" and "Regulation Down" are the most valuable services provided by energy storage. Please quantify or otherwise address the value of energy storage to the distribution system for regulation and other ancillary services, if applicable for a battery in the PSE distribution system as it relates to DE. I note PSE previously calculated the deferral benefit of substation upgrades and other benefits but did not address making the distribution system more efficient through regulation services and other ancillary services. I would suggest one located at the future Westminster or Vernell Substation as they are in the fast growing Spring District and half way between the big 230kV substations at Sammamish and Talbot. Spring District loads is an issue PSE is planning to address. Please describe how the EIM market would make the battery energy storage facility utilized more often.**

PSE Response: PSE will be using the Plexos model to calculate a value for the sub-hourly flexibility that different kinds of resources create for the portfolio. Plexos does not determine a specific value for each individual ancillary service, such as a flex-up and flex-down, as the model works with the operational parameters of each resource and optimizes across all the ancillary services the resource can provide dynamically. Batteries will be one of the resources that are examined. The sub-hourly value from Plexos will be applied as a net reduction in the cost of each resource, in the same manner as was done in the last two IRPs. PSE will note your suggestions concerning potential locations of a battery in PSE's system.

Q2 from Daren Anderson: Demand Response: **How do the PSE demand response contracts work? Are they all large scale and through RFPs or is there a way for residential customers to sign up for demand response and if so what is the response rate?**

PSE Response: In general, the IRP determines the amount of electric capacity (as measured in megawatts [MW]) of demand response that is cost effective in meeting future resource need. Third party contracts will be solicited thru a Request for Proposal (RFP) process, and the vendors propose how much capacity, which customer segments, type of end use, and years to ramp up aggregate capacity, costs, etc. The successful third party bidder will be responsible for aggregating customer loads and delivering total contracted dispatchable capacity, including frequency and duration of each demand response event.