PUGET SOUND ENERGY

2019 Integrated Resource Plan Advisory Group Meeting #2
Meydenbauer Center
Rooms 407 and 408,
1100 NE 6th Street, Bellevue, WA 98004
August 28, 2018
6 – 8 p.m.

Attendees

- James Adcock, PSE ratepayer
- Daren Anderson, The NESCO Group
- Neal Anderson, Sierra Club
- Rita Andreeva
- Stephanie Barbee, Vashon Climate Action Group
- Larry Becker, Northwest Power Consulting*
- Charlie Black, Consultant for Invenergy
- Joni Bosh, NWEC
- Rob Briggs, Vashon Climate Action
- Rachel Brombaugh, King County
- Aidan Carroll, 350 Seattle
- Brad Cebulko, UTC
- Chris Chapin, 350 Eastside
- Thad Curtz*
- Kim Danke, Thurston Climate Action Team and Sierra Club
- Andrew Dunn, PSE ratepayer
- Lori Elworth
- Nancy Esteb, Renewable Energy Coalition*
- Laura Gibbons, 350
- France Giddings, 350
- Suzanne Greenberg, Vashon Climate Action Group and PSE ratepayer
- Brian Grunkemeyer, Sierra Club
- Kelly Hall, Climate Solutions*
- Warren Halverson, CENSE
- Stephanie Hillman, Sierra Club
- David Howarth, National Grid*
- Doug Howell, Sierra Club
- Rita Hummel, PSE ratepayer
- Thara Johnson, City of Burien
- Solomon Karmel, PSE ratepayer
- Jennifer Keller, PSE ratepayer
- Devon Kellogg, Sierra Club, 350, and K4C
- James Kellogg
- Leah Kellogg
- Susan Kellogg
- Marilyn Kimmerling, Tacoma Direct Action
- Carol Kindt, 350 Tacoma
- Aaron Kunkler, Bellevue Reporter
- Victoria Leistman, Sierra Club
- Ben Levy, 350 Tacoma
- Jane Lindley, PSE ratepayer
- Nancy Logan, PSE ratepayer
- Virginia Lohr, PSE ratepayer
- Angela London, PSE ratepayer
- Kate Maracas Western Grid Group (WGG)*
- Don Marsh, CENSE
- Lora McLeran
- Mary Moore, League of Women Voters
- Arvia Morris
- David Morton
- Guila Muir, 350 Seattle
- Andrea Scott Murray
- Stacy Oaks, 350 Seattle
- Court Olson, Optimum Building Consultants
- Dave Osmer, PCA Bellevue
- Bill Pascoe, Pascoe Energy*
- David Perk, 350 Seattle
- Dominic Petoud
- John Poulson, 350 Eastside
- Emily Powell, 350
- Cəlalàkəm, Protectors of Salish Sea
- Marilyn Ritter, 350
- Phil Ritter, 350 Eastside
- Karen Rogers, Sierra Club
- S. Rogers, 350
- Margo Rolf, Saltwater Climate Action Now*
- Noah Roselander, Vashon Climate Action

- Nicole Sanders, City of Snoqualmie
- Kathi Scanlan, WUTC
- Barb Scavezze, Thurston Climate Action*
- Tina Sederholm
- Martine Smets
- Sue Stronk, CENSE
- Marilyn Subala, 350 Seattle
- Jeff Thiel, PCA Bellevue
- David Tomlinson, Solar Horizon
- Bill Westre, Sierra Club
- Bruce York*

* Indicates remote attendance

Project Team

- Samantha DeMars-Hanson, PRR
- Brett Houghton, PRR
- Michele Kvam, Puget Sound Energy
- Lorin Molander, Puget Sound Energy
- Irena Netik, Puget Sound Energy
- Jon Piliaris, Puget Sound Energy
- Aaron Poor, PRR
- Phillip Popoff, Puget Sound Energy
- Sharmila Swenson, Puget Sound Energy

Meeting Objectives

- Stakeholders understand how PSE is using their input from the May 30 meeting.
- PSE listens to stakeholder input on the IRP.
- Stakeholders gain familiarity with the IRP process and resource needs.
- Stakeholders gain familiarity with electric resource costs.

Welcome and introductions

The GoToMeeting function, intended to provide access for remote participants, did not work. Remote attendees through GoToMeeting were unable to hear the meeting.

The meeting began at 6 p.m. Irena Netik, director of energy supply planning and analytics for Puget Sound Energy (PSE), welcomed the group of almost 100 attendees with some brief remarks and a safety moment about bicycling to work alongside a newspaper delivery car in her neighborhood. While both the car and the bicyclist entered a neighborhood roundabout the correct way, Irena and the car had to slam on the brakes when another car entered the roundabout going the incorrect direction. The driver was hoping to quickly skirt through the roundabout to their next destination. While no one was hurt, Irena had a renewed commitment to not cutting corners, especially without knowing the consequences around that corner.

Next, Irena reviewed the meeting objectives and agenda for the second Integrated Resource Plan Advisory Group (IRPAG) Meeting. With a spoken comment period toward the end of the meeting, PSE also provided written comment forms for participants who were not able to speak during the comment period or preferred to comment in writing.

Updated IRP Stakeholder participation process

Irena presented changes PSE made to the IRP process to best hear stakeholder input. In response to stakeholder feedback, to ensure PSE gets the feedback they need, and to meet regulatory requirements, PSE has updated the IRP stakeholder process to include two groups: the Technical Advisory Group (TAG) and the Integrated Resource Plan Advisory Group (IRPAG).

The TAG consists of stakeholders with specific technical skills, knowledge, and experience relevant to the IRP. The IRPAG covers the breadth of stakeholder interests and concerns related to the IRP, including educating participants on the IRP process. The IRPAG will meet in the evenings, based on stakeholder feedback that evening meetings will be more inclusive and effective. Irena thanked participants for their support as PSE launches this new process and asked for their ongoing feedback through the next year.

Irena presented outcomes from the first IRPAG meeting that PSE will use to inform the 2019 IRP process. These included modeling greater carbon reduction scenarios, modeling no new fossil fuel generation in PSE's portfolio, modeling retiring PSE's fossil fuel power plants by 2025, and modeling a scenario with no Tacoma Liquefied Natural Gas (LNG) facility, and additional analysis to assure PSE's consistency with other regional analysis.

Michele Kvam, PSE IRP stakeholder manager, then reviewed the action items PSE from the May 30, 2018 IRPAG meeting. PSE is planning a fall listening session where company executives listen to comments from the public about issues that matter to them. PSE will model various carbon impacts including zero carbon electric resources. PSE sent letters to 31 federally-recognized tribes plus the Duwamish tribe to invite their participation in the IRP process. PSE was unable to contact an individual stakeholder concerning her PSE gas experience. PSE distributed a work plan on July 16 via email to the IRPAG distribution list. The document is also available at www.pse.com/irp.

Michele also reviewed action items from the July 26, 2018 TAG meeting. PSE will incorporate larger renewable projects into their final report than included in the July 26 presentation. For all July 26 TAG pre-meeting resource cost questions PSE partnered with HDR, an engineering firm, to answer in writing. PSE made responses from PSE and HDR available at www.pse.com/irp. PSE provided capacity factors for PSE's combined cycles for the last two years at www.pse.com/irp. PSE confirmed content from the RFP bids are confidential under a non-disclosure agreement with bidders. PSE continues to update both TAG and IRPAG charters.

PSE IRP discussion

Irena returned to add additional context into the IRP process including legal responsibilities, regulatory requirements, and additional vocabulary. PSE is an electric and gas utility company. Per Washington Administrative Code 480-100-238, "each electric utility regulated by the commission has the responsibility to meet its system demand with a least cost mix of energy supply resources and conservation…in furtherance of that responsibility, each electric utility must develop an 'integrated resource plan.'" The "lowest reasonable cost" is determined by several factors including resource costs, market-volatility, and the risks associated with environmental effects, including emissions of carbon dioxide among others. PSE develops the 20-year forecast in each IRP through a three-step framework: determining inputs (such as resource costs, load forecasts, prices and policies), modeling scenarios (including resource needs and resource adequacy among others), and identifying outputs (including conservation targets and system planning).

PSE uses the IRP to inform the resource acquisition process. The Washington Utilities and Transportation Committee (WUTC) reviews and assesses actual resource acquisition for prudency.

Irena reported that PSE is developing draft details concerning the charter and structure for the delivery system planning technical advisory group and hopes to share this with the WUTC in mid-September to check the alignment with intended draft rulemaking. For the delivery planning group, PSE will focus on

- bringing transparency to the delivery system planning process,
- assumptions, and
- evaluation process and assumptions regarding non-wire alternative analysis.

PSE is hoping to start the process in late October.

Lorin Molander, PSE load forecasting and analysis manager, gave an overview of load forecasting. A load forecast is an estimate of how much energy customers will demand, in this case, over a 20-year period. The forecast includes estimates of the number of future customers, the amount of energy sold, and the amount of energy needed during the peak demand (when the most people are using energy). These estimates do not include future demand side resources (DSR) like PSE's energy efficiency programs, codes and standards, and demand response.

To calculate the estimate for total energy sales, PSE multiplies the number of customers by the energy used per customer. PSE compiles these numbers from studying historical sales data and drivers of these factors. Drivers are related data that affect the number of customers and energy use per customer such as expected employment in the area and population growth projections. After PSE gathers the historical data, they determine the relationship between the drivers to customer growth and sales. PSE then uses this data to forecast the future, compiling forecasts of economics, demographic drivers, and project "normal" weather patterns. Applying the historical relationships to the forecasted drivers and "normal" weather allows PSE to forecast their load through the IRP timeline.

With the methods behind load forecasting explained, Lorin presented graphs detailing load and peak demand forecasts for both electricity and gas needs in the region from 2017 and 2019. These graphs raised questions from the participants. [Please note Q stands for question, A for answer, and C for comment].

Q: What drove the lower demand forecasted in this graph for the 2019 IRP compared to the 2017 IRP forecasts?
A: While energy sales and peak use are going up over time, PSE did not achieve the levels in the IRP forecast.
C: A PSE employee previously acknowledged that energy use per customer is going down and yet the forecasted demand increase is above the rate of population increase in King County.

Q: How does PSE define "normal weather?"
A: PSE uses the most recent 30-year average of weather data from National Oceanic and Atmospheric Administration (NOAA).

Q: If the 2019 peak is projected to be lower, how do you project that will affect the need for a Liquefied Natural Gas (LNG) plant in Tacoma?
A: I can only speak to the load forecasts.

Q: Can you give further definition of conservation?
A: Conservation is a demand side resource. Demand response is anything on the customer side of saving energy, such as programs used to encourage lower customer energy usage. It also includes changes to codes and standards in policy.

Q: I am still concerned about the load forecast.
1. What are the loads for the last 10 and 20 years?
2. PSE has not achieved forecasted levels of demand for a long period of time now, and why is that?
3. What is the percent change in peak demand since 2017?

A: 1. This will be answered as we move through the IRP process.

2. The rationale behind this curve is that PSE still has not seen a recovery from the 2008 recession.
3. Yes, we will provide this in the TAG meeting on load forecasting.

Q: What are the assumptions behind the higher load forecasts?

A: There is an appendix in the 2017 IRP with those details, possibly appendix E. If that is not helpful, please let us know what else you would like.
[Post meeting clarification: Please see PSE's 2017 IRP Appendix E. Demand Forecasting Models]

After Lorin's presentation on load forecasts, Phillip Popoff, PSE manager of resource planning and analysis, presented on planning standards and resource needs in the IRP process. The goals of this process is to ensure PSE can reliably meet the physical needs of its customers while complying with regulatory requirements. Phillip provided some initial context of three phrases: maximum (peak) capacity, energy, and renewable energy. When you turn on your light switch you expect the lights to turn on. Maximum capacity, measured in megawatts, reflects the energy PSE must provide if every customer wanted their lights on at the same time. Energy is measured in megawatt-hours. PSE must provide energy to meet customer demand every hour. Under the Revised Code of Washington (RCW), by 2020, a minimum of 15 percent of energy sales must be renewable energy. PSE and other utilities can exceed the minimum requirements. For example, the UTC permitted PSE to acquire the Lower Snake River wind farm because PSE demonstrated this was a cost effective measure.

Philip continued to explain this context through an example graph of peak capacity need and the different energy resources PSE uses to provide the energy. These include the Colstrip power plant, natural gas, small contracts with other energy producers, hydropower, wind power, and market transmission to capacity. Phillip explained drops in coal-fired energy in 2022 come from PSE's known plan to retire Colstrip in July of that year. PSE signed a coal transition contract with a second coal plant in Washington State to hasten their closure. PSE agreed to purchase energy from the coal plant (Centralia plant owned by TransAlta) if their ownership agreed to close by 2026. PSE also relies on short-term markets for energy.

The graph included a blue line to reflected peak load. PSE does not have enough existing contracts to provide peak load in the future. PSE is pursuing new resources through their usual Request for Proposals (RFP) process. They hope to fill the gap with renewable resources. Additional questions from stakeholders were:

Q: Does Puget Sound Energy get any wind power from Montana?

A: Not currently, but it is anticipated that PSE will receive bids through the RFP process.

Q: The trend line is flat and the graph shows declining demand, but the peak load forecast is accelerating in 2033. Can you explain why?

A: We are required to look at commercially-available conservation resources (which incentivize lower demand). Rather than spread out the demand reductions, PSE front-loads the reduced demand into the first 10 years of projections. The 2033 increase is when forecasted conservation resources end. This is not likely what will occur in practice.

Q: Are you talking about commercial use or residential use? What if builders make a lot of homes self-sufficient?
A: Commercial availability means all technology currently available on the market to help reduce energy usage. Washington is a winter-peaking region, meaning more people use energy in the winter to heat than any other season. Wind and solar have lower capacity factors, produce less energy, in the winter.

Q: Explain the drop in hydropower around 2031 and explain what you mean when you say we do not have capacity to store wind and solar energy.
A: We have long-term hydro contracts that expire in 2031 (Chelan County PUD contracts for Rocky Reach and Rock Island I & II). We hope to renew them but for the purposes of the IRP, we only work from existing contracts, so for the purposes of the IRP, these contracts will terminate.

Q: Does this graph include Microsoft leaving PSE?
A: Yes.

Following the December peak capacity need, a graph explained an example of renewable resource needs. Phillip noted the Renewable Energy Credit (REC) need jumps up starkly in 2020. There is a banking provision allowing PSE to count renewable energy it generated a year before as renewable energy generated a year later. It also can "borrow" renewable energy a year ahead.

Phillip explained electric resource costs, including feedback from the similar discussion at the July 26 TAG meeting. PSE hired HDR, an engineering firm, to develop generic resource costs. PSE uses these cost estimates to better inform their models. The TAG gave feedback on the draft report about the resource costs. Their feedback included include looking at larger solar and wind generators to reduce the cost of these energies and reexamining generic wind site locations. HDR is updating their report and considering all feedback provided by TAG members. In this report, Phillip clarified, PSE studies fixed and variable costs of energy. There are too many distinct details between types of energy production for a helpful levelized cost of energy comparison. Phillip acknowledged that PSE cannot reveal all the information they have about electric resource costs in the RFP process because of confidentiality clauses in the bids, and in consideration of negotiating new contracts and ownership agreements with energy providers.

This information also generated questions from stakeholders.

Q: What is the full name of the engineering firm and where are they based?
A: HDR originally stood for Henningson, Durham and Richardson, Inc. Now the initials do not formally represent anything. The company is headquartered in Omaha, Nebraska, and operates worldwide. The report drafted for PSE was generated from HDR's Ann Arbor office.

At this point the facilitator requested stakeholders state their name when speaking:

Q: Charlie Black, Invenergy: Are any other utility companies relying as heavily on transmission plus short-term market power purchases as a resource to supply their firm demand?
A: PacifiCorp. For further explanation, PSE does not want to build more plants than needed and have customers pay for those plants. If there is a lot of energy available in the market and PSE under-produces, that is good for energy costs and ratepayers. If there is less energy available in the market and PSE does not under-produce, rates go up.

Q: Stephanie: On this graph [on slide 24], why does natural gas use never change over this period?
A: This graph shows the existing fleet of resources PSE has. In this IRP, we will study if it is cost effective to retire these plants.

Q: Stephanie: This planning process looks complicated. Does your plan account for an independent energy revolution?
A: The plan accounts for things PSE can predict given past and current conditions. We have customer choice programs, including the Green Direct for large customers, to sign up for renewable energy. We will certainly be looking into offering more renewable energy and microgrids.

C: Don Marsh: The load forecast is so important. We do not understand the load forecast. Demand per capita is shown to be flat. From PSE's data, the City of Bellevue's website says there is a drop in demand per capita of 10 percent. If there is a difference between total consumption and peak demand, we want to understand the divergence.

Q: Devon Kellogg: What about the social cost of carbon mentioned in the UTC's acknowledgement letter to the 2017 IRP?
A: PSE will follow-up with Devon Kellogg to provide background about the social cost of carbon. [The email is provided as Attachment C]

Q: France: Is there a plan to move to a non-profit structure like a Public Utility District (PUD)?
A: That is not what we do in this IRP process.

Next steps

Michele returned to outline the next steps from this meeting. PSE will distribute meeting notes with action items outlined on September 7. September 13 is the deadline for IRPAG attendees to provide comments on meeting notes to PSE. On September 20 PSE will post the final meeting notes on the IRP website: www.pse.com/irp.

At this point, another question emerged:

Q: Virginia Lohr: When will we discuss the social cost of carbon?
A: We will discuss it at the October 11 TAG.

IRP comment period

The comment period began with Jamie reviewing the comment guidelines, explaining how a beeper would be used to ensure fairness to all speakers, and confirming if attendees are uncomfortable speaking at a microphone there is a form for written comments PSE will also read.

C: Doug Howell, Sierra Club: There is not enough time for comment, people expect more time and there should be more at the next meeting. PSE spends $53 million to prop up and extend the life of Colstrip, the dirtiest coal plant on the west coast. Colstrip had its 3rd forced outage in the last 9 years. It is not reliable, it puts hazardous chemicals including arsenic and lead into the air. Even the Montana Department of Environmental Quality says that the plant is not meeting quality standards met in 2011.

C: Don Marsh, CENSE (read a future article from the Bellevue Reporter dates August 28, 2030): That article celebrated PSE's announcement of going carbon free thanks to voter engagement and customer investment. These positives took affect after numerous environmental disasters ruined Washington of the [future] last decade. Back in 2018, he asked PSE to take an early lead in bringing the positive future to reality.

C: Jane Lindley, Bainbridge Island resident: The 2017 IRP states that PSE is keenly aware of customer interest in carbon emissions reduction. The current policy, seeking least cost solutions are directly responsible for the environmental crisis. The UTC has now directed PSE to use a more robust cost of carbon in their planning. Montana wind might fare better than it did in 2019. Denise Hey, Montana legislator, came to an IRP hearing in Renton to say Montana can deliver wind energy to Washing at a reasonable cost – especially in December when Washington experiences peaking energy demand.

C: Kimberly Danke, Olympia: The City of Olympia has adopted aggressive carbon emission standards. The energy sector is a large producer of the carbon emission, so achieving this will only come from PSE. The City Council asked Washington State to divest from fossil fuels as part of the worldwide divestment movement. Leaving carbon-emitting fuels is fiscally responsible. PSE publicly prides itself of green energy. Walk the talk. The IRP is key to making this happen.

C: Arvia Morris: I am concerned PSE's ability to use renewables is constrained by narrow cost-analysis. I am excited you are doing new modeling. This needs to be part of the analysis. Renewable must be more competitive. Wind capacity is Washington is not anywhere close to being tapped out. PSE should spend money on new wind farms, take more investment risks. I didn't like seeing natural gas 20 years out – hopefully that will not be here.

C: Carol Kindt, 350 Tacoma: Three points. PSE is a regional utility company. The city I live in contains an almost completed LNG plant without a clean air agency permit. What will happen if this permit is denied? My second point is the social cost of carbon has not been addressed in this meeting. My third point is I applaud your attempts to be more transparent. I invite you the September 8 Rise Up for Climate Jobs and Justice March in Tacoma.

C: Marilyn Kimmerling, Tacoma resident: I've been listening with skepticism. I understand this is not a policy meeting. I demand that policy makers come to sites around Puget Sound. The Policy is under a critical eye and people are not happy with it. I don't use Puget Sound Energy. Explore all options for additional energy. What about tidal power?

C: Victoria Leistman, Sierra Club: I appreciate the steps PSE has taken to remedy this process. PSE still has shown blatant disregard for communities most impacted, including when Dakota Case was denied the opportunity to speak at the May 30 meeting. Walk your talk. Sending off letters is not how you build relationships. Hold your listening session in Tacoma. Stop building the LNG facility. If load and peaks are forecasted lower, than this is not needed. Even at a 3% average leakage rate methane is 87 times more harmful than CO2 in the air.

C: David Morton: Costs of risk associated in carbon dioxide must be included. Methane research is not included in the IRP yet. A June 2018 article from the Journal of Science says the natural gas industry is leaking more than thought. PSE makes use of normal weather, but climate is unpredictable. PSE is directly contributing to global warming. PSE plans to sell electricity through burning natural gas. The public will suffer the damage.

C: David Perk, 350 Seattle: I've been observing the TAG meeting. I noticed there was a commitment to a model reducing all fossil fuel assets to zero by 2026 in response to a TAG members comment. Looking back in the notes I could not find that comment. I suggest you model zero fossil fuels by 2032 and 2039. I'm concerned that dropping everything by 2026 would lead to rate shock, or extreme prices that would then justify not moving forward with any fossil fuel reduction. I want a medium scenario with an 80% renewable energy provided by 2032. This aligns with the K4C King County Study by Cadmus. That would help the entire county move towards its emission goals.

C: Thad Curtz (online comment): In the 2017 IRP, PSE's consultants estimated the available winter peak load reductions from a four-hour demand response program for residential central heating and heat pumps at 1.75 kW per household, and the potential demand response load reductions from residential water heaters at .58 kW. My electric car draws 7.6 kW when it's plugged into a standard 220-volt home charger. Shifting its load off the peak would offer roughly four times your estimated reduction from a heat pump and 12 times your estimated reduction from my water heater. There are going to be a lot more electric vehicles in your service area over the twenty-year time frame of the IRP, but there doesn't seem to be any consideration in the 2017 IRP about managing their demand, about drawing on their batteries through vehicle to grid processes, or about alternating your tariff structures to allow aggregating and monetizing their potential grid services. Given what's going on around the country in other utilities' planning processes, this seems like a pretty profound gap in your consideration of the factors that will be significant in PSE's functioning over the next twenty years, and I really hope you'll start paying some attention to them in the current IRP process.

C: Charlie Black, Invenergy: Invenergy is a large, diversified resource developer of wind, solar, and natural gas generation. PSE has a much larger resource deficit than any other Northwest utility. During Phillip Popoff's presentation, I asked if any other utilities rely on the short-term market as heavily as PSE does. I looked at PacifiCorp's most recent resource plan. Their peak load is three times as much as PSE's. However, they only rely on the Mid-Columbia short-term market to meet about three percent of their market peak loads. Having been a prior energy risk manager, relying this heavily on the short-term market resource is highly risky.

C: Dominic Petoud: At the start of this meeting you said this is not a policy-decision meeting. Owners of PSE don't live in the Northwest, maybe they live in Dubai. They don't care about what happens here in the Northwest. To owners, you are not even people.

C: Angela London: As a primary care physician, my patients have come in over the last few weeks influenced by poor air quality included increased asthma and headaches. I've heard PSE talk about carbon taxing. Social cost of carbon is different than carbon taxing. The social cost of carbon includes increased costs from fighting fires, health issues, home loss due to floods and fires, air conditioning and air purifiers, and decreased revenue in the fishing and tourist industry. These must be considered.

C: Laura Gibbons, PSE ratepayer: This IRP must be for early adoption of clean electricity and a carbon-free grid. Stop the LNG plant, Colstrip, and all gas. I agree with the previous comment about the true cost of carbon. You mentioned the legal requirement for reasonable cost. I would be happy to pay whatever the rate for clean energy.

C: Virginia Lohr, PSE ratepayer: Climate change is here now, we see it in increased dramatic weather. We are in this together. We won't solve this with the 2017 plan. We should look at Synapse Energy Economics report submitted in 2017. It discusses declining emission caps. PSE cannot find viable paths to reducing carbon emissions with a flawed model. It's past time to expect others to deal with this.

C: Chris Chapin, Redmond resident: I'm a mountain climber and back-country skier. I go to the Cascades every week. There are Glaciers on maps that are now lakes. 2019 needs to have a 20-year plan to get to renewable energy. We don't need the Energize Eastside transmission line. Cutting down trees doesn't support the climate.

C: Gwen Hanson: I want to talk about the social cost of carbon. PSE speaks about carbon regulations as if PSE is watching passively. PSE contributed huge amounts of money to defeat the carbon tax late in the campaign in Washington. Now you must support initiative 1631 which will be on the ballot in November. You are missing the point. As a family doctor, I see the huge social costs of climate change.

C: Noah Roselander, PSE ratepayer: We are headlining into a climate crisis and we are behind. The cause of climate change is clear. Exxon Mobil figured this out in 80s and spent millions on disinformation campaigns. Technology of renewables is economically advantageous. The fate of the planet hangs in the balance. We need a plan for a transition to 100% renewable energy.

C: France Giddings: I have lived in this region since 1947. I have seen heartbreaking changes in the region. My friends who afford solar panels say they cannot send it back because there are not enough transmission lines. PSE should fund transmission lines for microgrids and fund training programs to educate staff. PSE should seek out profit free alternatives

C: Stephanie Barbee (addressing slide 24): I know this is not a technical meeting. Imagine PSE is a mother. Customers are the children. Fossil fuel is a step-father who supporters the family but is also bad for the family.

C: Cəlalàkəm: My name is Fighting woman, Daughter of Sea Monster Man. You are my enemy as long as you keep fossil fuel moving through the land of my people. Human life is more important, set a precedent. The peak demand looks like a flatline. Flatline means you are dead. Make profit in renewable energy. You all know the science. I am going to fight.

C: Stacey Oaks: I am a lifelong Washington resident, a grandmother, and an organizer at 350 Seattle. We are fighting the LNG facility. We are in a crisis. Cost is the whole pie; monetary amount is a slice of the pie. You are disrespecting the lives of indigenous women murdered at man camps. The UTC should deny any plan that is not a blueprint to a fossil free future. Think about the real costs.

Action Item

PSE will include a discussion of the social cost of carbon at the October 11 TAG meeting.

Adjourn

At the end of the meeting, Irena thanked everyone for attending the meeting and sharing their comments. The meeting adjourned at 8 p.m.

Appendix A: Written comments submitted at the meeting.

Appendix B: Emails or attachments provided by meeting participants consistent with the guidelines for the comment period.

Appendix C: Email to Devon Kellogg concerning the social cost of carbon, sent by PSE on September 4, 2018.

Note concerning abbreviations

Q: Question

A: Answer

C: Comment

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Appendix A

IRP Comment Form

IRPAG Meeting #2

August 28, 2018

Please provide your comments below.

(3) points:

* (1) PSE's IRP must be a PLAN for a carbon-free grid BY 2025.

(2) PSE must have a complete accounting of environmental impacts of fracked gas. Leaked methane is a PROBABILITY, not a "possibility," and methane is 87% more damaging than carbon dioxide.

(3) PSE (MUST) stop construction of the LNG ~~facility~~ in Tacoma. Besides not being permitted fully, ~~building~~ infra-structure lays the ground work for more infrastructure for more fracked gas. More fracked gas means 700% increase of traffic in the Salish Sea. traffic carrying explosive, dangerous fracked gas!

Name: Guila Muir

Organization: community member

Phone number: (206) 725 1994

Email: guila@guilamuir.com

IN SHORT — IRP MUST BE A PLAN FOR A CARBON-FREE GRID BY 2025.

PSE PUGET SOUND ENERGY

IRP Comment Form

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Please provide your comments below.

I am asking for a detailed technical explanation of exactly how you do load forecasting, including on how peak and average load are estimated, and especially exactly how "weather" data is used in that modelling. Further, how these load forecasts - exactly - are used in the rest of your modelling process.

Name: James Adcock

Organization: ratepayer

Phone number: 425-502-0217

Email: jimad@msn.com

PSE PUGET SOUND ENERGY

IRP Comment Form

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August 28, 2018

Please provide your comments below.

I have lived in the Seattle area for nearly 30yrs, and stayed because of the beauty and clean air in the region. I have severe asthma and cannot be outside if air quality is yellow or worse. The LNG facility will worsen air quality in the region. This impacts many including children who suffer from lung disease. Construction on the LNG facility should be immediately halted until it has the appropriate permits from the Puget Sound Clean Air Agency.

The social cost of carbon is closely tied to the rising medical costs due to poor air quality... this is also a justice issue. Those in poor communities are more heavily impacted by bad air quality because their neighborhoods are closer to coal plants, etc. We have the technology to replace use of fossil fuels that are dirty and impact our health. Please plan for getting to 100% renewal enery by 2032.

Thank you!

Name: Tina Sederholm

Organization: customer

Phone number: N/A

Email: tinasederholm@hotmail.com

From: barb@thurstonclimateaction.org
To: Kvam, Michele
Cc: IRP -- mail --
Subject: RE: IRP COMMENTS, Call in RVSP Barb Scavezze: RSVP for IRP Advisory Group Meeting via computer
Date: Tuesday, August 28, 2018 7:51:34 PM

Hi Michele,

As I'm sure you are aware, I was unable to hear the meeting. Here are my comments based on looking at the slides:

I don't see the cost of risks associated with environmental effects including emissions of carbon dioxide in the IRP Inputs or IRP Models in the IRP analytical process overview.

Thanks,
Barb Scavezze
3008 Amhurst Ct SE
Olympia, WA 98501
360-878-9901

> -------- Original Message --------
> Subject: Call in RVSP Barb Scavezze: RSVP for IRP Advisory Group Meeting via computer
> From: "Kvam, Michele" <michele.kvam@pse.com>
> Date: Tue, August 28, 2018 2:35 pm
> To: "barb@thurstonclimateaction.org" <barb@thurstonclimateaction.org>
> Cc: IRP -- mail -- <IRP@pse.com>
>
> Barb,
>
> The log-in info is provided in my out-of-office message. I may not be able to respond to all messages today.
>
> Thanks for letting me know you are calling in.
>
> Michele
>
> ---
>
> **From:** barb@thurstonclimateaction.org [mailto:barb@thurstonclimateaction.org]
> **Sent:** Tuesday, August 28, 2018 2:17 PM
> **To:** Kvam, Michele
> **Subject:** RSVP for IRP Advisory Group Meeting via computer
>
> Hi Michele,
>
> Please send me the log-in info so I can attend the meeting on my computer.
>
> Thanks,
>
> Barb Scavezze
> 360-878-9901
>

From: Don Marsh <don.m.marsh@hotmail.com>
Sent: Tuesday, August 28, 2018 5:54 PM
To: Don Marsh <don.m.marsh@hotmail.com>
Subject: Re: speech

My name is Don Marsh. I'm a co-founder of the citizen's group CENSE, which advocates "sensible energy" on the Eastside. I also serve on PSE's Technical Advisory Group.

In that spirit of sensible energy for ratepayers, our economy, and the environment, I would like to read a future article from the Bellevue Reporter, dated August 28, 2030.

Representatives from Puget Sound Energy were joined by environmental organizations, faith groups, and tribal leaders to celebrate the attainment of 100% renewable sources of electricity, two years ahead of the original 2032 target date.

On August 23, 2030, PSE switched its last natural gas power plant to run on hydrogen produced using excess wind, solar, and hydro power. Company officials shared credit for the achievement with voters who passed a precedent-setting carbon pricing initiative, communities that strengthened building codes, and customers who invested in solar panels and batteries to lower their carbon footprints.

"The winters of 2022 and 23 helped to focus our efforts," said PSE CEO Kimberly Harris. During back-to-back winters, no snow fell at elevations below 7,000 feet. Reduced snowmelt constrained hydro power for the region, forcing electricity rates higher. At the same time, water shortages and smoky skies reduced income from tourism, outdoor recreation, and fishing. The combination dealt a painful blow to the local economy.

"It became crystal clear to everyone," said Han Stevens, a local volunteer for the Sierra Club. "No one thrives when our environment is out of whack. Fortunately, PSE has taken a leading role in an energy revolution that is occurring all over the world. We are on track to have a carbon-free world where people and the planet will benefit."

Back here in 2018, we need a good plan to achieve our long-term goals, and I ask PSE to develop a plan that achieves 100% renewable electricity by 2032.

The IRP says that in estimating the "lowest reasonable cost mix of resources," it "must consider the cost of risks associated with environmental effects including emissions of **carbon dioxide**." While it appears that PSE **has** performed a detailed analysis of its carbon dioxide emissions, a thorough analysis of the amount of PSE's **methane** emissions is lacking. By its very **gaseous** nature, methane is **hard** to **contain**, and it **easily**, **invisibly**, **colorlessly**, and **odorlessly** escapes into the atmosphere. It's not likely that **scrupulous measures** are taken to **prevent**, **detect**, and **repair** all **methane leaks** starting from the underground natural gas deposits, through the refineries and pipelines, all the way to PSE's power plants. A **June, 2018**, study published in the journal **Science** reports that the U.S. natural gas industry is leaking **way more methane** than previously thought.

Also, in calculating long-term load forecasts, PSE makes use of something called "**normal weather**." Do we even know what "normal weather" means anymore? Our climate is undergoing wild and unpredictable changes.

PSE knows that their current and future **combustion** of **fossil fuels** and **leakage of methane** to the atmosphere have been contributing and will **continue** to contribute to **dangerous global warming**. PSE promotes **renewable** energy while at the same time **planning to sell more electricity generated by burning natural gas**. Through its **combustion of fossil fuels** and **leakage of methane**, PSE has helped to create a severe public nuisance in which the public suffers injury, loss, or damage caused by rising seas, coastal flooding, wildfires, hurricanes, heat waves, and other impacts of climate change.

Submitted by David Morton by email at 11:20 pm on August 28, 2018.

Slide 24 of tonight's presentation on planning standards and resource needs shows that PSE currently has a peak December demand of 6,000 megawatts, with over 1,500 megawatts of the peak assumed to be served by relying on market power purchases delivered via firm transmission from Mid-Columbia. This excessive dependence on short-term wholesale market purchases exposes PSE customers to large cost and reliability risks. During PSE's presentation, I asked whether PSE knows of any other Northwest utility that is so dependent on purchases from the short-term market. PSE responded that PacifiCorp also plans to supply an equally large share of its peak loads with short-term market purchases. This is not the case; PacifiCorp is actually much less dependent on short-term market purchases than PSE. PacifiCorp's latest IRP shows that while its peak demand is larger than PSE's (12,000 vs 6,000 megawatts), PacifiCorp only plans to supply this with up to 400 megawatts of short-term purchases from the Mid-Columbia market. If PSE adopts a less risky resource strategy that is less reliant on purchases from the short-term market, this will create opportunities for additional long-term resources to be added to PSE's resource portfolio.

Best Regards,
Charlie

CJB Energy Economics

Provided by email at 9:31 am on August 29, 2018

From: Jeff Thiel [mailto:jeff.r.thiel@outlook.com]
Sent: Tuesday, August 28, 2018 8:56 PM
To: IRP -- mail --
Subject: IRP Feedback

I attended tonight's meeting about the IRP process, but could not stay for the public comment period, so I'm providing my feedback in writing.

I am an economist by training, and a software product manager and entrepreneur by profession (MSFT, multiple startups). I'm a father of two girls that I want to inherit a livable planet. That's only going to be possible if PSE and other utilities dramatically accelerate delivery of clean energy to all their customers.

Recently I participated in a fellowship program where I researched the pathways to decarbonization that we must pursue to address the climate crisis that is already inflicting suffering and loss on millions of people around the globe. During that fellowship I reviewed past IRP's from PSE and compared them to Seattle's IRP's and to actual developments in the energy sector.

My overall observation is that the IRP methodology implemented by PSE is flawed in multiple ways:

- It is very backward looking. It relies on history to make plans for the future. Instead, the process should ask what kind of future customers want and need (clean and affordable energy), and make plans to deliver that future as quickly as possible.
- It ignores the single most important cost of delivering energy – the cost of the impact of greenhouse gas pollution.
- It assumes static behavior by consumers and businesses. Consumers and businesses will change their behavior if given choice and information and price signals.
- It does not fully consider the price changes due to innovation and continuous improvement in technology and operations.

I want to purchase energy that is clean and affordable from a company that is innovating to meet my needs. The IRP process as it is currently designed and implemented is not meeting my needs. If changing that requires that I provide this feedback to the UTC, please let me know.

Thanks for listening,

Jeff Thiel
5215 146th Ave SE Bellevue WA 98006

Comments for the PSE IRPAG Meeting, August 28, 2018.

Climate change is here now. Scientists are attributing a growing number of weather extremes to human causes. These include: high ocean and air temperatures, extreme rains, prolonged droughts, and increased wildfires - and that all happened in 2016.[1]

It's 2 years later, and it's noticeable worse.[2][3][4]

We are in this together, and we must work together to find solutions. We won't reduce our climate crisis with the 2017 PSE models that used a selected federal rule on carbon costs resulting in recommending more gas plants.

New approaches are essential, such as one proposed in the Synapse Energy Economics report submitted in the 2017 IRP process, which recommended modeling declining emissions caps[5]. PSE has the talent to find reasonable and viable paths to rapid decarbonization. That is what we expect, rather than another flawed model that may sound good, but doesn't get us where we need to go.

It should be undeniable to everyone that we are in a climate crisis. It's past time to expect others to deal with this. We need all hands on deck; we need all minds engaged.

Thank-you.

Virginia Lohr,
PSE customer (not representing any group)
lohr@turbonet.com
9514 SW Burton Drive
Vashon, WA

1 https://www.ametsoc.org/ams/index.cfm/publications/bulletin-of-the-american-meteorological-society-bams/explaining-extreme-events-from-a-climate-perspective/
2 https://www.climate.gov/news-features/understanding-climate/state-climate-highlights/2017
3 https://www.climate.gov/news-features/featured-images/influence-global-warming-us-heat-waves-may-be-felt-first-west-and
4 https://www.climate.gov/news-features/event-tracker/soggy-summer-mid-atlantic-2018
5 https://www.utc.wa.gov/_layouts/15/CasesPublicWebsite/CaseItem.aspx?item=document&id=00167&year=2016&docketNumber=160918&resultSource=&page=&query=&refiners=&isModal=&omItem=false&doItem=false

Some thoughts about your IRPAG from a customer/stakeholder

Stephanie Barbee

King County, WA

August 28, 2018

My comments refer to slide #24 in your presentation tonight, particularly to the broad blue band in your resource supply graphic that reveals strong confidence in acquiring large and unvarying amounts of "natural" gas throughout the planning period. All the other sources of energy vary, but your commitment to gas is very steady and clear.

Let's imagine for a minute that we are a family. You, PSE, are the mother, we customers are your kids, because we are dependent on you. The fossil fuel industry is a stepfather. Or a live-in boyfriend, with a good paying job. He provides 60% of our family's energy through burning coal and fracked gas. Now, you two go way back and have fun together. But this person is bad for us. He smokes in the house, exposing us to toxins and irritants. He undermines our efforts to make reasonable and fair rules. He risks your retirement and raids your children's future. This boyfriend farts methane and blames it on the dog. He is a bad neighbor. And worse. Though you don't like to think about it, he violates the Land. While he's away on business in those other states, you know in your heart that he is mining, drilling, forcing chemical cocktails deep into the ground, spilling and spoiling the land, air and water. And then walking away. Does it trouble your conscience? It troubles mine.

This boyfriend of yours, he has been a key provider for our family, so what to do? We need energy. What's to be done?

Mom! PSE, please, break up with him!! Distance yourself from carbon based fuels. It won't be easy. You are going to need a plan. You're going to need some help. Lucky for us, there are lots of creative people ready with ideas…Innovators, lawmakers, citizens, visionaries, technology experts and abundant free energy from the Sun. PSE, you don't actually need fossil fuels anymore! You have a

whole life ahead of you! A bright future in the renewable energy economy! Let us help you see it. Please.

We need this IRP to take us closer to a just, equitable, and life-sustaining future for all. Please, show us a plan that gets us to clean and carbon-free energy by 2030.

Thank you.

Submitted by email at 4:51 pm on August 28, 2018.

From:	Devon Kellogg
To:	IRP -- mail --
Subject:	Public Comment Submission from 8/28/18 Meeting
Date:	Wednesday, August 29, 2018 4:42:08 PM

Hi there,

My name is Devon Kellogg. I attended the PSE IRP Public Comment meeting in Bellevue the evening of 8/28/18. I was signed up to speak, but did not get a chance due to time constraints of the meeting. I was told I could send my "speech" to this email by 5:30pm today and it would get submitted and read. So here it is:

Good evening,

My name is Devon Kellogg. I have been a Redmond Resident and PSE Customer for over 25 years. I am also a preschool teacher, volunteer coach and a mother of two. It is on their behalf I would like to speak today about the importance of including the social costs of greenhouse gas emissions in your future planning.

This is a timely discussion considering the smoky haze that has enveloped our region. In fact, last week the Washington Post Reported that Vancover, BC had the worst air quality in the entire world. Seattle ranked #4.

The summer school students where I work were kept inside from recess, my kids' sports practices were all cancelled, and (as you can hear) my asthma was triggered, and I've been coughing and wheezing for weeks. All from simply breathing the air outside.

And as bad as it was for us, many fare far worse, loosing their homes and even their lives. Is this really the future we want for ourselves and our children?

Study after study has come out showing the enormous economic and health impacts from wildfires across the west - including thousands of premature deaths and billions of dollars per year just from the health effects of wildfire smoke alone.

And there is near unanimous consensus among experts that these wildfires are becoming more frequent and intense due to fossil fuel-driven climate change, most notably from heatwaves, drought and pest viability.

As impactful as it they are, wildfires are just one of many costly consequences of continuing to release heat-trapping gasses into our atmosphere. And according to the experts, we only have a few decades left to take action or the effects will be globally catastrophic.

As our regional power and gas supplier, PSE can and should play a key role preventing such climate effects from worsening in the future by including the full social costs of greenhouse gas emissions in the IRP.

I would also add that the worse the climate situation becomes, the more likely state and federal policy will dictate increasing renewable use. So please plan for this in your IRP as well to avoid future stranded assets. Ratepayers like me will not want to pay for your poor long-term planning in the "least cost" mix.

Thank you,

Devon Kellogg

From: Stacy Oaks [mailto:eddyssunprincess@gmail.com]
Sent: Wednesday, August 29, 2018 7:54 PM
To: Kvam, Michele
Subject: IRP Comment for Record

Hi Michele,
Nice to meet you yesterday. I wanted to submit this comment for public record in regards to the IRPAG meeting. I hope this is the correct place to send it - if not can you please pass it along & my apologies!

Whether we want to admit it or not - we are in a crisis.
The state of Washington, along with numerous cities and counties have formally acknowledged this by committing to reach our Paris Climate Accord goals, despite our president's decision to be the only nation on Earth still in denial.
It is absolutely criminal to continue building new or expanded fossil fuel infrastructure, locking us into decades of more climate destruction. We face human extinction without an immediate change in our energy trajectory. The science is available, the stakes are high and we have no time for incremental change or "bridge fuels".
The word cost is used often by PSE to justify their choices - like pushing fracked gas instead of investing in renewable energy. When we are real about the cost of using fossil fuels we have to include: the thousands that will die or have health issues each year due to global warming, the cost of all the property damage & loss of life from increasingly stronger natural disasters, the land and homes lost to sea level rise - including entire island nations. We would count each and every missing or murdered indigenous woman that disappeared near the man camps, we would count every gallon of precious drinking water forever poisoned by fracking slurry, we would count every species being pushed into extinction by our choices.
Monetary price is only one slice of the pie that makes up true "Cost". With everything at stake - money is the least important slice...if we are being honest with ourselves. Bigger bonuses for PSE executives and shareholders are not more important than leaving a livable planet for future generations. Period. If the Utilities and Transportation Commission (UTC) are serious about "prudent use of resources" it will reject any plan that is not a blueprint to a fossil fuel free portfolio. This plan should include steps towards phasing out existing "natural gas" facilities as well as abandoning any new or proposed gas projects - including the Tacoma LNG refinery.
Not in the public interest = not from public funds.

Stacy Oaks
Lifelong WA Resident, Grandmother, Water Protector & Organizer with 350 Seattle

David Perk
350 Seattle, 1919 E. Prospect St.,
Seattle, WA 98112

August 29, 2018

Michelle Kvam, IRP Stakeholder Manager, PSE
Irene Netik, Director of Energy Supply and Planning, PSE
Philiip Popoff, Manager Resource Planning, PSE

This comment contains three sections: A call for more effective modeling; additional comments on the August 28 IRPAG presentation, including three questions for which I would like answers shared with the IRP email list; and statements in support of comments made by others at the August 28 IRPAG.

More effective modeling scenarios are needed

The 2019 Integrated Resource Plan should describe the pathway to a carbon-free electric grid before the end of the planning period.

In Tuesday's IRPAG presentation, slide #5, titled "Outcomes from 1st IRPAG," the third item reads, "Retire all PSE's fossil fuel power plants by end of 2025".

After reviewing the May 30 meeting notes, and Handout 7, Action item report from May 30 IRPAG, I've found no record of a stakeholder making this comment. Please update the meeting notes or remove the reference from the Outcomes slide.

That correction is important because when one of the Technical Advisory Group stakeholders requested that the 2019 IRP deliver a roadmap for an electric generation portfolio of 100% renewable energy by 2030, PSE proposed to model 100% renewables by 2026.

I am concerned that the costs of accomplishing that scenario will lead to rate shock. And modeling rate shock will only delay the adoption of a 100% renewables portfolio.

Now that we live in an unstable climate, rapid adaptation is called for. But it must be handled in an organized and effective manner and not placed entirely on the backs of ratepayers. So 350 Seattle requests that two additional modeling efforts be undertaken.

First, a scenario that targets the 85% renewables portfolio in 2030 that was called for in the June 2018 Cadmus report for King County (see Section 4.6, Table 23, in the attached pdf, which is available from Rachel Brombaugh of King County, cc'd). That goal is aligned with the climate goals of the fourteen King County Cities Climate Collaboration. PSE plays a critical role in

achieving these goals. Moreover, modeling that target will highlight the costs and efforts needed to eliminate the last 15% of PSE's fossil portfolio, generally considered to be the most difficult to reduce.

Second, a 100% renewable electric generation portfolio by the end of the current planning cycle, 2039. This should be a baseline scenario for the 2019 IRP.

By modeling these additional scenarios the economic path forward will be clearer and more realistic than a single 2026 scenario.

Precisely how the carbon-free pathway will be accomplished is of equal importance. In their review of the 2017 IRP, Synapse Energy Economics recommended a series of declining emissions caps. I agree. Interim milestones would provide a clear basis of comparison in each of these scenarios.

August 28 IRPAG Presentation

These comments refer to the August 28 IRPAG presentation deck available on PSE's IRP page.

Slide 9, Action items from TAG meeting #1, item #1, PSE will incorporate the economics of scale of larger renewable projects in the final report:
What the economies of scale are should be shared with TAG participants before the final report.

Slide #13, WAC 480-100-238, citing "lowest reasonable cost":
Unfortunately this requirement is insufficient to meet future needs. Given the foreseen but disregarded impacts of fossil fuel use, this requirement should explicitly account for "least harm" at least cost. I recognize this language change is not within PSE's control, but it is time for PSE policy makers to use "least harm" as a guiding principle.

Slide #14, "and the cost risks associated with environmental effects including emissions of carbon dioxide":
Rather than wait for the state legislature to update the reference to carbon dioxide to include greenhouse gases more generally, PSE should explicitly acknowledge the greenhouse warming effect of methane: 87% greater than carbon dioxide for the first 20 years, and calculate cost risks accordingly, including upstream emissions for all gas resources.

Slide #14 also mentions the "energy policies of adopted by Washington state" -- should I-1631 pass in November, we expect to see it modeled as an input in the 2019 IRP.

Question: Slide #15's enumeration of inputs doesn't include Cost Risks. Is that an omission or are cost risks incorporated elsewhere in the IRP process, and if so, why?

Question: Slide #16, "If the IRP identifies a capacity, energy, or renewable resource need within three years, then PSE conducts a Resource Acquisition Process to secure the resources to meet that need."
Where can PSE's Resource Acquisition Process documentation be found?

Question: Slide #19, on load forecasting:
Given the past two summers of intensive wildfire haze in the Puget Sound area, what are PSE's forecasts for increased electrical use in summer, as air conditioners and electric air filters become more widely adopted? How much additional demand would be required for our electrical generation system to become summer peaking?

Slide #23, Planning standards:
Renewable Energy Credits should not be used as an artificial ceiling preventing an all renewables generation portfolio.

Slide #28, Comparison of electrical resource costs:
It would be helpful to see a modeling scenario that emphasizes those resources which are declining in price most rapidly.

August 28 IRPAG public comments

Many good points were raised in the public comment section of Tuesday's IRPAG and deserve repeating:

An executive listening session that focuses on policy is sorely needed and should be held in multiple locations, particularly in Tacoma.

"Normal weather" is a thing of the past. If NOAA's 30 year weather average does not include the last 7 years, PSE's load calculations will be anachronistic, not "forecasts".

PSE's continued support of Colstrip is imprudent.

The social cost of carbon is wholly different from a carbon tax. As has been noted in the first IRPAG and first TAG meetings, because the discount rate used by the federal social cost of carbon is insufficient, that calculation should be considered a base rate and additional modeling, up to $100 per ton of carbon emissions, is needed.

PSE should publicly support I-1631, particularly since its passage will enable PSE to underwrite steps toward a carbon-free generation portfolio.

Construction of the Tacoma LNG facility should be halted immediately, pending final permit approvals.

Thank you.

I look forward to observing the next TAG meeting and participating in the next IRPAG meeting.

David Perk
350 Seattle

cc Rachel Brombaugh, Energy Policy and Partnerships Specialist, King County

From: IRP -- mail --
Sent: Tuesday, September 04, 2018 2:21 PM
To: 'Devon Kellogg'
Cc: IRP -- mail --
Subject: RE: Public Comment Submission from 8/28/18 Meeting - and PSE follow-up

Devon,

Thank you again for this submittal and attending the IRPAG meeting on Wednesday August 28th . Your speech below will be captured in the meeting summary.

I would also like to provide a follow-up concerning a conservation that you had with Irena Netik, Director, Integrated Resource Planning & Analysis and Phillip Popoff, Manager, Integrated Resource Planning and Analysis on the evening of August 28th.

Irena referred to the Social Cost of Carbon in the Washington Utility Commission (UTC) acknowledgement letter to PSE's 2017 IRP. A copy of the letter is attached. Also, the report Irena mentioned that defined the Social Cost of Carbon can be found here:

https://www.epa.gov/sites/production/files/2016-12/documents/sc_co2_tsd_august_2016.pdf

Thank you again and we look forward to your continued participation in the IRP Advisory Group.

Sincerely and on behalf of Resource Planning & Analysis,

Michele

Michele Kvam
Resource Planning & Analysis
Puget Sound Energy, Inc.
10885 NE 4th Street; PSE-11S
Bellevue, Washington 98004-5591
P (425) 462-3137
F (425) 456-2481
Email michele.kvam@pse.com

Acknowledgment Letter Attachment
Puget Sound Energy's 2017 Electric and Natural Gas Integrated Resource Plan
Dockets UE-160918 and UG-160919

I. Introduction

RCW 19.280.030, WAC 480-100-238, and WAC 480-90-238 direct investor-owned electric and natural gas companies (IOUs) to develop an integrated resource plan (IRP or the Plan) every two years. The IRP must identify "the mix of energy supply resources and conservation that will meet current and future needs at the lowest reasonable cost to the utilities and its ratepayers."[1] The IRP touches every aspect of a company's operations and provides essential public participation opportunities for stakeholders to assist in the development of an effective plan. In preparing an IRP, utilities are required to consider changes and trends in energy markets, resource costs, cost of risks associated with greenhouse gas emissions, state and federal regulatory requirements, and other shifts in the policy and market landscape.[2] The statute and the Washington Utilities and Transportation Commission's (Commission) rules require that IOUs conduct a comprehensive analysis of the costs, benefits, and risks of various approaches to meeting future resource needs using commercially available information. The intent is for each regulated utility to develop a strategic approach that fits its unique situation, while minimizing risks and costs for the company and its ratepayers.

The development of Puget Sound Energy's (PSE or the Company) IRP and involvement of stakeholders and Commission staff (Staff) has been the most extensive such effort in memory. Over the course of the IRP, PSE held 16 meetings with stakeholders and the public. The Company also improved its stakeholder process by hiring an employee to manage its external communications with the advisory group. The Commission acknowledges and appreciates PSE's efforts in this IRP. We also acknowledge the stakeholders and members of the public who participated in the IRP meetings, submitted verbal and written comments, and attended the Commission's recessed open meeting. Their involvement improved the Company's final IRP and the Commission's process.

The Commission determines that Puget Sound Energy's 2017 Electric and Natural Gas IRP complies with the statute and rules governing IRPs and recommends the Company address several areas for improvement in developing its next IRP. In the following sections, we provide comments on the 2017 IRP and identify specific areas for improvement for the 2019 IRP.

II. Summary of 2017 Electric and Gas Integrated Resource Plan

a. Electric Portfolio Summary and Action Plan

[1] RCW 19.280.(9).
[2] RCW 19.280.020(11); WAC 480-100-238(2)(b).

As with the last several of its IRPs, PSE's 20-year load projections in its 2017 IRP are lower than the preceding IRP. After PSE applies demand-side resources, annual average energy demand is expected to increase at 0.4 percent annually, and peak growth at 0.6 percent per year to 5,664 MW in 2037.[3]

Figure 1: PSE 20-year electric load growth projection 2018-2037

	Annual Energy Growth	**Annual Peak Growth**
Before DSR	1.7%	1.6%
After DSR	0.4%	0.6%

Annual average energy growth is negative (-0.3 percent) for the first 10 years of the IRP, but increases to 1.1 percent per year from 2027 to 2037. Peak demand growth is also flat for the first 10 years, but ticks up to 1.1 percent in the second half of the plan.[4] As will be discussed later, the substantial increase in the latter half of the Plan is due to PSE's assumption that there is no cost-effective retrofit conservation of existing buildings beyond 10 years.

The rate of change of residential electric use per customer is negative after the application of demand-side resources (DSR), therefore, growth is expected to be driven by the increased number of customers.[5] Consistent with economic and population growth trends in the state, the Plan emphasizes that its electric growth is unevenly distributed, with nearly all of the customer growth occurring in its King County service territory.[6]

Figure 1: PSE 20-year electric load growth projection 2018-2037

	Annual Energy Growth	**Annual Peak Growth**
Before DSR	1.7%	1.6%
After DSR	0.4%	0.6%

PSE's Integrated Resource Planning Solution – its lowest-reasonable-cost portfolio – continues to rely heavily on energy efficiency and market purchases throughout the planning period.[7] Although load growth is slowing, PSE expects significant capacity needs during the 20-year period due, in part, to coal plant retirements and expiring long-term purchase power agreements (PPAs).[8]

[3] Page 5-7 of PSE's 2017 IRP.
[4] Page 5-7 of PSE's 2017 IRP.
[5] Page 5-3 of PSE's 2017 IRP.
[6] Page 5-31 of PSE's 2017 IRP.
[7] The Company does not build an 'Expected Case' or 'Preferred Portfolio' as does Avista and Pacific Power. The Company determines an 'Integrated Resource Planning Solution' as the Company's lowest reasonable cost portfolio from which it builds its Action Plan.
[8] Page 1-12 of PSE's 2017 IRP. The following are identified to be removed from the resource stack: 300 MW from Colstrip Units 1&2 in 2022, 380 MW from Centralia in 2025, 481 MW from Chelan PUD in 2031, and 370 MW from Colstrip Units 3&4 in 2035.

To meet its capacity need over the 20-year horizon, PSE plans to increase its reliance on the Mid-Columbia market hub (Mid-C) for market purchases, by redirecting another 188 MW of available transmission from its wind facilities in southeast Washington to the Mid-C.[9] With this improvement in its ability to use its existing cross-Cascade transmission capacity, the Company will have over 1600 MW of transmission available on which to schedule Mid-C market purchases for meeting peak energy needs.

The Base scenario forecasts that the Company will need 215 MW of additional peaking capacity by 2023.[10] To meet the requirements of the state Energy Independence Act, PSE expects it will need approximately 720,000 qualifying renewable energy credits by 2023, the equivalent of a 227 MW wind project or 266 MW of eastern Washington solar.[11] The Company also intends to acquire 741 MW of conservation over the 20-year period, 148 MW of demand response, and 75 MW of energy storage.

PSE's 2017 Electric Action Plan comprises the following:[12]

- Acquire 374 MW of energy efficiency by 2023.
- Issue a new demand response request for proposal (RFP) based on recent work on the prudence criteria and cost recovery mechanism.
- Install a small-scale flow battery to gain operational experience.
- Issue an all-source RFP in the first quarter of 2018 to meet its renewable and capacity need in 2022.
- Develop options to mitigate risk of relying on the market to meet energy and capacity needs.
- Continue to participate in the Energy Imbalance Market.
- Examine regional transmission needs in the 2019 IRP including re-purposing Colstrip transmission rights.

b. Natural Gas Portfolio Summary and Action Plan

The IRP identifies a natural gas shortfall beginning in the winter of 2018, and then again each year beginning in the winter of 2023.[13] To meet the short-term need in 2018, the IRP states that PSE will contract for short-term firm pipeline capacity to Sumas. Beginning in 2022, the Company will expand the Swarr propane facility.

[9] PSE has additional transmission capacity from its wind facilities in southeast Washington because the facilities have not achieved the capacity factor PSE projected at the time the facilities were built. PSE has had to reduce its projected capacity factor twice since the facilities were placed in service.
[10] Page 1-12 of PSE's 2017 IRP.
[11] Page 1-15 of PSE's 2017 IRP. PSE could also use unbundled renewable energy credits to meet some or all of its compliance obligations.
[12] Pages 1-7 – 1-10 of PSE's 2017 IRP.
[13] PSE expects the Tacoma Liquified Natural Gas (LNG) project to be completed by the 2019/2020 heating season providing capacity relief until 2023/2024.

To solve for the gas capacity shortfall, PSE modeled energy efficiency and various supply-side resources. PSE intends to acquire 14 million dekatherms per day (MDth/day) by winter of 2021 and 65 MDth/day by 2033. The IRP finds less conservation than the 2015 IRP due to lower demand forecasts, updated measure savings, and lower natural gas prices.[14] However, PSE increased its estimated achievability from 75 percent to 85 percent relative to the previous IRP. The Plan also finds the Swarr propane facility to be a least-cost resource in most scenarios because upgrading the facility is fully within PSE's ability to control and the Company has the flexibility to "fine-tune" the timing of this resource.[15] This expansion would add 30 MDth/day of capacity.

The Plan states that the Tacoma LNG facility is needed by 2021 in the high-growth scenarios, but under the Base Scenario, it is not needed until 2029. The project would add 16 MDth/day of capacity.

Finally, the Plan assumes the expansion of the Westcoast Pipeline from the Station 2 hub in Canada to the Sumas hub and the Northwest Pipeline from Sumas to PSE's service territory by 2029. The project would initially provide 61 MDth/day of capacity, increasing to 140 MDth/day by winter 2037.[16] PSE notes that this project does not require participation from any other party, unlike other pipeline alternatives.[17]

PSE's 2017 Natural Gas Action Plan includes:[18]

- Acquire 14 MDth per day of energy efficiency by 2022.
- Complete the PSE LNG peaking project by the 2019/2020 heating season.
- Maintain the ability to upgrade the Swarr propane-air injection system for the 2024/2025 heating season.

III. Comments and Modeling Improvements

PSE's electric and natural gas analysis of its resource needs over the 20-year planning horizon is generally comprehensive, and the Commission is satisfied with the scope of analysis and overall presentation.

An IRP is an iterative process in which the Company regularly updates its assumptions and responds to the external environment. The key inputs in an IRP such as load growth rate forecasts, natural gas prices, and environmental regulation risks, change from year to year. As such, out of each IRP the Commission asks the Company to consider new modeling scenarios

[14] Page 7-37 of PSE's 2017 IRP.
[15] Page 2-26 of PSE's 2017 IRP. Swarr is an extreme peaking facility that mixes propane and air in a ratio that approximates the heat content of pipeline gas.
[16] This option only evaluated an expansion of Northwest Pipeline from Sumas to PSE's service territory; it did not model an expansion on Northwest Pipeline's east-west route through the Columbia Gorge.
[17] Page 7-37 of PSE's 2017 IRP.
[18] Page 1-11 of PSE's 2017 IRP.

and sensitivities, or other improvements in its next Plan. The following section explains the topics and issues on which the Commission would like further analysis.

a. Continued Reliance on Market Purchases to Meet Peak Needs

PSE relies on nearly 1,600 MW of wholesale market purchases to meet its energy and peak capacity needs, and expects to increase that reliance in the 20-year plan.[19] Describing the risk of relying on wholesale market purchases, PSE writes that,

> While uncertainties remain, there are also reasons for increased confidence. So, while there is still some level of risk to PSE in relying on wholesale market purchases in order to meet resource need, this risk appears to be significantly reduced from the level presented in the 2015 IRP…[20]

PSE based its assessment on the updated long-term regional resource adequacy (RA) studies performed by the Northwest Power and Conservation Council (Council), the Pacific Northwest Utilities Conference Committee, and the Bonneville Power Administration conducted since the completion of the 2015 IRP. PSE is also more comfortable with its RA position than it was in the 2015 IRP because it shifted back to a 5 percent loss of load probability (LOLP) metric for capacity planning, as opposed to the Value of Lost Load approach in the previous plan.[21]

However, we are concerned that the Company's view of the reduction in risk of relying on the market for capacity at its current level may be unrealistic as part of a utility's preferred portfolio. Beginning after 2000, independent power producers added considerable generation capacity in the Northwest region that went unsubscribed and subsequently became surplus in the region. This provided utilities a temporary opportunity to pursue a least-cost strategy of reliance on the market to complete their capacity needs. The market capacity surplus is now dwindling and it does not appear that independent developers are stepping forward again to build without firm contracts. Both PSE and the Council are increasingly uncertain that there is sufficient RA in the next five years, and therefore a capacity-short position is an increasing possibility.

In demonstrating prudent utility action, PSE is responsible for considering market-volatility risks as a result of not acquiring fixed-cost generation assets or demand-side resources for meeting customer demand. PSE's 20-year resource plan does not necessarily need to show a path to closing out PSE's reliance on the market for its capacity resource needs.[22] As explained in the next section, the Company's continued improvements in its RA analysis is impressive. However, in all three of the RA studies described in the IRP, the direction of RA beyond 2021 is clear: capacity markets are likely to fall short of meeting the RA standards. Unfortunately, the

[19] Appendix G of PSE's 2017 IRP.
[20] Appendix G, p. G-4 of PSE's 2017 IRP.
[21] Page G-4 of PSE's 2017 IRP. Five percent LOLP is the planning standard used by the Northwest Power and Conservation Council.
[22] Pages 6-12, 1-9, and 2-6 of PSE's 2017 IRP.

IRP does not expressly model or address market prices that can result from a tight capacity market.[23]

Such analysis is arguably very difficult to perform in an IRP setting, but both theory and historical experience suggest that demand will be inelastic, leading to very high costs for purchasing capacity from a tight market. Without a firm analysis that can establish a reliable boundary for those potential costs, the absence of a plan for eliminating reliance on market purchases over the 20-year plan carries excessive risk. Therefore, PSE should pursue and model IRP alternatives to its historically heavy reliance on market resources to satisfy medium-term and long-term capacity needs.

b. Resource Adequacy (RA)

PSE re-examined its 2015 IRP RA analysis, moving back to the Council's 5 percent LOLP. PSE also examined two other RA metrics, the Expected Unserved Energy (EUE) resource adequacy metric, which is a quantitative measure of the magnitude of load curtailments, and the Loss of Load Expectation (LOLE) metric, also called the Loss of Load Hours (LOLH), which provides information about the duration of the curtailment events.

Each of these metrics provide unique heuristic measures of the failure to serve load. The Commission agrees with PSE's pursuit of the use of EUE and LOLE along with its use of LOLP. Though PSE and others in the industry will need to address how to balance the interpretations of the three unique measurements, the Commission recognizes PSE's leading effort to employ EUE and LOLE.

c. Colstrip Generating Station

In its 2011 Acknowledgment Letter, the Commission requested that PSE conduct a broad examination of the cost of continuing the operation of the Colstrip Generating Station over the 20-year planning horizon, including a range of anticipated costs associated with federal Environmental Protection Agency (EPA) regulations on coal-fired generation.[24] It also asked that PSE model a scenario without Colstrip that includes results showing how PSE would choose to meet its load obligations without Colstrip in its portfolio and estimates of the impact on Net Present Value (cost) of its portfolio and rates.

In its 2013 IRP, PSE ran four cases on Colstrip's environmental compliance costs.[25] PSE identified as the most likely scenario Case 2, which assumes Units 1 & 2 must comply with EPA Best Available Retrofit Technology requirements of EPA's Regional Haze Federal Implementation Plan. Under Case 2 conditions, PSE determined that all four Colstrip units

[23] The IRP uses an expansion model that adds capacity resources to prevent capacity shortages from thwarting price formation in the model.
[24] PSE's 2011 Electric and Gas Integrated Resource Plan, Dockets UE-100961 & UG-100960, Attachment: Utilities and Transportation Commission Comments.
[25] See PSE 2013 Integrated Resource Plan, Dockets UE-120767 and UG-120768, pp. 5-41 – 5-55.

would continue to run in six of its 10 scenarios including in its expected Base Case, and Units 3 & 4 continue to run in two of the remaining four.[26] In the Commission's 2013 Acknowledgment Letter, the Commission was unable to conclude that PSE's analysis demonstrated that the continued operation of Colstrip Units 1 & 2 should or should not be a component of the Selected Resource Plan.[27] Since the 2013 IRP, PSE has committed to closing Units 1 & 2 by July, 2022.[28]

In its 2017 IRP, PSE found that the continued operation of Units 3 & 4 is highly dependent upon future environmental regulations, and that a carbon policy would add to the dispatch costs of the units could make the units uneconomical. PSE conducted three sensitivities on how different retirement dates for the four units could affect decisions on what types of resources to replace Colstrip.[29]

The Company's Colstrip sensitivities are a useful exercise to inform itself, the Commission and the public of what types of resources could replace Colstrip Units 1-4 when they close, and at what cost. However, they do not address the economics of continuing to run Units 1 & 2 until July, 2022, and Units 3 & 4 indefinitely.

PSE's IRP does not identify the costs of outstanding liabilities for remediation responsibilities associated with the closure of Colstrip Units 1-4, or how those liabilities might grow with continued operation of the units. Such open-ended liabilities should be accounted for in assessing the monetary risk of operating the units within PSE's portfolio. In its 2017 general rate case, PSE agreed to a settlement to set the depreciation schedule for Units 3 & 4 to December 31, 2027, but did not commit to closing the units at that time.[30] In that case, PSE testified that "$95 million in hydro-related Treasury Grants addresses nearly all of the estimated decommissioning and remediation costs for Colstrip Units 1 & 2," and "remaining PTCs are available to fund additional decommissioning and remediation, if needed, after the $95 million in Treasury Grants has been used."[31] The Company did not estimate decommissioning and remediation costs for Units 3 & 4.

We are deeply concerned with the direct costs of continued operation of Colstrip Units 1-4 and the magnitude of economic risk of continued investment in those units. Nowhere in this IRP does PSE explicitly express or discuss risks imposed on the utility and its ratepayers, including costs of risks associated with Colstrip's fuel source, projected capital investments, and ongoing operational expenses, much less decommissioning and remediation cost assumptions. In the 2019 IRP, the Commission expects PSE to answer the following questions pertaining to Colstrip:

1. Regarding fuel source cost and risk:
    a. How dependent is Colstrip on a single-source mine for its fuel?

[26] See PSE 2013 Integrated Resource Plan, Dockets UE-120767 and UG-120768, page 5-46.
[27] PSE's 2013 Electric and Gas Integrated Resource Plan, Dockets UE-120767 and UG-120768, Attachment B: Utilities and Transportation Commission Comments.
[28] Page 1-5 of PSE's 2017 IRP.
[29] Page 4-5 of PSE's 2017 IRP. Sensitivity 1 retires Units 1 & 2 in 2018, Sensitivity 2 retires Units 3 & 4 in 2025, and Sensitivity 3 retires Units 3 & 4 in 2030.
[30] Dockets UE-170033 and UG-170034, Exh. PSE-1JT at 7:6-12.
[31] Dockets UE-170033 and UG-170034, Exh. PSE-1JT at 5:13-6:3.

   b. How well understood is the supply of coal from the Colstrip mine?
      i. What are the financial risks of the type of mining used to extract the existing coal?
      ii. As the need for fuel for Colstrip declines, how does the cost per unit of coal from the Colstrip mine increase?
      iii. What are the counter-party risks of mine operation?
      iv. What risks to coal supply and coal cost does the Joint Colstrip ownership agreement impose? How will PSE manage them?
   c. How does the fuel supply risk from Colstrip compare to that of natural gas?
2. Does PSE have an assessment of the cost related to the counter-party risk of Riverstone ceasing operation of its share of Colstrip Unit 3?[32] If not, why not?
3. Does PSE have an assessment of the cost of the counter-party risk of Riverstone being financially unable or otherwise failing to pay its share of decommissioning and remediation costs for Unit 3?
4. How are the economics of Colstrip Units 1 & 2 and Units 3 & 4 affected if natural gas prices continue to remain relatively flat?
5. What are PSE's best estimates of remediation and decommissioning costs associated with Colstrip Units 3 & 4?
6. Has PSE quantified capacity replacement costs for Colstrip Units 3 & 4 that it could use as a basis of seeking replacement capacity as an alternative to any large capital investments it faces at Colstrip?
7. What is the risk of the failure of a large cost component of Colstrip Units 3 & 4 (such as: the heat exchangers, steam turbine or drive shafts) over PSE's expected 20-year life of the plant?

The economic viability of Colstrip is dependent on the outcome of numerous future events. To properly capture the expected cost of Colstrip over the 20-year horizon of an IRP, the probability of each event needs to be assessed and the cost weighted by its probability of occurrence. This comprehensive approach produces a probability distribution for the set of possible total cost outcomes of the operation of Colstrip over the planning horizon. The Commission recognizes that the approaches to this analysis may vary; however, regardless of the approach used, each utility's resource plan must comprehensively assess all categories of cost and risk, particularly for complex resources like Colstrip Units 3 & 4 that are included in the Plan and future plans. In its next IRP, PSE should assess all categories of operational costs for Colstrip Units 1-4 and explicitly identify the range of possible costs in each category over the expected life of the units. PSE should also identify whether the costs are known or if they are open-ended. If costs are not known and measurable, the risk that such unknowns add to the utility portfolio should be identified by modeling a range of possible costs or other suitable means. As appropriate, the probability needs to be assessed and the cost weighted by its probability of occurrence. The Company's 2019 Plan should clearly and transparently identify cost data and discuss in detail the relationship between the range of these input assumptions, portfolio modeling logic, and the output of the modeling, as well as how the Company used such analysis to choose its Integrated Resource Planning Solution.

[32] Riverstone purchased the assets of Talen Energy.

d. Resource Cost Assumptions

The Company's assumptions on the cost and values of new generation resources was a major point of debate throughout the IRP process. PSE contracted Black and Veatch to provide price estimates for generic thermal resources, which showed frame peaking plants dropping 30 percent in price from the 2015 IRP.[33] PSE's own cost analysis for renewable energy generation found relatively modest price decreases. After some members of the advisory group put forth their own cost estimates using non-PSE data, and significant debate within the advisory group, PSE contracted for additional analysis for the cost of generic renewable resources from the consulting firm DNV-GL.[34] PSE took the right step in seeking additional, third-party analysis. However, some stakeholders continued to disagree with PSE's resource assumptions.

Writing on behalf of Sierra Club, Synapse Energy argued that PSE continues to overstate the costs associated with renewable resources and unnecessarily constrains the cumulative development of renewable resources in its portfolio over the planning horizon.[35] Renewable Northwest argued that PSE's assumption that utility scale solar has a capacity contribution of zero percent ignores its contribution to resource adequacy.[36] Multiple stakeholders raised concerns that PSE does not clearly define either the cost or capacity contribution estimates, or continue to express concerns over what they consider to be a lack of transparency about which cost components are included in the construction of the cost of each resource type.[37]

We recognize the Company and the stakeholders for working through this issue to the betterment of the IRP. Although not all members of the stakeholder group are satisfied with the Company's assumptions in the Plan, this type of Advisory Group discussion is necessary. Especially in IRPs that occur long after the Company has received actual cost bids in an all-source RFP, it is important for the Company to ensure it is using the best, commercially available resource costs. Fortunately, PSE will have the all-in cost estimates for many types of generators as a result of its 2018 all-sources RFP. However, if the Company relies on third-parties to provide the latest commercially available information, it is important for the Company to accurately assign generic costs, such as owners cost, to the specific technology as applicable. We also require that the Company present resource costs in a consistent reporting format, and continue to reassess its assumptions for each type of generation resource, including projected costs and year-round and peak capacity valuations.

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[33] Page 4-32 of PSE's 2017 IRP. Frame peaker NG-only 1x0 capital cost is $639/kW. In the 2015 IRP a frame peaker with oil was $879/kW.
[34] DNV-GL also provided Portland General Electric with its generic renewable resource costs in its latest IRP.
[35] Synapse Energy Economics Inc. Comments on Puget Sound Energy's 2017 Integrated Resource Plan, pp. 1-2, 6-11.
[36] Comments of Renewable Northwest, p. 5.
[37] Comments of Orion Renewable Energy Group LLC, Comments from Invenergy LLC, Comments of Renewable Northwest, Comments from the Northwest Energy Coalition, Comments from Synapse Energy Economics Inc. prepared for Sierra Club, and Comments from Climate Solutions.

e. Energize Eastside

At the request of stakeholders, PSE provided studies in support of the reliability need it identified and potential alternative solutions to the Energize Eastside Project.[38] However, we heard from Staff and some stakeholders that PSE would not discuss these studies in the advisory group, and therefore left unresolved some basic questions about the studies' assumptions, methodologies, and conclusions. For example, the Plan does not include a narrative regarding:

- The effect of the power flows due to entitlement returns on the need for the Energize Eastside Project.[39]
- The reason for, and effect on the need for the Energize Eastside Project, of modeling zero output from five of PSE's Westside thermal generation facilities.
- PSE's choice not to provide modeling data to stakeholders with Critical Energy Infrastructure Information clearance from FERC.
- Resolution of the effect of lower load assumptions on the need for Energize Eastside Project.

The IRP process is specifically structured to allow public discussion and inquiry, including a thorough examination of the analysis supporting a conclusion of need. This is an area in which we would like to see more engagement from the Company.

In describing the status of the Energize Eastside Project with respect to its 2017 IRP, PSE states, "the needs assessment and solution identification phases of this project have been completed. Currently, the project is in the route selection and permitting phases."[40] WAC 480-100-238(3)(d) requires an integrated resource plan to include "[a]n assessment of transmission system capability and reliability, to the extent such information can be provided consistent with applicable laws." The Company has an obligation to bring major transmission investments into the IRP for examination. The Company complied with the letter of the law in Chapter 8 where it provided a history of its Needs Assessment Reports. However, the Plan did not answer many questions that are needed for determining if the Company's conclusions are justified. For instance, it is still not clear if a joint utility analysis of all available transmission and potential interconnections in the Puget Sound region might solve the Energize Eastside reliability issues. Whether PSE has engaged in such analysis or discussions remains unclear and would have been better answered in the IRP.

f. Load Growth and the Effects of Conservation

PSE's forecasted increase in its annual energy and peak load growth over its 20-year planning horizon are due entirely to growth forecasted in the second half of the 20-year plan. As Staff

[38] Page 8-34 of PSE's 2017 IRP.
[39] Entitlement returns refers to the obligation of the United States to return a certain amount of power back to Canada as part of the Columbia River Treaty.
[40] Page 8-30 of PSE's 2017 IRP.

notes in its comments, historically, PSE's load forecasts have been overly optimistic. This was highlighted in a study by the Lawrence Berkeley National Laboratory of utility average annual growth rate of energy (AAGR).[41]

Figure 2: PSE's projected and actual average annual growth rate of electric energy

Period	PSE Projected AAGR	PSE Actual AAGR
2006-2014	1.75%	-0.19%
2012-2014	1.90%	-1.19%

The 2017 IRP projects flat to negative annual growth rates for the first 10 years of the Plan when there is projected aggressive energy conservation.[42] PSE models the first 10 years of conservation by applying 20 years of retrofit conservation measures from the conservation potential assessment (CPA) into the first 10 years of the IRP.[43] This and prior IRPs have shown the advantages of this compressed conservation schedule as it provides both a more cost-effective conservation portfolio and a reduction in PSE's revenue requirement. The acceleration of conservation is not unreasonable because the CPA relies on average regional conservation uptake rates that are normally exceeded by PSE's conservation performance. Furthermore, PSE has a history of aggressive conservation and the ability to achieve its targets has been demonstrated in every biennial conservation target to date.

However, the only conservation remaining in PSE's IRP model in years 11 through 20 are measures that are replaced on "burn-out" or new construction, with zero contributions from retrofit conservation measures. This lack of any retrofit conservation in the later years significantly affects the energy demand and therefore the projected need for new resources beyond year 10. PSE makes the same assumption for its natural gas demand forecasts and retrofit conservation. We agree with Staff's comments that PSE should assume in years 11 through 20 that a reasonable level of emerging retrofit conservation measures will become available in the market at cost-effective rates even though they cannot be accurately identified or predicted now.[44] This has been the experience in the region for more than three decades.

g. Greenhouse Gas Regulation and Carbon Price

Both State statute and Commission rule require an electric utility's expected case to represent the lowest reasonable cost, which includes "public policies regarding resource preference adopted by Washington state or the federal government, and the cost of risks associated with environmental effects including emissions of carbon dioxide."[45] That is, the Company must consider both known regulatory costs and the risk of future costs.

[41] Laurence Berkeley National Lab, "Load Forecasting in Electric Utility Integrated Resource Planning," October 2016, p. 25. https://emp.lbl.gov/publications/load-forecasting-electric-utility
[42] Page 5-8 of PSE's 2017 IRP.
[43] Appendix J of the IRP, Conservation Potential Assessment, pp. 16 and 45.
[44] Dockets UE-160918 and UG-160919 Staff Comments on PSE's 2017 Electric and Natural Gas IRP, pp. 9-10.
[45] WAC 480-100-238(2)(b).

Since the 2015 IRP, there have been significant changes to greenhouse gas emissions regulations, including increases to the renewable portfolio standards in California and Oregon, possible repeal and replacement of the Clean Power Plan (CPP), the implementation of Washington's Clean Air Rule (CAR), and now the rule's legal ambiguity. Despite the uncertainty surrounding the CPP and the CAR, there continues to be considerable legislative and regulatory risk associated with greenhouse gas emissions. In the last two years at the Washington State legislature, more than a dozen bills were introduced that would impose a cost on greenhouse gas emissions, or place limits on emissions.[46] Voters rejected a carbon tax at the ballot in 2016,[47] but another initiative has been filed, which may appear on the ballot in November 2018.[48] Additionally, Washington state and the federal government are in litigation by parties seeking regulation of the impacts of fossil fuels.[49] Local governments throughout PSE's service territory have established public policies to address climate change through aggressive greenhouse gas reduction goals.[50] Dozens of citizens testified concerning PSE's IRP at the Commission's public hearing arguing that their local public policies should be more fully recognized in PSE's next IRP.

Public policy is driving continued uncertainties in carbon policy, which exemplify the shifting regulatory terrain challenging the Company's planning efforts. In this environment, it is imperative that utility planners recognize the risks and uncertainties associated with greenhouse gas emissions and identify a reasonable, cost-effective approach to addressing them.

In its Base Scenario, PSE models the CAR regulations applying to both electric and gas utilities, the CPP across the Western Interconnection, and in-state resources transitioning from CAR to the CPP in 2022.[51] Both the CAR and CPP only applied to combined-cycle combustion turbines (CCCTs) and not to natural gas peaking plants. PSE concludes that the implied cost of carbon regulation is $27/metric ton. PSE runs seven Base Case Scenarios with different carbon regulations in its IRP, described as Scenarios 1, 9-14.[52]

The IRP is not clear on which set of carbon regulations is informing the Company's electric

[46] *See*, e.g. HB 1144, HB 1155, HB 1646, HB 2230, HB 2839, SHB 2995, SB 5127, SB 5385, SB 5509, SB 5930, SB 6096, SB 6203, SB 6335, and SB 6629.
[47] Washington Carbon Emission Tax and Sales Tax Reduction, Initiative 732.
[48] Seattle Times, "New Washington initiative would put fee on carbon emissions", March 2, 2018. https://www.seattletimes.com/seattle-news/environment/new-washington-initiative-would-put-fee-on-carbon-emissions/.
[49] Associated Press, "Activists Sue Washington State for Tougher Climate Policy", February 16, 2018. https://www.usnews.com/news/best-states/washington/articles/2018-02-16/activists-sue-washington-state-for-tougher-climate-policym. , and Bloomberg, "Teenagers Defeat Trump's Move to Kill Climate Change Lawsuit", March 7, 2018. https://www.bloomberg.com/news/articles/2018-03-07/youths-defeat-trump-s-move-to-kill-climate-change-lawsuit.
[50] *See* Whatcom County, http://www.whatcomcounty.us/documentcenter/view/31641; Pierce County, http://www.co.pierce.wa.us/5558/Climate-Change-Resilience; King County, https://www.kingcounty.gov/services/environment/climate/strategies/strategic-climate-action-plan.aspx; and Thurston County, http://www.co.thurston.wa.us/planning/climate/climate_program.htm
[51] Page 4-3 of PSE's 2017 IRP.
[52] Page 4-3 of PSE's 2017 IRP.

resource action plan. Although for most of the Action Plan PSE appears to be using the carbon regulation in Base Case 1, which applies a carbon price to CCCTs and not peakers, it also states that it intends to acquire demand response using results from the comparison between Scenarios 9 and 14, which apply no carbon price and a carbon price to all thermal plants.[53] We are concerned with the lack of clarity in the Plan regarding how PSE used the Scenarios to decide its Integrated Resource Planning Solution.

RCW 19.280.030(f) requires utilities to prepare a long term plan that identifies the near term and future needs at the lowest reasonable cost and risk to the utility and its ratepayers. The term lowest reasonable cost means the utility must consider "the risks imposed on the utility and its ratepayers, public policies regarding resource preference adopted by Washington state or the federal government, and the cost of risks associated with environmental effects including emissions of carbon dioxide."[54]

By only modelling existing state regulation in its preferred portfolio, the Company's price of carbon does not consider the complete risk of additional regulation and, as such, risks not meeting statutory requirements. In future IRPs, PSE should incorporate the cost of risk of future greenhouse gas regulation in addition to known regulations when it develops its Integrated Resource Planning Solution. This cost estimate should come from a comprehensive, peer-reviewed estimate of the monetary cost of climate change damages, produced by a reputable organization. We suggest using the Interagency Working Group on Social Cost of Greenhouse Gases estimate with a three percent discount rate.[55] PSE should also continue to model other higher and lower cost estimates to understand how the resource portfolio changes based on these costs.[56]

h. Modelling Greenhouse Gas Abatement Costs

As a condition of extending the Company's IRP submittal due date, the Commission approved PSE's proposal to model the cost of available greenhouse gas abatement options.[57] Through the adoption of the Clean Air Rule, and numerous policy level proposals at the legislature, it is likely that utilities will be required to lower emissions from utility operation. A marginal abatement cost curve (MACC) is a tool that helps identify the lowest-cost options for reducing greenhouse gases.

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[53] Scenario 9 has no carbon price on any resource. Scenario 14 applies a carbon price to all resources.
[54] RCW 19.280.020(11).
[55] *See* Technical Support Document:-Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866- Interagency Working Group on Social Cost of Greenhouse Gases, United States Government. August, 2016. https://www.epa.gov/sites/production/files/2016-12/documents/sc_co2_tsd_august_2016.pdf.
[56] For example, for complying with Washington state Executive Order 14-04, the Washington State Energy Office recommends state agencies use the Interagency Working Group on Social Cost of Greenhouse Gases estimate with a 2.5 percent discount rate.
[57] Dockets UE-160918 & UG-160919, Order 01, ¶5.

We applaud PSE for being the first investor-owned utility in Washington to develop and publish a MACC in its IRP. It is important for policymakers to have this type of information available as they continue to consider policy options to lower greenhouse gas emissions. As Commission Staff states in its comments, there are ways for PSE to improve upon its MACC.[58] At this time, the MACC is best at ranking resource choices that best reduce emissions rather than as a source for the actual dollar impact. We expect that this type of information will be highly sought after by policymakers, and we urge PSE to continue working with Commission Staff, stakeholders, and academic experts to refine its MACC.

i. *Conservation*

In all 14 scenarios in PSE's IRP, the Company expects to purchase the same quantity of conservation regardless of the other inputs, such as low or high natural gas prices, or the application of a carbon tax.[59] PSE's analysis in Chapter 6 also shows that a lower discount rate for residential conservation does not have a material impact on the amount of conservation purchased. Both of these outcomes seem implausible.

In its comments, Staff recommends that PSE create smaller electric conservation bundles particularly around anticipated cost-effectiveness price points for smaller groups of individual measures. Alternatively, Staff recommends that PSE model individual measures separately to determine more accurately the amount of cost-effective conservation available. Finally, Staff recommends that PSE examine the effect of a lower discount rate for residential conservation in the 2019 IRP.[60]

The Company should work with Staff, its Conservation Resources Advisory Group, and the Council to refine its conservation bundling. The Company should also use a lower discount rate for residential conservation in the Base Case as it is a more accurate representation of the opportunity cost of capital and the risk of the investment for the customers who are choosing to purchase energy efficiency.

j. Gas Peak Day Load Forecast

PSE design peak day used in this plan is a 52 heating degree-day, which equates to 13 degrees Fahrenheit average temperature for the day.[61] PSE adopted this standard in its 2005 Least Cost

[58] Dockets UE-160918 and UG-160919 Staff Comments on PSE's 2017 Electric and Natural Gas IRP, pp. 13-14.
[59] Page 2-7, figure 2-4 of PSE's 2017 IRP.
[60] Docket UG-121207, Policy Statement on the Evaluation of the Cost-Effectiveness of Natural Gas Conservation Programs, "For residential participants, the upfront costs are often small enough so as not to require long-term financing. Accordingly, residential programs evaluated under the TRC should use a discount rate reflective of minimal financing needs and low risk. We determine that the interest rate of U.S. Treasury notes is a reasonable indicator of low-risk investments."
[61] IRP Appendix E, E-12.

Plan, which was the forerunner to the IRP. Staff recommends that PSE consider revisiting its peak gas day standard in the next IRP to see if it needs to be updated.[62]

k. Tacoma LNG facility

PSE's second natural gas Action Plan Item is to complete the Tacoma LNG facility. PSE assumes that the Tacoma LNG facility will be completed and in operation prior to the 2019 winter season and may be needed to provide gas to meet core customer peak needs as soon as the 2021 winter season. However, even at this later stage in the project's development, the project has ongoing and potentially significant permitting issues.[63] Given that the plant is not completed or fully permitted, we agree with Staff that the Company's assumption that a not-yet-operational resource will be available comes with some significant risk to the Company's gas supply for core customers. PSE's next IRP must address what the Company will do in the event the LNG plant or pipeline upgrades are significantly delayed or cancelled.

l. Stakeholder process

As this commission has noticed, PSE's IRP meetings and presentations have increasingly attracted scrutiny from the public, environmental advocacy groups, and vendors. This has put additional stakeholder engagement pressure on PSE's IRP team. While we are aware of stakeholder complaints around the discussions of major transmission and distribution planning, we believe the Company adeptly managed its stakeholder process overall. In addition to hiring a facilitator to moderate advisory group meetings, midway through this IRP process PSE hired an internal process manager to facilitate the interaction between the Company and the stakeholders. We heard from our Staff and the stakeholders that the additional hire greatly improved the process. We applaud PSE for recognizing an issue and moving to remediate it mid-cycle.

IV. Conclusion

The Commission acknowledges that Puget Sound Energy's 2017 Electric and Natural Gas Integrated Resource Plan complies with RCW 19.280.030, WAC 480-100-238, and WAC 480-90-238. The Commission expects PSE to follow the recommendations outlined in this letter as it develops future IRPs.

V. Separate Statement of Commissioner Balasbas on Part III g.

I agree with my colleagues that in future IRPs, PSE should incorporate the cost of risk of future greenhouse gas regulation in addition to known regulations in its Integrated Resource Planning Solution (i.e. lowest reasonable cost portfolio). However, for the reasons outlined below, I

[62] Dockets UE-160918 and UG-160919 Staff Comments on PSE's 2017 Electric and Natural Gas IRP, p. 18.
[63] Puget Sound Clean Air Agency, "Current Projects: Puget Sound Energy - LNG Facility Tacoma." http://www.pscleanair.org/460/Current-Permitting-Projects.

respectfully disagree with my colleague's expectation that PSE use in its lowest reasonable cost portfolio the social cost of carbon as the proxy for future greenhouse gas regulation.

The 2018 legislature considered, but did not take final action on, House Bill No. 2839 and Senate Bill No. 6424. These bills, among other provisions, amended Commission statutes to require use of a "greenhouse gas planning adder" when evaluating integrated resource plans as well as intermediate-term and long-term resource options selected by electrical and gas companies under Commission jurisdiction.[64] The greenhouse gas planning adder can also be referred to as the social cost of carbon. The legislature's mere consideration of this provision indicates there is not clear authorization in current statute for the Commission to require use of the social cost of carbon in IRPs.

The expectation for PSE to use the social cost of carbon in its preferred portfolio is a clear statement that the 2018 legislation was irrelevant. I strongly disagree and would instead defer to the legislature's judgment of the Commission's statutory authority.

When commenting on IRPs, it is appropriate for the Commission to request scenarios using specific assumptions. However, I do not believe the Commission should mandate use of specific assumptions in the ***utility's*** preferred portfolio. My preference would have been to ask PSE to model a separate scenario in its 2019 IRP that uses the social cost of carbon. Then PSE can decide whether that model outcome should be used in its lowest reasonable cost portfolio.

Finally, I disagree with my colleagues mandating the use of the social cost of carbon to represent the "lowest reasonable cost" portfolio. As the Federal Energy Regulatory Commission recently stated in an order, "Without complete information, an analysis using the Social Cost of Carbon calculations would necessarily be based on multiple assumptions, producing misleading results."[65] While IRPs are by necessity assumption driven, I am concerned that requiring use of a speculative tool to choose a preferred portfolio could lead to higher than necessary rates for utility customers.

[64] ESHB 2839, Section 3
[65] FERC Docket Nos. CP14-554-002, CP15-16-003, CP15-17-002 Order on Remand Reinstating Certificate and Abandonment Authorization, ¶ 41 (Issued March 14, 2018)