From:	Amy Wheeless
To:	UTC DL Records Center
Cc:	Nightingale, David (UTC); Kvam, Michele; Joni Bosh
Subject:	Dockets No. UE-160918 and UG-160919, Comments from NWEC on PSE IRP
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Mr. King,

Please find attached comments, in PDF and word, on behalf of the NW Energy Coalition regarding Docket No. UE-160918 and UG-160919, Puget Sound Energy's Integrated Resource Plan. Please accept our apologies for the slight delay on these comments and let us know if you have any questions,

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February 22, 2018

Steven V. King
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Subject: Comments of the NW Energy Coalition regarding Puget Sound Energy's 2017 Integrated Resource Plan, Dockets No. UE-160918 and UG-160919

The NW Energy Coalition ("the Coalition" or NWEC) appreciates the opportunity to comment on Puget Sound Energy's (PSE or "the Company") 2017 Integrated Resource Plan (IRP) in response to the Commission's notice dated November 21, 2017 and the Utilities and Transportation Commission's (UTC or Commission) notice of comment extension dated January 17, 2018.

NWEC is a non-profit organization whose primary purpose is to promote a clean, affordable, and equitable energy future. NWEC provides technical and policy leadership on energy issues in this region, and seeks to promote the development of renewable energy, energy conservation, and affordable energy services, working with utilities and others to achieve these goals.

Overall Comments[1]

NWEC notes that the methodologies in this IRP are more consistent with regional approaches than was the case with the 2015 IRP, and appreciates that PSE did additional study and modeling to review assumptions. We also note that PSE requested stakeholder feedback on the IRP process after the final 2017 IRP was submitted to the Commission and appreciate that we were able to offer recommendations on how to improve the materials, which we hope will be incorporated and lead to more clarity in future reports.

This IRP confirmed our comments on the 2015 IRP—without the pressure of near-term capacity or energy shortfalls, PSE has the time to implement creative, strategic options that can help it better cope with not only low growth in energy and capacity needs, but the ever-increasing necessity to reduce the threats posed by climate disruption and transition to a more flexible, integrated system.

However, while energy storage and demand response (DR) resources can help push PSE's need for capacity resources out eight years, to at least 2025, the lack of pressing needs should not allow complacency. We encourage PSE to accelerate efforts to aggressively analyze and, where possible, implement combinations of renewable energy (RE) and additional DR, storage and other demand-side resources (DSR), along with new approaches to increased customer and system efficiency. Where transmission, or the lack thereof, appears to block RE, PSE should actively address those shortcomings.

NWEC is optimistic that the continuing decline in RE, DR, and storage costs as well as creative approaches to implementing energy efficiency (EE) will help defer or eliminate the need for new fossil

[1] Unless otherwise noted or implied, NWEC is commenting on PSE's electric integrated resource plan.

fueled resources far beyond 2024, a view shared by PSE, as the IRP finds that those resources and measures will

> "…push fossil fuel peaking plant additions out into the realm of hypothetical resources. The further into the future that the need for such plants can be pushed, the better the chances are that technological innovations will reduce the relative cost of energy storage, conservation and demand response, such that development of new dual-fuel peaker plants will continually be pushed into the future. And, as the need for new resources gets pushed out, it gives the region more time to continue heavy investments in conservation, which will continue to improve the reliability of market purchases."[2]

Action Plan Recommendations

NWEC acknowledges, as PSE notes, that the resource plan is not an action plan, but that it informs the near-term action plan. NWEC provides the following comments and recommendations on the near-term action plan.

1. Acquire Energy Efficiency: As in the past, PSE plans to front-load efficiency measures, which leads to more savings earlier in the planning time frame. PSE has long been in leader amongst utilities in Washington state on EE. A key step to accelerate the acquisition of conservation resources is to aggressively pilot and expand whole building metered savings programs. PSE is on the cusp of launching its pilot, and NWEC looks forward to the results and further work in this area.
2. Demand Response: NWEC strongly urges both the Commission and PSE to clarify the policy definitions as expeditiously as possible, so a robust DR program can be underway well before we reach a capacity point that requires some sort of response in 2024. For the last RFP, NWEC had advocated for an open-ended RFP, to allow bidders to be as creative as possible, but the actual two bid structure was very limiting. We would hope the next round of RFPs will be open and widely distributed.
3. Energy Storage: The structure of an IRP has an unfortunate tendency to silo various resources, or to limit the consideration of the values a resource offers to just one of two values. We think that is the case with storage and with storage combined with RE. The plan for storage is disappointing and severely limited. The Commission must work with PSE to achieve more comprehensive energy storage analysis and more installations. Most important, PSE must exhaustively assess storage and complementary resources, particularly wind and both utility-scale and distributed solar.
4. Supply Side Resources: While there are statutory timelines for issuing an RFP after an IRP has been acknowledged, the Coalition wonders if all the policy issues around DR described in the action plan will be resolved by the time an all-source RFP is issued. If there are two RFPs envisioned in this IRP, one for "All Sources" and another for "DR", then timing becomes extremely important. And while additional hydro resources are not specifically mentioned, they should also be considered as part of the energy and capacity mix when acquiring additional short- and mid-term contracts.

[2] Page 2-3, *2017 PSE Integrated Resource Plan*.

An all-source RFP should not exclude any resource out of hand at the beginning of the process, but encourage the submission of proposals that combine or aggregate resources (wind with storage, for example) and that recognize more than one value of a resource (storage offers multiple values, from minimizing peaks to voltage regulation; isolating and analyzing one value is not the best approach to evaluating any resource). Stacked or bundled resources may perform as well as, and at less cost than, a single resource to meet peak demands. An open and wide-ranging RFP should be able to help resolve many questions.

5. Develop Options to Mitigate Risk of Market Reliance: Developing options to ensure against market risk should not limited to fossil resource development. In the IRP Advisory Group meetings, PSE explained that this action referred to natural gas resources and that they had the land and permits in hand to build new peakers, if warranted, in about two years. That same sort of readiness needs to be built up for storage, DR, and RE options as well. This option should not contradict the intentions stated by PSE in the introduction to the IRP—that DR, EE, RE and other integrated resources will push any new fossil fueled generators so far out into the future that they are not constructed.
6. Energy Imbalance Market: We support PSE's involvement in the Western EIM. As the California ISO plans to expand the range of the Western EIM, we encourage PSE to participate in the development effort and to assess the potential for system benefits in the next IRP.
7. Regional Transmission: We support PSE's coordination with other stakeholders to study the alternatives for re-purposing transmission used for Colstrip 1 & 2 as these units are retired and in beginning to coordinate with other utilities and transmission providers to understand alternatives for re-purposing transmission from Colstrip 3 & 4. We hope this work will prepare PSE to fully utilize transmission assets when the plants retire, especially in the event that plants retire earlier than currently planned.

Resource Plan Recommendations

Below is a summary of NWEC's major recommendations related to PSE's IRP and Resource Plan. On the following pages, we provide detail and context around these recommendations. NWEC appreciates the opportunity to participate in PSE's IRP stakeholder process as well as the opportunity to present our recommendations to the Commission. Thank you for your attention to our comments.

NWEC recommends that UTC require PSE to:

- Use a social cost of carbon when evaluating resources in its IRP. (Page 5)
- Present resource costs in a consistent reporting format; and clarify the definition of "owner's cost" and apply it with appropriate adjustments for each resource type or use a different method to determine overall costs. (Page 11).
- Improve the methodology around capturing emerging technologies in the Conservation Potential Assessment (Page 12)

For its next IRP, NWEC recommends that PSE take the following actions.

- When considering options to fill short- and mid-term needs, PSE should more closely evaluate contracts for available hydroelectric generation in the region. (Page 5)

- PSE should more fully explain the justification that leads to different resource costs used in the modeling, especially when costing assumptions are substantially different from regional bodies and nearby utilities.
    - Natural gas prices are modeled lower than in the Northwest Power & Conservation Council (NWPCC)'s Seventh Power Plan; NWEC recommends PSE to model different prices for natural gas, including higher prices given the historic volatility of natural gas prices. (Page 7)
    - Natural gas peaker plant pricing dropped substantially compared to PSE's 2015 IRP. NWEC questions this price drop and is concerned that the price does not reflect the true costs of having these resources on PSE's system. NWEC believes the Commission has the authority to require analyses that consider long-term, least reasonable risks, costs, and measures to protect customers and reduce costs. (Page 8)
    - Utility-scale solar photovoltaic (PV) and wind is priced higher in this IRP than recent experience and data would expect. In the next IRP, NWEC recommends PSE evaluate the full experience and data on these resources, including how they can be combined effectively with storage. (Page 8)
- For assessing conservation potential in PSE's service territory, NWEC recommends that PSE evaluate and implement best practices of other utilities so that PSE can continue improving how it models its conservation acquisition and its value to the system. (Page 12)
- PSE and the Commission should work swiftly to resolve policy barriers to acquiring DR resources across all customer segments. (Page 12)
- Transportation electrification will become increasingly important as part of PSE's load, but it is not modeled as part of the base demand forecast in this IRP. NWEC recommends that PSE evaluate different ways of modeling electric vehicle growth and demand on the system for future IRPs. (Page 13)
- As the grid gets smarter and more distributed, deeper study will be needed to assess how the whole system is integrated together, not just its demand- and supply-side resources. NWEC recommends that the next integrated resource plan should really be an integrated *system* plan that incorporates data and insights from and is fully transparent about transmission and distribution planning. (Page 13)
- NWEC recommends that PSE update its climate data assumptions to better capture how climate change is expected to alter demand on its system. (Page 14)

Greenhouse Gas Emissions Costs

NWEC agrees with PSE that, even if the Clean Air Rule (CAR) and Clean Power Plan (CPP) are not enacted, some form of greenhouse gas or carbon regulation will be enacted and that it will happen earlier, rather than later, within the planning time period.[3] To reduce the rate risk to customers from stranded costs resulting from the projected construction of natural gas peaking plants or other fossil fueled plants in the 2020s that might be subject to early closure due to those regulations, the Commission should require an estimate of greenhouse gas emissions and related externalized costs from all generation resources over the lifetime of those resources, including peaking plants, going forward. We would recommend the utilities use the same social cost of carbon (SCC) as the state employs when conducting emissions analyses of various proposals.[4]

Without an even-handed analysis of the long-term costs of various fuels and the recognition of the value of early action to reduce climate changing emissions, comparisons between alternative generating resources will be misleading. As PSE noted in the case of CPP regulation, "…the IRP analysis indicates that CPP rules may distort the value of peaking plants, making them appear more economic than energy storage."[5] The methodology used to apply life-time carbon and greenhouse gas costs to peaking plants should be approved by the Commission. (See further comments under the costs of resources below).

NWEC appreciates the work and consideration that PSE put into the carbon emission abatement study that was recently released and we are encouraged by the Company's attention to the problem of GHG emissions. We look forward to working with PSE to incorporate elements from this study directly into the next IRP.

Modeling Market Purchases

The IRP asserts that, under the CAR, it may appear that PSE's emissions would go down, but PSE's highly efficient baseload gas plants would ramp down and other, less efficient gas plants in the WECC would ramp up, for a net increase in carbon emissions[6] in the region until 2035. This implies that PSE would go out-of-state to purchase possibly "dirtier", but less costly, thermal resources, or that customers to whom they are now selling energy from thermal resources would have to find other sources in the WECC region that do not run as cleanly as the Washington-based thermal resources.[7] Figure 6-8 shows

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[3] Page 1-4, page 4-15, *Ibid.*

[4] Washington State Department of Commerce. "Washington State Energy Office Recommendation for Standardizing the Social Cost of Carbon When Used for Public Decision-Making Processes." September 29, 2014. http://www.commerce.wa.gov/wp-content/uploads/2015/11/Energy-EV-Planning-Social-Cost-of-Carbon-Sept-2014.pdf

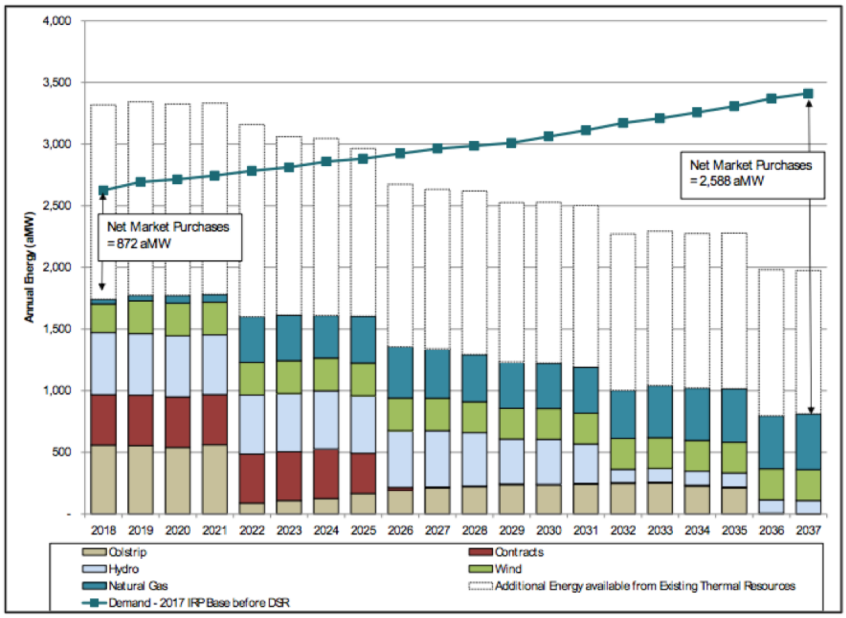
[5] Page 1-4, *Ibid*.

[6] Page 6-36, *Ibid*.

[7] Page 6-13, *Ibid*. (Emphasis Added) "Unlike utilities in the region that are heavily dependent on hydro, PSE has thermal resources that can be used to generate electricity if needed. In fact, **PSE could generate significantly more energy than needed to meet our load on an average monthly or annual basis,** but it is often more cost effective to purchase wholesale market energy than to run our high-variable cost thermal resources. We do not constrain (or force) the model to dispatch resources that are not economical; if it is less expensive to buy power than to dispatch a generator, the model will choose to buy power in the market. Similarly, if a zero (or negative) marginal cost resource like wind is available, PSE's models will displace higher-cost market purchases and use the wind to meet the energy need."

existing PSE resources that are presently displaced by market purchases. The white bar at the top of each column represents the thermal resources owned by PSE, but not dispatched to PSE customers due to being more expensive than market alternatives.

Figure 6-8: Annual Energy Position
Resource Economic Dispatch from Base Scenario



Yet the base scenario shows almost a 50% drop in emissions by 2022 due simply to the closure of Colstrip 1 & 2[8,9] and by "...the assumed implementation of a WECC-wide carbon price on coal and baseload gas plants, which significantly curtails the economic dispatch of Colstrip 3 & 4."[10]

To prevent the gradual increase in emissions projected due to the modeled increasing use of coal from Colstrip 3 & 4 until closure (2035 in the IRP) and increased reliance on gas plants, both combined combustion and peakers, PSE should be looking at acquiring more hydroelectric power, from BPA and other public generating pools and integrating wind, solar, and storage to replace natural gas facilities that will then be shuttered. By dispatching on only a lowest cost for peak demand basis, more flexible options are eliminated, such as renewables, hydro storage, and other non-wires approaches.

Given current information, PSE is tentatively projecting the construction of almost 2000 MW of new gas by 2037, in contrast to the projections in the Northwest Power & Conservation Council's (NWPCC) Seventh Power Plan (Seventh Plan) that forecast less than that amount for the entire region by 2035.[11] With discrepancies as large as this, it is critical that PSE explain fully how they justify that amount of new

[8] Page 6-37, *Ibid*.
[9] Figure 6-17, *PSE's CO2 Emissions for the Resource Plan Forecast in the Base Scenario*. *Ibid*.
[10] Page 1-21, *Ibid*.
[11] NWPCC Seventh Power Plan, Chapter 1: Executive Summary, page 1-2.
https://www.nwcouncil.org/media/7149937/7thplanfinal_chap01_execsummary.pdf

construction compared to the region. Before any construction is undertaken, PSE should exhaust every other clean and flexible demand side or supply side (renewable or hydro) resource. For example, as we highlighted in comments on PSE's 2015 IRP, the Seventh Plan recognizes the value of surplus generation in the region and we urge PSE to better evaluate these options:

> "*Several of the scenario analyses conducted for the [Seventh Power] Plan highlight the benefit of using surplus generation for in-region energy and capacity needs; it avoids the need to build new resources and lowers total system cost. Under a wide range of future conditions, the least-cost resource strategy depends on the Bonneville Power Administration selling surplus generation in-region.*
>
> *While by law regional utilities have first claim to Bonneville's surplus generation, the region's investor-owned utilities ultimately compete with out-of-region buyers for that generation... IOU access to Bonneville's surplus peaking capacity is limited to seven-year contracts. If the IOUs and Bonneville do not enter into contracts for energy or capacity, it's likely that new generation will need to be built, despite the availability of energy and capacity resources from Bonneville to serve in-region demand."*[12]

Resource Cost Assumptions

Throughout the IRP Advisory Group process, NWEC questioned many of the resource cost assumptions that seemed to result in overselecting natural gas and underselecting cleaner resources.

Natural Gas Costs

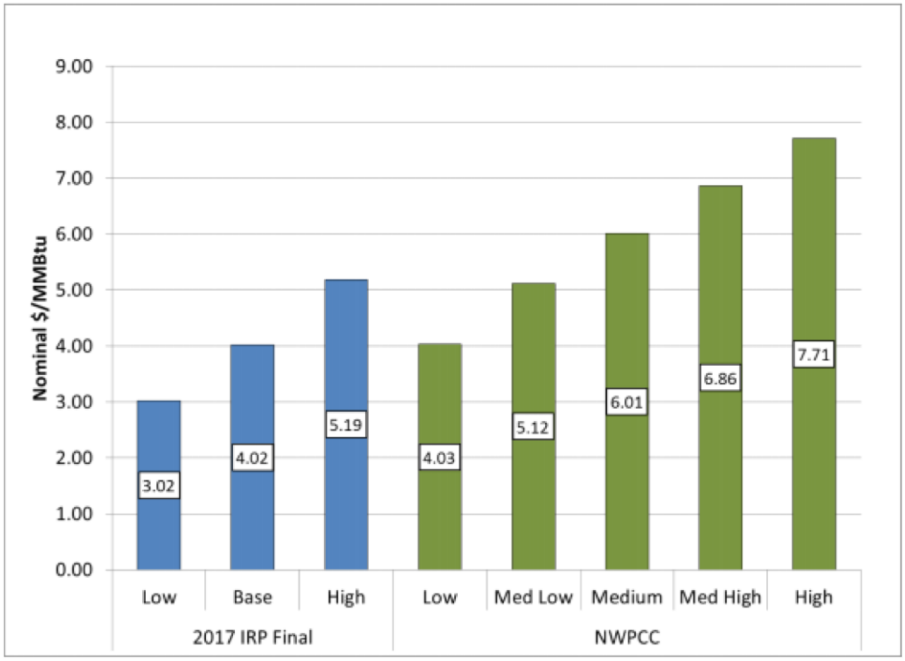
Figure 4-10, duplicated below, illustrates the difference between PSE IRP forecast natural gas prices compared to Seventh Plan gas prices. PSE chose a lower range of levelized gas prices for this analysis, without explanation in the narrative of the IRP. The highest levelized natural gas price PSE used in modeling ($5.19/MMBtu) is only five cents lower than the second to lowest Med-Low NWPCC price ($5.12/MMBtu) and 32% less than the NWPCC's high gas price ($7.71/MMBtu).

Looking at the history of natural gas price volatility over the past 20 years, the model does not capture even a hint of that historic risk when three-month averages of forward markets are used to forecast prices.

Using a low natural gas price impacts the value of conservation measures, as explained on page 4-20 of the IRP, and causes the model to over-select natural gas over other, cleaner options. In the next IRP, we would urge PSE to use an additional forecast high gas price, perhaps the adjusted nominal price used in the Seventh Plan, to test and see if more EE can be implemented, further delaying the need for new fossil fueled resources.

[12] Page 1-13, *Ibid.*

Figure 4-10: PSE 2017 IRP Gas Prices Compared to NPCC Seventh Power Plan Gas Prices (adjusted to nominal values)



Natural Gas Frame Peakers Cost

NWEC continues to question the spectacular drop in costs for a frame peaker with oil backup; the capital costs dropped 29% in just two years, from $896/kW in the 2015 IRP to $634/kW in the 2017 IRP.[13] The question we ask is, no matter the price, do we want these generators in our system ten years from now?

This IRP underlines yet again that it is not merely the direct price of a fuel, but it is implied lifetime costs and externalities must be factored in to protect customers from future economic risks. NWEC believes the Commission has the authority to require analyses that consider long term, least reasonable risk costs and measures to protect customers and reduce costs.

Renewable Cost Assumptions

At NWEC request, PSE did additional study and analysis around the peak value of Montana wind generation and develop data regarding renewable resources. NWEC appreciates PSE taking this the additional time and study that PSE undertook to better understand available renewables' costs; we think that the resulting IRP is stronger for this additional work. However, as detailed below, NWEC finds that the resulting costs are still higher than other utility experience would indicate. For its next IRP, NWEC recommends that PSE take the following steps:

- Review the most recent solar PV cost data, as well as experience curve assessments;
- Include storage resources in the costing and benefits of solar; and

[13] Page D-33, *2017 PSE Integrated Resource Plan*.

- Incorporate current research on Montana wind to better assess how this resource can serve PSE customers.

In addition, PSE should evaluate the full suite of resources not just on whether they meet RPS requirements, but also whether they can provide capacity and energy value and ancillary services in a way that can displace other resources, outside and additional to the requirements of the renewable portfolio standard.

Utility Solar PV Costing

PSE's finding that eastern Washington utility-scale solar PV is now the most cost-effective of potential new renewable resources is an important and welcome development. At the same time, however, the IRP values for solar costs remain substantially above currently indicated levels, and future projected costs are far above reasonable values. We believe a more realistic approach will substantially boost the prospects for solar PV going forward.

PSE lists the current cost of solar PV at $2,171/kW-ac.[14] Yet DNV GL estimated a range of costs for a 20 MW-ac "theoretical solar project" in eastern Washington from $1350 (low), to $1570 (medium) to $1790/kW-ac (high).[15] This estimate seems much more plausible, given that the NREL 2017 Q1 national benchmark study showed a national average of $1440/kW-ac, with all four Northwest states slightly less.[16] This is about one-third less than the cost estimated in Table D-20.

Further, as widely reported, at the end of December 2017, Public Service Co. of Colorado (PSCO, an operating unit of Xcel) reported initial results from an all-source RFP showing median solar PV bids at about $29.50/MWh.[17] This is one-third again lower than the NREL Q1 benchmark (roughly $43/MWh for $1440/kW-ac). While these costs are for system delivery up to 2023, they indicate that the dramatic decline in solar PV costs is continuing.

As we have indicated in previous comments to PSE, a range of future costs for innovative technology like solar PV can be estimated through experience curve assessment. When PSE did so at our request in Sensitivity 4, "Apply More Aggressive Solar Cost Curve," the results were striking: "With the more aggressive cost curve on solar, the levelized cost of a 2023 resource drops to $58/MWh instead of $73/MWh for the baseline assumption. The portfolio builds under this sensitivity do not change, but the total portfolio cost is down to $11.64 billion. This is a decrease of $340 million from the Base Scenario portfolio." [18]

To summarize, even though the IRP now selects eastern Washington solar as the best available renewable resource, it is likely to offer a far larger and cheaper opportunity than indicated. In addition to the national surveys, we will soon have indicative results for eastern Oregon and Washington solar PV from the renewable RFP that Portland General Electric (PGE) is now undertaking.

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[14] Table D-20, *Ibid*.
[15] Appendix M, Table 3-1, *Ibid*.
[16] Fu, Ran, et al. *U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017.* National Renewable Energy Laboratory. https://www.nrel.gov/docs/fy17osti/68925.pdf
[17] Deign, Jason. "Xcel Attracts 'Unprecedented' Low Prices for Solar and Wind Paired with Storage." Greentech Media. https://www.greentechmedia.com/articles/read/record-low-solar-plus-storage-price-in-xcel-solicitation#gs.pwTaW7k
[18] Page 6-58, *2017 PSE Integrated Resource Plan.*

It will be important in the 2019 IRP to explore the cost trends for solar PV with a more open approach, taking into account the most recent valid cost data as well as experience curve assessment. We would not be surprised to find estimated solar PV costs in the late 2020s that are well below $1000/kW-ac. Furthermore, the PSCO RFP returned a substantial amount of solar + storage bids that were about 20% higher in overall cost, but provided much more capacity value in terms of matching output to daily system load shape. With storage costs also coming down substantially, the longstanding concerns about the timing mismatch of solar production and peak load is already diminishing.

Wind Costing

Turning to wind, the IRP notes that wind scores nearly as well as eastern Washington solar, "though the results are close."[19] Yet, much of the remainder of the discussion of wind in the IRP leads, in various ways, to dismissing it out of hand, especially Montana wind. This includes Fig. 2.1, Electric Resource Plan Forecast, Cumulative Nameplate Capacity of Resource Additions showing estimates variously in 2023, 2027, and 2037 for conservation, demand response, solar, energy storage, redirected transmission and peaker gas – and none at all for wind, which is a very different resource from solar in its daily and seasonable availability.

There are real concerns with Montana wind, including transmission access, constraints posed by the renewable portfolio standard (RPS) qualification criteria under RCW 19.285 and other factors. Yet Montana wind is a very high-quality resource, well matched to PSE's seasonal demand shape, especially winter peaking. It deserves better treatment than it received in this IRP.

First, the corrected version of Table D-20 issued in early January indicates a capital cost for Washington wind of $1936/kW, possibly a bit high but not unreasonable. For comparison, the US DOE capacity-weighted average installed cost for 2016 was $1590/kW, with some regional variations.[20]

Yet the updated IRP cost for Montana wind in Table D-20 was raised from $2065/kW in an earlier version to $3950/kW. Footnote 6 accompanying this modification states, "Includes $52 Million of transmission upgrades. If the resource were only 100 MW, then the capital cost would be higher since the transmission upgrades are $52 million, regardless of size of plant."

In our view this is a misleading assessment. While transmission upgrades will be needed to integrate Montana wind for service to PSE and other utilities, this assigns a single, worst-case, lump sum cost and rolls it in to resource capital cost in a way that is applied to no other resource.

Of course, wind will not be considered at $3950/kW, and of course this misstates the complexity of the situation and the value of Montana wind.

First, as is readily evident, Montana wind is a much higher value resource in terms of both annual capacity factor and capacity value, especially for the winter season, than wind elsewhere in the Northwest.

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[19] Page 1-8, *Ibid.*

[20] Wiser, Ryan and Mark Bolinger. *2016 Wind Technologies Market Report: Summary.* Lawrence Berkeley National Laboratory. https://energy.gov/sites/prod/files/2017/08/f35/2016%20Wind%20Technologies%20Market%20Report%20Presentation_1.pdf

Second, there is clearly some ability to provide physical transmission access today for wind from Montana going westward, though the exact amount is in dispute. Although the IRP could not have anticipated the recent development of the joint project by the Bonneville Power Administration and Montana Governor Steve Bullock to assess the prospects for Montana wind, by the middle of 2018 we should have a much better idea what available transmission capacity is, what its barriers are, and how much more can be achieved with system upgrades and operational changes.

We also know that wind costs are again declining nationally, for a variety of reasons described in the US DOE Wind Technologies Market Report. In addition, the recent PSCO RFP mentioned above returned median solar PV costs of $29.50/MWh (and solar + battery at $36.00/MWh), yet wind was far better at $18.00/MWh and wind + battery just $21.00/MWh. Granting that Colorado wind is even more prolific than Montana, the cost trends are clear – as cheap as solar is becoming, the best wind is much cheaper if we can get to it.

PSE is fully involved in the BPA/Montana assessment project, and we fully support the Company's active involvement. In the 2019 IRP, it will be crucially important to reassess Montana wind given all the relevant factors, a fair reading of wind resource and transmission system upgrade and integration costs, and a forward-looking approach to the value this resource can offer to PSE's customers.

Owner's Cost

NWEC has consistently raised concerns about PSE's treatment of "owner's costs" in assessing new generation resources. In this IRP, PSE is applying a 30% owner's cost across the board to all new generating resources cost estimates. NWEC has three main issues with this treatment:

- First, the definition of owner's cost has not been entirely clear. This raises the possibility of double-counting if certain costs are included both in engineering, procurement, and construction (EPC) costs and owner's costs.
- Second, applying a constant owner's cost to different resource types may not accurately reflect differences in development approaches. This is particularly important considering project finance. While it may be appropriate based on experience to assign a default owner's cost to one type of generation, such as natural gas power plants, it may not be appropriate across asset classes due to different development circumstances. For example, the resource cost update from Black & Veatch for the Portland General Electric (PGE) IRP update explicitly assigns different owner's costs to different resources.[21]
- Third, a more general concern is that the IRP does not consistently present costs for different resource types in a consistent fashion, as is found in the Seventh Plan and various other regional utility IRPs.

For the next IRP, NWEC recommends that the UTC require that PSE present resource costs in a consistent reporting format. If the category of owner's cost continues to be used, PSE should clarify the definition of that term and apply it with appropriate adjustments for each resource type, or use a different method to determine overall costs.

[21] Black & Veatch, "Characterization of Supply-Side Options (2017)." Prepared for Portland General Electric. October 4, 2017. https://www.portlandgeneral.com/our-company/energy-strategy/resource-planning/integrated-resource-planning#

Conservation Acquisition

NWEC notes that PSE's Energy Efficiency program has had success in achieving and exceeding its conservation targets under RCW 19.285, acquiring cost-effective conservation to serve its needs and save customers money and energy. NWEC provides the following recommendations to improve conservation acquisition modeling in future IRPs and to continue providing cost-effective value of this resource to customers.

- PSE modeled conservation in bundles for both the electric and natural gas IRPs. In the electric modeling, the same bundle was selected by the resource model in almost all scenarios and sensitivities, which seems surprising, especially when thermal capacity costs are modeled higher. NWEC recommends that, for both the electric and natural gas IRPs, PSE either make the bundles of conservation smaller, or preferably, model individual measures as other utilities have done.
- Emerging technologies and technology improvements are not captured in the Conservation Potential Assessment. As experience has shown, there will likely be more conservation measures in future years than is identified by this IRP. Other utilities throughout the region are starting to incorporate emerging technology in their supply curves. We recommend that UTC require PSE's next IRP to improve the methodology for capturing the potential of emerging technology.

Demand Response Acquisition

NWEC strongly supports PSE's intention to develop significant new demand response (DR) resources in the coming years. However, we want to highlight the importance of moving quickly from resource assessment toward actually acquiring committed DR and scaling it up. This will help reduce market exposure during system stress periods going forward, as well as build consistently toward the time when the PSE system is facing substantial new capacity needs and the readiness of full-scale DR resources will be a primary concern.

Traditionally, DR was primarily considered to be supplied through arrangements with large commercial and industrial loads. While that type of DR remains a substantial opportunity, extending the range of DR to include load across the customer base is now a top priority toward achieving the full benefits of a comprehensive DR development effort. Diversifying DR will also mitigate the constraints within each customer sub-segment. For example, the assumptions of how much traditional industrial DR may be available can fluctuate with changing business conditions. Likewise, the real-time response of residential and small commercial DR programs must be tested in live conditions and continually monitored as the range of participation expands.

We are cognizant of the time needed to develop, deploy, and accumulate results and lessons learned from DR development. Just as with the early development of energy efficiency programs three decades ago, there will be unexpected shortfalls, areas of greater potential than expected, and program design and procedural elements that need revision. This is why it is so important to commit to a strong early DR development program in the next two years.

PSE's assessment work as well as other studies within the region, including the Seventh Plan, consistently indicate that DR overall is a very valuable and available resource. While NWEC feels the

Company's DR targets in the current IRP – 103 MW in 2023, 139 in 2027, and 148 in 2037 – are lower than they should be, it is more important now to gain real program development and field experience, which will then inform revision of the DR targets in future planning, including the commitment in the Electric Action Plan to assess day-ahead DR programs and develop new modeling capability to assess the value of DR in the sub-hourly context.

Further, it is important to broaden the view of DR to fully include the capabilities of storage resources, both battery and thermal. In regard to the latter, the current IRP basically does not address the potential for grid-integrated water heating. While water heater load control programs in the eastern US have long used simple timers and other methods for reducing peak demand, the more interactive capabilities of new water heater controls allow for a better tuned approach. Given the high saturation of electric water heaters and their aggregate on-peak demand contribution in PSE service territory, this is an important area to assess. The current BPA-sponsored pilot program, involving several Northwest utilities testing a grid-integrated water heater control device, will help provide basic information from a live field setting.

We are supportive of the efforts by PSE and UTC to resolve current policy barriers to a comprehensive DR strategy. However, in the meantime, many preparatory steps can be taken to position the Company to move forward quickly and effectively while those matters are being resolved. The benefits of moving toward a more flexible, reliable, and self-sufficient system and avoiding costly new thermal resources for capacity are well worth the attention and effort.

Transportation Electrification

Electric vehicle (EV) ownership and use was not included in the demand forecast, but rather was modeled as a sensitivity. Though the sensitivity did not have an impact on the near-term resource plan, it did modify the plan in the mid- and long-terms. For the next and future IRPs, NWEC recommends that PSE include forecasted energy load from electric vehicles into the base demand forecast.

NWEC recommends that PSE model EV penetration and subsequent load impacts in future base demand cases using a trend line consistent with Washington state's current 50,000 EV adoption goal. Though this goal is currently set for 2020, NWEC believes forecasting growth into years post-2020 consistent with the adoption rate will reflect current market trends and available incentives.

In addition to including a modest penetration of EVs into the base demand forecast, NWEC recommends PSE continue modeling EV penetration, but at different levels. Multiple approaches exist, including flat percentages across sectors or overall emission reduction goals, and the Coalition believes that PSE should convene a stakeholder workshop, perhaps as part of the next IRP process, that will evaluate different modeling approaches for including in future IRPs.

Distribution System and Transmission Planning

Throughout much of this IRP process, stakeholders brought up questions related to transmission assets and planning and to distribution system planning. As NWEC has commented in past proceedings, distribution resource planning and transmission planning should be included in the IRP process: "That brings into one focus all the elements of transmission and generation and how they interact, presenting

a more complete, integrated picture to customers."[22] As the grid gets smarter and more distributed, utilities including PSE will need to take deeper look at how the whole system is integrated together, not just its demand- and supply-side resources.

NWEC appreciates the inclusion of more substantial information and background on transmission planning in the IRP (Chapter 8, Delivery Infrastructure Planning). As a major proposed new project, Energize Eastside receives a great deal of attention, but it is also important to have details of other proposed actions for enhancing the transmission system.

In the next IRP, in addition to the high-level description and listing of proposed projects, it would be useful to summarize key features of the system, how the system interconnects with others in the region, including Seattle City Light, Tacoma Power, Snohomish PUD, and BPA, what areas of ongoing concern are being addressed, and more detail on modernization, upgrade, and expansion projects being considered in transmission planning.

Further, an assessment of what reliability concerns can be addressed by transmission and what must be partially or fully addressed in distribution planning – particularly on the west side of PSE's system – would be helpful. We recognize and look forward to the new direction anticipated from the UTC's revision of the IRP guidelines further incorporating transmission and distribution concerns.

Finally, a more coordinated approach between traditional IRP (power) planning along with enhanced transmission and distribution planning should strengthen the assessment of where transmission expansion may be needed and, perhaps more importantly, where "non-wires" alternatives to new power lines and distribution facilities can be incorporated. We believe the rapid development of innovative flexible demand, storage, and operational improvements can avoid or postpone costly and sometimes difficult new transmission projects.

Therefore, the next IRP should address how PSE intends to assess more systematically both new transmission and distribution projects and alternative ("non-wires") elements, especially where new resources already under consideration in the IRP such as energy efficiency, demand response, distributed generation, and storage can make an important contribution.

Additional Comments

Below are some additional recommendations for PSE to consider in the next IRP.

Climate data: Other utilities in the region have worked with the University of Washington Climate Impacts Group to develop information and forecasts for how climate change could affect demand- and supply-side forecasts. NWEC understands that PSE is following BPA's efforts to model climate change effects on the hydroelectric system and agrees that this is important supply-side information to model. However, for more accurately predicting demand, NWEC suggests that PSE communicate with other utilities (including Snohomish PUD and Tacoma Public Utilities) about their work with the Climate Impacts Group to have a forward-looking climate outlook to incorporate in its demand forecast.

[22] NWEC and Renewable Northwest Comments on UE-161024, November 2, 2016.

Process Comments: Overall, NWEC found that this IRP process was much improved over the last one. We provided a few comments in a meeting with PSE in December, but echo a few of our major process comments below.

- NWEC appreciates that PSE used a facilitator and project manager in the IRP process and think they were great additions and look forward to having this assist with future IRP processes.
- NWEC appreciates that PSE took additional time for more research on renewable costing numbers and acknowledges that the process was delayed as a result. However, the last few months seemed very rushed, without a lot of stakeholder time to provide comments and questions on the final results.
- As Sierra Club noted in their comments on the IRP, other utilities in the country provide greater transparency and access to the underlying data to stakeholders. We recommend the Commission consider this kind of stakeholder data access in its IRP process docket.