BEFORE THE WASHINGTON
UTILITIES AND TRANSPORTATION COMMISSION

In the Matter of Puget Sound Energy's Draft 2021 Electric Integrated Resource Plan	**DOCKET UE-200304**
In the Matter of Puget Sound Energy's Draft 2021 Natural Gas Integrated Resource Plan	**DOCKET UG-200305**

COMMISSION STAFF COMMENTS REGARDING PUGET SOUND ENERGY'S DRAFT INTEGRATED RESOURCE PLANS SUBMITTED IN COMPLIANCE WITH RCWs 19.405, 19.280 and WACs 480-90-238, 480-100-600 through-630, ORDER 02 UNDER DOCKETS UE-180607 and UG-180608, AND UNDER CONSOLIDATED DOCKETS UE-191023 AND UE-190698, Order R-601

February 5, 2021

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Introduction

On January 4, 2021, Puget Sound Energy (PSE or company) filed its draft of the 2021 integrated resource plan (Draft IRP) with the Washington Utilities and Transportation Commission (Commission) in Dockets UE-200304 and UG-200305. The next day, the Commission posted to the dockets a Notice of Opportunity to File Written Comments and Notice of Recessed Open Meeting. Written comments are due by February 5, 2021, and the recessed open meeting is scheduled for 10:30 a.m. on Friday, February 26, 2021. The company will file its completed 2021 IRP (Final IRP) with the Commission by April 1, 2021.[1]

Commission staff (Staff) prepared these comments to:

- Assess whether PSE's Draft IRP satisfies the rules and statutes governing the company's draft and final IRP filings; and
- Highlight areas of strength in the Draft IRP as well as opportunities for improvement in the Final IRP and the next integrated resource planning cycle.

PSE acknowledges that this Draft IRP is incomplete. A significant portion the IRP analysis was not completed in time for inclusion in the company's filing, including the following components: market reliance analysis; stochastic analysis; a completed assessment of energy and nonenergy benefits as described in RCW 19.280.030(1)(k); key sensitivities and scenarios, including an analysis on the potential impacts of climate change and a scenario exploring maximum customer benefits; and a compilation of the company's estimated avoided costs.[2]

Staff understands that the Commission may apply some flexibility in this first post-CETA IRP cycle.[3] We also recognize that the IRP analysis follows a particular order such that some components of the IRP must be completed before other parts of the analysis can begin. With the passage of the Clean Energy Transformation Act (CETA), Staff acknowledges that the list of assessments, scenarios and sensitivities required in PSE's 2021 IRP is more extensive compared to prior IRPs.

Still, CETA was passed in May of 2019, and PSE's 2019 IRP requirements were waived by the Commission with the understanding that CETA represented a paradigm shift in planning that would require time and discussion. Many of the components that were not included in PSE's Draft IRP are not dramatically different from previous IRPs. For example, the Commission explicitly requested the market reliance analysis dating back to the company's 2017 IRP.[4] The usefulness of public process focused on the company's Draft IRP depends on it being

[1] Dockets UE-180607 & UG-180608, Order 02, ¶ 28 (Nov. 7, 2019).
[2] These and other components of the IRP that are largely absent from the Draft IRP are described on page 1-6 of the Draft IRP.
[3] *In re Adopting Rules Relating to Clean Energy Implementation Plans and Compliance with the Clean Energy Transformation Act and Amending or Adopting rules relating to WAC 480-100-238, Relating to Integrated Resource Planning*, Dockets UE-191023 & UE-109698 (*Consolidated*), General Order 601, pp. 58-59, ¶ 168 (CETA Rulemaking Order) (Dec. 28, 2020).
[4] Dockets UE-160918 & UG-160919, Commission acknowledgement letter attachment, filed on May 7, 2018, and revised on June 19, 2018, starting at p. 5.

substantively complete. The IRP cannot benefit from stakeholder feedback and discussion if key components of the analysis are unavailable for stakeholder review.

While incomplete, Staff finds plenty to discuss in PSE's Draft IRP. In developing these comments, Staff consulted with Jeremy Twitchell from Pacific Northwest National Laboratory. Tom Eckman also provided helpful technical assistance to Staff in its review of the Draft IRP.

Gas transportation customer conservation

One tangential issue Staff brings to the Commission's attention is the requirement in RCW 80.28.380 for the utilities to identify and acquire all conservation measures that are available and cost-effective. While it has been the practice of the utilities to exclude gas transportation customers from participating in their conservation programs, Staff struggles to find an exclusion for gas transportation customers in the statutory language of RCW 80.28.380. Staff notes that the IRP does not address the provision of gas for these customers; they acquire their own gas. Thus, the Conservation Potential Assessment (CPA) typically included in a gas IRP has not historically included any assessment of conservation for these customers. There is, however, a linkage between the conservation potential for these very large gas transportation customers and the expected distribution system improvements the company includes in the IRP. Acquiring that conservation should reduce the need for distribution system improvements.

Staff expects the issue of conservation from gas transportation customers and its inclusion or exclusion from the target can be addressed on a case-by-case basis with each company during the approval of each company's CPA and target.

Overview of Draft IRP

2021 Preferred Portfolio Summary

PSE's preferred portfolio is a dramatic departure from previous resource plans, including more investments in conservation, demand response, energy storage, and solar. Figure 1-4 in the Draft IRP highlights the company's draft preferred portfolio. This is a draft portfolio; the company's finalized preferred portfolio is likely to differ, possibly in significant ways, from the draft preferred portfolio as key portions of the IRP analysis are completed.

Figure 1-4: Electric Preferred Portfolio, Incremental Nameplate Capacity of Resource Additions[5]

Resource Additions (MW)	2022-2025	2026-2030	2031-2045	Total
Distributed Energy Resources				
Demand Side Resources	256 MW	360 MW	1,168 MW	1,784 MW
Battery Energy Storage	75 MW	125 MW	550 MW	750 MW
Solar - ground and rooftop	80 MW	150 MW	450 MW	680 MW
Demand Response	10 MW	161 MW	44 MW	215 MW
DSP Non-Wire Alternatives	22 MW	24 MW	72 MW	118 MW
Total DER	443 MW	820 MW	2,284 MW	3,547 MW
Renewable Resources	600 MW	1,100 MW	2,762 MW	4,462 MW
Flexible Capacity	0 MW	237 MW	711 MW	948 MW

Comparison of Resource Need: 2019 IRP Progress Report contrasted with Draft IRP

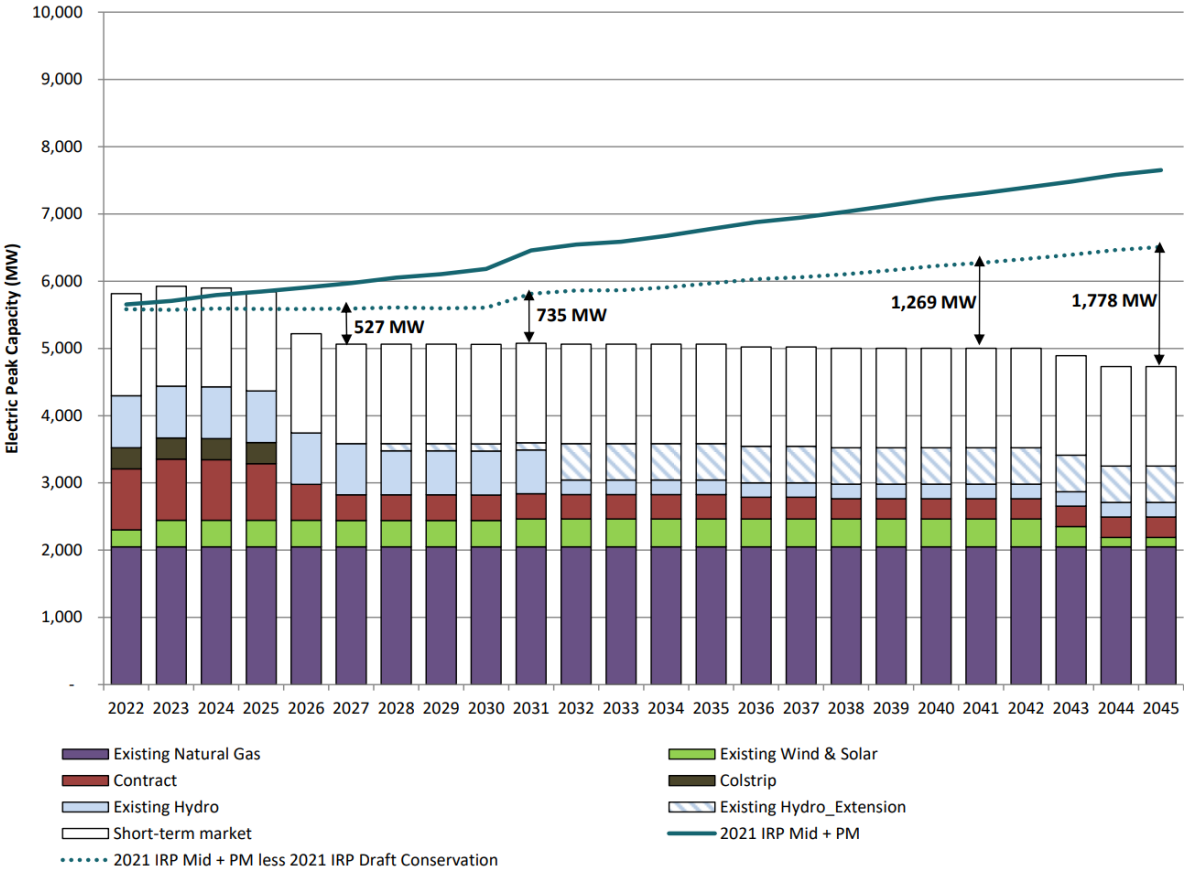
Capacity: During the 2019 IRP process, PSE forecasted a capacity shortage in the first year of the planning horizon, with a 685 megawatt (MW) resource deficiency in 2022. [6] The company's Draft IRP tells a different story. As shown in Figure 1-1, PSE now projects sufficient capacity through 2025, assuming cost-effective conservation and demand response is acquired as forecast,[7] and if approximately 1,500 MW of short-term market resources are available. Staff notes in addition to availability, financial risk is also a tangible consideration as PSE's market reliance position extends to upwards of 25% of its resource portfolio.

[5] *In re Puget Sound Energy's Draft 2021 Electric and Natural Gas Integrated Resource Plans*, Dockets UE-200304 & UG-200305, pp. 1-14 (Draft IRP) (Jan. 4, 2021). "Flexible capacity" is the term used in PSE's Draft IRP for resources that can generate electricity using natural gas or, with minimal or no modification, alternative fuels such as hydrogen.

[6] Dockets UE-180607 & UG-180608, PSE 2019 IRP Progress Report, filed on November 15, 2019, and revised on December 10, 2019, page 12. Comparisons of the 2021 Draft IRP with the company's previous planning cycle are complicated by the lack of a comprehensive 2019 IRP; the 2019 IRP Progress Report was filed instead per Order 02 in Dockets UE-180607 & UG-180608. Staff has pulled comparable information where available – some from the IRP Progress report, and some from the public meeting materials related to the 2019 IRP process.

[7] From 2011 through 2020, PSE issued approximately 15 conservation and energy efficiency and targeted demand response RFPs, excluding evaluation and marketing. Staff data request, September 23, 2020.

Figure 1-1: Electric Peak Hour Capacity Resource Need after Cost-effective Demand-side Resources [8]



Energy: Comparing PSE's forecasted annualized energy needs tells a similar story, with a noticeable reduction in average megawatts (aMW) in the more recent Draft IRP forecast. In the 2019 IRP process, PSE forecasted roughly 2700 aMW of annualized energy need in 2022, increasing to almost 3500 aMW by 2039.[9] In the Draft IRP, the company forecasts just over 2500 aMW of system need in 2022, escalating to roughly 3300 aMW by 2045.[10]

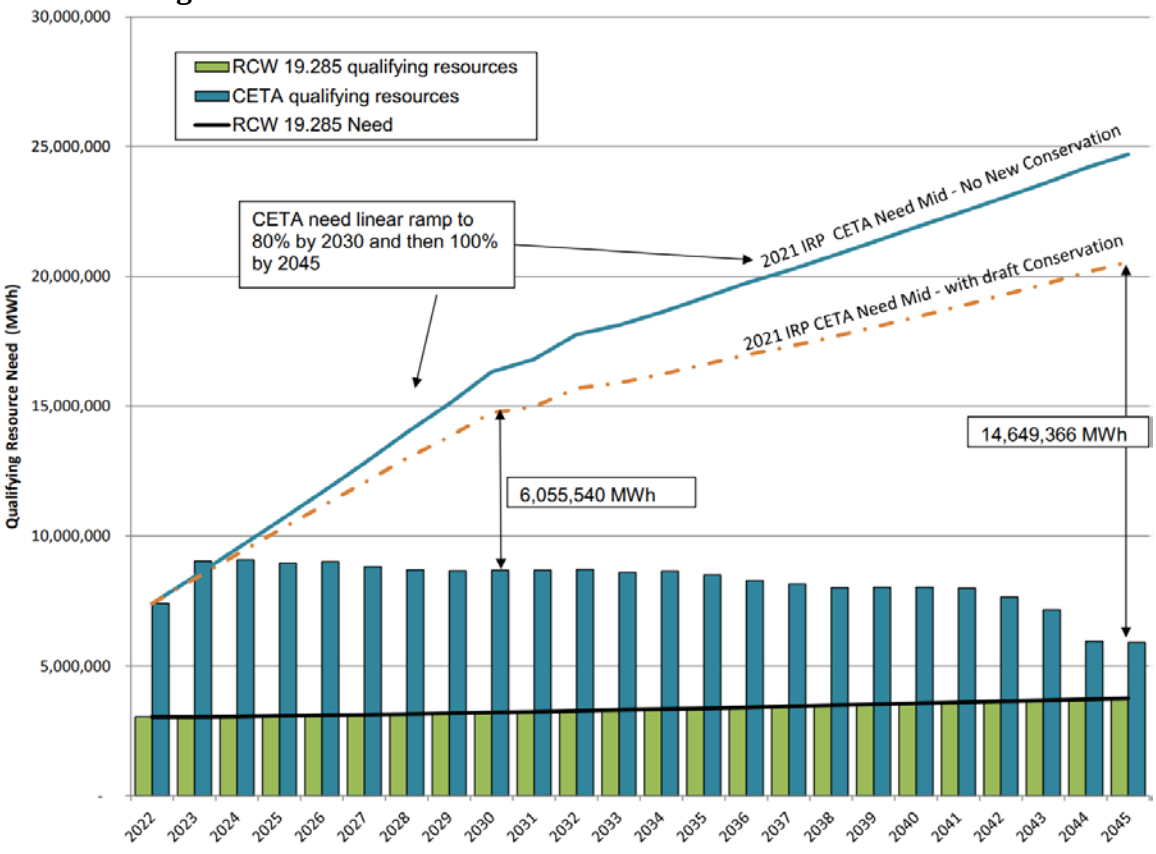
Renewable portfolio standard and non-emitting energy requirements: CETA's renewable energy requirements augment, but do not replace, the renewable portfolio standard (RPS) established in 2007 with Washington's Energy Independence Act (EIA) and codified as RCW 19.285. The EIA requires PSE to generate or acquire and then retire renewable energy credits (RECs) from eligible renewable resources equivalent to 15 percent of the utility's customer load in 2020 and beyond.

[8] Draft IRP at 1-9.
[9] Slide 39 from Technical Advisory Group (TAG) meeting #8, September 19, 2019. *Available at* PSE's IRP public participation website. Figures are estimates based on Staff's reading of PSE's graphs; Staff requests that PSE make the data comprising graphs more readily available in future IRP cycles.
[10] Draft IRP at 1-11, Figure 1-2: Annual Energy Position with Energy from All Existing Thermal Resources.

In both the 2019 IRP process and the Draft IRP, the utility's RPS requirements are satisfied in the near term.[11] Since the 2019 IRP Progress Report's filing, PSE has acquired other RPS-eligible resources, firming up its long-term RPS compliance position.

As seen in Draft IRP Figure 1-3 below, PSE's analysis also shows a significant system need for non-emitting resources to comply with CETA requirements. CETA's non-emitting resource requirements are the primary constraint on PSE's resource planning. The company's recent acquisitions through the 2018 RFP were predominately renewable, moving PSE incrementally toward these objectives.[12] PSE will implement CETA objectives through development of the Clean Energy Implementation Plan (CEIP), which will be informed by the 2021 Clean Energy Action Plan (CEAP).

Draft IRP Figure 1-3: Renewable Need after Cost-effective Demand-side Resources [13]



[11] The RPS position described in the 2019 IRP process can be found in PSE 2019 IRP Progress Report, page 17, Figure 6: Qualifying Energy Need to Meet RCW 19.285 and CETA Requirements.
[12] PSE discusses the recent acquisitions in Draft IRP at B-18, and confirm their inclusion in the 2021 IRP analysis in, for example, Draft IRP at 7-19, Figure 7-5: Impact of Key Input Revisions for 2027.
[13] Draft IRP at 1-12, Figure 1-3: Renewable Need after Cost-effective Demand-side Resources.

Draft Clean Energy Action Plan

Staff's review of PSE's draft CEAP is guided by the new IRP rules and CETA requirements in WAC 480-100-620(12) and RCW 19.280.030(1) and (2). Staff again notes that for its electric IRP analyses, PSE has yet to complete the risk analysis and other modeling necessary support a final decision on selecting a preferred resource portfolio and final CEAP.

Included as part of the Draft IRP, the company presents a CEAP with a summary of clean resource additions derived from the modeling and portfolio analysis completed to-date, specifying (1) peak hour capacity for resource adequacy; (2) hourly energy; and (3) resource types, including renewable and non-emitting resources, to meet load. PSE asserts its CEAP in the next ten years eliminates all coal-fired resources from meeting PSE customers' electricity needs by the end of 2025; provides greenhouse gas neutral electricity starting in 2030 through the end of 2044; projects cost-effective conservation; and prioritizes distributed energy resources and demand response.

PSE's 2021 Draft CEAP forecasts an accelerated acquisition of energy conservation and focus on distributed energy resources, including demand response. PSE contends, "although current market power prices are low, accelerating acquisition of demand-side resources continues to be a least-cost strategy to meet the renewable requirements."[14] Staff concurs.

Supply-side resource considerations: For utility-scale supply-side resources, PSE modeled renewable wind energy located in eastern Washington, central Montana, eastern Montana, Idaho, eastern Wyoming, western Wyoming and off the coast of Washington. The company also modeled several geographies for its utility-scale solar options. PSE completed its utility-scale resource analysis by considering hybrid resource types, a first in PSE's IRP process, which combine two or more resources as the same location and have distinct performance and cost advantages in combination. As shown in the table below, PSE's CEAP proposes the following resource additions to satisfy CETA requirements, including 600 MW of renewable resource additions by 2025 and 1,700 MW by 2030.

[14] Draft IRP at 1-14.

Table 1: Overview of PSE's Clean Energy Action Plan (CEAP)

Resource	2022-2025 Incremental Nameplate Capacity	2025-2030 Incremental Nameplate Capacity	2031 Energy	2031 Capacity
Distributed Energy Resources (DER)				
Energy Efficiency Savings[15]	157 MW	245 MW	266 aMW	458 MW
Distributed Generation: Solar PV	2.5 MW	37.7 MW	7 aMW	1 MW[16]
Distribution Efficiency Savings	3.9 MW	6.3 MW	11 aMW	12 MW
Codes and Standards Savings	92 MW	71 MW	93 aMW	177 MW
Cost-effective Demand Response	10 MW	161 MW	*	*
DER-battery energy storage	75 MW	125 MW	*	*
DER-solar ground & rooftop	80 MW	150 MW	*	*
DSP non-wire alternatives	22 MW	24 MW	*	*
Subtotal	443 MW	820 MW		
Supply-side or Utility Scale Resources				
Renewable Resources	600 MW	1,100 MW	*	*

* *Not specified in Figure 2-1.*

Flexible capacity additions: Staff notes Figure 3-1, which is located within the Resource Plan Decisions section of the IRP, shows PSE's anticipated "flexible capacity additions" – thermal resources which are assumed to be able to burn natural gas or similar fuel not derived from fossil fuel extraction, such as hydrogen – for the years 2026-2030 in the amount of 237 MW. However, PSE's ten-year CEAP does not contain this addition, other than an explanation that, "additional flexible capacity is needed to maintain an adequate resource system."[17]

DERs and Deliverability: PSE identifies a total of 443 MW of distributed energy resource additions through 2025 and an additional 820 MW added by 2030. Of this, PSE identified 22 MW of non-wires alternatives, increasing to 46 MW total by 2030, including energy storage systems and solar generation. To implement its CEAP, PSE provides commentary on deliverability of resources, data availability, integrity and granularity, distribution monitoring and control systems, security, and infrastructure to enable integration and electrification. PSE assumes for the 2021 IRP/CEAP its system in western Washington is unconstrained; it does not include the PSE IP Line (crossing the Cascade mountain range) or Kittitas area transmission, which is fully subscribed.[18] To ensure deliverability of resources shown in Table 1 above, PSE provides a more detailed discussion in the following appendices:

- a long-range, 10-year delivery system infrastructure plan, including owned transmission and distribution system upgrades outlined in Appendix M; and

[15] Customer solar PV is the only distributed resource modeled as a separate measure, CHP is included in energy efficiency.
[16] PSE shows the DG Solar PV as 58 MW nameplate. Draft IRP at 2-7, Figure 2-1 (10-year Demand Side Resource Savings).
[17] Draft IRP at 1-13.
[18] *Id*. at 5-36.

- transmission on a regional level and opportunities to coordinate planning shown in Appendix J.

CETA alternative compliance options: The company also discusses the alternative compliance options, noting its compliance with CETA may be met through other mechanisms still under development and may include energy transformation projects, unbundled RECs, and other options.[19] PSE indicates it will work to further analyze these mechanisms, but notes in its Draft IRP that the company's analysis does not incorporate alternative compliance mechanisms to achieve the carbon neutral standard in its IRP portfolio emissions results.[20]

Customer benefit provisions: For CETA's new customer benefit provisions, Staff appreciates PSE's extensive narrative explaining its progress towards meeting the requirements in WAC 480-100-610(4)(c). PSE details incremental progress and lists future commitments: establishment of a new Equity Advisory Group in 2021; additional outreach to populations and communities not typically represented in the IRP public participation process; affirmative development of new metrics and indicators; and finalization of the Economic, Health and Environmental Benefits Assessment (Assessment). All these commitments are needed to inform future IRP/CEAPs and the CEIP. Staff agrees with PSE's conclusion in the CEAP that the new customer benefit related CETA requirement will be an evolution and will not happen overnight.

CETA's resource "use" requirement: Finally, as evidenced by the CEAP and company's Resource Plan Decisions section of the IRP, PSE is planning to procure resources capable of meeting Washington load. Questions remain regarding whether such resources could be dispatched in a manner to serve Washington demand. For example, does clean energy resource acquisition imply clean energy operations? In addition, Staff voices concern that unspecified power purchases continue to play a significant role in PSE's load and resource balance. As shown in Draft IRP Figure 1-1, PSE assumes that roughly 1500 MW of short-term market purchases – about 25 percent of total system peak need – will be available when needed to satisfy peak capacity needs. Operationally, how this energy is getting used and whether such "use" meets the spirit and letter of CETA remains a topic of discussion during Washington clean energy legislation implementation.[21]

CEAP Recommendations
Because modeling is not complete on the maximum customer benefit sensitivity, flexible capacity analysis, and a bevy of other modeling and risk analyses that could change the draft CEAP, our comments are limited on this section. In the interim, we offer the following suggestions and comments for the final CEAP:

- In the CEAP, identify the specific actions to be taken by the utility consistent with the long-range integrated resource plan. PSE's CEAP must provide adequate narrative

[19] *Id*. at 2-21.
[20] *Id*. at 8-23.
[21] *See* Docket UE-191023, "Use" discussion relating to Clean Energy Implementation Plans and Compliance with the Clean Energy Transformation Act, (June 12, 2020).

identifying the utility's ten-year resource need and ramp required to meet the energy, capacity, and system flexibility needs required to maintain safe, reliable operation, while achieving its clean energy transformation objectives. To Staff, this means any potential flexible capacity additions, including ramping capacity, should be contained in the CEAP.

- In terms of CEAP presentation, Staff found one particularly helpful element of the presentation of Avista Utilities' 2021 Draft Electric IRP, Table 15.2. Through 2030, Avista presents the company's planned clean energy acquisitions and year-over-year targets (aMW), including percent clean energy goal, available resources, including owned and contracted, and projected shortfall in a comprehensive table format. In the same table, the resource forecast is provided showing resource need and resource forecast.

  Staff recommends PSE develop a similar year-over-year CEAP presentation, expanded to also include incremental nameplate capacity (MW). Staff envisions this table showing details such as: (1) existing and contracted resources (identified by resource type, location, or potential location); (2) peak import projections; (3) peak capacity needs before demand-side resources (developed from forecast + planning margin); (4) demand-side resources; and (5) peak capacity resource need net demand-side resources.

Summary of Staff Assessment and Recommendations

Electric: PSE's Draft IRP is incomplete, missing important parts of the analysis that could dramatically alter the company's Final IRP. With that caveat, the components included in the Draft IRP signal that the Final IRP is likely on track to satisfy requirements in rule and statute. Staff believes PSE has made great strides in many areas of its IRP process and analysis, including a more robust and transparent public participation process. Based on PSE's meeting materials, we anticipate seeing a greater level of analytical rigor in its flexibility analysis within the Final IRP. Staff's recommendations are summarized below. More information regarding Staff's recommendations is provided in the second part of these comments, discussing IRP focus areas in greater detail.

Recommendations related to the Final IRP

- **Public Participation**: *Recommendation to the Commission* – Issue a notice for another 30-day public comment period discussing the Final IRP. Doing so will allow interested stakeholders to build a record to inform PSE's Clean Energy Implementation Plan and will provide an opportunity for comments on those portions of the Final IRP that were not included in this Draft IRP.
- **Customer Benefit Provisions**:
  1. Circulate its proposed customer benefit indicators (CBIs) with stakeholders as soon as possible, and work with IRP participants to apply them in the company's portfolio analysis. Staff suggests including them on the agenda for the IRP meeting scheduled for February 10, 2021, or informing stakeholders via email by March 1, 2021, at the

latest.
2. Complete the assessment of economic, health and environmental burdens and benefits required by WAC 480-100-620(9).
3. Model the maximum customer benefit scenario to the best of the company's ability. PSE is expected to provide a narrative explanation of the decisions it has made developing its preferred portfolio, including how the CEAP will achieve CETA objectives.

- **Load forecasting**:
  1. Highlight and discuss the adjustments made to the load forecast due to the COVID-19 pandemic and explain how the IRP analysis countenances the risk of any variance around those assumptions – for example, the assumed length and depth of the related economic slowdown.
  2. For PSE's temperature sensitivity and climate change analysis, provide targeted narrative and graphics comparing impacts to both summer and winter peak loads relative to the company's weather inputs for its base case, not just average megawatts. Additionally, the company should discuss the risks and impacts on resource adequacy resulting from this analysis.
- **IRP Modeling**:
  1. Complete all sensitivities and scenarios.
  2. Provide additional narrative explaining the company's calculation and use of line loss estimates and loss factors.
  3. Expand the company's reporting around GHG emissions and GHG-related cost comparisons for all scenarios and sensitivities, including preferred portfolio.
- **Resource Adequacy and Uncertainty**:
  1. Incorporate the findings of the company's market reliance risk analysis into its resource adequacy assessment and metrics.
  2. Provide additional narrative indicating whether the company included other resource additions and retirements that have happened or will occur, beyond its own resources, focusing on the GENESYS modeling used as an input to the Resource Adequacy Model.
  3. Provide resource adequacy assessment metrics by month to provide a better view into the nature of PSE's system needs.
  4. Review the application of PSE's capacity valuation metrics, and provide more information on the nature of the modeling results.
  5. Discuss how PSE contemplates construction risk uncertainties into its IRP analysis, and provide some narrative explanation on how PSE manages and mitigates these risks.
- **Conservation and Conservation Potential Assessment (CPA)**:
  1. Provide the conservation potential assessment model and underlying data.
  2. Calculate flexibility benefits for DERs, especially conservation and demand response.
  3. Explain how the pro-rata acquisition requirement in the EIA interacts with PSE's modeled acquisition of conservation.
- **Demand Response (DR)**:
  1. Provide adequate data and access to the demand response potential model and

underlying data.
2. Provide additional background and explanation for the resource parameters characterizing DR resources, such as the 10 call/year limit.

- **Energy Storage**: Provide further narrative and analysis on whether the company's peak capacity credit accurately represents the value of energy storage.
- **Data Disclosure**: File all underlying data related to the company's CPA and IRP modeling tools, in native file format as appropriate. Data may be filed confidentially.
- **Avoided Costs**: Collate all IRP outputs used as PURPA-related tariff inputs with the section or appendix containing the company's avoided cost calculations.
- **Upstream Emissions and Social Cost of Greenhouse Gas Calculations (SCGHG)**:
  1. Articulate exactly how the company calculated the SCGHG, as required in WAC 480-100-620(11), and bolster narrative.
  2. Work with Staff to reconcile the difference in PSE's SCGHG prices as compared to those used in Avista Corporation's IRP analysis.

Recommendations for the company's CEIP and future planning cycles

- **Customer Benefit Provisions**:
  1. Develop linkages between CBIs and resource selections to better utilize portfolio optimization and increase consistency of CBI analysis across portfolios.
  2. Create an equity advisory group by May 1, 2021, to provide useful and timely input for the planning cycle. Staff understands that PSE has already begun organizing this group and commends the company's considered approach.
- **Load forecasting**:
  1. Conduct a back cast of its load forecasting model, using actual values for their independent variable inputs to their load forecast, to assess whether their models have systematic bias.
  2. For any future climate change risk analyses, ensure that weather-dependent conservation savings potential estimates are adjusted to appropriately align with shifting loads.
  3. Analyze whether the company's use of 30 years of historical weather data in its base forecast is appropriate and consider alternative timespans.
- **IRP Modeling**: Consider whether moving the analysis currently performed by the Resource Adequacy Model over to other modeling tools, such as Plexos, is feasible and beneficial.
- **Resource Adequacy and Uncertainty**: Consider incorporating construction risk uncertainties into the IRP analysis, or provide some narrative explanation regarding PSE's modeling.
- **Conservation and CPA**:
  1. Include all well-vetted estimates of non-energy impacts in the base case CPA analysis, rather than as a sensitivity.
  2. Share the draft CPA and any available underlying data much sooner in the IRP process.
  3. Ensure that CPA outputs allow PSE to align conservation potentials with load forecasts.
- **Demand Response**:

1. Take into account the full value of DR to meet all types of system needs, not just peaking needs, at the lowest reasonable cost.
2. Consider the customer benefits of DR programs and how to equitably provide these benefits to customers.
3. Improve the modeling and assumptions of cost-effective demand response, in collaboration with stakeholders and experts. Explore alternative program designs, including varying call limits and sizes.
4. Propose pilot programs that collect more accurate data to evaluate DR programs for the next IRP and begin the process of educating the utility and its customers about DR.
5. Identify barriers to taking advantage of Washington's CTA-2045-compliant water heater mandate.
6. Analyze and model the interactions among conservation, DR and other DERs.
7. Contemplate the distribution system impacts of DERs as a part of PSE's distribution planning efforts and in its DER assessment(s).

- **Non-energy Impacts**:
  1. Work with stakeholders and Staff to identify which nonenergy impact estimates meet the rule's standard for required inclusion. Work further to include these non-energy impacts in the company's base case.
  2. Work with stakeholders and Staff to better understand how the modeling and consideration of non-energy impacts should interact and overlap with equity requirements.
  3. Identify where real data collection is appropriate and where the use of proxy non-energy impact valuations is acceptable.
- **Energy Storage**:
  1. Consider developing an estimate of PSE's valuation of storage by incremental resource acquisition.
  2. Develop proxy resource assumptions around programmatic DER acquisitions, such as customer-sited and utility-managed energy storage.
- **Public Participation**:
  1. Submit a substantively complete Draft IRP, with no incomplete or missing components required by rule or statute.
  2. Solicit scenario and sensitivity feedback earlier in the IRP process.
- **Data Disclosure**:
  1. Timely respond to stakeholder data requests, or clearly state why such requests cannot be fulfilled or must be delayed.
  2. Share any draft studies which act as inputs to the IRP analysis, such as the CPA and other DER assessments as soon as they are available. Include data and workpapers as possible.

Natural gas: Overall, Staff is satisfied with PSE's analysis and resulting preferred portfolio for its natural gas line of business. PSE's analysis shows that continued acquisition of cost-effective conservation is sufficient to meet natural gas needs over the planning horizon.[22] Given that no new, large resource acquisitions are anticipated in the short- or long-term, it is perhaps

[22] Draft IRP at 1-21.

understandable that the electric line of business garners more attention. However, there are still some important topics that warrant further discussion. We highlight areas of interest and key recommendations below.

- **SCGHG and upstream emissions estimates**: This recommendation also applies to the electric line of business.
    1. Include a clear articulation of how the company calculated the SCGHG as required in WAC 480-100-620(11).
    2. Work with Staff to reconcile the difference in PSE's SCGHG prices as compared to those used in Avista Corporation's IRP analysis.
    3. Explain the difference in PSE's SCGHG prices as compared to Avista's prices.
- **Design Day**:
    1. Review and seriously consider updating the 2005 study underpinning the company's 52 HDD standard based on the best available science on climate change and PSE's temperature sensitivity. Provide an interim report at least one year before the next draft IRP is due, explaining the company's analysis and decision.
    2. Retain the commitment found on page 9-15 of the Draft IRP to study the impact of changing its planning standard. PSE should conduct said analysis, and report on the results in its next IRP.
    3. Explore whether it is appropriate to incorporate colder-than-normal "shoulder days" surrounding its peak day.
- **Impacts of potential policy changes**: Many states with climate goals broadly shared by Washington are adopting policies that would shift energy use away from natural gas. PSE's IRP analysis will explore this possibility somewhat in Sensitivity D, Fuel Switching, Gas to Electric, but Staff cannot identify in the Draft IRP an analytical approach that would inform PSE's actions if these prospective policy shifts came to fruition. PSE should explore this possibility more thoroughly, with a focus on how or whether the company's system planning efforts would change if such policies were adopted.

Staff Assessment of 2021 Draft Integrated Resource Plan by Focus Area

Public Participation

Summary of PSE's public participation efforts related to the Draft IRP

PSE's Draft IRP includes a full description of its public participation activities in Appendix A. This appendix documents some examples of the input considered and, in many cases, adopted for use in the company's IRP analysis. PSE includes many of the scenarios and sensitivities proposed by interested stakeholders. PSE hosted eleven public input meetings and has two more scheduled before the Final IRP is filed. These meetings allowed useful discussion of important inputs such as resource cost assumptions, transmission constraints, and PSE's modeling of SCGHG in the IRP.

Staff commends PSE's significantly improved public participation processes. Due in part to the ongoing COVID-19 public health crisis, the 2021 IRP public participation process cycle looked very different as compared with previous IRP cycles. It was decidedly more challenging for all involved, with advisory group meetings held virtually via webinar. PSE retained the services of the consulting firm EnviroIssues with the goal of keeping public input meetings transparent and inclusive while sticking to the topics on a given webinar's agenda. The utility invited questions verbally during the webinars, with pauses during presentations, and via a chat function in the remote conferencing software used for the virtual meetings. PSE also accepted feedback before and after each webinar through an online feedback form available to the public on the IRP-focused website, which was routinely updated with IRP-related content.

From Staff's perspective, PSE demonstrated commitment to providing responses to questions and comments. The company compiled these after every meeting, and responded to each comment in a feedback report, which was published on the IRP website two weeks after each meeting. PSE also published a consultation update describing how this extensive feedback process rolled into its modeling efforts. The feedback reports and consultation updates created a robust written record, which was included in the IRP as Appendix A, and posted on the company's IRP-focused website.

Staff received feedback from some participants that PSE at times synopsized their questions and comments and sometimes provided generalized responses to questions, which were not sufficiently detailed or relevant. We agree. There are opportunities for PSE to further improve their public engagement in the next IRP cycle, especially when responding to comments and questions of a technical nature posed real-time in the webinars or meetings by stakeholders.

Recommendations for improvement in PSE's public participation efforts

PSE's public participation process for its 2021 IRP is robust and extensive. Staff is concerned about the many components of the IRP analysis that are not included in this Draft IRP for stakeholder review. The public's ability to provide meaningful and timely feedback is impaired by these omissions. Providing a substantively complete Draft IRP is a critical part of the public participation process.[23] To ensure transparency, it is also important that the modeling and

[23] WAC 480-100-625; -630; and -655.

portfolio analysis leading to the Draft IRP be as complete as possible.

For the Final IRP, Staff recommends:

- The Commission hold a second written comment period after the Final IRP is submitted to allow stakeholders to comment on the unseen components.[24]

For the next IRP cycle, and to continue the momentum of building greater transparency through the advisory group process, PSE should:

- File a substantially complete Draft IRP and CEAP.[25]
- Seek input from its advisory groups on scenarios and sensitivities earlier in the IRP development process, making it possible to perform all modeling sooner, as compared with the 2021 public participation work plan.

Customer Benefit Provisions in CETA

Summary of PSE's progress regarding CETA's customer benefit provisions in the Draft IRP
Staff recognizes PSE has made incremental progress, but one of the biggest missing pieces to the Draft IRP is a meaningful, substantive consideration of CETA's customer benefit provisions. These CETA requirements are perhaps the most dramatic departure from "business as usual" when it comes to utility planning and would likely have benefited most from *earlier public review*. The draft did not include an economic, health, and environmental burden and benefit assessment, nor did the company propose any customer benefit indicators (CBIs) to guide its resource decisions and programs.

While the lack of content related to the customer benefit provisions is a missed opportunity, the factors contributing to its absence are understandable. The Washington Department of Health's cumulative impact analysis was not available in time to inform the company's Draft IRP. In the absence of that report, PSE began the complex work of identifying potential assessment metrics and data sources related to those metrics. Staff believes PSE's Appendix K, which currently includes a proposed methodology and assessment metrics, indicates that the company's work thus far on this focus area is well-considered, and looks forward to expanded narrative and analysis in the Final IRP.

PSE did not model the maximum customer benefit scenario required by WAC 480-100-620(10)(c) in the Draft IRP. The company's description of this sensitivity makes it clear it is struggling with where to start.[26] Staff agrees that the parameters of this modeling task currently are not currently well-defined, though this ambiguity does not mean the requirement is nullified. The first step toward understanding what actions or resource selections might maximize customer benefit is developing customer benefit indicators (CBIs) to be used and reaching out to stakeholders for input.

Staff understands the purpose of this sensitivity is to test the bounds of what is possible by

[24] Draft IRP at 1-5.
[25] CETA Rulemaking Order at ¶ 168.
[26] Draft IRP at 1-6.

creating a portfolio which maximizes all CBIs regardless of cost. Without defined CBIs, and without some reasonable and vetted assumptions regarding the impact potential resource decisions would have on those CBIs, it would be difficult to know how a portfolio might be modified to bring about such increases. PSE deserves recognition for the progress it has made in modeling some DERs as proxy resources, which may overlap with the company's CBIs. PSE has also made solid progress in assembling an equity advisory group as required under WAC 480-100-655(2). The company has brought on a consultant that specializes in tackling these challenges and is actively engaging in conversations with many different individuals and organizations. Staff sees value in applying this group's expertise to the company's CEIP, and for this reason, Staff hopes that the equity advisory group can be established by May 1, 2021.

Recommendations for PSE's customer benefit efforts
For the Final IRP, Staff recommends that the company:

- Circulate its proposed CBIs with stakeholders as soon as possible and work with IRP participants to apply them in the company's portfolio analysis. Staff suggests the IRP meeting scheduled for February 10, 2021, or at the latest via email by March 1, 2021.
- Complete the assessment of economic, health and environmental burdens and benefits required by WAC 480-100-620(9).
- Include the maximum customer benefit scenario to the best of the company's ability, based on continued consultation with stakeholders.
- Explain whether and how the company's consideration of customer benefits affected its preferred portfolio, supporting the decisions it has made and addressing how the utility's long-range integrated resource plan expects to achieve the clean energy transformation standards in WAC 480-100-610 (1) through (3) at the lowest reasonable cost, including all customer benefit provisions.

In the CEIP and future IRPs, PSE should:

- Create an equity advisory group by May 1, 2021, to provide useful and timely input for the planning cycle.
- Work with stakeholders to better understand the relationship between CBIs, assessment metrics, and resource selections, with the goal of leveraging portfolio optimization tools to maximize customer benefits for the required scenario and for the rest of the company's portfolio analysis.

Load Forecasting and Climate Change Impacts

Summary of PSE's load forecasting in the Draft IRP
PSE's load forecast is an econometric model, which uses inputs such as population growth, economic changes, job growth and usage-per-customer estimates. Staff finds that the approach taken by PSE, which the company has used for at least the past few IRPs and which the company has incrementally improved each cycle, is reasonable, though wonders whether there may be an upward bias inherent in the company's econometric approach. Figure 6-41 shows that the

company has systematically over-forecasted its peak demand through several IRP cycles.[27]

In consultation with IRP stakeholders, PSE has performed a load forecast temperature sensitivity to explore the possible impacts of climate change. The results in the Draft IRP are presented mainly in terms of average MW (aMW). aMW is a useful metric for understanding annual energy usage but does not convey the effect of rising temperatures on the utility's peak demand in winter and summer. Staff considers this sensitivity to be a completed input to a broader and incomplete climate change sensitivity, which will analyze the effect of climate changes on PSE's projected system needs. We anticipate that the altered peak demand forecast and its impacts on resource adequacy, planning margin and resource selection will be further explored in that sensitivity.

PSE included an adjustment to its load forecast energy from customer-owned DERs, notably distributed solar generation. Distributed solar is one of many types of DERs that must be assessed per the new WAC 480-100-620(3). Staff encourages the company to explore the advantages and disadvantages of including customer-owned solar as a load decrement, and to consider whether other forms of DERs should be handled similarly.

PSE's load forecasting approach is generally consistent with that of its peer utilities. The company conducted base, high, and low load growth forecasts, as did Avista and PacifiCorp. Like the other utilities, no other DERs, such as battery storage, appear to have been included in the forecast. [28] Like PacifiCorp, PSE briefly discusses the impact the COVID-19 pandemic has had on its load forecast. In discussing the inputs to its load forecast, PSE cites an economic forecast published in May 2020 which assumes that the pandemic would begin to abate by early summer 2020 –in retrospect, a flawed assumption.

Recommendations for PSE's load forecasting
In its Final IRP, Staff believes that PSE should:

- Specify what adjustments were made to the load forecast due to the pandemic. Discuss how any flawed inputs may have affected the forecast, and how PSE managed that risk.
- For its temperature sensitivity, provide narrative and graphics around impacts to both summer and winter peak loads, not just average megawatts. Additionally, the company should link the temperature sensitivity to its resource adequacy requirement and its climate change scenario.

For future IRPs, the company should:

- PSE should conduct a back cast of its load forecasting model, using actual values for their independent variable inputs to their load forecast to assess whether their models have systematic bias. (If PSE has such an analysis for the 2021 IRP, it should discuss the analysis and its results in the Final IRP.)
- Adjust conservation savings inputs that are weather-dependent to account for the change in HDDs/CDDs in any future climate change risk analyses. Many of the load types

[27] Draft IRP at 6-50.
[28] WAC 480-100-620(3)(b).

comprising a utility's peak load forecast are highly weather-dependent. Climate change impacts are likely to have an impact on adoption of certain technologies – for example, air conditioning in the Puget Sound region. It should be feasible to scope a future CPA to include this nuance.

- During the IRP process, several stakeholders commented on PSE's use of 30 years of historical weather data in its base forecast, instead suggesting using 15 or 20 years of data. Avista and PacifiCorp are both using 20 years of weather data in their load forecast. PSE should provide some discussion on why 30 years continues to be appropriate for its load forecast.

IRP Modeling

Summary of PSE's IRP modeling in the 2021 IRP
Modeling tools overview: Broadly, Staff believes PSE's modeling tools and approaches are reasonable and are used competently by the company's IRP modeling team to produce actionable results. PSE employs a collection of modeling tools in its IRP analysis, which are described and evaluated below.

Aurora: Aurora comprises the core modeling platform. PSE uses Aurora to generate the company's power price forecasts and perform its long term capacity expansion (LTCE) portfolio optimization. Aurora is well-regarded in the industry and has been used in previous PSE IRP cycles. PSE presented its generic resource cost assumptions in its first public input meeting and worked with stakeholders to hone these important model inputs. Staff commends PSE for including distributed generation as an available generic resource. We trust that the assumptions around these comparatively less-understood resources will be refined in future IRP cycles.

Plexos: Plexos is another modeling software package capable of doing similar types of analysis as Aurora. Plexos is distinguished by its ability to model system operations and dispatch at a subhourly timescale, allowing PSE to simulate load and resource balances at a time granularity that can expose reliability issues around ramping and resource sufficiency across all parts of an hour, day and year. PSE is using this modeling tool to better understand its system's flexibility needs and vulnerabilities, and to better understand the costs and benefits inherent in its existing resources as well as its generic resource options. This analysis is incomplete and was not included in the Draft IRP. However, Staff is encouraged by the company's added attention to the topic of resource and system flexibility, and believes the tool fits the modeling need well.

Resource Adequacy Model (RAM): PSE's RAM is a Python-based modeling script that performs stochastic modeling to better understand possible resource shortfalls given stochastic pairings of historical weather and hydro conditions. The RAM also uses the Northwest Power and Conservation Council's (NWPCC) GENESYS modeling of regional imports and curtailments as a data input. The modeling tool is proprietary, and its inputs and outputs are not as accessible as commercially marketed modeling platforms. The tool generates multiple pivotal IRP metrics such as effective load-carrying capability (ELCC) estimates for all types of resources, loss of load probability (LOLP), and the resulting planning margin, which forms the foundation of PSE's understanding of peak capacity need. The RAM is programmed to work in tandem with PSE's Wholesale Market Purchases Curtailment Model, which is used to perform much of the

company's market reliance risk analysis.

While Staff's review of the RAM's functionality and use in PSE's analytical process revealed no significant concerns, we note that much of the analysis done by the RAM could be performed by PSE's other modeling tools, such as Plexos. Staff sees some advantages in using a software suite which is supported by a third-party vendor, which can be more easily understood by other stakeholders, and which can use common inputs for various modeling tasks. Staff is also wary of the RAM's reliance on 80+ years of historical data to generate stochastic model runs, particularly considering the changing climate. Staff looks forward to the resource adequacy component of its climate change temperature sensitivity, which we understand was not completed in time for the Draft IRP in part because of the added work required to modify RAM to work with something other than historical weather data.

Other topics related to PSE's IRP modeling
Staff has identified a few other topics related to PSE's modeling efforts which merit discussion.

Loss factors and line losses: On page 5-41, Figure 5-24 shows transmission line losses by resource group region. PSE does not specify whether these estimates represent average line losses or line losses during summer or winter peaks. Similarly, on page 6-46, PSE states that the "The electric loss factor is 6.8 percent, compared to 7.1 percent in the 2019 IRP Process." It is not clear whether this loss factor estimate represents, nor whether the estimate is a system-wide average during normal operations or during a peak event. PSE should explain how it determines the line losses and electric loss factor(s) used in its analysis and clarify whether these inputs are consistent across all applications.

Inclusion of the social cost of greenhouse gasses (SCGHG) in portfolio modeling: Statute and rule require that utilities "must incorporate the social cost of greenhouse gas emissions as a cost adder" in their IRPs, CEAPs and resource selections. [29] Appropriately handling SCGHG within IRP analyses is a critical modeling consideration for utilities during the 2021 cycle. PSE's Draft IRP implements this requirement by calculating a fixed-cost adder to emitting resources, which is considered by the long-term capacity expansion model as it optimizes to reduce total portfolio costs. Many stakeholders contend that the SCGHG should be implemented as a cost in dispatch, which would have the effect of altering the modeled dispatch by making thermal resources more expensive on a $/MWh basis. Staff sees advantages and disadvantages to both approaches. PSE has committed to running two SCGHG-in-dispatch sensitivities to better understand how each modeling approach might affect total portfolio costs, conservation and DR selections, and total emissions.[30] Unfortunately, this work was not completed in time for inclusion in the Draft IRP.

Some additional analysis comparing costs and emissions for the scenarios and sensitivities would help Staff and stakeholders better understand the differences among the portfolios. Table 3-10, on page 3-18 of the Draft IRP, is a useful comparison of annual emissions, but the cumulative effect of emissions is not easily understood with this representation. A comparison of GHG emissions and GHG-related cost, including a portfolio cost per ton of GHG avoided within each

[29] RCW 19.280.030(3)(a); WAC 480-100-620(11)(j).
[30] These are identified as Sensitivities I and J and are described in PSE's Draft IRP starting at 5-47.

scenario, sensitivity, and preferred portfolio would provide another useful perspective regarding all of the company's results.

No-.040 and -.050 counterfactual scenario: This requirement in WAC 480-100-620(10)(a) helps the company and stakeholders understand the effect of CETA's GHG-neutral by 2030 and GHG-free by 2045 mandates. This sensitivity is provided in the Draft IRP as Sensitivity T.[31] PSE's draft preferred portfolio is not limited to considering solely cost, and factors in risks associated with, for example, transmission constraints. While the portfolio costs are not perfectly comparable, PSE's preferred portfolio is significantly more expensive ($14.4 billion[32]) than the purely cost-optimized Sensitivity T portfolio ($9.4 billion[33]). Staff encourages PSE and other stakeholders to join the Commission in exploring the implications of this portfolio cost differential and discussing what other modeling would further inform PSE's CEIP, especially considering WAC 480-100-660.

Market reliance risk analysis: Despite the Commission identifying this issue in its 2017 IRP acknowledgement letter, [34] PSE did not include any components of its market reliance risk analysis in the Draft IRP.[35] Multiple regional organizations have identified a capacity shortfall in the Pacific Northwest, spurred in part by the closure of coal-fired generators such as Colstrip.[36] PSE's modeling assumption that its firm transmission to the Mid-Columbia energy trading hub is equivalent to firm capacity grows more tenuous with each retirement. Market reliance risk has been a topic of Commission, Staff and stakeholder interest for at least five years, so it is disappointing that the Draft IRP did not include relevant content.

Recommendations for PSE's modeling efforts
For the Final IRP, Staff recommends that PSE:

- Complete all analyses which were not included in the Draft IRP – climate change sensitivity, SCGHG in dispatch sensitivity, stochastic analysis, flexibility analysis, market reliance risk analysis, maximum customer benefit scenario, and more.
- Provide additional narrative explaining the company's calculation and use of line loss estimates and loss factors.
- Include additional reporting around GHG emissions and GHG-related cost comparisons for scenarios and sensitivities, including a portfolio cost differential per ton of GHG avoided within each scenario and sensitivity, as well as a graph showing cumulative emissions for each portfolio over the planning horizon.

For future planning cycles, Staff recommends that PSE:

- Explore the feasibility of integrating the analysis currently performed by the Resource

[31] For a description of all sensitivities to be included in the Final IRP, see Figure 5-26: 2021 IRP Electric Portfolio Sensitivities, starting on p. 6-43.
[32] Draft IRP at 1-19, Figure 1-6.
[33] Draft IRP at 3-16, Figure 3-8.
[34] Dockets UE-160918 & UG-160919, Commission acknowledgement letter attachment, filed on May 7, 2018, and revised on June 19, 2018, starting at p. 5.
[35] Draft IRP at 1-5.
[36] Northwest Power and Conservation Counsel, Pacific Northwest Power Supply Adequacy Assessment for 2024, p.16 (Oct. 31, 2019) (The assessment estimates an 8.2 percent LOLP for the region).

Adequacy Model into other modeling tools, such as Plexos. Staff understands the Plexos modeling software may be able to produce similar studies to the proprietary RAM. If so, this could allow for better integration of resource adequacy and flexibility analyses, increase consistency of assumptions and inputs across modeling studies, and permit better third-party review of the modeling.

Resource Adequacy Assessment and Incorporation of Uncertainty

Summary of PSE's resource adequacy assessment and incorporation of uncertainty
As intermittent renewable energy resources increase in prevalence, the study of resource adequacy (RA) is increasingly important. CETA requires PSE to determine "resource adequacy metrics for the resource plan" and to identify "an appropriate resource adequacy requirement and measurement metric consistent with prudent utility practice."[37] In its Draft IRP, PSE establishes a 5 percent loss of load probability (LOLP) resource adequacy metric to assess its physical resource adequacy risk.

In the Draft IRP, PSE identifies its peak capacity need in the mid-demand forecast, plus planning margin, as 907 MW in 2027, which is further reduced to 527 MW after cost-effective demand-side resources. For 2031, PSE projects a 1,381 MW deficit, reduced to 735 MW after cost-effective demand-side resources. This includes a 20.7 percent planning margin[38] (or "buffer" above a normal peak) to achieve and maintain PSE's 5 percent LOLP planning standard. The projected peak capacity deficit identified by PSE does not include the 1,500 MW of market purchases the company relies on to meet peak capacity need, an assumption that brings price risk and reliability risk. PSE notes further analysis of market availability is forthcoming in the Final IRP and may change PSE's electric peak hour capacity need.

Recommendations for PSE's RA and Uncertainty Analysis
Staff reviewed PSE's draft resource adequacy analysis presented in Chapter 7, including the company's resource adequacy modeling approach, consistency with regional resource adequacy assessments, operating reserves and planning margin, and peak capacity credit of resources. We provide the following questions, comments, and suggestions for the Final IRP related to resource adequacy and incorporation of uncertainty in the analysis:

- *Future market availability*: PSE should consider market availability and wholesale market risk scenario(s), incorporating this uncertainty into its resource adequacy analysis. Based on the utility's analysis of the scenario and sensitivity cases in its Draft IRP, the utility developed several "hybrid" resource portfolios (Sensitivities V & W) that appear to be designed to reduce market risk by relying more on DERs than on market purchases or renewable resources that are either (1) located outside its service area, or (2) would require development of additional transmission infrastructure. Staff suggest the risk reduction provided by these two alternative portfolios should be tested prior to PSE filing its Final IRP because they have a relatively small incremental cost compared to PSE's "base" (i.e., lowest expected cost) resource portfolio. If this was

[37] RCW 19.280.030(1)(g) and (i).
[38] Draft IRP at 1-8.

already done and these sensitivity results were factors in creating PSE's preferred portfolio, PSE should explain the lessons learned and how those lessons influenced the final portfolio. Staff understands the company plans to evaluate the risk reduction associated with each portfolio in the Final IRP, and we request the company provide a thorough and comparative explanation of the results.

- *Coal plant retirements*: Figure 7-2 only shows coal plant retirements, and the narrative indicates that only PSE resources (wind and solar) were assumed as resource additions. PSE does not indicate whether it included other resource additions/retirements that have or will occur, beyond its own resources, when it updated GENESYS for the years 2027 and 2031. If only PSE resource additions and retirements are included in the Draft IRP modeling, this assumption likely understates the changes across the Pacific Northwest (and WECC). PSE indicates (see p. 7-8) that it used BPA's "White Book" (BPA's 2019 Pacific Northwest Loads and Resources Study). It appears PSE may have included other resource additions/retirements in its resource adequacy modeling. However, PSE does not describe this in the Draft IRP narrative. We request additional narrative in the Final IRP indicating whether the company included other resource additions/retirements that have or will occur, beyond its own resources, when it updated GENESYS for 2027 & 2031.

  Joint comments from multiple stakeholders were filed, noting that PSE has not completed an updated Colstrip analysis.[39] Optimal resource retirement is one of the outcomes of a thorough IRP analysis, and Colstrip is reasonably a focal point when considering whether any of PSE's current assets might be retired on an economic basis. Staff cannot recall stakeholder interest in an updated analysis specific to the Colstrip facility was being raised in meetings, and our review of PSE's Appendix A found no such request. Staff encourages PSE and stakeholders to continue exploring the question of Colstrip's continued operation; such considerations must factor in system reliability and availability of capacity to meet PSE's peak demand.

- *Power supply uncertainty*: Staff questions whether PSE addressed uncertainty related to construction within the RA analysis in the Draft IRP or whether the company plans to address it in future IRPs. Construction uncertainties refer to the risks of construction delays for new assets, and other future considerations for resource maintenance, plant upgrades, and transmission expansion.[40] Examples of construction risks include permitting delays, equipment delivery delays, and liquidated damages. Staff request PSE clarify in the Final IRP, or through analyses next cycle: (1) how PSE plans to incorporate these uncertainties and (2) how construction risks can be mitigated.

- *Hours of Loss of Load*: Staff asks the company to provide monthly values for each adequacy metric (EUE, LOLH, LOLE and LOLEV). Knowing each of the metrics for

[39] Dockets UE-200305 & UG-200305, Joint Comments (Jan. 15, 2021).
[40] *See* Juan Pablo Carvallo et al., Implications of a regional resource adequacy program on utility integrated resource planning - Study for the Western United States, Energy Analysis and Environmental Impacts Division, Lawrence Berkeley National Laboratory, p. 19 (Nov. 2020).

each month will help stakeholders understand why some resource options are more appropriate solutions for an adequacy shortfall; it may also explain why certain options may not be optimal choices (see Figure 7-7).

Peak Capacity Credit of Resources – LOLP and EUE: It appears PSE uses different reliability metrics for different resources, where variable energy resources, such as wind or solar, may show different ELCC values depending on which reliability metric is being used – LOLP or EUE. It appears the Expected Unserved Energy (EUE) metric for energy-limited resources like energy storage and demand response could be the source of *significantly lower capacity values* shown on page 2-12 for storage resources, as compared with peer utilities.[41]

Further, thermal resources appear to be evaluated based on their probability of creating a deficit using the LOLP methodology, regardless of size, whereas storage and DR appear to be evaluated based on their ability to fill the deficit. For example, it appears that PSE assigns the dual fuel combustion turbine a 100 percent peak capacity credit.[42] However, all resources have some small chance of unavailability, as PSE shows the forced outage rate around 2.38 percent.[43] ELCC is a sort of "derating factor" applied to a generation facility's maximum capacity, which can represent the uncertainty of the facility's capability to deliver due to uncertain factors, such as a forced outage rate for a thermal unit. If the logic applied to energy storage applied to this generic resource, presumably every modeled event that was larger than its nameplate winter capacity of 237 MW would count as a failure for this resource and could result in a lower peak capacity credit. Staff is unclear on this point and encourages the company to clarify and correct if so. In either case, Staff would appreciate continued conversation on this topic.

Staff requests additional narrative in the Final IRP regarding how ELCC and EUE create the planning margin. It appears that EUE "sums up all the deficit MW across all draws" regardless of their duration and frequency. Hence, it is the "average" EUE/draw. It appears that whether a draw has ten deficits of 10 MW each lasting 5 hours or one deficit of 500 MW lasting 1 hour, the "average" EUE/draw would be the same, even though the impact on the system would be vastly different. Eliminating the first type of deficit might be possible with a large DR program or energy storage; however, that may not be the case for the second type. PSE should discuss its approach and specifically address whether the use of EUE to produce an ELCC adequately captures variations in duration and magnitude when estimating the capacity value of storage.[44]

Peak Capacity Credit of Resources – Battery and Hybrid Resources: Figure 7-19 shows that the "marginal" capacity credit for batteries increases as the share of variable

[41] Portland General Electric 2019 IRP, p. 165, Figure 6-5 (published July 2019) Marginal ELCC for storage resources vary by storage type, but 4+ hour storage resources are valued at roughly 62 to 85 percent.
[42] Draft IRP at 7-28. "Generic 1x0 F-Class Dual Fuel Combustion Turbine" has a peak capacity credit of 237 MW." This is the same value as the winter capacity value of that resource in the Draft IRP Appendices. *Id*. at Appendix D, D-81, Figure D-34 (Generic Combustion Turbine Resource Assumptions).
[43] *Id*. at Appendix D, D-81, Figure D-34 (Generic Combustion Turbine Resource Assumptions).
[44] *Id*. at 7-31. PSE describes how it estimated its EUEs.

resources increases. That means that there is an increasing number of short-duration curtailments that these resources can fill. This, in addition to cost declines, may explain why battery storage is selected later in PSE's base portfolio. Staff suggests PSE also develop peak capacity credits for 2045 and use interpolated "peak capacity credits" for batteries acquired in the years between 2027 and 2040 to better reflect their increasing benefits as additional wind and solar resources are added to the portfolio.

Peak Capacity Credit of Resources – Demand Response: As shown in figure 7-21 (p.7-32), the peak capacity credit for all DR is based on a "call limit" of 10 times per year. PSE provides a simplification in describing "proxy resources," but it would be useful to test alternative call limits. The relative depth and frequency of calls could be spread across many participants, whereas PSE's assumption that all DR programs are limited to just 10 calls per year/100 MW of capacity reduction may be too conservative. For example, automated demand response (ADR) systems might be installed in thousands of commercial buildings and permit more than 10 calls per year that provide significant capacity without noticeably disrupting consumer services. Staff recommends that PSE: (1) provide additional narrative on the call limits in the Final IRP, and (2) test alternative program designs, including varying call limits and sizes, in future IRP cycles.

Conservation and CPA

Summary of PSE's consideration of conservation and contents of draft CPA
PSE filed a draft CPA as Appendix E to the company's Draft IRP. The draft CPA included assessments of achievable technical potential for demand response, combined heat and power, and distributed rooftop solar. The draft CPA included incremental improvements and updated inputs, such as recent building stock assessments and changes to energy codes and standards. The energy efficiency measures considered in this CPA also aligned with RTF estimates for unit energy savings, where possible.

As discussed in the data disclosure section of these comments, the data and analysis underlying this draft CPA have not been filed to the docket, nor have any workpapers or similar CPA-related work products been provided to stakeholders, despite early and persistent requests.[45]

With that caveat, the analysis appears to be comparable in methodology and results to the CPA developed through PSE's 2019 IRP process, with roughly similar assessments of the 20-year achievable technical potential for electric and gas energy savings across residential, commercial and industrial customers.[46] The CPA estimated technical conservation potential and achievable conservation potential but did not calculate economic potential; this last step was appropriately completed by PSE in its portfolio modeling for both the gas and electric lines of business.

[45] Two examples of these requests can be found in Appendix A of the Draft IRP Appendices, .pdf pages 137 and 151.

[46] Draft IRP at Appendix E, draft CPA p. 5, Table 4. Differences in total achievable technical potential are explained on page 6 and include three key shifts: exclusion of data centers, adjustments to the escalation of energy use from indoor cannabis cultivation, and updated commercial lighting baselines.

The conservation and DR potentials identified in the CPA are based on PSE's mid load forecast. The availability of many energy efficiency measures and DR resources hinge on this load forecast, and hence should be adjusted to account for any changing load forecast assumptions. For example, if the company's high load scenario includes an increased number of new home builds, then the availability of new home energy efficiency measures and DR resources should adjust upward accordingly. PSE's current analysis does not account for this interactive effect. PSE estimates that the over- or under-estimation of conservation and DR availability is minor,[47] but Staff suspects that divergence may be more significant. Staff provide detailed questions on this subject in Appendix 2.

The CPA appears not to provide any analysis regarding other value streams provided by conservation and DR. Figure 5-17, on page 5-31 of the Draft IRP, shows some preliminary flexibility benefit estimates associated with dispatchable resources.[48] DR, especially flexible demand resources which can be called without noticeable customer impact, may provide similar flexibility benefits. DR's flexibility value was identified in the 2017 IRP Electric Action Plan, but that valuation does not appear to be included in the Draft IRP.[49] Conservation is likely to have some value in this lens, as well. Conservation reduces the scale of renewable acquisitions to meet CETA requirements, which in turn reduces PSE's sub-hourly system flexibility needs.

Staff also noticed a possible misalignment between EIA requirements and PSE's forecasted acquisition of cost-effective conservation. The EIA requires that PSE's conservation target be set at the greater of the energy efficiency available within the next two years, or a pro-rata share of the cost-effective conservation potential for the next 10 years. In Figure 2-2, page 2-7, PSE shows a technical achievable potential of about 310 aMW over the 10-year horizon, and about 40 aMW in the first two years. While this graph does not show cost-effective conservation selections, if the pattern is similar, PSE would be obliged by the EIA's pro-rata requirement to acquire more conservation in the first two years, which may have some impact on the company's near-term resource needs. Staff would appreciate some clarification on how PSE considers this requirement in its planning.

Staff appreciates the increased focus on low-income residential customers; a better understanding of energy usage for that customer segment can only assist the company in addressing the customer benefit provisions in CETA. Given that DR and customer-sited solar were explored in this CPA and are only two types of DERs, we are uncertain about whether and how PSE intends to assess other types of DERs such as customer-sited energy storage.

It is important to note that Staff will be further analyzing the details of the CPA as part of the CPA approval process described in Appendix 1 to these comments.

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[47] Draft IRP Appendices, Appendix A .pdf page 165. PSE states, "Changes in load forecast have a relatively minor impact on the total achievable potential."

[48] This is also alluded to in the description of Scenario F: "Baseline assumption: Conservation and demand response measures ramp up to full implementation over 10 years." Draft IRP at 5-46.

[49] Draft IRP Appendices, Appendix B, B-17.

Recommendations for PSE's draft CPA
In the Final IRP, PSE should:

- Provide the conservation potential assessment model and underlying data.
- Calculate flexibility benefits for DERs, especially conservation and DR.
- Explain how the pro-rata acquisition requirement in the EIA interacts with PSE's modeled acquisition of conservation.

For future IRP cycles, Staff recommends that PSE:

- Include all well-substantiated estimates of NEIs in the company's base analysis.
- Share a draft CPA as early as possible.
- Ensure that CPA outputs allow PSE to calibrate conservation potentials with varying load forecasts, including low/medium/high load scenarios and climate change-related sensitivities or adjustments.
- Consider whether CPA should contain other DER assessments.

Demand Response

Summary of PSE's consideration of DR in the Draft IRP
As noted in the conservation section, we have not been provided with workpapers or other data to review, so our assessment of DR in this IRP is limited to the contents of the draft CPA. We are surprised that the amount of DR potential in the 2021 draft CPA is roughly comparable to the potential estimated in the previous IRP. The estimates for water heaters, specifically, seem quite low in view of the recently passed Washington statute mandating CTA-2045 demand response capabilities on all new water heaters.

Cadmus explains that their analysis incorporates the impacts of this standard by shifting the program participants to grid-enabled water heaters (GEWH) over time but the data provided is insufficient for Staff to understand the assumptions used.[50] In addition, by starting participants on a costly switch program (Cadmus assumed $315/switch) and then moving them to a GEWH program where the device is included in the price of the water heater, the cost of the program as a whole could be drastically overinflated compared to a program that only included customers as they naturally acquired the equipment. Staff does not know this to be the case but without access to the data or model it is difficult to determine.

We have significant concerns regarding the treatment of grid enabled water heaters. Washington has established that electric storage water heaters sold in the state that are manufactured after January 1, 2021, must include a demand response communications port.[51] Turnover of the state's electric water heater stock will take some time but will steadily increase the potential of this resource without additional equipment being required at customer premises, allowing for significantly lowered barriers to adoption and lowered implementation costs. This technology allows frequent load curtailment requests while ensuring a supply of hot water remains available to the customer.[52] Each utility included this technology in the potential assessments, but no

[50] Draft IRP Appendices, Appendix E, 62 of Cadmus CPA.
[51] RCW 19.260.080.
[52] *See generally*, Bonneville Power Administration, CTA-2045 Water Heater Demonstration Report (Nov. 9, 2018).

utility provided sufficient discussion of potential program costs and assumptions with the advisory group. Staff requests that this technology be given additional consideration by the utilities. Given the large size of a potential program and the current inexperience of northwest utilities with demand response, it is likely that costs are overestimated, and reliability is underestimated.

Recommendations for PSE's demand response modeling and evaluation
As discussed in the demand response technical workshop last year, the utilities need to improve their DR potential modeling.[53] In order for a demand response potential assessment to accurately determine all cost-effective demand response it should, among other things:

- Factor in both positive and negative interaction effects with energy efficiency, storage and any other DERs;
- Include the full value of load flexibility by including all value streams, not just values for peak planning; [54]
- Be evaluated using a model that runs at least hourly and chronologically; and
- Be evaluated using a model that evaluates hydro and weather stochastically.

Demand response programs take time to ramp up to maximum participation levels. Utilities should begin or expand efforts to test technology and pilot programs. Doing so will help the companies better evaluate future DR resources, develop more experience integrating a qualitatively unique resource, and build customer knowledge and participation.

In the Final IRP, Staff recommends that PSE:

- Provide the demand response potential model and underlying data.
- Provide additional background and explanation for the resource parameters characterizing DR resources, such as the 10 call/year limit.

In the CEIP and future IRP planning cycles, PSE should –

- Consider the full value of DR to meet system all types of needs, not just peaking needs, at the lowest reasonable cost.
- Identify the customer benefits associated with DR programs and investigate how to equitably provide these benefits to customers.
- Work closely with stakeholders and experts to improve the modeling and assumptions of cost-effective demand response. Explore alternative program designs, including varying call limits and sizes.
- Propose pilot programs that collect more accurate data to evaluate DR programs for the next IRP and begin the process of educating the utility and its customers about DR.
- Identify barriers to taking advantage of Washington's CTA-2045-capable water heater mandate.
- Identify and quantify, if possible, any interactive effects among conservation, DR and other DERs, and include reasonable estimates of these effects in the company's

[53] Dockets UE-190698 & UE-191023 (Consolidated), Workshop Presentation, on behalf of Staff (June 8, 2019).
[54] Examples of these values include geographically targeted T&D deferral; load shifting and load building; and ancillary services.

modeling.
- Contemplate the distribution system impacts of DERs as a part of PSE's distribution planning efforts and in its DER assessment(s).

Nonenergy Impacts

Summary of PSE's consideration of NEIs in the Draft IRP

PSE appropriately included the types of non-energy benefits that have been included in previous potential assessments, such as saved water and reduced maintenance costs for certain energy efficiency measures. In addition, the Draft IRP describes Sensitivity G as a model run including additional non-energy impacts for conservation.[55] Few specifics are provided, however, and the results of this sensitivity were not included in the Draft IRP.

The draft CPA included analysis of a sensitivity that included a $0.02/kWh NEI as a benefit for conservation. This figure comes from an Environmental Protection Agency (EPA) study estimating broad health and environmental impacts associated with energy use. Staff has reviewed the EPA study and supports its inclusion in this IRP. The analysis in the CPA provides the inputs needed for the portfolio Sensitivity G described in the Draft IRP. Staff understands the new rule requirements to mandate that robustly quantified proxy NEIs be included in the main analysis underpinning the company's base case and flowing into all scenarios and sensitivities, rather than as a single sensitivity informing the preferred portfolio. [56] However, we also recognize that the appropriate handling of NEIs in IRP analysis is new, and that what qualifies as robustly quantified would benefit from further discussion.

CETA and the new WAC language also require that PSE assess the economic, health and environmental burdens and benefits to vulnerable populations and highly impacted communities. Many of these impacts could be potentially characterized as non-energy impacts. PSE has not yet performed this analysis,[57] though describes its anticipated methodology. Staff reviewed the contents of PSE's Appendix K, which aligned with the information provided in PSE's public input meetings. We anticipate that this analysis, including determination of customer benefit indicators, will benefit from further refinement through public comment, the establishment of an equity advisory group by May 1, 2021, and the development of the company's finalized CEAP and CEIP.

Recommendations for PSE's NEI efforts

In its next IRP cycle, Staff recommends that the utility:
- Develop a framework with stakeholders to clarify which estimates of nonenergy impacts are required by rule, which should be explored with sensitivities, and which are not robust enough for inclusion in the IRP analysis.
- Consider how NEIs overlap with CETA's customer benefit provisions.

[55] Draft IRP at 5-47.
[56] WAC 480-100-620(3)(a).
[57] Draft IRP at 1-5. "Economic, health and environmental assessment of current conditions" is identified as a component of the IRP that is not completed for the Draft IRP. Staff notes that PSE's analysis should assess current conditions as well as anticipated future impacts of resource decisions considered in the IRP. *See* RCW 19.280.030(1)(k).

- Identify where real data collection makes sense and where continued use of proxy is acceptable.

Energy Storage

Summary of PSE's consideration of energy storage in the Draft IRP
CETA's requirements make dispatchable, non-emitting resources a valuable addition to PSE's portfolio. Without the company's flexibility study, Staff is unable to fully review PSE's consideration of storage in its IRP analysis. The prices used in the company's analysis appear reasonable. Staff appreciates the discussion of storage projects selected in the course of PSE's delivery system planning as a part of the company's non-wire analysis. These projects are modeled in the IRP analysis as must-take resources, which Staff supports.

Without a DER analysis focused on batteries, Staff could not confirm that PSE considered any programmatic energy storage offerings as a system resource, similar to the company's consideration of distributed solar. Staff encourages PSE to expand its DER-based proxy resource offerings, including energy storage, as other utilities have shown this to be feasible and possibly cost-effective. Stakeholders and industry experts can help the utility develop reasonable modeling inputs.

While we commend PSE's commitment to studied consideration of energy storage, PSE's typical metric for capacity valuation, ELCC and EUE, would benefit from more discussion when applied to energy storage. We understand the logic behind these metrics' application to other resources as an estimate of the probability that a resource will *cause* a deficit. For energy storage, the ELCC metric seems to represent something different – whether the storage asset can *fill* a capacity deficit.

As discussed in Staff's review of PSE's resource adequacy analysis, studies by other utilities in the region have found much higher capacity values for batteries, and even after larger investments, do not get as low as PSE's. A study commissioned by the CPUC found that the state could install 10,530 MW of storage before marginal capacity values dropped to 90 percent.[58] These views on the capacity value of energy storage both run counter to the capacity value implied by PSE's ELCC calculation. Staff would appreciate further conversation and education on this topic.

Recommendations for PSE's consideration of energy storage
For the company's Final IRP, we recommend that PSE provide further narrative and analysis on whether ELCC and EUE are appropriate metrics to estimate the value of energy storage.

For future IRP planning cycles, PSE should:

- Work with stakeholders to develop reasonable proxy resource costs and operational attributes representing programmatic DER acquisitions, such as customer-sited, utility-controlled energy storage.

[58] Astrapé Consulting, Energy Storage Capacity Value on the CAISO System: Final Report, p. 5 (November 20, 2019).

- Further develop its DER assessment required by WAC 480-100-620(3).

Data Disclosure

Summary of PSE's data disclosure activities related to the Draft IRP
PSE has built a robust framework for public participation and response to questions and comments and has been reasonably responsive to the requests for more information that stakeholders have submitted through the company's public participation processes. Staff has heard from some participants that they were dissatisfied with the depth of information provided. Of note, PSE's Energize Eastside project was a topic that was studiously avoided during webinars.

PSE's Draft IRP filing included two Adobe .pdf files: one for the IRP, and one for the appendices. No data input files have been filed with the Commission. After many months of discussion, Staff received some of the non-confidential input files for one of PSE's many modeling software platforms. Without a clear view into all inputs for all models, Staff and other stakeholders cannot comprehensively vet the inputs or the results of PSE's analysis. Staff appreciates that commercially sensitive information should be treated appropriately, and we believe that the new rules provide the motive and framework needed to share this information more easily.

Staff appreciates PSE's efforts to set deadlines for its own work products, and to establish similar deadlines for stakeholder input. Staff encourages PSE develop a data and information sharing schedule, where appropriate, company to cultivate collaborative engagement among the utility and stakeholders.[59] Such collaboration could help the company adjust its internal timelines to better meet the new IRP schedule during future planning cycles.[60]

Unless confidentiality concerns prevent the company from circulating requested data, Staff encourages PSE to be more forthcoming with data and analysis, even if preliminary, to foster independent review. For example, Staff requested some view into the draft CPA in July 2020. PSE had preliminary results available, evidenced by the July 14, 2020, meeting materials focused on demand-side resources. PSE responded to these requests with a commitment to include the draft CPA in the Draft IRP, which would be six months after Staff's initial request. Sadly, PSE did not include any spreadsheets supporting its CPA when if filed its Draft IRP.

Further, PSE did not file with the Commission any data input files in native format as appendices to its Draft IRP. Moreover, most of the data PSE has included in its Draft IRP is in the form of static charts and tables, conveyed to corroborate company resource conclusions.[61] Neither Staff nor interested stakeholders can feasibly interrogate such data to independently verify company decisions. Hence, PSE's Draft IRP, like that of PacifiCorp, have missed the mark with respect to the type and format of data filed. Adobe .pdfs of data sets or, more accurately, portions of data sets, are not accessible to stakeholders and PSE should not repeat this filing practice for the Final

[59] CETA Rulemaking Order at ¶ 137.
[60] *Id.* at ¶ 168.
[61] The majority of provided data supporting PSE Draft IRP is found within Appendices A-M of the Draft IRP.

IRP nor draft plans required during future IRP cycles.

Recommendations for PSE's data practices
For its Final IRP, Staff recommends that PSE:

- File all underlying data related to the company's CPA and IRP modeling tools, in native file format as appropriate. Data may be filed confidentially.

For future planning cycles, PSE should:

- Respond without significant delay to stakeholder questions and requests for additional data, or clearly state why such requests cannot be fulfilled. If the company cannot fulfill the request within a reasonable timeframe, explain the reason for the perceived delay. Staff acknowledge confidentiality concerns may limit circulation of requested information but encourage PSE to minimize the amount of information designated as confidential.[62]
- File all data input files in native format as appendices. To ensure Staff can manipulate said data and modeling files when analyzing the utility's actions, PSE may need to provide access to modeling software and cloud access to data.[63]

Qualifying Facilities – Avoided Cost Methodology

Summary of PSE's avoided cost calculations and presentation in the Draft IRP
While the company did perform a wholesale energy price forecast, PSE did not include an analysis of the avoided cost estimates for capacity, transmission, distribution and GHG emissions in the Draft IRP. The company has committed to including its analysis and findings in the Final IRP.[64] While some preview of the presentation of this analysis would have been helpful and may have benefited from public comment, Staff understands that this analysis is most efficiently undertaken at the end of the IRP analysis, after the preferred portfolio – which largely determines what costs are avoided – is finalized.

PSE's Draft IRP does include estimates of each resource type's capacity credit and capacity factor for renewable resources,[65] which are key inputs to the calculation of avoided cost rates offered to certain facilities under the Public Utility Regulatory Policies Act (PURPA). Staff commends PSE for including these estimates and suggests that these and any other PURPA-related tariff inputs be collated and included with the section or appendix that will contain avoided cost calculations in the Final IRP.

Recommendations for PSE's calculation and presentation of avoided costs
Staff recommends for the Final IRP that PSE:

- Collate all IRP outputs used as PURPA-related tariff inputs with the section or appendix that will contain avoided cost calculations. This information may also be presented in other sections, as appropriate.

[62] CETA Rulemaking Order at ¶ 176.
[63] *Id*. at ¶ 179.
[64] Draft IRP at 1-6.
[65] *Id*. at. D-56. Examples of these values as tabulated for solar resources can be found on Figure D-27.

Natural Gas Design Day (Planning Standard)

Summary of PSE's natural gas system planning standard in the 2021 IRP

PSE's peak day planning standard for natural gas is "13 degrees Fahrenheit average temperature," corresponding to a 52 heating degree day (HDD) standard.[66] The Draft IRP does not discuss the origins of this design peak day, but the company did present some of its history in its October 14, 2020, webinar focused on the natural gas line of business.[67] The standard was drawn from a benefit-cost analysis performed as a part of PSE's 2005 least-cost plan, a precursor to what is now the IRP.

PSE's planning horizon for its natural gas line of business in this IRP is winter 2022-2023 to winter 2041-2042. By the end of this planning horizon, the study underpinning PSE's understanding of its natural gas system need will be almost 40 years old. This study should be reviewed and possibly refreshed. While we would encourage the company to refresh the study to include new resource options, contemporary climatological forecasts and new statutory requirements as applicable, we are open to the argument that the results of the study are still valid in guiding company decisions for 2020-2045. The company should defend its decision to refresh the study, or to not refresh it.

PSE and Avista both calculate their design days to represent some of the most extreme temperature scenarios in their territories. PSE's design day is based on the 98th percentile of experienced annual peak days, while Avista's methodology uses a 99 percent probability of experiencing an extremely cold temperature in each of its service areas. Avista adjusts the two days on each side of the peak day to be colder than normal, which PSE does not appear to do. As mentioned in Staff's discussion of PSE's load forecast, PSE is performing a sensitivity that uses the NWPCC's 2020-2049 temperature projections to develop a future climate change scenario.

Recommendations for PSE's natural gas design day implementation

Staff have the following recommendations for PSE's next IRP cycle:

- Review and seriously consider updating the 2005 study underpinning the company's 52 HDD standard based on the best available science on climate change and PSE's temperature sensitivity. Provide an interim report at least one year before the next Draft IRP is due, explaining the company's analysis and decision.
- Retain the commitment found on page 9-15 of the Draft IRP to study the impact of changing its planning standard. PSE should conduct said analysis, and report on the results in its next IRP.
- Explore whether it is appropriate to incorporate colder-than-normal "shoulder days" surrounding its peak day.

[66] Draft IRP at 6-18.
[67] PSE 2021 IRP TAG meeting #8, held on October 14, 2020. The 52 HDD standard is referenced on slide 32 of the PowerPoint.

Upstream Emissions Estimates & SCGHG calculations

Summary of PSE's consideration of SCGHG and upstream emissions in the 2021 IRP
PSE's consideration of SCGHG includes the climate impact of upstream emissions of natural gas associated with each line of business. The valuation of these upstream emissions in the Draft IRP is not unreasonable, but in Staff's view could be improved. PSE has defended its decision to use global warming potential (GWP) factors from the Intergovernmental Panel on Climate Change's 2007 Fourth Assessment Report (AR4) because it is consistent with its analysis related to the company's permit for its liquified natural gas facility in Tacoma. While those estimates are defensible, and may in that case be required, the company's IRP is not similarly constrained. Staff always supports the use of the best available science for utility planning, which means we believe PSE should use the 2014 Fifth Assessment Report (AR5) in its IRP analysis. PSE's method of incorporating upstream emissions into its analysis is also inconsistent with Avista's approach, which is based on AR5 factors.

For upstream emission estimates, PSE and Avista use the same upstream methane leakage rate (0.77 percent) for Canadian natural gas. PSE does not state in the Draft IRP the upstream methane leakage rate used for gas sourced from the U.S. Rockies, but has indicated that the inputs related to upstream emissions are, like the AR4 factors, borrowed from the methodology used in the Tacoma facility's environmental impact statement.[68] Many stakeholders raised concerns about the GREET and GHGenius models used to estimate upstream emissions in that proceeding and in feedback through PSE's IRP public participation process. The company should ensure that it uses the most recent scientifically rigorous estimates of global warming potential.

PSE's SCGHG price is lower than Avista's by around $10/metric ton of carbon dioxide equivalent ($MTCO_2e$) in the earlier years of the planning horizon, but by 2052 appears to be significantly higher than Avista's price in the same year. Both companies model their respective prices as adders to their base gas price costs. Staff has not yet been able to determine the source of this difference but hopes that this can be reconciled before the companies' final IRPs.

Recommendations for PSE's inclusion of upstream emissions and SCGHG
In its Final IRP, PSE should:

- Include a clear articulation of how the company calculated the SCGHG as required in WAC 480-100-620(11).
- State what upstream emissions rate the company uses for Rockies natural gas, and explain why that number is appropriate.
- Explain the difference in PSE's SCGHG prices as compared to Avista's prices.

In future IRPs, PSE should use the GWP estimates from the most recent Assessment Report of the Intergovernmental Panel on Climate Change or justify why it is acceptable to not use said number.

[68] *Id*. at slide 67.

Renewable Natural Gas (RNG)

Summary of PSE's RNG-related activities
PSE was prompted to secure a supply of RNG to meet the requirements of RCW 80.28.390, which requires gas utilities to provide voluntary RNG programs for interested customers. Related statute RCW 80.28.385 permits the utilities to include RNG for service to all customers. PSE intends to add any RNG not claimed in the voluntary RNG program to its supply for all customers. PSE's Draft IRP did not include a proxy resource for RNG, stating, "Because of RNG's significantly higher cost, the very limited availability of sources and the unique nature of each individual project, RNG is not suitable for hypothetical analysis."[69]

PSE's approach to RNG is not consistent with Avista's. Avista chose to model generic RNG resources as new supply options using cost inputs derived with the help of a consultant. Staff encourages PSE to similarly pursue this refinement.

Recommendations for PSE's treatment of RNG
In future IRP cycles, PSE should consider using any up-to-date cost and other data that is available to model potential RNG resources, even if these are not project-specific. Such analysis would guide the company in vetting specific projects when they are identified.

[69] Draft IRP at 4-13.