EXH. CPC-1HCT
DOCKETS UE-22___/UG-22___
2022 PSE GENERAL RATE CASE
WITNESS: COLIN P. CROWLEY

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent**	**Docket UE-22____** **Docket UG-22____**

PREFILED DIRECT TESTIMONY (HIGHLY CONFIDENTIAL) OF

COLIN P. CROWLEY

ON BEHALF OF PUGET SOUND ENERGY

REDACTED VERSION

JANUARY 31, 2022

PUGET SOUND ENERGY

PREFILED DIRECT TESTIMONY (HIGHLY CONFIDENTIAL) OF COLIN P. CROWLEY

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I. INTRODUCTION

Q. Please state your name, business address, and position with Puget Sound Energy.

A. My name is Colin P. Crowley. My business address is 355 110th Ave NE, Bellevue, WA 98004. I am the Manager of Resource Acquisition for Puget Sound Energy ("PSE").

Q. Have you prepared an exhibit describing your education, relevant employment experience, and other professional qualifications?

A. Yes, I have. It is Exh. CPC-2.

Q. What are your duties as Manager of Resource Acquisition for PSE?

A. My present responsibilities include oversight of: (i) the acquisition of electric resources for PSE; and (ii) contracts for long-term electric supply.

Q. What is the purpose of this prefiled direct testimony?

A. This purpose of this prefiled direct testimony is to seek a finding of prudence and cost recovery for the Clearwater Wind Power Purchase Agreement ("Clearwater Wind PPA") (Project ID #18169). To demonstrate the prudence of the Clearwater

Wind PPA (Project ID #18169), my testimony describes the 2018 All Resources RFP for Proposals ("2018 All Resources RFP") evaluation and results, and includes each of the following:

- An overview of PSE's peak capacity need to meet the projected demands of PSE's electric customers and renewable needs to satisfy the requirements of the Energy Independence Act;
- A description of the process PSE used to evaluate and select resources in response to the 2018 All Resources RFP to meet the identified resource needs; and
- A description of the re-evaluation analysis PSE performed during the negotiation process.

The addition of the Clearwater Wind PPA (Project ID #18169) will enable PSE to meet the renewable and peak capacity needs identified in the 2018 All Resources RFP process, and take a meaningful step forward in its ramping strategy toward meeting the clean energy requirements of the Washington State Clean Energy Transformation Act ("CETA").[1] CETA requires that at least 80 percent of electric sales in Washington State be met with non-emitting or renewable resources by 2030 and 100 percent be met with non-emitting or renewable resources by 2045.

[1] Chapter 19.405 RCW (CETA).

Q. Has the Washington Utilities and Transportation Commission (the "Commission") rendered a decision about the prudence of any other resource decisions and associated resource costs related to the 2018 All Resources RFP in a prior proceeding?

A. Yes. In Order 05 in Docket UE-200980, the Commission found the following resource acquisition decisions associated with the 2018 All Resources RFP to be prudent:

- The Sierra Pacific Industries ("SPI") Biomass Power Purchase Agreement ("SPI Biomass PPA") (Project ID #18100);
- The Bonneville Power Administration ("BPA") Peak Capacity Product ("BPA Peak Capacity Product") (Project ID #18161);
- The Golden Hills Shaped Wind Power Purchase Agreements ("Golden Hills PPAs") (Project ID #18170), which consist of two separate but related power purchase agreements; and
- The Morgan Stanley Capital Group Inc. System Power Purchase Agreement ("MSCG System PPA") (Project ID #UP006).

Q. Please briefly describe the resource for which PSE is currently seeking a determination of prudence and cost recovery as presented in this prefiled direct testimony.

A. This prefiled direct testimony presents the Clearwater Wind PPA, for which PSE is seeking a determination of prudence and cost recovery. The Clearwater Wind PPA (Project ID #18169) is a 20-year, fixed price power purchase

agreement with a five-year extension option for a 350 MW share of a new wind development in Montana. The energy will be delivered to the Colstrip substation and will begin concurrent with the commercial operations of the Clearwater Wind project, which is expected to occur in November 2022. The five-year extension option lowers the price for all 25 years of the PPA from [redacted] to [redacted] per MWh. This is a limited time option, which PSE must exercise no later than December 31, 2025. At this time, PSE is seeking a determination of prudence and cost recovery for the 25-year PPA option to take advantage of the lower price offer for PSE's customers. PSE has not previously requested a prudence determination on the Clearwater Wind PPA.

PSE presented the Clearwater Wind PPA (Project ID #18169) to its Energy Management Committee in November 2019 with four other projects that had been selected in its 2018 All Resources RFP analysis. As further described below, negotiation of the Clearwater Wind PPA (Project ID #18169) was not completed until February 3, 2021, due to delays in the completion of a required System Impact Study.

II. PSE'S DECISION TO ENTER INTO THE CLEARWATER WIND PPA IS PRUDENT

A. Overview

Q. What is PSE's understanding of the Commission's prudence standard?

A. In PSE's 2003 Power Cost Only Rate Case proceeding, Docket UE-031725, the Commission reaffirmed the standard it applies in reviewing the prudence of power generation asset acquisitions:

> The test the Commission applies to measure prudence is what a reasonable board of directors and company management would have decided given what they knew or reasonably should have known to be true at the time they made a decision. This test applies both to the question of need and the appropriateness of the expenditures. The company must establish that it adequately studied the question of whether to purchase these resources and made a reasonable decision, using the data and methods that a reasonable management would have used at the time the decisions were made.[2]

In addition to this reasonableness standard, the Commission has cited several specific factors that inform the question of whether a utility's decision to acquire a new resource was prudent. These factors include the following:

- First, the utility must determine whether new resources are necessary.[3]
- Once a need has been identified, the utility must determine how to fill that need in a cost-effective manner. When a utility is considering the purchase of a resource, it must evaluate that resource against the standards of what other

[2] *WUTC v. Puget Sound Energy*, Docket UE-031725, Order 12 ¶ 19 (Apr. 7, 2004).
[3] *See e.g., WUTC v. Puget Sound Power & Light Co.*, Docket UE-921262, *et al.*, Nineteenth Supplemental Order at 11 (Sept. 27, 1994).

purchases are available, and against the standard of what it would cost to build the resource itself.[4]

- The utility must analyze the resource alternatives using current information that adjusts for such factors as end effects, capital costs, impact on the utility's credit quality, dispatchability, transmission costs, and whatever other factors need specific analysis at the time of a purchase decision.[5]

- The utility should inform its board of directors and/or management about the purchase decision and its costs. The utility should also involve the board of directors and/or management in the decision process.[6]

- The utility must keep adequate contemporaneous records that will allow the Commission to evaluate its actions with respect to the decision process. The Commission should be able to follow the utility's decision process; understand the elements that the utility used; and determine the manner in which the utility valued these elements.[7]

Q. Did PSE's decision to enter into the Clearwater Wind PPA (Project ID #18169) meet this prudence standard?

A. Yes. PSE had a clear, documented need for capacity and renewable resources that would comply with Washington State's Renewable Portfolio Standards ("RPS") in both the near and long terms. PSE also performed the analyses, decision-making and documentation processes expected by the Commission, as summarized in this prefiled direct testimony.

[4] *Id*. at 11.
[5] *Id*. at 2, 33-37, 46-47.
[6] *Id*. at 37, 46.
[7] *Id*. at 2, 37, 46.

B. The 2017 Integrated Resource Plan Informed PSE's Resource Need for Capacity and Renewable Resources

Q. How did PSE determine its need for new capacity and renewable resources?

A. PSE determined its need for capacity and renewable resources based on the analyses in its 2017 Integrated Resource Plan (the "2017 IRP"), which PSE filed with the Commission in November 2017. Please see Exh. CPC-3, for a copy of an excerpt from the 2017 IRP.

Q. Please describe how the Integrated Resource Plan process guides PSE's efforts to acquire resources.

A. The Integrated Resource Plan guides PSE's efforts to acquire new resources at the lowest reasonable cost, as directed by Chapter 19.280 of the Revised Code of Washington (RCW). Each Integrated Resource Plan provides an updated customer demand forecast and an analysis of the costs and risks involved in securing new energy supplies to meet identified shortfalls. PSE biennially prepares a revised Integrated Resource Plan.

a. The 2017 IRP Process Identified a Peak Capacity Need of 215 MW in 2023 and a Renewable Energy need of 720,000 MWh by 2023

Q. What peak capacity need did the 2017 IRP identify?

A. The 2017 IRP identified a need for 215 MW of capacity resources in 2023. The expected peak capacity need was driven primarily by the retirement of several large resources from PSE's electric resource portfolio, beginning in 2022 with the

assumed retirement of approximately 300 MW of capacity associated with Colstrip Units 1 and 2.[8]

Q. What renewable resource need did the 2017 IRP identify?

A. Washington State's Renewable Portfolio Standard requires PSE to serve at least 15 percent of electric load with renewable resources by 2020. At the time PSE filed the 2017 IRP, PSE had sufficient renewable resources to meet this benchmark through and including calendar year 2022 with banked renewable energy credits ("RECs"). The 2017 IRP demonstrated a need to acquire approximately 720,000 RECs annually to meet the 15 percent of load benchmark for calendar year 2023.[9]

b. The 2018 All Resources RFP Identified an Updated Peak Capacity Need of 272 MW in 2022 and an Updated Renewable Energy Need of 671,000 MWh by 2023.

Q. Did PSE update its peak capacity and renewable resource need forecasts prior to filing the 2018 All Resources RFP?

A. Yes. After publishing the 2017 IRP, PSE updated the assessment of its peak capacity and renewable resource needs in its 2018 All Resources RFP filings with the Commission.[10]

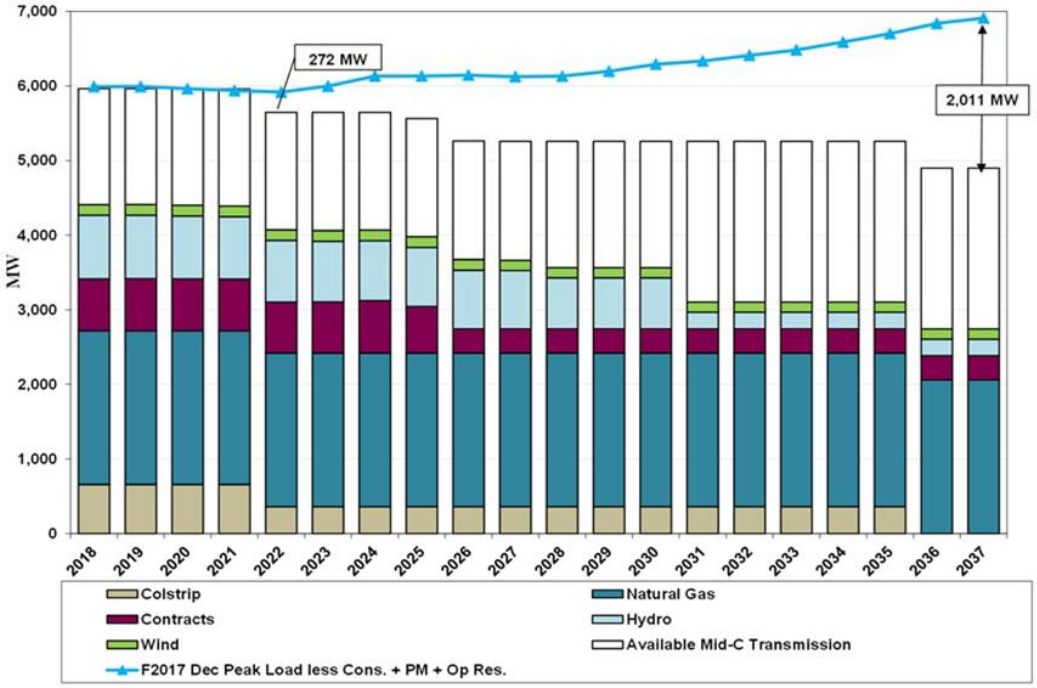
[8] *See* Crowley, Exh. CPC-3 at 31.
[9] *Id*. at 34.
[10] *See* Crowley, Exh. CPC-4 (presenting PSE's need in the 2018 All Resources RFP).

The new forecasts reflected PSE's F2017 load forecast, as well as updates to conservation and PSE's assessment of available transmission. The models and methodologies used to update the 2018 All Resources RFP resource need forecasts are consistent with those used in the 2017 IRP process.

Q. What peak capacity need did the 2018 All Resources RFP identify?

A. As shown in Figure 1, PSE forecasted a modest peak capacity need prior to 2021 that was expected to increase to a deficit of 272 MW in 2022 after the retirement of Colstrip Units 1 and 2.

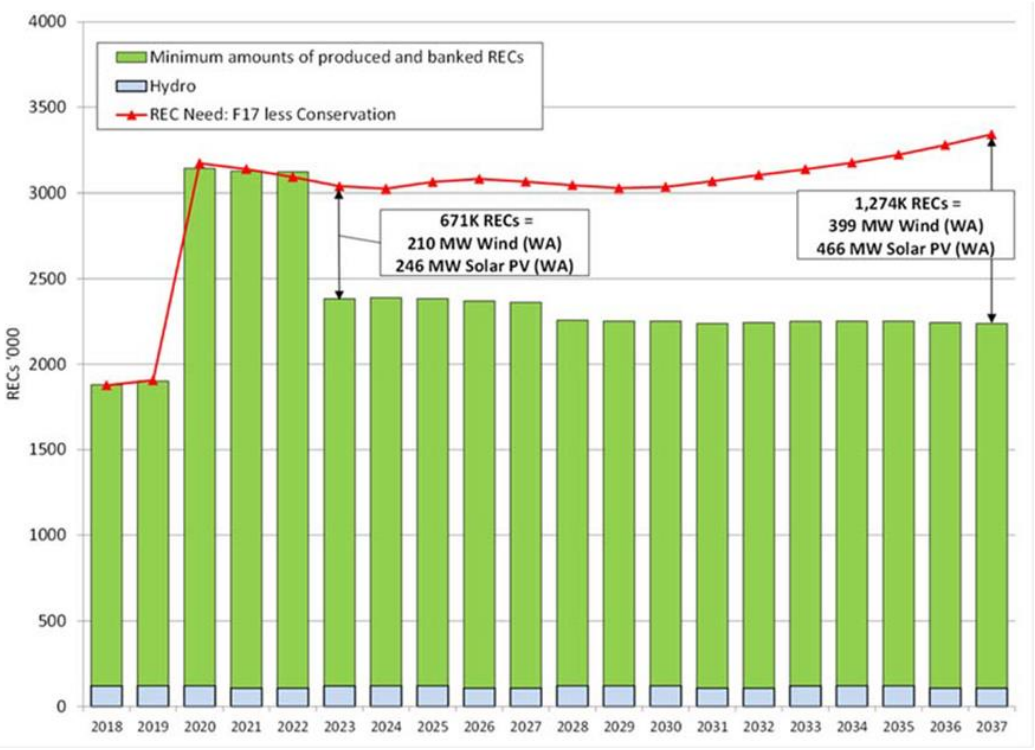
Figure 1. Electric Resource Peak Capacity Need Forecast (as filed in the 2018 All Resources RFP)



Q. What renewable resource need did the 2018 All Resources RFP identify?

A. As shown in Figure 2, the renewable resource need forecast demonstrated a need for 671,000 RECs beginning in calendar year 2023. This need is driven by an increase in Washington State's Renewable Portfolio Standard from 9 percent to 15 percent for calendar year 2020. However, PSE's inventory of banked RECs delays the need for additional resources to meet this incremental increase until calendar year 2023.

Figure 2. Renewable Resource Need Forecast
(as filed in the 2018 All Resources RFP)



Q. Does PSE consider resources acquired to meet the need established in the 2018 All Resources RFP to be used and useful?

A. Yes. Resources contracted or purchased to meet the need identified in the 2018 All Resources RFP will help PSE meet its reliability obligation to customers and comply with the Energy Independence Act. Additionally, the selected renewable resources will contribute to PSE's efforts to meet the clean energy requirements of CETA, which requires that at least 80 percent of electric sales in Washington State be met with non-emitting or renewable resources by 2030 and 100 percent be met with non-emitting or renewable resources by 2045.

C. PSE Issued a Request for Proposals to Meet its Resource Needs

Q. How did PSE implement its strategy to meet its peak capacity and renewable resources needs?

A. Shortly after completing and filing the 2017 IRP, PSE filed a draft 2018 All Resources RFP with the Commission on March 29, 2018. The Commission approved the 2018 All Resources RFP on June 28, 2018. PSE subsequently released the 2018 All Resources RFP on July 6, 2018.

Please see the Third Exhibit to the Prefiled Direct Testimony of Colin P. Crowley, Exh. CPC-4, for a copy of the 2018 All Resources RFP.

The 2018 All Resources RFP requested proposals from power producers, marketers, and power-plant developers to meet PSE's resource needs starting in

calendar year 2022. The 2018 All Resources RFP sought any viable power supply offer or technology that could help meet all or part of the resource needs established in the 2018 All Resources RFP. PSE also indicated that it would consider various resource types and commercial arrangements, such as investment in existing power plants, ownership of new plants, unbundled RECs or long-term power purchase agreements.

D. PSE Evaluated Resource Alternatives Using Current Information that Adjusted for Appropriate Factors and Risks

Q. How did PSE evaluate proposals submitted in response to the 2018 All Resources RFP?

A. PSE engaged in a comprehensive process to evaluate the costs and risks associated with each proposal. The evaluation team consisted of both a core team of quantitative and qualitative analysts and commercial managers, and a broader cross-functional group of subject matter experts from across the utility. PSE evaluated the proposals in two stages based on the criteria set forth in its 2018 All Resources RFP. PSE designed these criteria to take into account qualitative and quantitative factors impacting the decision whether to acquire a potential resource. The criteria included consideration of dispatchability, operating costs, contractual costs, transmission costs, capital costs, impact on PSE's credit quality, project feasibility, transmission feasibility, site control, permitting, technical and operational considerations, legal and environmental matters, public benefits, counterparty experience, and a variety of other factors.

PSE evaluated the proposals on an individual basis, and in combination with other 2018 All Resources RFP proposals and PSE's existing resource portfolio, to identify proposals with the highest portfolio benefit and the lowest risk profiles.

Ultimately, PSE's goal was to select the lowest reasonable cost portfolio solution to meet the needs of its customers.[11]

Q. How did PSE evaluate unsolicited proposals submitted after the commencement of the 2018 All Resources RFP?

A. PSE customarily considers new and unsolicited information and re-evaluates its resource decisions to confirm it is selecting the lowest reasonable cost portfolio solutions to meet customer needs, consistent with resource acquisition prudence rules and policies including Chapter 480-107 WAC. PSE reviewed the unsolicited proposals to determine how well they aligned with resource needs identified in the 2018 All Resources RFP and compared the costs to other reasonably executable alternatives. PSE examined unsolicited proposals using the same due diligence criteria, analytic rigor, and models it used to evaluate the 2018 All Resources RFP proposals.

[11] *See* Crowley, Exh. CPC-4 at 19-27 (providing an overview of the evaluation criteria used by PSE for the 2018 All Resources RFP).

E. PSE Informed and Involved its Board of Directors and Energy Management Committee

Q. Has PSE involved its Board of Directors and Energy Management Committee in its resource acquisition process?

A. Yes. During the course of the evaluation, PSE staff regularly presented updates to PSE's Energy Management Committee on the status of the evaluation, results, and conclusions. PSE also sought appropriate approvals prior to executing selected resource contracts.

F. PSE Kept Contemporaneous Records of its Evaluation and Decision Processes

Q. Did PSE keep contemporaneous records of its evaluation and decision processes?

A. Yes. Throughout the 2018 All Resources RFP process, PSE's evaluation team met weekly to review, discuss, and document its findings and recommendations. PSE captured these findings and recommendations, as well as the details of the evaluation process, in presentations, work papers, and the 2018 All Resources RFP Evaluation Process Document prepared during the course of the evaluation.

The exhibits submitted with this prefiled direct testimony demonstrate PSE's contemporaneous documentation:

- Please see the Fourth Exhibit to the Prefiled Direct Testimony of Colin P. Crowley, Exh. CPC-5HC, for a copy of the 2018 All Resources RFP Evaluation Process Document.

- Please see the Fifth Exhibit to the Prefiled Direct Testimony of Colin P. Crowley, Exh. CPC-6HC at 576-668, for copies of presentations made to PSE's board of directors and to PSE's Energy Management Committee subsequent to Phase 2 of the 2018 All Resources RFP.

III. PSE'S EVALUATION PROCESS

A. PSE Received a High Number of Responses to its 2018 All Resources RFP Relative to Previous RFPs

Q. How many proposals did PSE receive in response to its 2018 All Resources RFP?

A. PSE received 97 proposals representing a combined total of more than 13.5 GW of proposed resources. Additionally, PSE received seven unsolicited proposals after the proposal due date. Some proposals contained multiple transaction options, such as varying ownership or offtake options, contract term lengths, resource size, or hybrid resources (e.g., the option to pair renewables with storage).[12]

[12] *See* Crowley, Exh. CPC-5HC at 19-22, 50-57.

Q. How did the response to PSE's 2018 All Resources RFP compare to previous RFPs?

A. PSE received its largest response ever to an All-Source or Renewable RFP. Table 1 below compares the overall resource mix and number of megawatts proposed in response to the 2018 All Resources RFP to the last two RFPs.

Table 1. Summary of Response to 2018 All Resources RFP [13]

			Past RFPs			
	2018 All Resources RFPs		2017 Renewables Only RFP (Green Direct 2.0)		2011 All Resources RFP	
Resource Type	# Proposals	Max Cap MW	# Proposals	Max Cap MW	# Proposals	Max Cap MW
Solar - PV	16	2,240	17	574	2	24
Solar - PV +BESS	20	2,848				
Wind - Off-Shore	1	400				
Wind - On-Shore	16	3,303	20	2,601	4	369
Wind + Winter Sys PPA	1	371				
Wind + Solar and/or BESS	2	464	4	339		
Storage - Battery (BESS)	17	1,265			2	251
Storage - Pumped Hydro	2	900				
Biomass	2	72			3	61
Biomass + BESS	1	15				
Natural Gas-fired Generation	4	1,377			10	2,624
Geothermal	2	43				
Hydro - Run of River	1	38	2	4	1	77
System PPA / Call Option	1	100			4	400
Unbundled RECs	5					
Demand Response	6	154				
Coal - Traditional + IGCC					1	500
Cold Fusion					1	1,800

[13] Please note that Table 1 does not include unsolicited proposals received after the commencement of the 2018 All Resources RFP evaluation process.

Table 1. Summary of Response to 2018 All Resources RFP [13]

			Past RFPs			
	2018 All Resources RFPs		2017 Renewables Only RFP (Green Direct 2.0)		2011 All Resources RFP	
Resource Type	**# Proposals**	**Max Cap MW**	**# Proposals**	**Max Cap MW**	**# Proposals**	**Max Cap MW**
Distributed Generation						
Waste-to-Energy/Landfill Gas						
TOTAL	97	13,590	43	3,518	29	6,209

Please see Exh. CPC-5HC, at 19, for a comparison of the overall resource mix and number of megawatts proposed in response to the 2018 All Resources RFP to all of PSE's RFPs since 2005.

Q. Did PSE submit self-build resource options in response to the 2018 All Resources RFP?

A. No. PSE included generic resource costs developed by HDR, Inc.[14] as a proxy self-build option but did not submit a self-build proposal. Additionally, PSE included a "Transmission Redirect Option" to represent using 100 MW of existing BPA transmission to access additional Mid-C market purchases.[15]

When considering whether to propose a renewable self-build resource, PSE considered current conditions and the expected timing of its 2018 All Resources RFP resource decisions. PSE ultimately decided not to propose a self-

[14] HDR, Inc. is an employee-owned design firm, specializing in engineering, architecture, environmental and construction services.

[15] *See* Crowley, Exh. CPC-5HC at 23, 132-158.

build resource because it did not identify a potential project that was likely to be competitive in the 2018 All Resources RFP.

Q. Did PSE consider any other proposals as part of its 2018 All Resources RFP evaluation?

A. Yes. PSE also evaluated seven proposals received after the commencement of the 2018 All Resources RFP.[16]

B. 2018 All Resources RFP Evaluation Process

Q. Please describe the 2018 All Resources RFP evaluation process.

A. PSE divided the 2018 All Resources RFP renewable and peak capacity evaluation processes into two phases.

In Phase 1, PSE conducted an initial screening and fatal flaw analysis and produced a list of the most promising resources (the "Candidate List"). The Phase 1 quantitative analysis considered the benefits and costs of each proposal on a standalone basis.

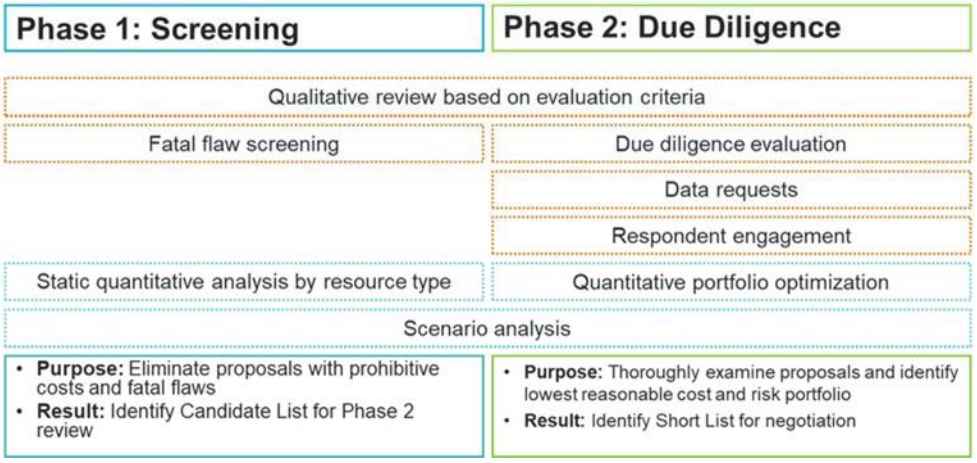
In Phase 2, PSE subjected the resources on the Candidate List to additional qualitative and quantitative due diligence. The Phase 2 quantitative analysis

[16] *See id*. at 55-56 (listing the unsolicited proposals considered by PSE during the 2018 All Resources RFP). Unsolicited proposals are identified as such in the Project ID column.

included additional standalone analytical modeling and portfolio optimization analysis that considered combinations of resources.

Figure 3 summarizes the Phase 1 and Phase 2 evaluation processes.

Figure 3. Phase 1 and Phase 2 Evaluation Process



Q. Please describe the role of the 2018 All Resources RFP evaluation team.

A. PSE's resource acquisition team led a cross-functional evaluation team (the "2018 All Resources RFP evaluation team") in screening and identifying proposals with high costs, unacceptable development risks, insufficient deliverability potential, or feasibility constraints. The 2018 All Resources RFP evaluation team consists of subject matter experts from different functional/technical areas within PSE (also referred to as "working groups") that led the evaluation from each working group's area of expertise.

The working groups screened each proposal according to the evaluation criteria set forth in the 2018 All Resources RFP document. The evaluation team reviewed

both the qualitative and quantitative attributes of a proposal, including price, development and construction status, counterparty experience, commercial terms, environmental impacts, permitting issues, real estate, technical considerations, operating characteristics, transmission and interconnection, community impacts, and project-specific economic analysis.[17]

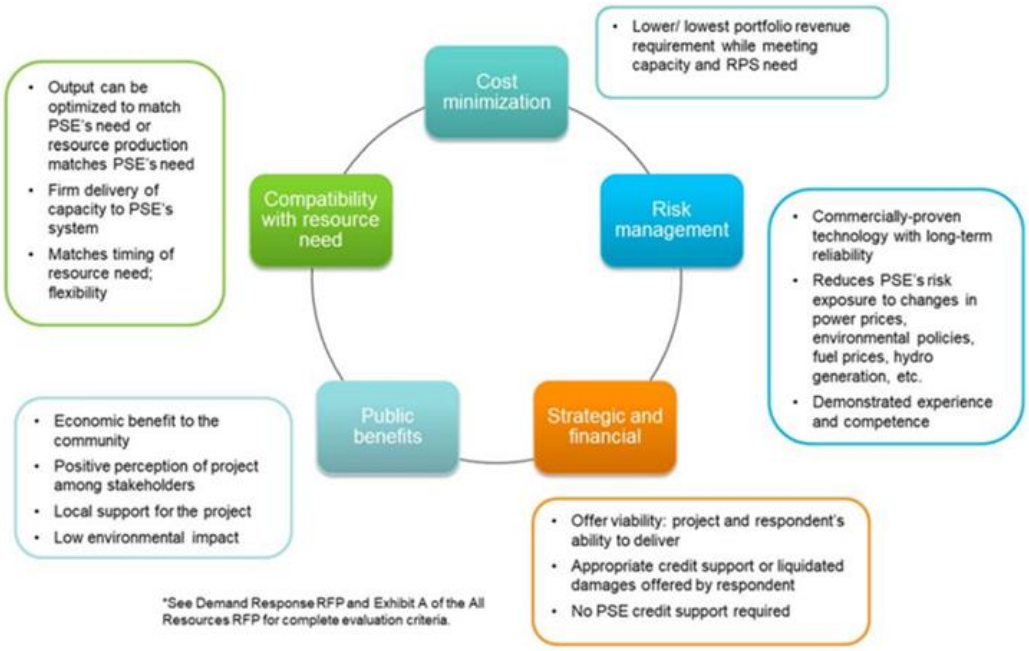
Q. What evaluation criteria did PSE use during the evaluation process?

A. In general, PSE's evaluation criteria established a preference for offers that benefit customers by complementing PSE's resource and timing needs, minimizing cost, minimizing risk, providing strategic and financial benefits, and providing additional public benefits. Each of these evaluation criteria contains a set of sub-criteria or guidelines that specify PSE's preferences for a successful proposal.[18]

Figure 4 provides a summary of the primary evaluation criteria employed by PSE in the evaluation process.

[17] *See generally* Crowley, Exh. CPC-5HC.
[18] *See* Crowley, Exh. CPC-5HC at 58-66 (discussing the 2018 All Resources RFP evaluation criteria).

Figure 4. Summary of 2018 All Resources RFP Evaluation Criteria



Q. How did PSE apply the qualitative criteria?

A. Individual working groups evaluated the proposals from the perspective of their specific areas of expertise based on guidance established in the evaluation criteria. Working groups considered the unique risks and benefits of each proposal and reported their findings to the evaluation team at weekly meetings.[19]

Q. What models did PSE use in the 2018 All Resources RFP quantitative analysis?

A. In its 2018 All Resources RFP analysis, PSE used modeling tools and methodologies consistent with those used in the development of PSE's 2017 IRP.

[19] *See* Parts IV and V of this testimony (discussing how the evaluation team performed the qualitative analysis based on guidance set forth in the evaluation criteria); *see also* Crowley, Exh. CPC-5HC.

PSE uses two analytical models in its quantitative evaluation of resources, Aurora and the Portfolio Screening Model III ("PSM").[20]

Q. How does PSE use Aurora in its quantitative analysis?

A. Aurora is a production cost model run hourly that provides the dispatch of a given resource with the variable cost and market value of energy. Aurora provides several key inputs to PSM, including estimates of energy output by resource, variable costs or dispatch costs (fuel and variable operations and maintenance), emissions, and market purchases and sales.

Q. How does PSE use PSM in its quantitative analysis?

A. PSM is an Excel-based, capacity expansion model that optimizes resource decisions by minimizing costs, while meeting peak capacity and renewable needs. The model is based on the 2017 IRP methodology that identified a 20-year projected portfolio of electric resources that PSE could acquire to meet future load, capacity and REC requirements. PSM forecasts an updated portfolio cost, based on these recommended resource acquisitions.

Portfolio cost is derived from a series of cost projections, including but not limited to the capital cost of resources, gas prices, market price for power purchases and sales, market price for REC sales, transmission cost, operation and maintenance costs, and available tax incentives. These cost projections represent

[20] *See* Crowley, Exh. CPC-5HC at 133-136 (describing the models).

PSE's forecast of what it would cost to acquire typical (or "generic") resources to meet PSE's resource need.

PSM simulates the impact on portfolio economics of replacing a "generic" resource with a specific proposal from the 2018 All Resources RFP. PSM also simulates the impact on portfolio economics of replacing "generic" resources with combinations of proposals from the 2018 All Resources RFP to identify the optimal solution to meet PSE's resource needs.

Q. What metrics does PSM calculate to assess the economic viability of individual proposals?

A. PSM calculates five metrics used by PSE to assess the economic viability of individual proposals:

1. **Levelized Cost** is calculated by taking the specific resource's net present value revenue requirement over the 20-year analytic period with end effects, divided by the net present value generation. The levelized cost is measured on a dollar per megawatt-hour basis and represents the cost of each megawatt-hour over the life of the project. A lower value is better. This metric is useful for comparing projects that have the same or similar operating characteristics.

2. **Levelized Net Cost per REC or Unit of Capacity** is the difference between the net present value project revenue requirement and the net present value market revenue of the project's generation divided by the net present value of the project's capacity contribution. If a renewable project is being considered, then the numerator is divided by the net present value of the project's contribution to PSE's renewable energy target. A lower value is better. This metric is useful for comparing different project sizes and technologies.

3. **Levelized Portfolio Benefit per Unit of Capacity**, for capacity projects, is the project's portfolio benefit divided by the present value of its peak capacity contribution. A higher value is better. This metric is useful for comparing different project sizes and technologies.

4. **Levelized Portfolio Benefit per REC**, for renewable projects, is the project's portfolio benefit divided by the present value of its contribution to PSE's renewable energy target. A higher value is better. This metric is useful for comparing different project sizes and technologies.

5. **Portfolio Benefit** is the difference between the net present value portfolio revenue requirement with a proposed project, and the net present value portfolio revenue requirement of the generic portfolio strategy. A positive portfolio benefit means that the proposed project is less expensive than a comparable "generic" resource. A negative portfolio benefit indicates that the proposed resource is more expensive than a generic resource. A higher value is better. This metric is useful for comparing projects with the same winter capacity value or the same contribution to meeting PSE's renewable energy target.

Each metric offers a slightly different perspective on the economic benefits associated with each proposal. PSE considers all metrics when comparing resources.[21]

[21] *See, e.g.*, Crowley, Exh. CPC-5HC at 136.

C. 2018 All Resources RFP Quantitative Analysis Assumptions: Phases 1 and 2

Q. Did PSE update its peak capacity and renewable resource need forecasts for the Phase 1 analysis?

A. No. PSE performed its Phase 1 analysis using the peak capacity and renewable resource need forecasts filed and approved in the 2018 All Resources RFP, as presented in Figure 1 and Figure 2 of this testimony.

Q. Did PSE update its peak capacity and renewable resource need forecasts for the Phase 2 analysis?

A. Yes. PSE updated its renewable resource and peak capacity need assessments before the second phase of the 2018 All Resources RFP to reflect the most current information available at the time the analysis was conducted. Figure 5 shows the updated peak need based on the F2019 load forecast and conservation from the 2017 IRP. It shows an overall increase in the need for capacity resources over the planning horizon, including an increase of new capacity in calendar year 2022 from 272 MW (as filed) to 299 MW.

Figure 5. Electric Resource Peak Capacity Need Forecast (Phase 2)

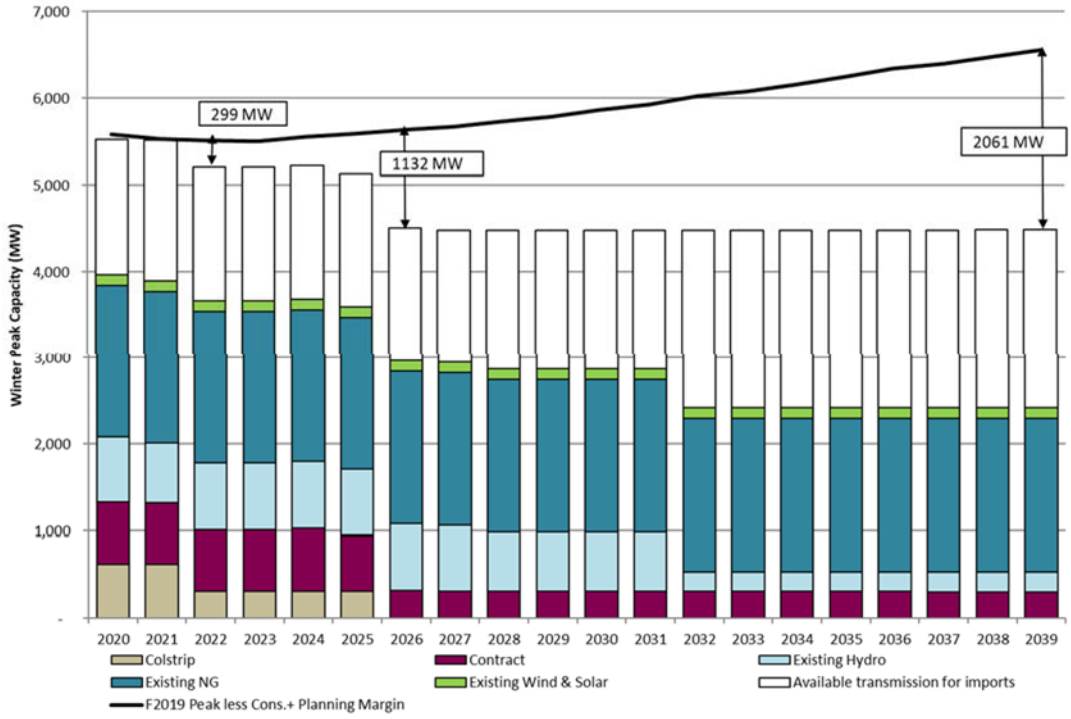
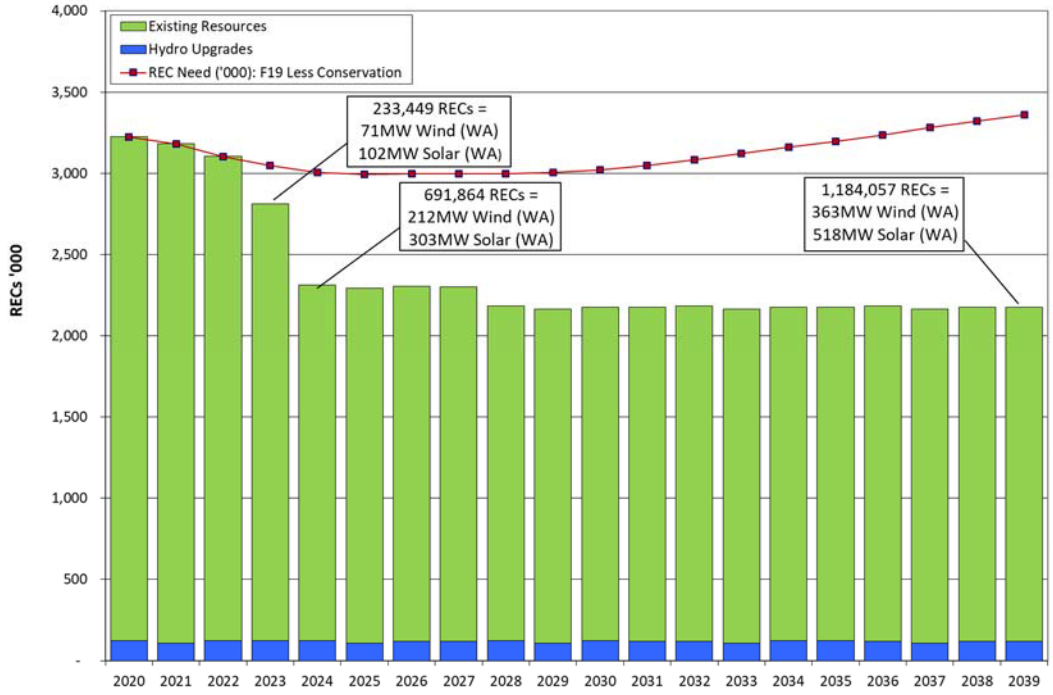


Figure 6 shows a reduced renewable need in calendar year 2023 of 233,449 RECs (compared to the 671,000 RECs sought in the 2018 All Resources RFP filing), which grows to 691,864 RECs in calendar year 2024. The renewable resource need is driven by Washington State's Renewable Portfolio Standard; however, PSE's need is delayed until calendar year 2023 due to its banked RECs.

Figure 6. Renewable Resource Need Forecast (Phase 2)



Q. Did PSE prepare an exhibit describing the key quantitative assumptions used in the 2018 All Resources RFP evaluation?

A. Yes. Please see Exh. CPC-5HC at 133-158, for a description of the key quantitative assumptions used throughout the 2018 All Resources RFP evaluation.

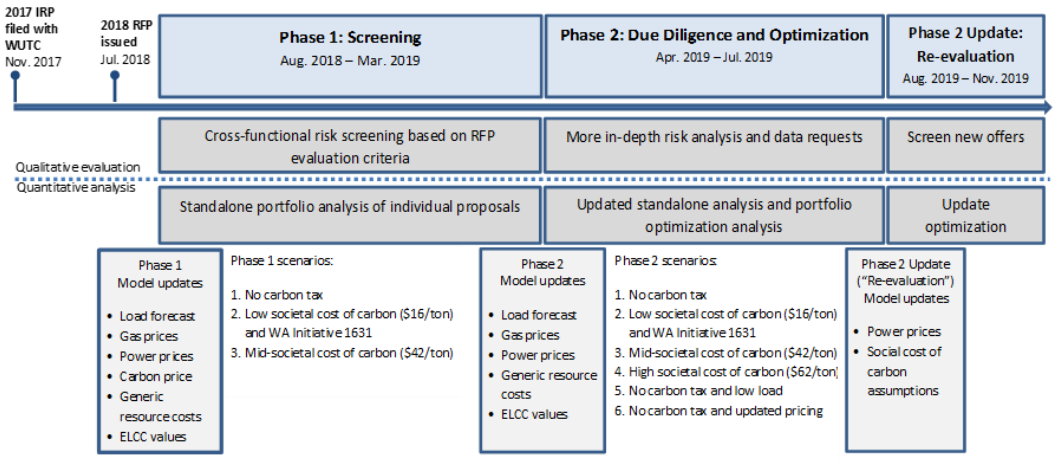
Q. What were the key assumptions and how did they evolve during the evaluation process?

A. The 2018 All Resources RFP quantitative analysis included several key assumptions: load forecast, market power and gas prices, carbon prices, generic resource costs, and resource peak capacity contributions.

The 2018 All Resources RFP evaluation was performed in parallel with the development of PSE's anticipated 2019 Integrated Resource Plan. As a result, several key modeling assumptions used in the 2018 All Resources RFP analysis evolved during the evaluation process. PSE updated these assumptions for each phase of the 2018 All Resources RFP evaluation to reflect then-current conditions. In general, key assumptions were refreshed prior to each phase of the 2018 All Resources RFP process, although some assumptions were updated during the phases as new information became available.[22]

Figure 7 depicts generally the timing and nature of the updates relative to the 2018 All Resources RFP timeline.

Figure 7. Timing of Key Assumptions Updates During the 2018 All Resources RFP Evaluation Process



[22] *See* Crowley, Exh. CPC-5HC at 137-147 (describing the specific assumptions used by PSE in each phase of the 2018 All Resources RFP analysis).

Q. How did PSE incorporate the key assumptions into the 2018 All Resources RFP evaluation?

A. PSE utilized the six scenarios listed in Table 2 to incorporate and stress test the key assumptions in the 2018 All Resources RFP evaluation. As shown in Table 2, PSE's scenarios were designed to test a range of potential future carbon costs, from $0/ton to $62/ton. This analysis offered insights into how portfolio costs might be affected by potential carbon legislation.

The Scenario 2 low societal cost of carbon assumption ($16/ton) is based on a Washington State carbon tax proposed in Initiative 1631, which failed to pass at the ballot box in November 2018.

The Scenario 3 mid-societal ($42/ton) and Scenario 4 high societal ($62/ton) cost of carbon assumptions are based on estimates from the United States Government Interagency Working Group's technical support document on the social cost of carbon, which was published in August 2016.

Scenario 6 reflects updated pricing as a result of California Senate Bill 100, which sets a California statewide renewable energy requirement of 100 percent renewables by 2045.

Table 2. Modeling Scenarios Used in the 2018 All Resources RFP Evaluation

Scenarios	Phase	WECC /PSE Demand	Gas Price	Generic Resource Costs
1. No carbon tax	1 + 2	Base	Base	Base
2. CO2 (low societal $16/ton)[23]	1 + 2	Base	Base	Base
3. CO2 (mid-societal $42/ton)[24]	1 + 2	Base	Base	Base
4. CO2 (high societal $62/ton)	2	Base	Base	Base
5. No CO2 low load	2	Low	Low	Base
6. No CO2 updated pricing	2	Base	Update	Base

IV. PHASE 1 EVALUATION AND RESULTS

A. Phase 1 Qualitative Analysis: Preliminary Risk and Fatal Flaw Screening

Q. How did the 2018 All Resources RFP evaluation team work together to assess the risks and merits of each individual proposal?

A. Throughout Phase 1, PSE's cross-functional 2018 All Resources RFP evaluation team met weekly to discuss the costs, risks and merits of individual proposals. Each week, the team's subject matter experts would review and evaluate a subset of proposals (typically four to six per week) based on the evaluation criteria previously described in Part III, Section B, of this prefiled direct testimony.[25]

[23] The Scenario 2 low societal cost of carbon assumption ($16/ton) is based on a Washington State carbon fee proposed in Initiative 1631, which failed to pass at the ballot box in November of 2018.

[24] Source of Scenario 3 and Scenario 4 mid-societal cost of carbon assumption: Intragency Working Group on Social Cost of Greenhouse Gases, *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866, Interagency Working Group on Social Cost of Greenhouse Gases* (Aug. 2016). In 2007 dollars per metric ton of CO2, $42/ton and $62/ton reference the three percent and 2.5 percent scenarios for 2020, respectively.

[25] *See also* Crowley, Exh. CPC-5HC at 58-66 (providing further information about the evaluation criteria).

During evaluation team meetings, subject matter experts presented the proposal elements associated with their areas of expertise, described their overall findings and discussed potential risks that might impact PSE as an owner or off-taker. Subject matter experts also prepared follow-up questions for the developers. Many of the concerns and questions raised in Phase 1 later became the basis for data requests submitted to bidders during Phase 2.

Q. How did the subject matter experts review and evaluate the proposals based on the evaluation criteria?

A. Subject matter expert working groups evaluated each proposal from the perspective of their specific areas of expertise based on guidance established in the evaluation criteria. For example, members of the commercial and development working group met weekly to discuss the proposals with certain key elements in mind, such as the viability of the project, counterparty risk, commercial terms, and whether the development timeline was realistic. Other working groups asked different questions, such as:

- Does the project have permits, fuel supply agreements and transmission and interconnection agreements in place? If not, can they reasonably be obtained in time to meet the commercial online date?
- Does the project proponent have site control?
- What are the operational or technology risks?
- Are there risks associated with public opposition or sensitive environmental habitat?

- Does the project provide environmental benefits through the reduction of greenhouse gasses?
- Does the bidder have the financial wherewithal to deliver and maintain the project over the term of the project?
- What are the costs associated with the proposal, and how do the benefits and costs compare with other proposals?

Working groups assessed the unique risks and benefits of each proposal and sought to identify any potential fatal flaws or risk areas.

Q. Can PSE provide examples of fatal flaws?

A. Yes. Examples of fatal flaws include, but are not limited to, proposals with insurmountable or otherwise prohibitive feasibility constraints, the inability to permit the project or deliver energy, commercially unproven technology, excessive counterparty risk, and regulatory or legal risk associated with noncompliance that could adversely affect PSE.

Q. How did the 2018 All Resources RFP evaluation team deal with incomplete or unclear proposals?

A. In Phase 1, PSE identified potential risks for further review and verification in Phase 2. Additionally, if certain elements of a proposal were either missing or unclear, PSE generally requested supplemental information or clarification from developers. However, two proposals were considered to be extremely underdeveloped. Neither proposal contained the minimum amount of information needed to substantiate or evaluate the viability of the proposed resource, or its

associated costs and risks. These two proposals were subsequently removed from consideration. They were the only proposals eliminated during Phase 1 based on qualitative fatal flaws.[26]

B. Phase 1 Quantitative Analysis: Individual Portfolio Analysis Screening

Q. How did the 2018 All Resources RFP evaluation team conduct the Phase 1 quantitative evaluation?

A. PSE's Phase 1 screening analyzed each project on a standalone basis and, using the metrics from PSM (as described in Part III, Section C of this testimony), compared the portfolio impact in three potential future scenarios. PSE constructed each of the scenarios using base demand, gas price and generic resource cost assumptions; however, PSE varied its carbon assumptions to test a range of potential future carbon costs:

1. Scenario 1: No carbon tax.
2. Scenario 2: Low societal cost of carbon ($16/ton).
3. Scenario 3: Mid-societal cost of carbon ($42/ton).

Q. What value streams did PSE consider in the Phase 1 quantitative evaluation?

A. The Phase 1 quantitative analysis compared the cost of a particular proposal to its value within PSE's electric power portfolio. The primary value streams included

[26] *See* Crowley, Exh. CPC-5HC at 68-104 (providing a summary of the screening results for all Phase 1 proposals).

the contribution of a resource toward meeting PSE's renewable resource need, its peak capacity need, or both. The 2018 All Resources RFP evaluation team compiled two distinct lists to rank these values: (i) resources capable of meeting the renewable resource need, and (ii) resources capable of meeting the peak capacity need.

Two metrics were most useful in understanding the contributions of resources with different attributes to each of these resource needs:

- Portfolio benefit per kW-yr (PB/kW-yr) for capacity need; and
- Portfolio benefit per REC (PB/REC) for renewable resource need.

In general, proposals offered either a material peak capacity or renewable resource contribution, but only a few offered both. Most renewable resources offered only a very minor contribution to the peak capacity need and, therefore, only appear on the renewable ranking list. However, there were several exceptions, such as Montana wind, Columbia Gorge wind, and biomass, which offered considerable contributions to meeting both the renewable resource and peak capacity needs. These resources appear on both lists.

Q. What are the Phase 1 quantitative results for renewable resources?

A. A summary of the Phase 1 quantitative results for the renewable resources is presented in Table 3, which summarizes the results for three metrics in the No Carbon Tax scenario.[27]

Table 3. 2018 All Resources RFP Phase 1
Renewable Resources Quantitative Results Summary

ID	Project Offer	State	Type	Size (MW or REC)	PB / REC ($/REC)	LCOE ($/MWh)	Net Cost/REC ($/REC)
18169	ClearWater 2021 (updated offer)	MT	Wind PPA	300 MW	[redacted]		
18135	[redacted]	WA	Solar PPA	[redacted]			
18173		MT	Wind PPA				
18132		OR	Wind PPA				
18176		MT	Wind PPA				
18135		WA	Solar PPA				
18112		WA	Solar PPA				
18175		WA	Wind PPA				
18132		OR	Wind PPA				
18163		OR	Unbundled REC				
18169		MT	Wind PPA				
18173		MT	Wind PPA				
18165		OR	Unbundled REC				
18165		OR	Unbundled REC				
18111		WA	Solar PPA				
18179		WA	Wind PPA				
18125		WA	Solar PPA				
18122		WA	Solar PPA				
18190		WA	Unbundled REC				
18132		OR	Wind PPA				
18170		OR	Wind Ownership				
18190		WA	Unbundled REC				

[27] *See also* Crowley, Exh. CPC-5HC, at 105-110 (providing a complete list of results).

Table 3. 2018 All Resources RFP Phase 1
Renewable Resources Quantitative Results Summary

ID	Project Offer	State	Type	Size (MW or REC)	PB / REC ($/REC)	LCOE ($/MWh)	Net Cost/REC ($/REC)
18131	[redacted]	WA	Solar PPA	[redacted]			
18125		WA	Solar PPA				
18127		WA	Solar PPA				
18114		WA	Solar PPA				
18127		WA	Solar PPA				
18139		OR	Solar PPA + BESS				
18122		WA	Solar PPA + BESS				
18166		OR	Wind PPA				

Q. What are the Phase 1 quantitative results for capacity resources?

A. A summary of the Phase 1 quantitative results for the capacity resources is presented in Table 4 below, which summarizes the results for three metrics in the No Carbon Tax scenario.[28]

Table 4. 2018 All Resources RFP Phase 1
Capacity Resources Quantitative Results Summary

ID	Project Offer	State	Type	Size (MW)	PB/kw-yr ($/kW-yr)	LCOE ($/MWh)	Net Cost/kW-yr ($/kW-yr)
18169	ClearWater 2021 (updated offer)	MT	Wind PPA	300 MW	[redacted]		
18169	[redacted]	MT	Wind PPA + Ownership	[redacted]			
18173		MT	Wind PPA				
18176		MT	Wind PPA				
18173		MT	Wind PPA				
18100	SPI Industrial Biomass	WA	Biomass PPA	17 MW			
18105	[redacted]	WA	Thermal Ownership	[redacted]			

[28] *See id.*

Table 4. 2018 All Resources RFP Phase 1
Capacity Resources Quantitative Results Summary

ID	Project Offer	State	Type	Size (MW)	PB/kw-yr ($/kW-yr)	LCOE ($/MWh)	Net Cost/kW-yr ($/kW-yr)
18105	[redacted]	WA	Thermal PPA	[redacted]			
XXX		MT	Transmission Redirect				
18105		WA	Thermal PPA				
18105		WA	Thermal Ownership				
18170	Golden Hill -Shaped	OR	Wind PPA	200 MW			
18105	[redacted]	WA	Thermal PPA	[redacted]			
18201		WA	Demand Response				
18103		WA	Thermal PPA				

C. Summary of 2018 All Resources RFP Phase 1 Evaluation Results by Resource Type

Q. How did solar resource proposals perform in Phase 1?

A. PSE received a much higher number of solar resource proposals in response to the 2018 All Resources RFP than it has in previous years. In total, PSE received 38 proposals for solar resources, including solar alone, solar paired with wind and/or solar paired with battery storage. The declining cost of energy from solar projects led PSE to select eight of the 16 standalone solar proposals for Phase 2 consideration. However, solar projects co-located with battery energy storage systems ("BESS") did not fare as well because most did not include delivery to PSE's system, thereby negating the capacity value of the BESS, or they were early development projects that had yet to fully secure site control, apply for critical permits, or apply for interconnection and transmission service.

Q. How did wind resource proposals perform in Phase 1?

A. Eight of the 17 wind proposals advanced for further due diligence in Phase 2. Three of the selected proposals were Montana wind proposals and four were located along the Columbia River Gorge in Oregon or Washington. PSE received one offshore wind project, but it did not advance to Phase 2 due to high costs and a long development cycle that did not meet the needs of this 2018 All Resources RFP.

Montana wind proposals, in particular, performed very well in the Phase 1 analysis but had potential development risks associated with deliverability to PSE's load. The higher expected capacity factors of these resources, combined with seasonal wind shapes with a high level of correlation to PSE's load, produced a high peak capacity contribution relative to other renewable resources.

Q. How did energy storage resource proposals perform in Phase 1?

A. PSE received a variety of energy storage proposals, which included two pumped hydro storage projects, 17 standalone BESS, and another 23 proposals offering renewable generation paired with a BESS resource. PSE's quantitative analysis applied several value streams to storage resources. However, even with these value streams applied and a significant decrease in pricing over the past several years, BESS proposals were not competitive enough with other capacity alternatives in PSE's screening analysis to be selected for Phase 2 consideration.

Q. Can you please describe the value streams that PSE applied to BESS proposals?

A. PSE applied two value streams to all BESS projects and pumped hydro storage projects: (i) the proposal's contribution to peak capacity (for proposals with firm delivery to PSE's system), and (ii) a flexibility benefit. Additionally, BESS projects located on PSE's system received a transmission system deferral value.

Q. Please describe the flexibility value.

A. The flexibility value quantifies the sub-hourly benefits of adding a generation asset to the transmission system. These benefits, which apply to both pumped hydro and battery energy storage resources, include: regulation up and down, voltage control, frequency control, spinning reserves, non-spinning reserves, and supplemental reserves. Storage resources with higher maximum output capacities and longer durations offered greater flexibility benefits.

Q. Please describe the transmission system deferral value.

A. Transmission system deferral value is an avoided cost metric representing the mitigation benefit of neither building nor retrofitting transmission assets as a result of adding the operational flexibility of a battery to the transmission system. PSE's analysis assumed a deferral value of $26/kW-yr escalated at 2.5 percent

annually.[29] This proxy value was applied to all BESS proposals in the preliminary quantitative screening.

Q. How did biomass resource proposals perform in Phase 1?

A. In general, the biomass projects were relatively expensive from an energy standpoint. Of the three biomass projects proposed in the 2018 All Resources RFP, only one advanced to Phase 2. The selected biomass resource is already operating and would provide baseload output, which resulted in a higher contribution to capacity value than the other biomass proposals. In addition, the biomass resource selected for Phase 2 benefitted in PSE's analysis from its contribution to both the renewable resource and peak capacity needs defined in the 2018 All Resources RFP.

Q. How did natural gas-fired resource proposals perform in Phase 1?

A. While natural gas-fired generation projects have historically represented a high percentage of proposals received in PSE's 2018 All Resources RFP, averaging about 33 percent of the total proposals received since 2005, in this cycle only four of the 97 proposals received were for natural gas-fired resources. Two of the four advanced to Phase 2 based on their contribution to peak capacity value and their relatively lower cost compared to other capacity resource alternatives available in

[29] *See* Crowley, Exh. CPC-5HC at 145 (information about the deferral benefit assumed in the analysis).

the 2018 All Resources RFP. One proposed an operational combined cycle project and the other proposed to install retrofitted aircraft engines at an existing PSE site.

Q. How did demand response resource proposals perform in Phase 1?

A. PSE received a total of six demand response proposals in the 2018 All Resources RFP. Three targeted residential direct load control opportunities such as smart thermostat and smart water heater technologies, one targeted behavioral demand response technology for residential customers, and two others targeted commercial and industrial curtailment. The capacity offered by the demand response projects was generally modest compared to generation resources, ranging between 9 MW and 40 MW.

Given the costs and relatively low capacity values, demand response projects were not as competitive as other resources. As a result, only one of the demand response proposals performed well enough in the standalone portfolio analysis to be selected for consideration in Phase 2.

Q. Did PSE receive any other resource proposals in Phase 1?

A. Yes. PSE received and assessed several other resource proposals in Phase 1: one operational run-of-river hydro, two development geothermal, a system power purchase agreement capacity call option, and five unbundled REC proposals.

Q. How did these other resource proposals perform in Phase 1?

A. The hydro proposal was selected to advance to Phase 2 because it is an operating plant with a potentially high contribution to capacity. The geothermal proposals were not selected for Phase 2 because they offered relatively expensive energy and little capacity value. The system power purchase agreement capacity call option was not selected for Phase 2 because it did not include delivery to PSE's system, which negated its contribution to capacity value. The unbundled REC proposals posed little general offtake risk, as many of the underlying projects were either operating or soon-to- be constructed. Of the six proposals (one was unsolicited), three proceeded to Phase 2 due to their relatively low costs.

D. Candidate List Selected at the End of Phase 1

Q. What was the result of PSE's Phase 1 evaluation?

A. At the conclusion of its preliminary screening, PSE selected a list of 25 "candidate" proposals for further evaluation in Phase 2 (the "Candidate List"). Selected proposals were generally those that ranked most favorably in the quantitative screening relative to one or both of the resource needs (as defined in the 2018 All Resources RFP) and had no known fatal flaws. Projects that provided a contribution to both resource needs were generally selected for

Phase 2, due to a higher total portfolio benefit produced by the dual value streams.[30]

Q. How was the Candidate List determined?

A. After eliminating the proposals with higher costs, PSE recognized that it would have relatively few proposals with significant capacity contributions to compare in Phase 2 without including any thermal generation. The team also recognized that several of the selected candidates proposed development projects had potentially material risks requiring further evaluation in Phase 2. Additionally, the selected Montana wind resources, which were some of the most favorable in the Phase 1 quantitative analysis, were all proposing to use the same Colstrip Units 1 and 2 transmission rights to bring their power to PSE's load. In other words, they were mutually exclusive.

As a result of these findings, PSE chose to include two natural gas-fired resources on the Candidate List to ensure that there would be sufficient capacity resources in the Phase 2 candidate pool to meet PSE's physical reliability need. The gas resource proposals added potentially valuable resource and locational diversity to the mix, as well as substantially higher peak capacity contribution than most other alternatives. However, they also carried potentially substantial risks that required additional scrutiny and careful consideration in Phase 2.

[30] *See* Crowley, Exh. CPC-5HC at 67-110 (providing results of PSE's Phase 1 qualitative and quantitative analysis).

Q. Please describe the Candidate List.

A. The Candidate List includes 25 resource proposals and the Transmission Redirect option. The 2018 All Resources RFP evaluation team presented the Candidate List to the Energy Management Committee on March 21, 2019, and to Commission Staff on April 2, 2019.

Table 5 presents the Candidate List.

Table 5. Phase I Candidate List

ID	Project Name	Resource Type	Nameplate (MW/RECs)	Counterparty	State
18100	SPI Industrial	Biomass	17 MW	SPI	WA
18201	[redacted]	Demand Response	[redacted]		WA
18169	Clearwater Wind	MT Wind	300 MW	NextEra	MT
18173	[redacted]	MT Wind	[redacted]		MT
18176		MT Wind			MT
18163		REC Only			OR
18165		REC Only			OR
18190		REC Only			WA
18107		Run-of-River			ID
18135		Solar			WA
18111		Solar			WA
18122		Solar			WA
18131		Solar			WA
18127		Solar			WA
18114		Solar			WA
18112		Solar			WA
18125		Solar			WA
18139		Solar + BESS			OR
18105		Thermal			WA

Table 5. Phase I Candidate List

ID	Project Name	Resource Type	Nameplate (MW/RECs)	Counterparty	State
18103	[redacted]	Thermal	[redacted]		OR
XXXXX	Transmission Redirect	Transmission	100 MW	BPA Transmission	N/A
18175	[redacted]	Wind	[redacted]		WA
18132		Wind			OR
18179		Wind			WA
18170	Golden Hill Wind - Shaped	Wind	200 MW	Avangrid	OR
18166	[redacted]	Wind	[redacted]		OR

V. PHASE 2 EVALUATION, DUE DILIGENCE, OPTIMIZATION AND RESULTS

A. Phase 2 Analysis Overview

Q. What analysis did PSE conduct in Phase 2?

A. During Phase 2, the 2018 All Resources RFP evaluation team took a more rigorous, in-depth look at the Candidate List proposals. In Phase 2, PSE examined risks identified during Phase 1 and subjected each proposal to further quantitative scrutiny. Additionally, PSE evaluated new unsolicited proposals and proposals that were repriced during the evaluation. Phase 2 included an updated standalone portfolio analysis for each candidate proposal based on the most current information available to PSE. Phase 2 also included portfolio optimization analysis in PSM, to identify the best combination of resources to meet the resource needs established in the 2018 All Resources RFP at the lowest reasonable cost.

Q. Were there changes to the Candidate List after the conclusion of Phase 1?

A. Yes. At the conclusion of Phase 1, PSE contacted respondents to provide an update on the status of their proposals. In response, PSE received several updates from respondents, adjusting the terms of their proposals. Four of the adjustments resulted in changes to the Candidate List.

Q. Please describe the changes to the Candidate List.

A. As a result of proposal updates received after the conclusion Phase 1, PSE adjusted the Candidate List as follows:

1. PSE removed the [redacted] proposal (Project ID #18112) after [redacted] withdrew it for unspecified reasons at the beginning of Phase 2.

2. PSE added the BPA Peak Capacity Product (Project ID #18161) proposal after BPA adjusted the delivery point from the Mid-C to PSE's load (PSEI.SYSTEM), which qualified the project as a capacity resource.

3. PSE added [redacted] proposal (Project ID #UP002) after [redacted] reduced the price, which improved its relative ranking in the quantitative analysis. This proposal was originally submitted as an unsolicited proposal partway through the Phase 1 analysis.

4. PSE added a commercial and industrial curtailment proposal (Project ID #18205) after [redacted] reduced the price, which improved its relative ranking in the quantitative analysis.

With these changes, the total number of Phase 2 candidate proposals increased to 27 proposals.

B. Phase 2 Qualitative Analysis: Due Diligence Evaluation

Q. How did PSE conduct the Phase 2 qualitative analysis of the 2018 All Resources RFP proposals?

A. In Phase 2, the 2018 All Resources RFP evaluation team continued to investigate the risks and information gaps identified during Phase 1 for each candidate proposal. The team compiled a series of data requests developed by the subject matter experts who performed the Phase 1 qualitative screening. Data requests were designed to help PSE refine its qualitative and quantitative analyses.

Q. Can PSE provide some examples of data requests sent to bidders as part of the Phase 2 qualitative due diligence evaluation?

A. Yes. PSE organized data requests into the following topics: commercial matters (e.g., counterparty considerations, schedule, proposal terms, etc.), energy delivery (i.e., interconnection and transmission), technical and operations (e.g., technology, operational characteristics, maintenance, etc.), permitting matters (or compliance for existing resources), site control, and outreach. Examples of sample data requests include, but are not limited to:

1. **Commercial** – Does seller intend to continue as the long-term owner and operator of the project after commercial on-line date.

2. **Energy Delivery** – Please provide a status update on the Interconnection Agreement negotiations.

3. **Technology** – Please provide site suitability analysis documentation showing that the proposed turbine's design parameters for average wind speed, turbulence, wind shear, etc. are a good fit for the site.

4. **Permitting** – Please provide copies (or links) to all baseline environmental and background studies, permit applications/approvals, staff reports and permits that exist for the project.

5. **Site Control** – Please provide copies of deeds, leases and easements necessary for the generation tie-line.

6. **Outreach** – Detail any plans for government and key stakeholder outreach to garner support for the project.

On an as-needed basis, the 2018 All Resources RFP team also sent supplemental data requests or arranged phone conversations between bidders and relevant subject matter experts to clarify or expand upon certain data request responses.

Q. Did PSE conduct any additional qualitative analysis during Phase 2?

A. Yes. Subject matter experts also conducted independent investigations to assess the validity of development plans and risk mitigations using publicly available information sources. Examples of public information sources utilized during the evaluation include, but are not limited to, public permitting meetings (e.g., the Oregon Energy Facility Siting Council), media reports, and information posted on transmission provider OASIS sites.

Q. What were the results of the Phase 2 qualitative analysis of the 2018 All Resources RFP proposals?

A. The Phase 2 qualitative analysis determined that most of the Phase 2 candidate proposals presented some amount of material risk.[31] Two proposals were eliminated due to qualitative fatal flaws. These proposals were not included in the Phase 2 quantitative analysis:

1. [redacted] (Proposal ID #18105) proposed by [redacted] proposed expanding PSE's existing [redacted] plant to include a new aero-derivative peaker. The evaluation team ultimately determined that additional thermal development at this site would be extremely risky for both the expansion project and the existing operational plant, particularly with regard to permitting and reputational risks. In addition to significant risks associated with the development project related to permitting, opposition and energy delivery, an attempt to modify the existing site could reopen the operating permit for the [redacted] plant and place its existing operating limits under review.

2. [redacted] (Proposal ID #18190) proposed by [redacted]. PSE eliminated this proposal based on a variety of substantial qualitative concerns, including: interconnection uncertainties that could impact the total REC output of the underlying projects, substantial feasibility risks for the underlying projects, [redacted], counterparty risks, and concerns about local opposition related to siting the projects on commercial agricultural land.

[31] *See* Crowley, Exh. CPC-5HC at 39-40, 111-131 (summarizing the Phase 2 qualitative findings).

C. Phase 2 Quantitative Analysis: Individual Proposal Analysis and Portfolio Optimization

Q. How did the 2018 All Resources RFP evaluation team conduct the Phase 2 quantitative evaluation?

A. The Phase 2 quantitative evaluation consisted of three main activities:

1. Updated economic analysis of individual proposals.
2. Portfolio optimization analysis.
3. Re-evaluation of resource alternatives.

Similar to Phase 1, PSE used PSM and the Aurora dispatch model to perform the quantitative analysis for Phase 2. PSE updated a variety of key assumptions in Phase 2 as new information became available (as described in Part III, Section C of this testimony),[32] including its load forecast, gas and power price forecasts, effective load carrying capability values, and generic resource costs.

In Phase 2, PSE also updated its pricing scenarios, adding three new scenarios to the three it tested in Phase 1 (shown in Table 2). The additional pricing scenarios allowed PSE to stress test proposals in different potential future pricing environments including a high social cost of carbon, a low load forecast and an update to market power prices.

[32] *See also* Crowley, Exh. CPC-5HC at 132-158.

Q. Did PSE's analysis include any other updates?

A. Yes. As part of its evaluation, PSE's 2018 All Resources RFP evaluation team sent data requests to the Phase 2 bidders. Some of the requests were designed to validate and refine data inputs for the quantitative evaluation. These inputs included the resource's hourly energy generation profile, contribution to peak capacity, REC eligibility, transmission path availability and costs of transmission wheels, integration costs, and updates to contract offer terms including contract price, term duration, and commercial on-line date.

Q. How did the 2018 All Resources RFP evaluation team conduct the updated economic analysis of individual proposals?

A. PSE individually re-assessed and re-ranked proposals in Phase 2 using the key metrics produced by PSM (described in Part III, Section B of this testimony): portfolio benefit, levelized portfolio benefit per kW or REC, levelized net cost per kW or REC, and levelized cost. Overall, the individual proposal analysis process in Phase 2 was fundamentally the same as the Phase 1 process.

Q. What are the Phase 2 economic analysis results for individual renewable resources?

A. A summary of the Phase 2 individual analysis results for the renewable resources is presented in Table 6 below, which summarizes the results of three metrics in the No Carbon Tax scenario.

Table 6. 2018 All Resources RFP Phase 2
Renewable Resources Quantitative Results Summary

ID	Project Offers	State	Type	Size (MW or REC)	PB / REC ($/REC)	LCOE ($/MWh)	Net Cost/REC ($/REC)
18163	[redacted]	OR	Unbundled REC	[redacted]	[redacted]	[redacted]	[redacted]
18165	[redacted]	OR	Unbundled REC	[redacted]	[redacted]	[redacted]	[redacted]
18190	[redacted]	WA	Unbundled REC	[redacted]	[redacted]	[redacted]	[redacted]
18169	Clearwater 2021 (updated offer)	MT	Wind PPA	[redacted]	[redacted]	[redacted]	[redacted]
18190	[redacted]	WA	Unbundled REC	[redacted]	[redacted]	[redacted]	[redacted]
18190	[redacted]	WA	Unbundled REC	[redacted]	[redacted]	[redacted]	[redacted]
18173	[redacted]	MT	Wind PPA	[redacted]	[redacted]	[redacted]	[redacted]
18190	[redacted]	WA	Wind PPA	[redacted]	[redacted]	[redacted]	[redacted]
18135	[redacted]	WA	Solar PPA	[redacted]	[redacted]	[redacted]	[redacted]
18111	[redacted]	WA	Solar PPA	[redacted]	[redacted]	[redacted]	[redacted]
18127	[redacted]	WA	Solar PPA	[redacted]	[redacted]	[redacted]	[redacted]
18135	[redacted]	WA	Solar PPA	[redacted]	[redacted]	[redacted]	[redacted]
18125	[redacted]	WA	Solar PPA	[redacted]	[redacted]	[redacted]	[redacted]
18127	[redacted]	WA	Solar PPA	[redacted]	[redacted]	[redacted]	[redacted]
18132	[redacted]	OR	Wind PPA	[redacted]	[redacted]	[redacted]	[redacted]
18125	[redacted]	WA	Solar PPA	[redacted]	[redacted]	[redacted]	[redacted]
18173	[redacted]	MT	Wind PPA	[redacted]	[redacted]	[redacted]	[redacted]
18111	[redacted]	WA	Solar Ownership	[redacted]	[redacted]	[redacted]	[redacted]
18139	[redacted]	OR	Solar PPA	[redacted]	[redacted]	[redacted]	[redacted]
18132	[redacted]	OR	Wind PPA	[redacted]	[redacted]	[redacted]	[redacted]
18114	[redacted]	WA	Solar PPA	[redacted]	[redacted]	[redacted]	[redacted]

Table 6. 2018 All Resources RFP Phase 2
Renewable Resources Quantitative Results Summary

ID	Project Offers	State	Type	Size (MW or REC)	PB / REC ($/REC)	LCOE ($/MWh)	Net Cost/REC ($/REC)
18179	[redacted]	WA	Wind Ownership	[redacted]			
18166		OR	Wind PPA				
18132		OR	Wind PPA				
18170	Golden Hills PPA	OR	Wind PPA	200 MW			
18122	[redacted]	WA	Solar PPA	[redacted]			
18166		OR	Wind PPA				
18131		WA	Solar PPA				

Q. What are the Phase 2 economic analysis results for individual capacity resources?

A. Table 7 below presents a summary of the Phase 2 quantitative results for the capacity resources, which summarizes the results of three metrics in the No Carbon Tax scenario. As explained later in this testimony, a lower ranked resource may be selected in the optimization analysis if it results in a better fit to one or both of the resource needs, and a lower overall portfolio cost when combined with other 2018 All Resources RFP resources.

Table 7. Phase 2 Capacity Resources Quantitative Results Summary[33]

ID	Project Offer	State	Type	Size (MW)	PB/kw-yr ($/kW-yr)	LCOE ($/MWh)	Net Cost/kW-yr ($/kW-yr)
18170	Golden Hills Shaped	OR	Wind PPA	200 MW	[redacted]		
18169	Clearwater 2021 (updated offer)	MT	Wind PPA	300 MW			

[33] *See also* Crowley, Exh. CPC-5HC, at 125-127.

Table 7. Phase 2 Capacity Resources Quantitative Results Summary[33]

ID	Project Offer	State	Type	Size (MW)	PB/kw-yr ($/kW-yr)	LCOE ($/MWh)	Net Cost/kW-yr ($/kW-yr)
18100	SPI Industrial Biomass	WA	Biomass PPA	17 MW	[redacted]		
18173	[redacted]	MT	Wind PPA	[redacted]			
18173		MT	Wind PPA				
18179		WA	Wind Ownership				
16161	BPA Peak Capacity Product	WA	Capacity PPA	100 MW			

Q. Why did the 2018 All Resources RFP evaluation team conduct the portfolio optimization analysis?

A. While the individual proposal economic analysis is useful for the purposes of comparing and ranking proposals on a standalone basis, it does not consider the benefits of resource combinations to meet the combined resource needs of the 2018 All Resources RFP. It cannot take into account the efficiencies and economic benefits of pooling resources with complementing attributes or an optimally-sized solution to meet both the renewable and capacity resource needs. In other words, it does not account for the fact that a lower individually ranked resource (from a portfolio benefit perspective) could be part of a lowest reasonable cost, best-fit to need solution in the optimal portfolio because its unique "fit" provides economic savings when paired with other resources.

The individual proposal analysis does not account for the fact that some higher ranked resources may be mutually exclusive due to commercial constraints such as transmission. Also, it would be difficult to use the individual proposal analysis

to compare the impact to PSE's overall resource mix of adding proposals that contribute both renewable and capacity benefits, to the impact of adding proposals that contribute just one of these benefits.

For these reasons, PSE uses a portfolio optimization approach to analyze and identify the optimal resource portfolio to meet PSE's renewable and peak capacity resource needs using a combination of 2018 All Resources RFP resources.

Q. Did PSE include all of the Phase 2 candidate proposals in the optimization analysis?

A. No. As described earlier in this prefiled direct testimony, the 2018 All Resources RFP evaluation team eliminated two proposals based on the Phase 2 qualitative analysis. These proposals were not included in any of the Phase 2 quantitative analysis.

Prior to the optimization analysis, another four of the 27 Phase 2 candidate proposals were eliminated based on a combination of the results of the Phase 2 individual portfolio analysis and the qualitative analysis. The four additional eliminated proposals include:

1. [redacted] (Project ID #18176) due to a third-party assessment indicating a 10 percent lower net capacity factor than provided by the seller, and a determination that meteorological towers had not yet been erected on site to verify or support the proposed output.

2. [redacted] (Project ID #18107) because the 2018 All Resources RFP evaluation team determined that

the run-of-river asset provided little capacity value, was not RPS-compliant, and presented a complex and potentially risky energy delivery strategy to PSE.

3. [redacted] (Project ID #18201) because high costs provide little to no cost saving compared to generic resources, and due to qualitative concerns with the feasibility of an aggressive customer acquisition rate. It also does not have experience integrating with PSE's Distributed Energy Resource Management system.

4. [redacted] (Project ID #18205) because high costs provide little to no cost saving compared to generic resources, and due to qualitative concerns with the viability of the counterparty as the company has not had a profit since its inception. It also does not have experience integrating with PSE's Distributed Energy Resource Management system.

PSE included the remaining 21 Phase 2 candidate proposals in its optimization analysis. Six of the 21 Phase 2 candidate proposals were capacity resources.

Q. How did the 2018 All Resources RFP evaluation team conduct the portfolio optimization analysis?

A. PSE used PSM and the Risk Solver optimizing module to perform the optimization analysis. In this analysis, the model meets the renewable and peak capacity resource needs with a combination of 2018 All Resources RFP resources. This is different than the way PSM evaluates resources in the individual proposal economic analysis. In the PSM analysis, the model meets any portion of the renewable or peak capacity need not supplied by the analyzed project with generic resources.

The Risk Solver optimization model calculates a total portfolio benefit and identifies the least cost optimized resource portfolio to meet the identified resource needs. The Risk Solver model also accounts for the social cost of carbon as an adder to the total portfolio costs in the calculation.

Due to the limited number of proposals in the candidate pool featuring a substantial contribution to capacity, filling the peak capacity need was the primary constraint in the optimization analysis. The renewable resource need was filled coincidentally by projects with dual value renewable (RPS-compliant) and capacity attributes. Three of the four proposals selected in the optimal portfolio featured dual value attributes.

Q. What was the result of the portfolio optimization analysis?

A. PSE completed the Phase 2 analysis in July 2019 and presented to its Energy Management Committee an optimal portfolio of four proposals with the least portfolio costs including social cost of carbon:

1. The 17-year SPI Biomass PPA (Project ID #18100).
2. The five-year BPA Peak Capacity Product (Project ID #18161) that provides a peak capacity call option for system resources offered by BPA.
3. The Clearwater Wind PPA (Project ID #18169) in Montana offered by NextEra.
4. The 20-year Golden Hills Shaped Wind PPA (Project ID #18170) for output from the Golden Hills Wind Project in Oregon paired with the Golden Hills Interim Capacity PPA,

a winter peak-shaping product offered by Avangrid Renewables.

Table 8 shows the optimal portfolio, including its portfolio benefit, contribution to peak capacity and contribution to RPS requirements.

Table 8. Optimal Portfolio as Determined by Phase 2 Optimization Analysis Peak Capacity and REC Needs 2022-2025

(A)	(B)	(C)	(D)	(E)	(F)	(G)
List	**Project ID**	**Resource**	**Project**	**Nameplate (MW)**	**Peak Capacity Credit (MW)**	**RECs**
1	18100	Biomass	SPI	17 MW	16 MW	[redacted]
2	18161	Call Option	BPA Peak Capacity Product	100 MW	53 MW	
3	18169	MT Wind	Clearwater 350 MW	350 MW	146 MW	
4	18170	Wind	Golden Hill Spread	200 MW	77 MW	
5		**Total Peak Capacity Credits - MWh**			291 MW	
6		**Total Annual RECs**				
7		**Portfolio Benefits w/ Carbon Credits as an Adder - $M**				**$1,030**

Peak Capacity and REC Need 2022 - 2025	**2022**	**2023**	**2024**	**2025**
Peak Capacity Need (MW)	299 MW	291 MW	328 MW	457 MW
REC Need	0	233,449	691,864	700,482

Q. Why did PSE acquire substantially more RECs than needed to meet the need in 2023?

A. All four resources selected by the model included a substantial capacity benefit. Three of the four selected proposals—the SPI Biomass PPA (Project ID #18100), Clearwater Wind PPA (Project ID #18169), and the Golden Hills Shaped Wind PPA (Project ID #18170)—offered a contribution to both the renewable and peak capacity needs. The fourth proposal, the BPA Peak Capacity Product (Project ID #18161), offered a call option in winter peak months for BPA system

resources, which are primarily non-emitting hydro resources. Although the RECs may be surplus in the near-term, the resources were still necessary to meet the expected peak capacity need.

During Phase 2, PSE was aware of the potential need for renewable and non-emitting resources that would ultimately be created by CETA which was signed into law by Governor Inslee on May 7, 2019, just prior to completion of the Phase 2 analysis. Thus, PSE knew that CETA had substantially increased PSE's need to acquire renewable and non-emitting resources to meet the targets established therein. The Clearwater Wind PPA provided significant capacity attributes and ultimately contributes toward meeting PSE's need for renewable resources.

D. Phase 2 Short List

Q. Did PSE's Phase 2 qualitative and quantitative evaluation result in a short list?

A. Yes. Based on the results of the Phase 2 qualitative and quantitative evaluation, PSE's Energy Management Committee approved for negotiation at its July 2019 meeting the short list of resources selected in the optimization model as the optimal portfolio (as shown in Table 8).

E. Post- Phase 2 Unsolicited Bids

Q. Please describe any proposals received after the completion of Phase 2.

A. Subsequent to receiving approval from the Energy Management Committee to initiate negotiation discussions for the 2018 All Resources RFP short-listed resources, PSE received two new unsolicited proposals:

1. On August 29, 2019, [redacted] (Project ID #UP005) proposed either an asset sale of their interest in the [redacted] natural gas-fired combined cycle facility ([redacted] percent) or a 7-year power purchase agreement with delivery to [redacted] 230 kV Substation, beginning September 1, 2022.

2. On October 23, 2019, Morgan Stanley Capital Group Inc. proposed the MSCG System PPA (Project ID #UP006), a three- to five-year seasonally shaped, heavy load hour PPA with various product structure and pricing options, for up to 100 MW of system power delivered to BPAT.PSEI beginning January 1, 2022.

PSE also received updated pricing for three of the 2018 All Resources RFP resources between August and November 2018:

1. The [redacted] (Project ID #18173) (lower price).

2. The BPA Peak Capacity Product (Project ID #18161) (higher price).

3. The SPI Biomass PPA (Project ID #18100) (lower price).

Q. Did PSE evaluate these resources relative to the 2018 All Resources RFP proposals?

A. Yes. PSE customarily considers new and unsolicited information and re-evaluates its resource decisions to confirm that it selects the lowest reasonable cost solutions to meet customer needs, consistent with resource acquisition prudence rules and policies including Chapter 480-107 WAC. PSE performed an updated optimization analysis of its resource alternatives between August and November 2019. To confirm that the lowest reasonable cost, best fit combination of alternatives available would be selected, PSE included in its updated analysis all of the original 2018 All Resources RFP Phase 2 optimization resources, the two new proposals and the proposal pricing updates. PSE also updated certain key modeling assumptions to reflect the most current information available to PSE at the time the analysis was conducted.

F. Phase 2 Update: Re-evaluation of Selected 2018 All Resources RFP Resources

Q. Please describe the process PSE conducted to re-evaluate its 2018 All Resources RFP resource selections.

A. PSE's optimization analysis process for the Phase 2 Update was fundamentally the same as the process for Phase 2, using the same models and metrics, and many of the same assumptions used in Phase 2. However, PSE updated certain assumptions to reflect the most current information available at the time the Phase 2 Update analysis was conducted.

Q. Please specify the assumptions that PSE updated in the Phase 2 Update analysis.

A. PSE updated four assumptions to facilitate a proper economic evaluation with the most current information available at the time.[34] The updated assumptions include:

1. Updated peak capacity need to align with PSE's revised 2019 IRP Progress Report filed on December 10, 2019.

2. Reduced Mid-C power price forecast from the 2018 All Resources RFP Phase 1 price forecast to align with PSE's revised 2019 IRP Progress Report.

3. Updated social cost of carbon assumptions based on guidance from Docket U-190730, dated September 12, 2019 (2.5 percent discount rate scenario, 0.437/ton/MWh market purchase carbon intensity).

4. Updated peak capacity need to reflect the assumed retirement of Colstrip Units 1 and 2 in early 2020.

Please see the Sixth Exhibit to the Prefiled Direct Testimony of Colin P. Crowley, Exh. CPC-7, for a copy of PSE's revised 2019 IRP Progress Report.

Q. What were the key findings of the re-evaluation analysis?

A. PSE completed its re-evaluation analysis in November 2019, resulting in a revised optimal portfolio. The revised quantitative results confirmed the selection of the

[34] *See* Crowley, Exh. CPC-5HC at 132-158 (providing details about the assumptions PSE used in the 2018 All Resources RFP and 2018 All Resources RFP Update analysis); *see also* Crowley, Exh. CPC-7 (providing a copy of the 2019 IRP Update).

original Phase 2 Short List resources and added one additional unsolicited resource, the MSCG System PPA (Project ID #UP006).

PSE's optimization analysis recommended adding the MSCG System PPA (Project ID #UP006) five-year option as part of an optimal portfolio solution to help mitigate remaining need not met by the original short list. As shown in Table 9, the initial short list left a small need in 2022 and a larger need in 2024. Additionally, the MSCG System PPA (Project ID #UP006) offers benefits such as: (i) delivery to PSE's system, and (ii) seasonal shaping and heavy load hour shaping to help meet demand when capacity is most needed and to minimize surplus off peak.

Q. Did this updated analysis result in a change to the short list?

A. Yes. PSE presented the revised optimization results to its Energy Management Committee in November 2019 and recommended adding the five-year seasonally shaped option from Morgan Stanley Capital Group Inc.[35] to its short list for negotiation.[36]

Q. Does the revised short list address PSE's near-term peak capacity need?

A. Yes. With the addition of the capacity contributed by the revised short list resources, which includes the original short list resources and the MSCG System

[35] The contract was initially proposed as a five-year PPA, but was later shortened to a four-year, 363-day PPA to comply with the requirements of Chapter 80.80 RCW.

[36] *See* Crowley, Exh. CPC-5HC at 284-297.

PPA (Project ID #UP006), PSE expected to meet the peak capacity need identified in the 2018 All Resources RFP process through 2024. PSE's analysis demonstrated that when combined with the existing electric resource portfolio, the revised short list represented the most favorable combination of resources to best meet PSE's renewable and peak capacity needs at the lowest reasonable cost and risk. Table 9 shows the updated expected peak capacity need after the inclusion of the revised short list resources.

Table 9. Updated Portfolio Peak Capacity Need with Revised Short List Resources

	2022	2023	2024	2025	2026
Peak Need	299 MW	292 MW	358 MW	477 MW	1,124 MW
July EMC Resources Contributed Peak Capacity	292 MW	292 MW	292 MW	292 MW	292 MW
Need / (Surplus) without MSCG (MW)	7 MW	0 MW	66 MW	185 MW	832 MW
MSCG Contributed Peak Capacity (MW)	79 MW	79 MW	79 MW	79 MW	79 MW
Need / (Surplus) with MSCG (MW)	-72 MW	-79 MW	-13 MW	106 MW	753 MW

Q. Has the Commission approved any of the five shortlisted proposals that resulted from the Phase 2 Update prudent?

A. Yes. As mentioned earlier in my testimony, in Order 05 in Docket UE-200980, the Commission found four of the resource acquisition proposals on the shortlist from the 2018 All Resources RFP to be prudent: (i) the SPI Biomass PPA (Project ID #18100); (ii) the Golden Hills Shaped Wind PPA (Project ID #18170); (iii) the BPA Peak Capacity Product (Project ID #18161); and (iv) the MSCG System PPA (Project ID #UP006).

VI. PSE'S DECISION TO ENTER INTO THE CLEARWATER WIND PPA IS PRUDENT

A. Contract Negotiation and Re-evaluation of the Clearwater Wind PPA (Project ID #18169)

Q. Please describe the rationale for selecting the Clearwater Wind PPA (Project ID #18169).

A. PSE selected the Clearwater Wind PPA (Project ID #18169), which offers 146 MW of peak capacity credit and [redacted] RECs to the Colstrip Substation at a fixed price limiting PSE's exposure to fluctuations in the market. The proposal was selected as part of the optimization process in Phase 2 because it contributes to both peak capacity and renewable needs. PSE plans to use repurposed Colstrip transmission and BPA transmission to deliver the power from Montana to PSE's system.

Q. Over what time period did PSE and NextEra negotiate the terms of the Clearwater Wind PPA (Project ID #18169)?

A. PSE and NextEra negotiated the Clearwater Wind PPA (Project ID #18169) between November 2019, when PSE completed its 2018 All Resources RFP analysis, and February 3, 2021, when the contract was executed. The period for the negotiations was extended due to delays in the completion of a System Impact Study ("SIS") that was required to obtain transmission service for the Clearwater Wind PPA (Project ID #18169) on the Colstrip Transmission System. PSE ultimately received the SIS on November 30, 2020.

The results of the SIS were fundamental to understanding the scope and costs of required upgrades to provide the requested service and, therefore, the viability of the transmission arrangements contemplated for the project, its economics, and the terms of the Clearwater Wind PPA (Project ID #18169). To minimize risk, PSE waited to seek management and board of director approval to execute the Clearwater Wind PPA (Project ID #18169) until January 2021, after the SIS had been completed.

Q. Did PSE perform any additional re-evaluation of alternatives during the negotiation of the Clearwater Wind PPA (Project ID #18169)?

A. Yes. Between November 2019 and January 2021, as new information became available, PSE re-evaluated its alternatives and conducted additional quantitative analyses to determine whether the Clearwater Wind PPA (Project ID #18169) remained the best resource alternative from the 2018 All Resources RFP. Incremental changes included updates to PSE's resource need assumptions, as well as ongoing analytical consideration and sensitivities relating to performance, deliverability and cost assumptions. In each case, analysis showed conclusively that the Clearwater Wind PPA (Project ID #18169) continued to provide the highest portfolio benefit of the resource alternatives from the 2018 All Resources RFP.

Table 10 below presents a chronological list of the qualitative and quantitative re-evaluation analyses, updates to PSE's Energy Management Committee ("EMC")

and updates to its board of directors that occurred prior to PSE receiving approval from the board of directors to execute the Clearwater Wind PPA (Project ID #18169) on January 21, 2021.

Table 10. Re-Evaluation Analyses Conducted During Negotiation of the Clearwater Wind PPA (Project ID #18169)

Analysis updates	Key terms and assumptions revised

1. EMC Informational Update, May 21, 2020	• Status of ongoing pricing and term negotiation
	• Project development progress update
	• Uncertainties affecting agreement execution and COD:
	  ○ securing firm transmission for project
	  ○ timing of production tax credit ramp down

2. Clearwater Sensitivities, July 2020	Updated comparative analysis and stress tested portfolio benefits of Clearwater to reflect the following updates: • Sensitivity performed to assess [redacted] • Ongoing pricing and term considerations • Negotiated shift of the risk of transmission delay beyond 2022 from PSE to NextEra • Increased wind balancing cost estimate
3. EMC Informational Update, August 27, 2020	• Updated peak capacity need based on F2020 load forecast • Analysis comparing portfolio benefit of Clearwater Wind PPA with a 2022 COD to that of a 2025 or 2026 COD • Status of System Impact Study for CTS • Project development progress update
4. EMC Informational Update, September 24, 2020	• Status update on System Impact Study for CTS • Negotiated [redacted] • Consideration of proposed mutual right to extend agreement for 5 years • Project development and construction schedule update
5. Board of Director Update Call, October 7,	• Status of ongoing pricing and terms negotiation • Summary of key project development and construction risks

Table 10. Re-Evaluation Analyses Conducted During Negotiation of the Clearwater Wind PPA (Project ID #18169)

Analysis updates	Key terms and assumptions revised
2020	• Results of updated portfolio benefit analysis comparing Clearwater with next best resource option from the 2018 All Resources RFP
6. EMC Decisional, December 17, 2020	• Updated expected clean energy and peak capacity resource needs from draft 2021 IRP • Final contract terms • Status of project development progress, including receipt of System Impact Study for CTS on Nov. 30, 2020 • Results of final portfolio benefit analysis comparing Clearwater with next best resource option from the 2018 2018 All Resources RFP
7. Board of Director Update Call, January 6, 2021	• Updated need from the draft 2021 IRP • Status of System Impact Study for CTS • Final contract terms • Final agreement pricing[37]

PSE has prepared an exhibit that describes each interim analysis performed during the negotiation period, as listed in Table 10 above. The exhibit includes a detailed description of the evolving terms and assumptions considered during this process, the results of each interim analysis, and updates presented to PSE's Energy Management Committee and board of directors. *See* Exh. CPC-06HC at 576 - 668.

The following testimony describes the details of the analysis presented to the Energy Management Committee on December 17, 2020 and to the board of

[37] The final pricing presented to the board of directors on January 6, 2021 (i.e., $[redacted]/MWh for a 20-year term and $[redacted]/MWh for a 25-year term, if the five-year extension is exercised), is the same as the pricing assumptions used in the final portfolio benefit analysis presented to the Energy Management Committee on December 17, 2020.

directors on January 6 and January 21, 2021, which resulted in PSE receiving approval from its board of directors to execute the Clearwater Wind PPA (Project #18169).

Q. What qualitative risks did PSE consider in its re-evaluation of the Clearwater Wind PPA (Project ID #18169)?

A. Throughout the negotiation period, PSE received updates on the development status of the Clearwater wind project and incorporated the new information into its qualitative assessment. When NextEra submitted the Clearwater Wind PPA (Project ID #18169) into the 2018 All Resources RFP, it was an early development project. By the time PSE sought approval to execute the Clearwater Wind PPA (Project ID #18169), the project had progressed; however, additional development and construction work remained to be completed to achieve commercial operation. Some of these tasks had the potential to delay the overall project schedule.

Table 11 below summarizes the remaining key risks associated with project development, transmission, and future operations, as presented to the Energy Management Committee on December 17, 2020. As shown in Table 11, PSE had identified mitigation plans to address each of the remaining key risks.

Table 11. Key Risks and Mitigations Associated with the Clearwater Wind PPA (Project ID #18169), as Presented to the Energy Management Committee on December 17, 2021

Risk	Description	Mitigation Strategy
Development	Potential project delays related to permitting and leases: • Acquisition of real estate rights at Colstrip property adjacent to the Colstrip Substation • Acquisition of leases for project property from the State of Montana, a State Highway encroachment permit for the gen-tie line, and various crossing permits • Execution of transmission line crossing agreements required with Northwestern and the CTS Owners • Approval for Sage grouse mitigation plan or EIS associated with State of Montana wind farm lease • Approval of an amendment to mine reclamation plan required for alternate route into Colstrip	• PSE entitled to collect liquidated damages ("LDs") up to $25M for delays in gen-tie, wind farm and commercial online date ("COD") milestones • PSE's delayed peak capacity need may result in no required mitigation if COD is delayed
Transmission	• Final timing of obtaining long-term firm, point-to-point transmission along the CTS for the project • CTS and BPA remedial action scheme ("RAS") delays • Delays in PSE pseudo-tie completion	• PSE not obligated to take energy on a firm basis from NextEra if COD is reached but firm transmission is not obtained • PSE agrees to take commercially reasonable efforts to purchase power

Table 11. Key Risks and Mitigations Associated with the Clearwater Wind PPA (Project ID #18169), as Presented to the Energy Management Committee on December 17, 2021

Risk	Description	Mitigation Strategy
Ongoing Operations	Frequent temporary or permanent reductions in transmission capacity due to WECC Path 8 rerating on three transmission wheels of Colstrip Transmission System, BPA Eastern Intertie, and BPA main grid (low risk)	• Sell energy at Colstrip, optimize generation between Colstrip 3&4 and Clearwater, acquire third party transmission • With removal of Colstrip 3&4 from rates in 2026, likely additional transmission available

Prior to seeking board of director approval to authorize the execution of the Clearwater Wind PPA (Project ID #18169), PSE also prepared a detailed risk assessment for the project. See Exh. CPC-6HC at 94-102 for the risk assessment that PSE included in the January 21, 2021 report to its board of directors detailing the business case for executing the Clearwater Wind PPA (Project ID #18169).

Q. Describe the remaining siting risks to the overall project development schedule when the Clearwater Wind PPA (Project ID #18169) was executed.

A. PSE considered the risk that real estate rights that had not yet been obtained could be delayed or withheld; in particular, land rights on Colstrip Power Plant property immediately adjacent to the Colstrip Substation, leases for project property from

the State of Montana, a State Highway encroachment permit for the generation-tie line and various crossing permits. NextEra had begun securing leases and easements from the state of Montana, transmission line crossings, and substation lines on Colstrip plant property; however, the outcomes remained unknown at the time the Clearwater Wind PPA needed to be executed to achieve the project COD.

Q. Describe the remaining permitting risks to the overall project development schedule when the Clearwater Wind PPA (Project ID #18169) was executed.

A. PSE considered the risk that delays in securing certain permits and approvals might delay the overall project COD or increase costs. A number of federal, state, county, and local permits and approvals are required to construct and operate the wind farm and the associated generation-tie line that interconnects the Clearwater wind project to the Colstrip Substation. The Conditional Use Permit from the City of Colstrip, which is the primary discretionary permit required, has been granted and was not appealed. However, other significant required approvals include approval of a sage grouse mitigation plan and a State of Montana wind farm lease, which requires approval of an environmental impact statement.

Additionally, an interconnection design alternative was being considered that would avoid the need for underground lines and crossing agreements from Colstrip owners. If utilized, it would require an alternate generation-tie line route across Westmoreland mine property to interconnect the project, which would require the approval of an amendment to the mine reclamation plan.

Q. How did PSE mitigate the risk of project delays associated with potential siting or permitting delays?

A. PSE negotiated contract terms with NextEra that provide for the risk of any resulting delay in the commercial online date ("COD") to rest with NextEra. Under the terms of the Clearwater Wind PPA, PSE is entitled to collect liquidated damages ("LDs") up to [redacted] for delays in the gen-tie, wind farm and COD milestones specified in the contract.

Q. Describe the transmission arrangements associated with the Clearwater Wind PPA.

A. PSE is responsible for the delivery path from the Colstrip Substation to customer load. The Clearwater project will repurpose transmission available from the retirement of Colstrip Units 1 and 2. The transmission path consists of three transmission wheels: (1) Colstrip Transmission System ("CTS"), (2) the BPA Eastern Intertie, and (3) the BPA main grid. All three segments have been analyzed for potential use for a proposed Montana renewable project.

PSE submitted a Transmission Service Request for 350 MW on the CTS on August 14, 2019 and was first in the queue for this firm capacity, subject to a series of transmission studies required by NorthWestern Energy ("NorthWestern"). PSE also holds sufficient firm point-to-point capacity rights on BPA's main grid from Garrison to PSE's load. On the Eastern Intertie, PSE holds 680 MW of capacity under the Montana Intertie Agreement through 2027, which

may be renewed. PSE had originally planned to use Eastern Intertie capacity that would have been available to PSE after the sale of Colstrip Unit 4; however, as a result of the cancellation of the sale, PSE needed to secure an additional 40 MW to accommodate the entirety of Clearwater's throughput. At the time PSE sought approval to execute the Clearwater Wind PPA, PSE had confirmed that the additional 40 MW was available and began taking the necessary steps with BPA to secure it.[38]

Q. What studies are required to obtain transmission service for the Clearwater wind project on the Colstrip Transmission System?

A. NorthWestern requires a series of transmission studies to assess the impact of delivering the wind energy from the Clearwater wind project to the Colstrip Substation and westward on the Colstrip Transmission System, and to identify any required upgrades. These studies provide visibility into the costs associated with system upgrades, timelines to complete upgrades, and the resulting transmission system capabilities. They examine a number of new frontiers along the Colstrip Transmission System, including the introduction of variable energy on the Colstrip Transmission System, effects on nearby transmission systems (BPA) and the design/scoping of a remedial action scheme (RAS) across the Colstrip Transmission System. The list below provides a brief description of

[38] The additional 40 MW of firm capacity is expected to be available in September 2022, once the CTS RAS and Western Montana RAS (described on next page) upgrades are complete.

the required transmission studies and their status at the time PSE sought approval to execute the Clearwater Wind PPA (Project ID #18169).

NorthWestern System Impact Study – Complete

The NorthWestern System Impact Study (SIS) analyzes the technical aspects of PSE's transmission request on the Colstrip Transmission System and determines the electrical impacts to the system (voltage stability, transient stability, reactive power, etc.). The SIS provides a high-level overview of the transmission construction timeline, identifies needed upgrades and estimates the cost of the upgrades required to deliver energy from the new Clearwater wind resource through 350 MW of firm transmission capacity on the Colstrip Transmission System. This preliminary estimate and timeline were refined and subject to modification in a subsequent, more detailed Facilities Study.

The NorthWestern SIS estimated the preliminary cost of the upgrades required to integrate the 350 MW Clearwater wind project to be relatively low at $440,000. At the time the NorthWestern SIS was completed, 20 MW of the needed transmission was available with no needed upgrades. The remaining 330 MW of transmission service will require the Clearwater wind project to connect to a new RAS on the Colstrip Transmission System, which will be part of an already planned network upgrade on behalf of the Colstrip Transmission System owners following the shutdown of Colstrip Units 1 and 2. This work is expected to be completed in June 2022.

BPA Affected System Study - Complete

The BPA Affected System Study was performed concurrently and in coordination with the NorthWestern SIS. BPA's Affected System Study identified the need for a change to its Western Montana RAS to integrate the Clearwater wind project. This Western Montana RAS will operate in concert with the new RAS identified in the NorthWestern SIS. The BPA Affected System Study indicated no cost to PSE for this work and the work is expected to be completed in summer 2022, aligning with the Colstrip Transmission System RAS upgrade work.

NorthWestern Facilities Study – Pending

The Northwestern Facilities Study provides more detailed cost and timeline information for the RAS integration work required for the remaining 330 MW of CTS transmission capacity. At the time PSE sought approval to execute the Clearwater Wind PPA (Project ID #1869), PSE estimated that it would receive the final FS from NorthWestern by June 2021.

Northwestern delivered the Facilities Study and offered PSE a Transmission Service Agreement on September 1, 2021. The Facilities Study affirmed the cost, scope and expected timing of the required RAS upgrades identified in the SIS. PSE and Northwestern executed the Transmission Service Agreement for 330 MW on September 14, 2021. A contract for the other 20 MW had previously been executed by the parties on December 11, 2020. Service is expected to begin after

the required upgrades are completed, which is expected to occur in June 2022; however, the date is not guaranteed.

PSE Pseudo-Tie Study - Pending

To integrate the Clearwater wind resource into PSE's Balancing Authority Area (BAA), the project's output will be connected to PSE's system by way of a pseudo-tie. A pseudo-tie is a "virtual" tie-line, between the NorthWestern BAA and the PSE BAA. At the time PSE sought authorization to execute the Clearwater Wind PPA (Project ID #18169), PSE had begun the process of submitting a pseudo-tie request to PSE Transmission ("PSEI"), in accordance with PSEI's business practice. PSEI had indicated that determination of the timeline and costs for conducting a feasibility study and establishing the pseudo-tie will in part be driven by the results of the NorthWestern SIS and NorthWestern Facilities Study. The pseudo-tie must be in place prior to the November 30, 2022 COD, and PSE is confident that this timeline does not present a technical challenge based on prior experience with the Colstrip pseudo-tie.

WECC Path Rating Study – Pending (after COD)

The WECC Path Rating Study will determine whether any changes are required to the rating for Path 8, which is the path that energy from Clearwater will cross as it travels from Montana to Washington. The path rating (MW) is an indicator of the amount of energy that can flow from Montana into Idaho or Washington. NorthWestern has indicated that the WECC Path Rating Study will occur after the

Clearwater resource is operational. NorthWestern has briefed the WECC Path Rating Committee on its intended approach.

PSE has assessed the risk that the study may result in a lower path rating and identified potential mitigations. These include selling energy at Colstrip, purchasing unused transmission from CTS owners or prioritizing scheduling of power over Colstrip Units 3 and 4 (until 2026, when the units are removed from rates). PSE's assessment of the risks and mitigations for Clearwater, including risks associated with the outcome of the WECC Path Rating Study, are detailed in Exh. CPC-6HC at 78-81, 101.

Q. What did PSE consider to be the main outstanding risk associated with the Colstrip Transmission System when the Clearwater Wind PPA (Project ID #18169) was executed and how did PSE mitigate this risk?

A. With the results of the SIS in hand, PSE considered the main outstanding risk associated with the CTS to be the potential for a delay in the start of the firm transmission service. There is a potential for delays in the completion of the remaining transmission studies and associated upgrades, such that the required 350 MW of firm capacity may not be available by the contractually guaranteed COD.

Under the terms of the Clearwater Wind PPA, PSE is responsible for securing the required transmission; however, the resource acquisition team negotiated for NextEra to assume the risk of a firm transmission delay beyond the Guaranteed

COD. PSE is not obligated to take energy on a firm basis from NextEra, if the project COD is reached but firm transmission has not been obtained. PSE calculated this avoided risk to be approximately $5.7 million per month, an amount equivalent to the payment for lost energy plus the lost PTC benefit amount. NextEra's acceptance of the transmission timing risk underlines the long-term value of the Colstrip Transmission System capacity and the favorable terms of the Clearwater Wind PPA.

Q. Did PSE perform any quantitative analysis of the risks and costs associated with the delivery of energy from Montana to PSE's load?

A. Yes. A cross-functional team of analysts from PSE's energy supply, energy analysis, resource planning and resource acquisition teams tested and re-evaluated the economics of the Clearwater Wind PPA (Project ID #18169) as follows:

- Sensitivity analysis and stress testing of the Clearwater Wind PPA in consideration of [redacted] and associated curtailment scenarios, including the impact of curtailment in a worst case scenario;
- Assessment of incremental costs due to extra requirements for contingency reserves and flexible reserves related to integrating a Montana wind resource into the PSE BAA; and
- Re-evaluation of the Clearwater Wind PPA economics based on updated capacity contribution assumptions to align with the most current data available through the 2021 IRP process.

The results of the sensitivity analysis showed that the Clearwater Wind PPA (Project ID #18169) continued to provide the highest portfolio benefit among alternative resource options. See Exh. CPC-6HC at 579-80, 605-07 for a more detailed description of the sensitivity analyses and results, which reaffirm the selection of the Clearwater Wind PPA (Project ID #18169) as part of a lowest reasonable cost solution to meet the needs of PSE's customers.

Q. Describe generally the changes to the proposed contract terms that resulted in updated pricing during the negotiation period.

A. Updates to the proposed pricing during the negotiation period reflected key changes such as a shorter 20-year term with an option to extend the contract term for five years, the shifting of firm transmission timing risk from PSE to NextEra, increased credit support and liquidated damages protections for PSE against commercial operation date (COD) and associated construction-timing risks, the sharing of production tax credit (PTC) extensions due to changes in the law,[39] winter output guarantees[40] and system curtailment protections.

[39] Under then-current tax rules, the Clearwater Wind PPA (Project ID #18169) would be eligible for 80 percent of the PTC with a 2021 COD and 60 percent of the PTC with a 2022 COD. The U.S. Department of the Treasury indicated that it was considering extending the deadline from 2021 through 2022 to benefit from 80 percent of the PTC, rather than allowing the credit to drop to 60 percent of its value for qualifying projects with a 2022 COD. PSE negotiated to share the benefits from the change in the prior tax law equally with NextEra.

[40] Guaranteed winter (Nov-Feb) output of [redacted] MWh.

Final contract terms and pricing are further described on pages 88 to 89 in Part VI, Section B of my testimony. A complete, executed copy of the Clearwater Wind PPA has also been provided as Exh. CPC-8C.

Q. What changes to the resource need assumptions did PSE consider in its re-evaluation analysis?

A. PSE re-examined its need for the capacity contribution of the Clearwater Wind PPA (Project ID #18169) following updates to its load forecast in late July 2020 and subsequent updates to the resource need in December 2020, which were developed as part of the ongoing 2021 IRP process. The team also considered the renewable energy contribution of the Clearwater Wind PPA (Project ID #18169) toward meeting the sizeable need for new renewable and non-emitting energy resources associated with PSE's 2030 compliance obligation under CETA.[41] As noted earlier in my testimony, CETA requires that at least 80 percent of electric sales (delivered load) in Washington state be met with non-emitting or renewable resources by 2030 and 100 percent be met with non-emitting or renewable resources by 2045. Prior to 2030, PSE has adopted a ramping strategy to meet these requirements.

The change to PSE's load forecast had the effect of decreasing PSE's expected peak capacity need, resulting in a surplus capacity position through 2025 without the addition of the Clearwater Wind PPA (Project ID #18169). However, the

[41] Chapter 19.405 RCW.

removal of Colstrip Units 3 and 4 from PSE's portfolio in 2025, as required by CETA, caused a peak capacity need to re-emerge in 2026. Additionally, the passage of CETA significantly increased PSE's need for new renewable and non-emitting energy resources. PSE's draft 2021 IRP work demonstrated that PSE would need to add approximately 7.35 TWh of CETA-compliant energy to its portfolio by 2030.

Table 12 shows PSE's then-current peak capacity and clean energy need forecasts, and the contribution of the Clearwater Wind PPA (Project ID #18169) to meeting each need.

Table 12. PSE's Expected Peak Capacity and CETA Need Before and After the Clearwater Wind PPA (Project ID #18169)

		A	B	C	D	E	F	G	H
		2023	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
1	Peak Capacity Need/(Surplus) before Clearwater (MW)	(205)	(161)	(112)	514	672	690	675	691
2	Clearwater Peak Capacity in (MW)	145	145	145	145	145	145	145	145
3	Peak Capacity Need/(Surplus) (MW)	(350)	(306)	(257)	369	527	545	530	546
4	CETA Need before Clearwater in (TWh)	0.6	1.5	2.6	3.4	4.5	5.6	6.5	7.4
5	Clearwater Clean Energy Addition (TWh)[2]	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4

[1] *Based on Draft 2021 IRP results presented at the advisory group meeting on 12/15/2020. Resource needs include the draft 2021 conservation targets.*

[2] *Clearwater energy is calculated from GNV-GL net capacity factor. Clearwater contribution to CETA need will be based on energy delivered to PSE. The row 5 estimate will be adjusted to reflect transmission line losses from Montana to PSE's service territory.*

Q. What is the Clearwater Wind PPA's (Project ID #18169) contribution to meeting PSE's clean energy need under CETA?

A. As shown in Table 12 above, the Clearwater Wind PPA (Project ID #18169) is expected to meet approximately 20 percent of PSE's remaining CETA clean energy need in 2030 after accounting for existing resources. In the meantime, the Clearwater Wind PPA (Project ID #18169) aligns well with PSE's plan to ramp into this substantial need to avoid the cost and feasibility risks associated with a just-in-time strategy.

Q. Did PSE's portfolio analysis consider whether a just-in-time strategy might be more beneficial for customers than acquiring the Clearwater Wind PPA (Project ID #18169) ahead of PSE's revised peak capacity need?

A. Yes. The resource acquisition team updated its quantitative analysis to compare the carrying cost of acquiring the Clearwater Wind PPA (Project ID #18169) ahead of PSE's peak capacity need in 2026 to the benefit of higher tax incentives achievable with an earlier online date in 2022. On August 27, 2020, PSE staff presented to the Energy Management Committee the results of an analysis comparing the portfolio benefit of the Clearwater Wind PPA (Project ID #18169) with a 2022 COD to that of a 2025 and a 2026 COD. Due to the unique combination of the Clearwater Wind PPA's (Project ID #18169) high capacity contribution, ability to use PSE's existing Montana transmission, and ability to capture the 80 percent production tax credit benefit, results showed that a 2022

COD had a portfolio benefit of $48 million more than a 2025 COD and $173 million more than a 2026 COD.[42]

Q. Do the final portfolio analysis results, as presented to the Energy Management Committee on December 17, 2021, reaffirm the selection of the Clearwater Wind PPA (Project ID #18169) as part of a lowest reasonable cost solution to meet the needs of PSE's customers?

A. Yes. Table 13 presents the results of PSE's updated portfolio benefit analysis and a comparison with the next best resource alternative. The results showed that the Clearwater Wind PPA (Project ID #18169) continued to present a significant portfolio benefit of nearly $100 million. The Clearwater Wind PPA (Project ID #18169) also maintained a sizeable advantage over the next best resource options from the 2018 All Resources RFP.

Table 13. Updated Portfolio Benefit Analysis Results (December 2020[43])

	Lowest Cost	Lowest Cost	Next Best Alternative 20 Yr
Project Name	**Clearwater (Project ID #18169)**	**Clearwater (Project ID #18169)**	**[redacted] (Project ID #18173)**
Portfolio Benefit with CO2 Costs	$97.6 M	$164.9 M	$18.3 M
Nameplate	350 MW	350 MW	296.7 MW
PPA Term	20 Yr	25 Yr	20 Yr
COD	Nov 30, 2022	Nov 30, 2022	Dec 31, 2023

[42] *See* Exh. CPC-6HC at 580-81, 611-12 (description of the analysis performed by PSE staff and the results presented to the Energy Management Committee).

[43] The 2018 All Resources RFP resource acquisition team presented these updated results to the Energy Management Committee on December 17, 2020.

PPA Price	[redacted]	Wh	[redacted]	Wh	[redacted]	Wh
NCF Delivered						
Energy Delivered		MWh		MWh		MWh

Q. What are the primary factors driving the Clearwater Wind PPA's (Project ID #18169) portfolio value?

A. The primary drivers of the Clearwater Wind PPA's (Project ID #18169) portfolio value include (i) a meaningful contribution toward meeting PSE's peak capacity and clean energy needs from a Montana wind resource with a relatively high net capacity factor ("NCF"); and (ii) the ability of the project to qualify for 80 percent of the production tax credit ("PTC") with its 2022 COD. The PTC is scheduled to decrease over the next few years to 0 percent for projects with a 2026 COD.

Q. Does the Clearwater Wind PPA (Project ID #18169) offer other material benefits to PSE's customers?

A. Yes. In addition to its portfolio benefit and CETA value, the Clearwater Wind PPA (Project ID #18169) presented an opportunity of considerable strategic value, in that it allows PSE to harness the Colstrip Transmission System ("CTS") to deliver Montana wind to its customers. At the time the Clearwater Wind PPA (Project ID #18169) was executed, PSE was first in the transmission queue for 350 MW of capacity vacated by the retirement of Colstrip Units 1 and 2, with 20 MW of firm capacity offered and the remaining 330 MW expected to be

offered following completion of certain transmission studies and related upgrades.[44]

If PSE had elected not to proceed with the Clearwater Wind PPA (Project ID #18169), PSE would have been at risk of losing all or part of the 330 MW to strong competition for this valuable transmission capacity. At the time PSE's board of directors approved the execution of the Clearwater Wind PPA (Project ID #18169), there were 2,750 MW of interconnection requests at the Colstrip Substation. PSE was in a position to be a first mover to deliver Montana wind with a high net capacity factor and attractive seasonal shape to our customers over the repurposed CTS.

B. Decision and Execution of the Clearwater Wind PPA (Project ID #18169) is prudent

Q. Please describe the executed Clearwater Wind PPA (Project ID #18169).

A. On February 3, 2021, PSE entered into the Clearwater Wind PPA (Project ID #18169) with Clearwater Energy Resources, LLC, an affiliate of NextEra Energy Resources Development, LLC ("NextEra"), for the output of 350 MW of the Clearwater wind project and the associated environmental attributes. Energy will be procured at a fixed price of [redacted] per MWh for a 20-year contract term. Under the terms of the Clearwater Wind PPA, NextEra will deliver as-generated wind energy from the Clearwater Wind Project in southeast Montana to the

[44] *See* Exh. CPC-6HC at 12-15, 70-91 (description of the relevant transmission studies and upgrades).

Colstrip Substation by a guaranteed commercial operations date of November 30, 2022. PSE will use transmission rights available from the closure of Colstrip Units 1 and 2, including existing PSE-owned transmission rights on the Bonneville Power Administration's transmission system and the Colstrip Transmission System, to deliver the power to PSE's load center. See Exh. CPC-8, for a copy of the Clearwater Wind PPA.

Q. Describe the material changes to the Clearwater Wind PPA (Project ID #18169) between the proposal submitted in response to the 2018 All Resources RFP and contract execution.

A. Throughout the evaluation and negotiation process key terms were updated until the parties agreed on a final offer. Material changes included the: (i) price, (ii) nameplate capacity, (iii) contract term, and (iv) guaranteed COD. The key terms of the executed contract include a $[redacted] price, 350 MW nameplate, and a 20-year term starting with a November 30, 2022 COD. PSE also has a unilateral right to extend the contract for five years, which adjusts the price to $[redacted] for all 25 years of the contract. This is a limited time option, which PSE must exercise no later than December 31, 2025. PSE is seeking a determination of prudence and cost recovery for the 25-year PPA option to take advantage of the lower price offer for PSE's customers. Please see Exh. CPC-6HC at pages 576 to 586, for a discussion of key term changes before final execution.

Q. Did the change(s) described above to the Clearwater Wind PPA (Project ID #18169) materially change the analysis of the Clearwater Wind PPA (Project ID #18169)?

A. No. As described in Section VI, Part A of this testimony, PSE continuously updated its evaluation analysis to reflect material changes in the terms, as well as other updates. Table 14 below summarizes the results of the portfolio benefit analysis and demonstrates that the Clearwater Wind PPA (Project ID #18169) provides approximately $146.6 million portfolio benefit relative to the next best available alternative.

Table 14. Portfolio Benefit Analysis Results

	Lowest Cost Portfolio	Next Best Available Portfolio
Resource Selected	Clearwater	[redacted]
Portfolio Benefit	$[redacted] Million[45]	$[redacted] Million

Q. What are the rate year costs associated with the Clearwater Wind PPA (Project ID #18169)?

A. Table 15 presents the rate year costs for the Clearwater Wind PPA (Project ID #18169).

Table 15. Rate Year Costs of the Clearwater Wind PPA

	2023	2024	2025
Clearwater 25-year @ $[redacted]/MWh	$[redacted]	$[redacted]	$[redacted]

[45] Clearwater results are based on the 25-year PPA price of [redacted] per MWh, as presented to PSE's board of directors on January 6, 2021.

Q. Please summarize the benefits that PSE's customers will receive from the Clearwater Wind PPA (Project ID #18169).

A. As described in Section VI, Part A of my testimony, the Clearwater Wind PPA (Project ID #18169) (i) provides a meaningful contribution toward meeting PSE's significant peak capacity and clean energy needs by 2026, (ii) is part of a lowest reasonable cost portfolio solution based on alternatives analysis performed throughout the 2018 All Resources RFP evaluation and negotiation period, (iii) allows for the efficient utilization of current tax incentives and existing PSE transmission rights, and (iv) is a valuable Montana resource that is of strategic importance to PSE in meeting the ambitious targets of CETA at a reasonable cost for customers.

Q. Did PSE seek management approval to enter into the Clearwater Wind PPA (Project ID #18169)?

A. Yes. On December 17, 2020, PSE received the approval of its Energy Management Committee[46] to present the Clearwater Wind PPA (Project ID #18169) to its board of directors. The PSE board of directors subsequently authorized PSE to execute the Clearwater Wind PPA on January 21, 2021.

[46] *See* Crowley, Exh. CPC-6HC at 637-57 (providing a copy of the presentation to the Energy Management Committee for approval to enter into the Clearwater Wind PPA).

VII. CONCLUSION

Q. Could you please summarize your testimony?

A. Yes. PSE's acquisition of the Clearwater Wind PPA (Project ID #18169) will help meet the expected clean energy and peak capacity needs of PSE's customers for years to come. Based on the resource needs described herein, the robust analysis performed during the 2018 All Resources RFP evaluation and subsequent negotiation, and the benefits to PSE's customers described in my testimony, PSE is seeking a determination of prudence and cost recovery for the Clearwater Wind PPA (Project ID #18169).

Q. Does that conclude your prefiled direct testimony?

A. Yes, it does.