EXH. CLS-1HCT
DOCKET UE-20___
2020 PSE PCORC
WITNESS: CINDY L. SONG

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent**	**Docket UE-20____**

PREFILED DIRECT TESTIMONY (HIGHLY CONFIDENTIAL) OF

CINDY L. SONG

ON BEHALF OF PUGET SOUND ENERGY

REDACTED
VERSION

DECEMBER 9, 2020

PUGET SOUND ENERGY

PREFILED DIRECT TESTIMONY (HIGHLY CONFIDENTIAL) OF CINDY L. SONG

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PUGET SOUND ENERGY

PREFILED DIRECT TESTIMONY (HIGHLY CONFIDENTIAL) OF CINDY L. SONG

I. INTRODUCTION

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

A. My name is Cindy L. Song. My business address is 355 110th Ave NE, Bellevue, WA 98004. I am the Director of Resource Acquisition and Energy Risk Control for Puget Sound Energy ("PSE").

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

A. Yes. Please see the First Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-2.

Q. What are your duties as Director of Resource Acquisition and Risk Control for PSE?

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

Q. What is the nature of this prefiled direct testimony in this proceeding?

A. This prefiled direct testimony describes the 2018 All-Source Request for Proposals ("2018 All Resources RFP") evaluation and results, and includes each of the following:

- an overview of PSE's 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
- for each of the following selected resources, a request for a determination of prudence including all costs associated with these resources:
  - 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 ("PPA"), and
  - the Morgan Stanley Capital Group Inc. System Power Purchase Agreement ("MSCG System PPA") (Project ID #UP006).

The addition of these contracts will enable PSE to meet peak capacity needs and renewable energy targets identified in the 2018 All Resources RFP.

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

A. This prefiled direct testimony presents four resources for which PSE is seeking a determination of prudence and cost recovery.

(i) The **SPI Biomass PPA** (Project ID #18100) is a 17-year fixed price PPA delivering 17 MW of firm capacity from a biomass project located in PSE's system beginning in January 2021.

(ii) The **BPA Peak Capacity Product** (Project ID #18161) is a five-year agreement for firm capacity delivered to PSE's system. This contract functions as a call option for capacity that may be scheduled in [redacted] increments from [redacted] MW on a [redacted] basis, beginning in January 2022.

(iii) The **Golden Hills PPAs** (Project ID #18170) are two separate, but related PPAs:

a. The **Golden Hills Shaped Wind PPA** is a 20-year fixed price contract delivering to PSE's system the output from a 200 MW wind development project paired with shaped capacity up to [redacted] MW during winter peak hours.[1] The Golden Hills Shaped Wind PPA (Project ID #18170) will begin concurrent with the commencement of commercial operations of the Golden Hills Wind Project, which is expected to occur in June 2022.

b. The **Golden Hills Interim Capacity PPA** provides winter capacity in the event that the Golden Hills Wind Project encounters COVID-19 related development delays.

[1] Shaped schedule: November through February, hours ending (HE) [redacted] and (HE) [redacted].

The Golden Hills PPAs (Project ID #18170) are intertied to provide a combined solution; as such, PSE is seeking a prudence determination for both PPAs in this rate case. Due to the timing of the rate year, PSE is only seeking cost recovery for the Golden Hills Interim Capacity PPA in this rate case and will seek cost recovery of the Golden Hills Shaped Wind PPA in a future proceeding.

(iv) The **MSCG System PPA** (Project ID #UP006) is a 4-year, 363-day, fixed price system PPA with Morgan Stanley Capital Group for 100 MW of firm heavy load hour energy delivered in the first and fourth quarters of the calendar year, beginning in January 2022.

II. PSE'S DECISIONS TO ENTER INTO THE FIVE PPAS ARE 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]

[2] *WUTC v. Puget Sound Energy*, Docket UE-031725, Order 12 ¶ 19 (Apr. 7, 2004).

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 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]

[3] *See e.g.*, *WUTC v. Puget Sound Power & Light Co.*, Docket UE-921262, *et al.,* Nineteenth Supplemental Order at 11 (Sept. 27, 1994).
[4] *Id.* at 11.
[5] *Id.* at 2, 33-37, 46-47.
[6] *Id.* at 37, 46.
[7] *Id*. at 2, 37, 46.

Q. Did PSE's decisions to enter into each of the SPI Biomass PPA (Project ID #18100), the BPA Peak Capacity Product (Project ID #18161), the Golden Hills Shaped Wind PPA, the Golden Hills Interim Capacity PPA, and the MSCG System PPA (Project ID #UP006) meet this prudence standard?

A. Yes. PSE had a clear, documented need for capacity and Washington State's Renewable Portfolio Standards ("RPS")-compliant renewable resources 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.

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 the Second Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-3, for a copy of 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 the Revised Code of Washington chapter 19.280 (Chapter 19.280 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.

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

Q. What capacity need did the 2017 IRP identify?

A. The 2017 IRP identified a need for 215 MW of capacity resources in 2023. The expected 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

[8] *See* Song, Exh. CLS-3, at 1-12.

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]

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

Q. Did PSE update its 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 capacity and renewable resource needs in its 2018 All Resources RFP filings with the Commission.[10] Please see the Third Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-4, for a copy of the 2018 All Resources RFP Document.

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.

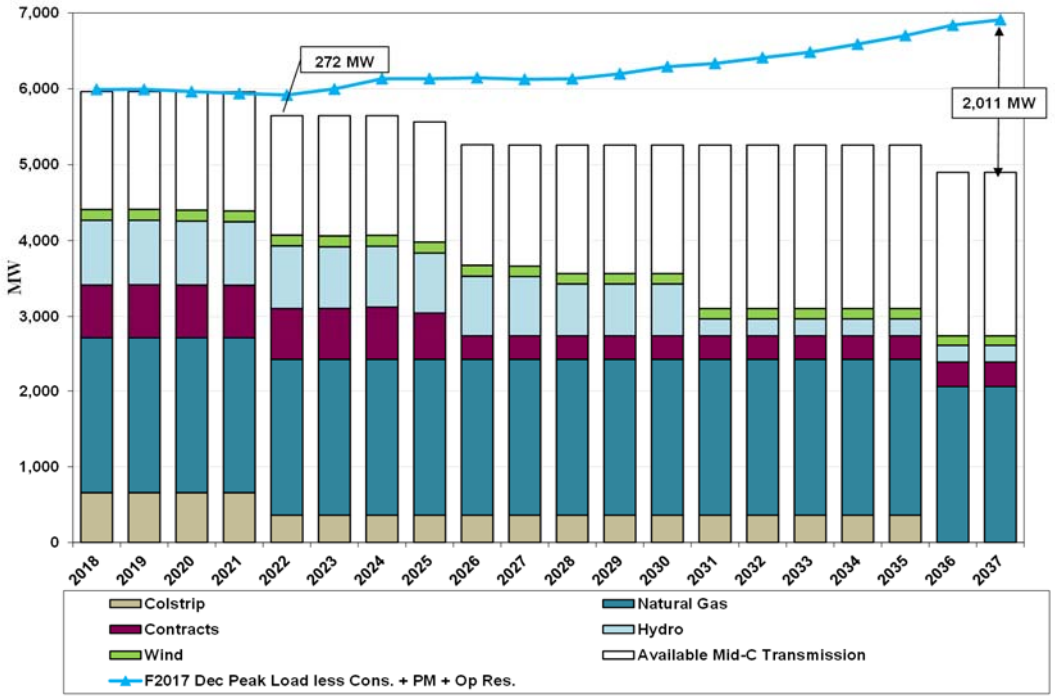
[9] *See* Song, Exh. CLS-3, at 1-15.
[10] *See* Song, Exh. CLS-4, at 1 (presenting PSE's need in the 2018 All Resources RFP).

Please see the Fourth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-5HC, for a copy of the 2018 All Resources RFP Evaluation Process Document. Please see Attachment E, Section 1, of the 2018 All Resources RFP Evaluation Process Document for a discussion of the load forecast assumptions used in developing the 2018 All Resources RFP resource need.

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

A. As shown in Figure 1, PSE forecasted a modest 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.

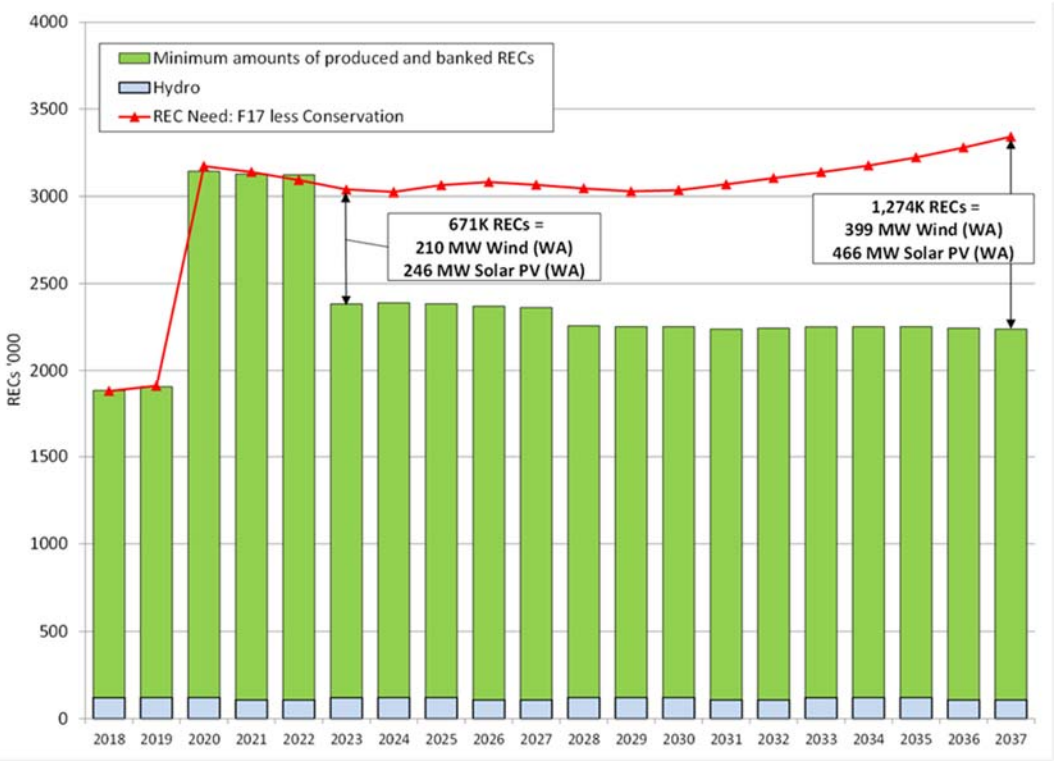
Figure 1. Electric Resource Capacity Need Forecast (as filed in the 2018 All Resources RFP)



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 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 Washington State's Clean Energy Transformation Act.

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

Q. How did PSE implement its strategy to meet its 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 Cindy L. Song, Exh. CLS-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 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 PPAs.

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 ensure selection of 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.

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

[11] *See* Song, Exh. CLS-4, at 20-27 (providing an overview of the evaluation criteria used by PSE for the 2018 All Resources RFP).

conclusions. PSE also sought appropriate approvals prior to executing selected resource contracts.

Please see the Fourth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-5HC, at 160-297 for copies of presentations presented to the Energy Management Committee during the 2018 All Resources RFP evaluation process.

Please see the Fifth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-6HC, for copies of presentations made to PSE's Energy Management Committee subsequent to Phase 2 of the 2018 All Resources RFP.

Please see the Sixth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-7HC, copies of presentations made to PSE's Board of Directors subsequent to Phase 2 of the 2018 All Resources RFP.

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 Cindy L. Song, Exh. CLS-5HC, for a copy of the 2018 All Resources RFP Evaluation Process Document.
- Please see the Fifth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-6HC, for copies of presentations made to PSE's Energy Management Committee subsequent to Phase 2 of the 2018 All Resources RFP.
- Please see the Sixth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-7HC, for copies of presentations made to PSE's Board of Directors 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* Song, Exh. CLS-5HC, at 19-22; *see also id.* at 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 and Demand Response 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
Distributed Generation						
Waste-to-Energy/Landfill Gas						
TOTAL	**97**	**13,590**	**43**	**3,518**	**29**	**6,209**

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

Please see the Fourth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-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-build resource because it did not identify a potential project that was likely to be competitive in the 2018 All Resources RFP.

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

[15] *See* Song, Exh. CLS-5HC, at 23; *see also id*. at 132-158.

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 capacity evaluation processes into two phases.

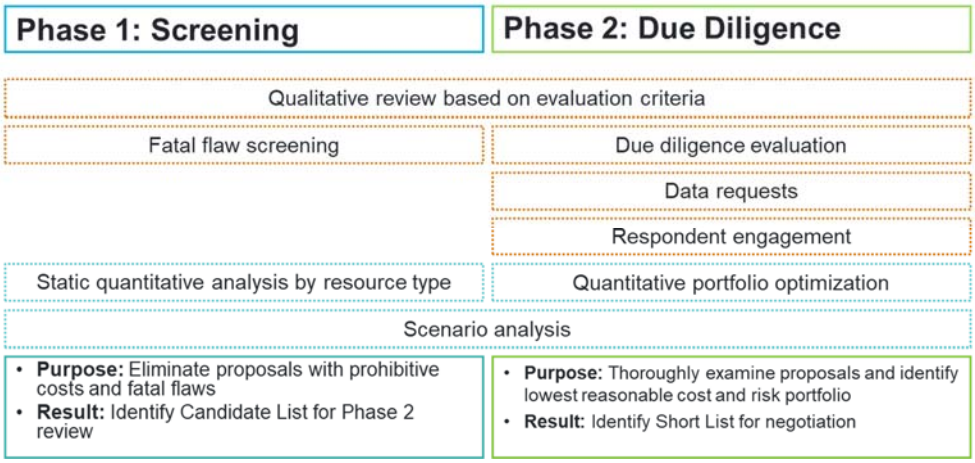
In Phase 1, PSE conducted an initial screening and fatal flaw analysis and produced a list of the most promising resources (the "Candidate List"). The Phase 1 quantitative analysis considered the benefits and costs of each proposal on a standalone basis.

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

[16] *See* Song, Exh. CLS-5HC, 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.

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 screen 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?

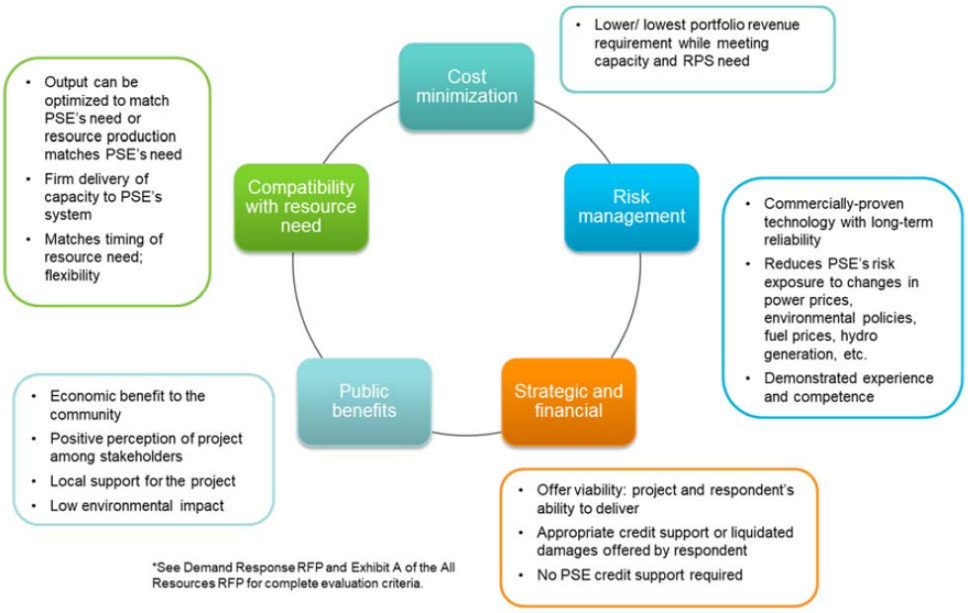
A. In general, PSE's evaluation criteria established a preference for offers that benefit customers by complementing PSE's resource and timing needs, minimizing cost, minimizing risk, providing strategic and financial benefits, and providing additional public benefits. Each of these evaluation criteria 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* Song, Exh. CLS-5HC.

[18] *See* Song, Exh. CLS-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 the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-1HCT (discussing how the evaluation team performed the qualitative analysis based on guidance set forth in the evaluation criteria); *see also* Song, Exh. CLS-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 purchase and sales, market price for REC sales, transmission cost, operation and maintenance costs and available tax incentives. These cost projections represent

[20] *See* Song, Exh. CLS-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:

(i) **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.

(ii) **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.

(iii) **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.

(iv) **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.

(v) **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.,* Song, Exh. CLS-5HC, at 136.

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

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

A. No. PSE performed its Phase 1 analysis using the 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 capacity and renewable resource need forecasts for the Phase 2 analysis?

A. Yes. PSE updated its renewable resource and 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 Capacity Need Forecast (Phase 2)

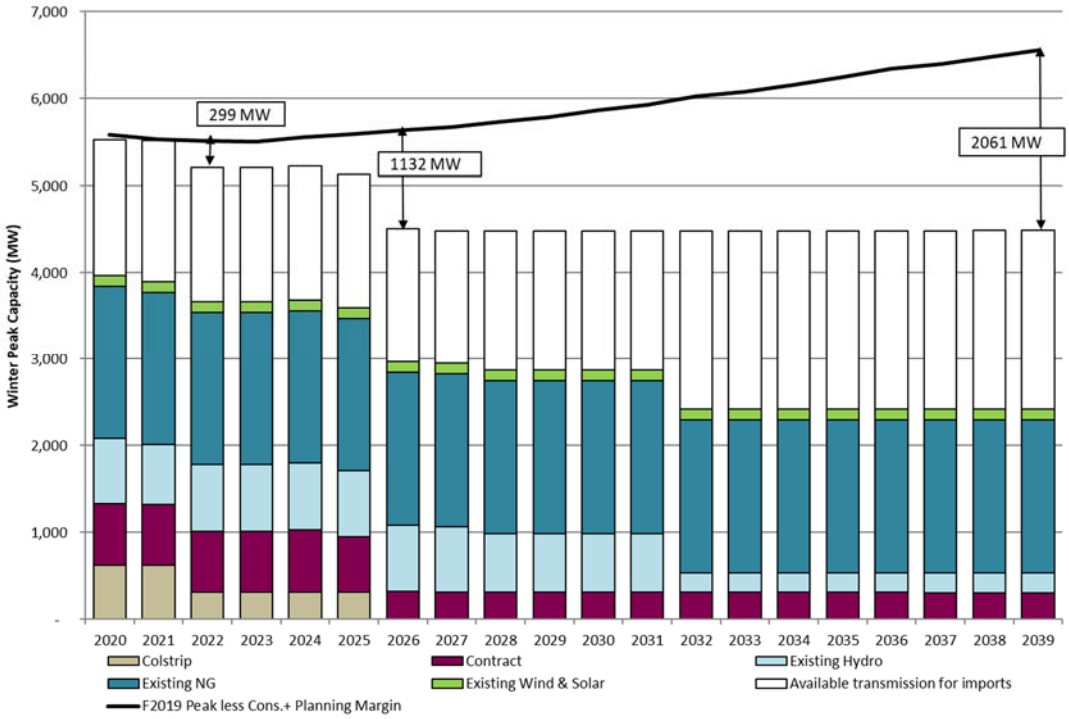
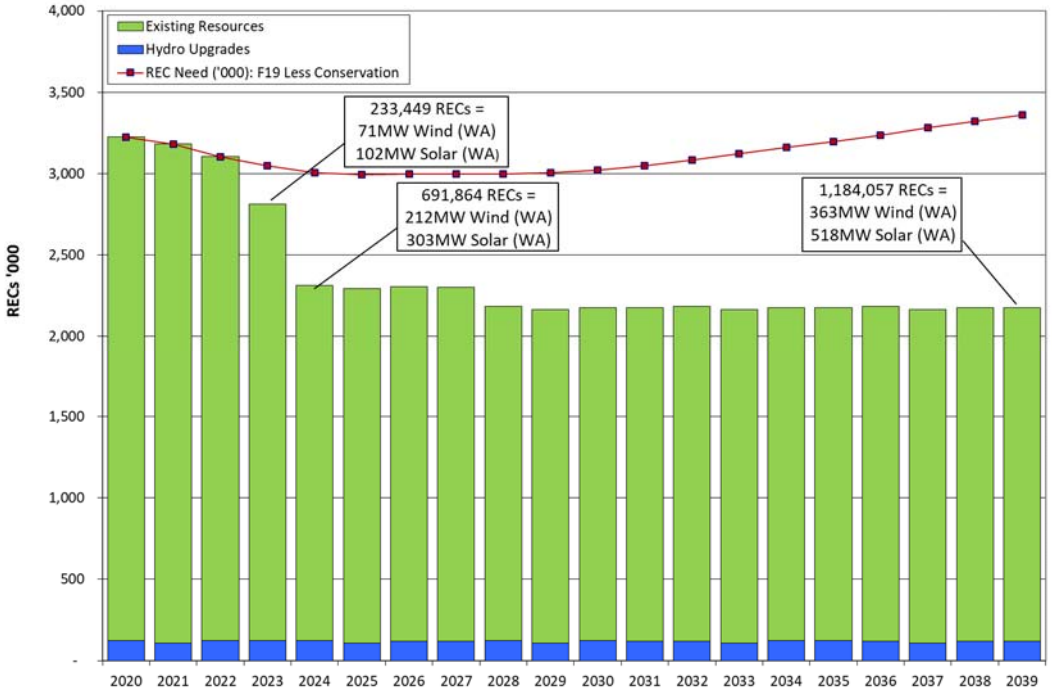


Figure 6 shows a reduced renewable need in calendar year 2023 of 233,449 RECs (compared to the 671,000 RECs sought in the 2018 All Resources RFP filing), which grows to 691,864 RECs in calendar year 2024. The renewable resource need is driven by Washington State's Renewable Portfolio Standard; however, 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 the Fourth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-5HC, at 133-158, for a description of the key quantitative assumptions used throughout the 2018 All Resources RFP evaluation.

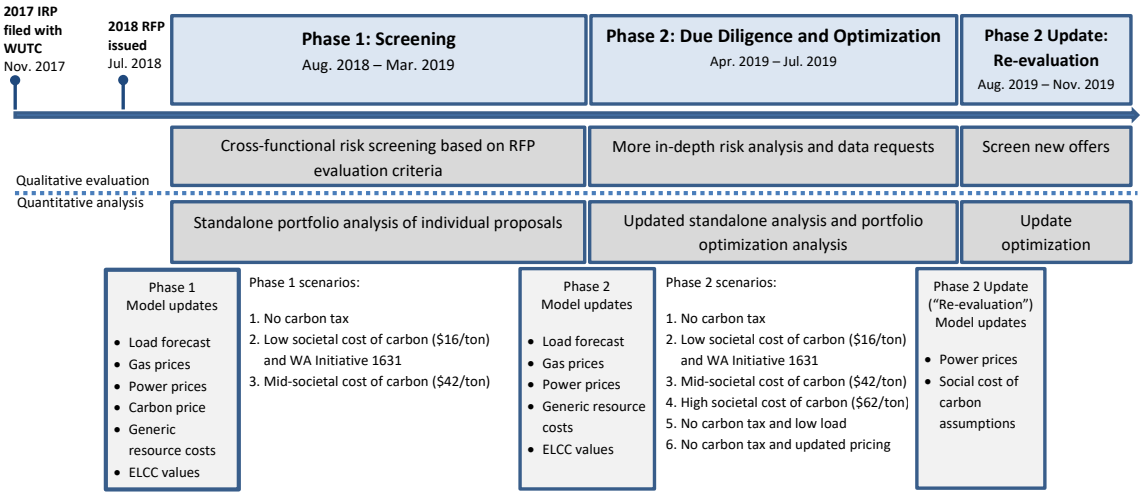
Q. What were the key assumptions and how did they evolve during the evaluation process?

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, 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* Song, Exh. CLS-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 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

[23] 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.

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

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]

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?

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

- 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 some 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 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:

(i) Scenario 1: No carbon tax

(ii) Scenario 2: Low societal cost of carbon ($16/ton)

(iii) Scenario 3: Mid-societal cost of carbon ($42/ton)

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

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 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	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18135	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18173	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18132	[redacted]	OR	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18176	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18135	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18112	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18175	[redacted]	WA	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18132	[redacted]	OR	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18163	[redacted]	OR	Unbundled REC	[redacted] REC	$[redacted]	$[redacted]	$[redacted]
18169	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18173	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18165	[redacted]	OR	Unbundled REC	[redacted] REC	$[redacted]	$[redacted]	$[redacted]
18165	[redacted]	OR	Unbundled REC	[redacted] REC	$[redacted]	$[redacted]	$[redacted]
18111	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18179	[redacted]	WA	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18125	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18122	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18190	[redacted]	WA	Unbundled REC	[redacted] REC	$[redacted]	$[redacted]	$[redacted]
18132	[redacted]	OR	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18170	[redacted]	OR	Wind Ownership	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18190	[redacted]	WA	Unbundled REC	[redacted] REC	$[redacted]	$[redacted]	$[redacted]
18131	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]

[27] *See also* Song, Exh. CLS-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)
18125	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18127	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18114	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18127	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18139	[redacted]	OR	Solar PPA + BESS	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18122	[redacted]	WA	Solar PPA + BESS	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18166	[redacted]	OR	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]

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	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18169	[redacted]	MT	Wind PPA + Ownership	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18173	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18176	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18173	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18100	SPI Industrial Biomass	WA	Biomass PPA	17 MW	$[redacted]	$[redacted]	$[redacted]

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[28] *See also* Song, Exh. CLS-5HC, at 105-110 (providing a complete list of results).

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

18105	[redacted]	WA	Thermal Ownership	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18105	[redacted]	WA	Thermal PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
XXX	[redacted]	MT	Transmission Redirect	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18105	[redacted]	WA	Thermal PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18105	[redacted]	WA	Thermal Ownership	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18170	Golden Hill -Shaped	OR	Wind PPA	200 MW	$[redacted]	$[redacted]	$[redacted]
18105	[redacted]	WA	Thermal PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18201	[redacted]	WA	Demand Response	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18103	[redacted]	WA	Thermal PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]

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

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

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 into 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 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.

[29] *See* Song, Exh. CLS-5HC, at 145.

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 PPA 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 PPA 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

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

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.

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] MW	[redacted]	WA
18169	[redacted]	MT Wind	[redacted] MW	[redacted]	MT
18173	[redacted]	MT Wind	[redacted] MW	[redacted]	MT
18176	[redacted]	MT Wind	[redacted] MW	[redacted]	MT
18163	[redacted]	REC Only	[redacted] REC	[redacted]	OR
18165	[redacted]	REC Only	[redacted] REC	[redacted]	OR
18190	[redacted]	REC Only	[redacted] REC	[redacted]	WA
18107	[redacted]	Run-of-River	[redacted] MW	[redacted]	ID
18135	[redacted]	Solar	[redacted] MW	[redacted]	WA
18111	[redacted]	Solar	[redacted] MW	[redacted]	WA
18122	[redacted]	Solar	[redacted] MW	[redacted]	WA
18131	[redacted]	Solar	[redacted] MW	[redacted]	WA
18127	[redacted]	Solar	[redacted] MW	[redacted]	WA
18114	[redacted]	Solar	[redacted] MW	[redacted]	WA
18112	[redacted]	Solar	[redacted] MW	[redacted]	WA
18125	[redacted]	Solar	[redacted] MW	[redacted]	WA
18139	[redacted]	Solar + BESS	[redacted] MW	[redacted]	OR
18105	[redacted]	Thermal	[redacted] MW	[redacted]	WA
18103	[redacted]	Thermal	[redacted] MW	[redacted]	OR
XXXXX	Transmission Redirect	Transmission	100 MW	BPA Transmission	N/A
18175	[redacted]	Wind	[redacted] MW	[redacted]	WA
18132	[redacted]	Wind	[redacted] MW	[redacted]	OR
18179	[redacted]	Wind	[redacted] MW	[redacted]	WA
18170	Golden Hill Wind - Shaped	Wind	200 MW	Avangrid	OR
18166	[redacted]	Wind	[redacted] MW	[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 this phase, 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:

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

(ii) 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.

(iii) PSE added [redacted] unbundled REC 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.

(iv) 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:

- **Commercial** – Does seller intend to continue as the long-term owner and operator of the project after commercial on-line date?
- **Energy Delivery** – Please provide a status update on the Interconnection Agreement negotiations.
- **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.
- **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.
- **Site Control** – Please provide copies of deeds, leases and easements necessary for the generation tie-line.

- **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:

(i) [redacted] **(Proposal ID #18105)** proposed by [redacted] proposed expanding PSE's existing [redacted] plant to

[31] *See* Song, Exh. CLS-5HC, at 39-40; *see also id*. at 111-131 (summarizing the Phase 2 qualitative findings).

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.

(ii) [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.

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, and

(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.

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.

[32] *See* also Song, Exh. CLS-5HC, at 132-158.

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] REC	$[redacted]	$[redacted]	$[redacted]
18165	[redacted]	OR	Unbundled REC	[redacted] REC	$[redacted]	$[redacted]	$[redacted]
18190	[redacted]	WA	Unbundled REC	[redacted] REC	$[redacted]	$[redacted]	$[redacted]
18169	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18190	[redacted]	WA	Unbundled REC	[redacted] REC	$[redacted]	$[redacted]	$[redacted]
18190	[redacted]	WA	Unbundled REC	[redacted] REC	$[redacted]	$[redacted]	$[redacted]
18173	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]

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

ID	Project Offers	State	Type	Size (MW or REC)	PB / REC ($/REC)	LCOE ($/MWh)	Net Cost/REC ($/REC)
18190	[redacted]	WA	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18135	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18111	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18127	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18135	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18125	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18127	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18132	[redacted]	OR	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18125	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18173	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18111	[redacted]	WA	Solar Ownership	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18139	[redacted]	OR	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18132	[redacted]	OR	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18114	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18179	[redacted]	WA	Wind Ownership	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18166	[redacted]	OR	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18132	[redacted]	OR	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18170	Golden Hills PPA	OR	Wind PPA	200 MW	$[redacted]	$[redacted]	$[redacted]
18122	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18166	[redacted]	OR	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18131	[redacted]	WA	Solar PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]

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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]	$[redacted]	$[redacted]
18169	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18100	SPI Industrial Biomass	WA	Biomass PPA	17 MW	$[redacted]	$[redacted]	$[redacted]
18173	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18173	[redacted]	MT	Wind PPA	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
18179	[redacted]	WA	Wind Ownership	[redacted] MW	$[redacted]	$[redacted]	$[redacted]
16161	BPA Peak Capacity Product	WA	Capacity PPA	100 MW	$[redacted]	$[redacted]	$[redacted]

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[33] *See also* Song, Exh. CLS-5HC, at 125-127.

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 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:

- [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.
- [redacted] (Project ID #18107) because the 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.
- [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.

- [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 that analysis, the model meets any portion of the renewable or peak capacity need not supplied by the analyzed project with generic resources.

The optimization model calculates a total portfolio benefit and identifies the least cost optimized resource portfolio to meet the identified resource needs. The 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 Phase 2 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:

(i) the 17-year SPI Biomass PPA (Project ID #18100),

(ii) the five-year BPA Peak Capacity Product (Project ID #18161) that provides a peak capacity call option for system resources offered by BPA,

(iii) the 25-year PPA with the [redacted] (Project ID #18169) in Montana offered by [redacted], and

(iv) the 20-year Golden Hills Shaped Wind PPA 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	[redacted]
3	18169	MT Wind	[redacted] MW	[redacted] MW	[redacted] MW	[redacted]
4	18170	Wind	Golden Hill Spread	200 MW	77 MW	[redacted]
5		**Total Peak Capacity Credits - MWh**			[redacted] MW	
6		**Total Annual RECs**				[redacted]
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

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), [redacted] (Project ID #18169) and the Golden Hills Shaped Wind PPA—offered a contribution to both the renewable and capacity needs. The fourth proposal for 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.

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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 resource 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:

(i) 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 PPA with delivery to [redacted] 230 kV Substation, beginning September 1, 2022; and

(ii) 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:

(i0 the [redacted] (Project ID #18173) (lower price);

(ii) the BPA Peak Capacity Product (Project ID #18161) (higher price) and

(iii) the SPI Biomass PPA (Project ID #18100) (lower price).

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

A. Yes. PSE customarily considers new and unsolicited information and re-evaluates its resource decisions to ensure 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 ensure 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 evaluation 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 did update certain assumptions to reflect the most current information available at the time the 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:

(i) Updated peak capacity need to align with PSE's revised 2019 IRP Progress Report filed on December 10, 2019;

(ii) 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;

(iii) Updated social cost of carbon assumptions based on guidance from Docket U-190730, dated September 12,

[34] *See* Song, Exh. CLS-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* Song, Exh. CLS-8 (providing a copy of the 2019 IRP Update).

2019 (2.5 percent discount rate scenario, 0.437/ton/MWh market purchase carbon intensity); and

(iv) Updated capacity need to reflect the assumed retirement of Colstrip Units 1 and 2 in early 2020.

Please see the Seventh Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-8, 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 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. What capacity need did PSE project when updated to include the revised short list resources?

A. With the addition of the capacity contributed by the revised short list resources, PSE is expected to meet the peak capacity need identified in the 2018 All Resources RFP process through 2024. Table 9 shows the updated expected capacity need after the inclusion of the original short list resources, and the revised short list resources including the MSCG System PPA (Project ID #UP006).

Table 9. Updated Portfolio 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	[redacted] MW	[redacted] MW	[redacted] MW	[redacted] MW	[redacted] MW
Need / (Surplus) without MSCG (MW)	[redacted] MW	[redacted] MW	[redacted] MW	[redacted] MW	[redacted] MW
MSCG Contributed Peak Capacity (MW)	79 MW	79 MW	79 MW	79 MW	79 MW
Need / (Surplus) with MSCG (MW)	[redacted] MW	[redacted] MW	[redacted] MW	[redacted] MW	[redacted] MW

[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* Song, Exh. CLS-5HC, at 284-297.

G. Selected Proposals Performed Well in Quantitative and Qualitative Analysis, and Meet the 2018 All Resources RFP Renewable and Capacity Needs

Q. Are the five shortlisted proposals that resulted from the Phase 2 Update prudent?

A. Yes. PSE had a clear, documented need for capacity and RPS-compliant renewable resources in both the near and long term. As a result of the Phase 2 Update, PSE's analysis recommended adding the MSCG System PPA (Project ID #UP006). Three of the five selected proposals—the SPI Biomass PPA (Project ID #18100), the [redacted] (Project ID #18169),[37] and the Golden Hills Shaped Wind PPA—offered a contribution to help meet both the renewable and capacity needs. The two remaining proposals—the BPA Peak Capacity Product (Project ID #18161) and the MSCG System PPA (Project ID #UP006)—offered necessary peak capacity contributions.

PSE's analysis demonstrates 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 capacity needs at the lowest reasonable cost and risk.

[37] Negotiations for this project remain ongoing at the time of this filing.

Q. Please describe the rationale for selecting the SPI Biomass PPA (Project ID #18100).

A. PSE selected the SPI Biomass PPA (Project ID #18100), which offers over 16 MW of peak capacity credit and [redacted] RECs to PSE's system at a known price, limiting PSE's exposure to fluctuations in the market. The proposal was selected as part of the optimization process in Phase 2. As an existing generator, this proposal has fewer associated risks and provides favorable economics relative to other 2018 All Resources RFP alternatives. The project interconnects to PSE's system and has no known transmission constraints.

Q. Please describe the rationale for selecting the Golden Hills Shaped Wind PPA.

A. PSE selected the Golden Hills Shaped Wind PPA, which offers about 77 MW of peak capacity credit and about [redacted] RECs to PSE's portfolio at a fixed price, limiting PSE's exposure to fluctuations in market prices. The proposal was selected as part of the optimization process in Phase 2 because it contributes to both capacity and renewable needs. Avangrid Renewables will guarantee the wind project's output using other existing resources and will deliver the energy to PSE's system using their transmission rights.

Q. Please describe the rationale for selecting the BPA Peak Capacity Product (Project ID #18161).

A. PSE selected the BPA Peak Capacity Product (Project ID #18161), which offers 53 MW of peak capacity credit to PSE's system. The proposal was selected as part of the optimization process in Phase 2 because it contributes to the capacity need. BPA will deliver the energy to PSE's system using its transmission rights.

Q. Please describe the rationale for selecting the MSCG System PPA (Project ID #UP006).

A. PSE selected the MSCG System PPA (Project ID #UP006), which offers 79 MW of peak capacity credit to PSE's system, as part of an optimal portfolio solution. MSCG System PPA helps mitigate the remaining need unmet in 2022 and 2024 by the original 2018 All Resources RFP short list. Additionally, the MSCG System PPA (Project ID #UP006) offers benefits such as:

- delivery to PSE's system;
- seasonal shaping and heavy load hour shaping to help meet demand when capacity is most needed and minimize surplus off peak; and
- helps to mitigate the potential development risk of the [redacted] (Project ID #18169) associated with the project's early development status and aggressive schedule, and the potential for COVID-19-related delays.

Q. Please describe the rationale for selecting the [redacted] (Project ID #18169).

A. PSE selected the [redacted] (Project ID #18169), which offers [redacted] 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 capacity and renewable needs. PSE is expected to use repurposed Colstrip Transmission System and BPA transmission to deliver the power from Montana to PSE's system. Negotiations for this project remain ongoing.

VI. PSE'S DECISION TO ENTER INTO SPI BIOMASS PPA (PROJECT ID #18100) IS PRUDENT

Q. Please describe the executed SPI Biomass PPA (Project ID #18100).

A. On January 27, 2020, PSE entered into a 17-year PPA with SPI for 17 MW of capacity, the associated energy, and the associated environmental attributes of the biomass cogeneration facility known as "SPI Burlington" located in Skagit County, Washington. The contract delivery term is from January 1, 2021 through December 31, 2037.

Please see the Eighth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-9C, for a copy of the SPI Biomass PPA (Project ID #18100).

Q. Please describe any material changes to the SPI Biomass PPA (Project ID #18100) offer between the proposal submitted in response to the 2018 All Resources RFP and contract execution.

A. The price went from $[redacted] per MWh, escalating at [redacted] percent annually, to a final price of $[redacted] per MWh, escalating at [redacted] percent annually.

Q. Please describe the key commercial terms of the agreement.

A. SPI Burlington will generate as a base load resource. PSE will take delivery of 17 MW per hour around the clock. During the months of [redacted] and [redacted], PSE may reduce the deliveries from the plant to [redacted] MW per hour.

Q. Please describe the transmission arrangements for the SPI Biomass PPA (Project ID #18100).

A. The project's Point of Interconnection is within PSE's system.

Q. What is the expected plant availability of the SPI Biomass PPA (Project ID #18100)?

A. This contract provides two performance guarantees. First, a Guaranteed Winter Period Monthly Output that guarantees output consistent with a [redacted] percent monthly availability factor. The second is a Guaranteed Annual Availability Factor of at least [redacted] percent. The contract provides for liquidated damages if SPI fails to meet these guarantees.

Q. Did PSE seek management approval to enter into the SPI Biomass PPA (Project ID #18100)?

A. Yes. On January 20, 2020, PSE received the approval of its Energy Management Committee to enter into the SPI Biomass PPA (Project ID #18100).[38]

Q. What are the rate year costs associated with the SPI Biomass PPA (Project ID #18100)?

A. PSE has included $5.62 million in the rate year for the SPI Biomass PPA (Project ID #18100).

Q. Please describe the benefits that PSE's customers will receive from the SPI Biomass PPA (Project ID #18100).

A. As described in Parts IV and V of this testimony, the SPI Biomass PPA (Project ID #18100) has favorable economics, minimal risks and was part of the optimized portfolio selection in the 2018 All Resources RFP. As a capacity and renewable resource, the SPI Biomass PPA (Project ID #18100) provides PSE with valuable capacity during those months in which PSE is most in need of capacity. Moreover, PSE's 2018 All Resources RFP Update analysis demonstrated that it remained part of the lowest cost portfolio to meet PSE's resources needs when compared to the most recent offers.

[38] *See* Song, Exh. CLS-6HC, at 2-7 (providing a copy of the presentation to the Energy Management Committee for approval to enter into the SPI Biomass PPA (Project ID #18100)).

VII. PSE'S DECISION TO ENTER INTO BPA PEAK CAPACITY PPA (PROJECT ID #18161) IS PRUDENT

Q. Please describe the executed BPA Peak Capacity Product (Project ID #18161).

A. On March 3, 2020, PSE entered into a five-year PPA with BPA for 100 MW of capacity and the associated energy. BPA will supply the power from its portfolio of resources, consisting primarily of the Federal Columbia River Power System. The contract delivery term is from January 1, 2022 through December 31, 2026.

Please see the Ninth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-10C, for a copy of the BPA Peak Capacity Product (Project ID #18161) agreement.

Please see the Tenth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-11, for the WSPP Master Agreement, the terms and conditions of which the BPA Peak Capacity Product (Project ID #18161) agreement incorporates by reference.

Q. Please describe any major changes to the BPA Peak Capacity Product (Project ID #18161) offer between the proposal submitted in response to the 2018 All Resources RFP and contract execution.

A. After Phase 1, BPA updated its proposal to include delivery to the PSE system. This resulted in the proposal counting towards PSE's capacity need. BPA also updated the price, and the final agreement reflects a fixed cost of $[redacted] per kW-

month, adjusted for changes to BPA's point-to-point transmission rate, and a Mid-C index price for energy delivered to PSE.

Q. Please describe the key commercial terms of the agreement.

A. BPA will provide up to 100 MW of power for up to [redacted] hours a day on a [redacted] basis. PSE can schedule deliveries during any heavy load hour.[39] BPA will provide low carbon power consistent with its Asset Controlling Supplier status as reported to the California Air Resources Board. The exact emission factor including carbon content will be documented with the California Air Resources Board.

Q. Please describe the transmission arrangements for the BPA Peak Capacity Product (Project ID #18161).

A. BPA will deliver the power to PSE's system on a firm basis.

Q. Did PSE seek management approval to enter into the BPA Peak Capacity Product (Project ID #18161)?

A. Yes. On February 27, 2020, PSE received the approval of its Energy Management Committee to enter into the BPA Peak Capacity Product (Project ID #18161).[40]

[39] HLH are hour ending 0700 through hour ending 2200 Pacific Prevailing Time, Monday through Saturday, excluding NERC holidays.

[40] *See* Song, Exh. CLS-6HC, at 8-15 (providing a copy of the presentation to the Energy Management Committee for approval to enter into the BPA Peak Capacity Product (Project ID #18161) agreement).

Q. What are the rate year costs associated with the BPA Peak Capacity Product (Project ID #18161)?

A. PSE has included $3.88 million in the rate year for the BPA Peak Capacity Product (Project ID #18161).

Q. Please describe the benefits that PSE's customers will receive from the BPA Peak Capacity Product (Project ID #18161).

A. As described in Parts IV and V of this testimony, BPA Peak Capacity Product (Project ID #18161) has favorable economics and was part of the optimized portfolio selected in the 2018 All Resources RFP. The BPA Peak Capacity Product (Project ID #18161) provides PSE with valuable capacity. Moreover, PSE's 2018 All Resources RFP Update analysis demonstrated that it remains part of the lowest cost portfolio to meet PSE's resource needs when compared with the most recent offers.

VIII. PSE'S DECISION TO ENTER INTO THE MSCG SYSTEM PPA (PROJECT ID #UP006) IS PRUDENT

Q. Please describe the executed the MSCG System PPA (Project ID #UP006).

A. On February 28, 2020, PSE entered into a PPA with Morgan Stanley Capital Group Inc. for 100 MW of capacity and the associated energy. Morgan Stanley Capital Group Inc. will supply system power on a firm basis, and this is an unspecified source contract. The contract delivery term is from January 3, 2022 through December 31, 2026.

Please see the Eleventh Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-12C, for a copy of the MSCG System PPA (Project ID #UP006).

Please see the Tenth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-11, for the WSPP Master Agreement, the terms and conditions of which the MSCG System PPA (Project ID #UP006) incorporates by reference.

Q. Please describe any material changes to the MSCG System PPA (Project ID #UP006) offer between the proposal submitted in response to the 2018 All Resources RFP and contract execution.

A. Morgan Stanley Capital Group Inc. originally offered either a year-round 3-year or five-year PPA sourced from renewable resources but did not include the associated renewable attributes. PSE determined that without the associated RECs, the resource should be evaluated as a system purchase. Morgan Stanley Capital Group Inc. submitted an update to the proposal as a system purchase and adjusted the price to $[redacted] per MWh. Morgan Stanley Capital Group Inc. also modified the delivery term to four years, 363 days to comply with Chapter 80.80 RCW.

Q. Please describe the key commercial terms of the agreement.

A. Morgan Stanley Capital Group Inc. will provide up to 100 MW of capacity during heavy load hours for the months of January, February, March, October, November, and December. Morgan Stanley Capital Group Inc. will deliver the

power to PSE's system and will incur liquidated damages in the event of an interruption in delivery.

Q. Please describe the transmission arrangements for the MSCG System PPA (Project ID #UP006).

A. Morgan Stanley Capital Group Inc. will deliver the power to PSE's system on a firm basis.

Q. Did PSE seek management approval to enter into the MSCG System PPA (Project ID #UP006)?

A. Yes. On February 27, 2020, PSE received the approval of its Energy Management Committee to enter into the MSCG System PPA (Project ID #UP006).[41]

Q. What are the rate year costs associated with the MSCG System PPA (Project ID #UP006)?

A. PSE has included $5.77 million in the rate year for the MSCG System PPA (Project ID #UP006).

Q. Please describe the benefits that PSE's customers will receive from MSCG System PPA (Project ID #UP006).

A. As described in Part V, Sections F and G of this testimony, the MSCG System PPA (Project ID #UP006) has favorable economics and was part of the optimized

[41] *See* Song, Exh. CLS-6HC, at 16-23 (providing a copy of the presentation to the Energy Management Committee for approval to enter into the MSCG System PPA (Project ID #UP006).

portfolio selection process in the 2018 All Resources RFP Phase 2 Update analysis when compared to the Phase 2 proposals and the most recent offers. The MSCG System PPA (Project ID #UP006) provides PSE with valuable capacity at a fixed price.

IX. PSE'S DECISION TO ENTER INTO THE GOLDEN HILLS SHAPED WIND PPA IS PRUDENT

Q. Please describe the executed Golden Hills Shaped Wind PPA.

A. On May 28, 2020, PSE entered into a PPA with Avangrid Renewables for the output of the Golden Hills Wind Project, including 200 MW of capacity, the associated energy and the environmental attributes. During the winter heavy load hours, Avangrid Renewables guarantees to deliver [redacted] MW per hour. Any portion of the capacity not filled with generation from the wind project will be shaped with system resources as defined in the contract. The contract delivery term will start no later than June 30, 2022 and extend for 20 years.

Please see the Twelfth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-13C, for a copy of the Golden Hills Shaped Wind PPA.

Q. Please describe any material changes to the Golden Hills Shaped Wind PPA between the proposal submitted in response to the 2018 All Resources RFP and contract execution.

A. Avangrid Renewables originally proposed a Commercial Operations Date in 2020, which was subsequently adjusted to 2021. In the late stages of negotiation,

due to concerns about potential delays related to the COVID-19 pandemic, Avangrid Renewables requested that the Commercial Operations Date be changed to June 30, 2022. In exchange for accepting a change to the later Commercial Operations Date, PSE negotiated the Golden Hills Interim Capacity PPA.

Please see the Thirteenth Exhibit to the Prefiled Direct Testimony of Cindy L. Song, Exh. CLS-14C, for a copy of the Golden Hills Interim Capacity PPA.

Additionally, to ensure compliance with RCW 80.80, PSE and Avangrid Renewables negotiated a list of permissible resources to be used by Avangrid Renewables to provide the guaranteed winter output under the Golden Hills Shaped Wind PPA.[42]

Q. Please describe the key commercial terms of the Golden Hills Shaped Wind PPA.

A. The Golden Hills Wind PPAs consist of two contracts:

(i) This first contract is a 20-year PPA with a year round fixed energy price of $[redacted] per MWh, and an additional capacity charge of $[redacted] per kW-month payable during the winter months from November through February. Avangrid Renewables will deliver the power to PSE's system and will incur liquidated damages in the event of an interruption in delivery. The winter shaped component of the deliveries will be source from the Golden Hills Wind Project, and if necessary additional power to be sourced from the resources in Exhibit K to the Golden Hills Shaped Wind PPA[43] when the project is generating less than

[42] *See* Song, Exh. CLS-13C, at 103 (Exhibit K to the Golden Hills Shaped Wind PPA).
[43] *See id.*

[redacted] MW in an hour during specified winter heavy load hours.

(ii) The second contract is a 1-year system PPA that provides interim capacity in the event that construction delays push the commercial on-line date for the Golden Hills Wind Project beyond December 2021. The Golden Hills Interim Capacity PPA provides [redacted] MW per hour during defined heavy load hours for the months of January, February, November, and December. January and February are priced at a fixed rate while November and December are priced at a [redacted]. The Golden Hills Interim Capacity PPA will terminate once the Golden Hills Wind Project achieves commercial operation.

Q. Did the change to the project commercial on-line date and the addition of the Golden Hills Interim Capacity PPA materially change the analysis of the Golden Hills Shaped Wind PPA (Project ID #18170)?

A. No. The Phase 2 analysis assumed that the project would have a commercial on-line date of December 2021. This meant that the capacity benefits would be reflected starting in 2022 and PSE would incur a full calendar years' worth of cost at the contract rate. The delay of the commercial operation date to June 2022 and the addition of the Golden Hills Interim Capacity PPA resulted in lower first-year costs while retaining similar capacity benefits.[44] Please note that the costs identified in Table 8 do not include the capacity charge of $[redacted] kW-month or $[redacted] per month for the Golden Hills Shaped PPA. When the capacity costs are included, the costs for the Golden Hills PPA has a cost of $[redacted],

[44] *See* Song. Exh. CLS-6HC, at 55.

which is more than the costs, $5.02 million, of the Golden Hills Interim Capacity PPA product for the same time period.

Q. Do the resources used to shape the Golden Hills Shaped Wind PPA (Project ID #18170) satisfy the Emissions Performance Standard in Chapter 80.80 RCW?

A. Yes. The Emission Performance Standard in Chapter 80.80 RCW requires long-term baseload financial commitments to have an emission rate below the maximum allowable emission rate set by Washington Department of Ecology.[45] For resources that are supplied by multiple sources, this standard applies to each resource individually. Due to the intermittent nature of wind, Avangrid Renewables may be required to use other resources in their generation portfolio to supply the firm winter shape of [redacted] MW during the contracted heavy load hours.[46] The Golden Hills Shaped Wind PPA (Project ID #18170) limits those resources which can be used to supply the firm winter shape. Avangrid Renewables is contractually limited to use less than 12 percent unspecified source purchases and the specific resources outlined in Exhibit K to the agreement.[47] These resources are either renewable or, in the case of the natural gas resources, comply with the emissions standard as follows:

(i) The Emissions Performance Standard was updated on October 20, 2018 pursuant to Chapter 173-407 WAC and

[45] Chapter 173-407 WAC.
[46] Heavy load hours are hours ending 0700 through hour ending 2200 pacific prevailing time, Monday through Saturday, excluding NERC holidays.
[47] *See* Song, Exh. CLS-13C, at 103.

Chapter 194-26 WAC. The EPS is currently 925 lb/MWh. Table 10 shows [redacted] facility emissions for years 2015-2019. The [redacted] Facility emissions have operated below the current Emissions Performance Standard in each of the last five years and are in compliance with the standard.

(ii) The [redacted] Facility is not a baseload electric resource, and the facility has consistently operated below the Emissions Performance Standard limit.

Table 10 below shows the capacity factor for the last five years, the capacity factor is well below the 60 percent limit for baseload resources.

Table 10. [redacted] Facility Emissions and Capacity Factor

	2015	2016	2017	2018	2019
Washington Standard (lb/MWh)	970	970	970	925	925
[redacted] Facility rate (lb/MWh)	893	911	911	896	895
[redacted] Facility Capacity Factor	3.6%	5.6%	7.7%	5.0%	9.7%

Q. Please describe the transmission arrangements for Golden Hills Shaped Wind PPA (Project ID #18170).

A. Avangrid Renewables will deliver the power to PSE's system on a firm basis for both the Golden Hills Shaped Wind PPA (Project ID #18170) and the Golden Hills Interim Capacity PPA.

Q. Did PSE seek management approval to enter into the Golden Hills Shaped Wind PPA (Project ID #18170)?

A. Yes. On April 23, 2020, PSE received the approval of its Energy Management Committee[48] to present the Golden Hills Shaped Wind PPA (Project ID #18170) to its Board of Directors.[49] On May 21, 2020 PSE received approval of its EMC to enter into the Golden Hills Interim Capacity PPA.[50]

Q. What are the rate year costs associated with the Golden Hills PPAs (Project ID #18170)?

A. Due to the timing of the rate year, at this time, PSE is only seeking cost recovery of the Golden Hills Interim Capacity PPA. PSE has included $5.02 million in the rate year for the Golden Hills Interim Capacity PPA.

Q. Please describe the benefits that PSE's customers will receive from the Golden Hills Shaped Wind PPA (Project ID #18170).

A. As described in Parts IV and V of this testimony, the Golden Hills Shaped Wind PPA (Project ID #18170) has favorable economics and was part of the optimized portfolio selection in the 2018 All Resources RFP. The Golden Hills Shaped Wind PPA (Project ID #18170) provides PSE with valuable capacity and

[48] *See* Song, Exh. CLS-6HC, at 24-42 (providing a copy of the presentation to the Energy Management Committee for approval to enter into the Golden Hills Shaped Wind PPA).

[49] *See generally* Song, Exh. CLS-7HC (providing a copy of the presentation to the PSE Board of Directors for approval to enter into the Golden Hills Shaped Wind PPA).

[50] *See* Song, Exh. CLS-6HC, at 43-55 (providing a copy of the presentation to the Energy Management Committee for approval to enter into the Golden Hills Interim Capacity PPA).

renewable energy. Moreover, PSE's 2018 All Resources RFP Update analysis demonstrated that it remained part of the lowest cost portfolio to meet PSE's resource needs when compared to the most recent offers.

X. CONCLUSION

Q. Could you please summarize your testimony?

A. Yes. PSE's acquisition of the resources identified in my testimony will help meet the expected resource and capacity needs of PSE's customers for years to come. Based on the resource need established in the 2018 RFP, the robust analysis performed in the RFP evaluation and the benefits to PSE's customers described in my testimony, PSE is seeking a determination of prudence for the five PPAs PSE has executed to date, and cost recovery for the SPI Biomass PPA (Project ID #18100), the BPA Peak Capacity Product (Project ID #18161), the MSCG System PPA (Project ID #UP006), and the Golden Hills Interim Capacity PPA.

Q. Does that conclude your prefiled direct testimony?

A. Yes, it does.