BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UE 358

In the Matter of PORTLAND GENERAL ELECTRIC COMPANY, Advice No. 19-04 New Load Direct Access	)	CALPINE ENERGY SOLUTIONS, LLC'S CROSS EXAMINATION EXHIBITS AND LIST OF TESTIMONY AND EXHIBITS

Calpine Energy Solutions, LLC ("Calpine Solutions") hereby submits its cross-examination exhibits in this proceeding, and provides a list of all testimony and exhibits proposed for admission into the record.

Based on the record and discovery provided at this time, Calpine Solutions plans to offer the following exhibits for admission to the record:

Pre-Filed Testimony and Exhibits

Testimony/Exhibit	Description	Date Filed or Submitted
Calpine Solutions/100	Opening Testimony of Kevin C. Higgins	July 18, 2019
Calpine Solutions/101	PGE Responses to Data Requests Referenced in Calpine Solutions/100	July 18, 2019
Redacted and Confidential Calpine Solutions/200	Rebuttal and Cross-Answering Testimony of Greg Bass	August 21, 2019
Calpine Solutions/300	Rebuttal and Cross-Answering Testimony of Kevin C. Higgins	August 21, 2019

Calpine Solutions/301	PGE Responses to Data Requests Referenced in Calpine Solutions/300	August 21, 2019

Hearing Exhibits

Testimony/Exhibit	Description	Date Filed or Submitted
Calpine Solutions/400	PGE's Response to Calpine Solutions' Data Request No. 31	To be offered at hearing
Calpine Solutions/401	PGE's Response to Calpine Solutions' Data Request No. 32 with Attachment A	To be offered at hearing
Calpine Solutions/402	PGE's Responses to AWEC's Data Request 28 and Calpine Solutions' Data Request No. 33	To be offered at hearing
Calpine Solutions/403	PGE's Response to Calpine Solutions' Data Request No. 34	To be offered at hearing
Calpine Solutions/404	PGE's Response to Calpine Solutions' Data Request No. 35	To be offered at hearing
Calpine Solutions/405	PGE's Response to Calpine Solutions' Data Request No. 36	To be offered at hearing
Calpine Solutions/406	Excerpt of PGE's 2019 Integrated Resource Plan (pages 33, 110-112, and 178-179)	To be offered at hearing

DATED: September 26, 2019.

RICHARDSON ADAMS, PLLC

/s/ Gregory M. Adams

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Of Attorneys for Calpine Energy Solutions, LLC

August 16, 2019

TO: Greg Adams
Calpine Energy Solutions, LLC

FROM: Karla Wenzel
Manager, Pricing & Tariffs

PORTLAND GENERAL ELECTRIC
UE 358
PGE Response to Calpine Energy Solutions, LLC's Data Request No. 031
Dated August 9, 2019

Request:

Please provide the amount of energy (MWhs) PGE procured under a firm liquidated damages contracts to serve PGE's retail load in: (i) 2017 and (ii) 2018.

Response:

PGE objects to this request on the basis that it is vague, overly broad and unduly burdensome. Without waiving this objection, PGE responds as follows:

PGE actively participates in the wholesale energy market to economically dispatch its generating units and reduce customers' net variable power costs. The potential output of PGE's generating units may be economically displaced by wholesale energy market purchases, however those units remain available to provide a physical source of power if required.

As identified in the FERC Form 1, PGE's annual purchased power was 9,002,682 MWh in 2018 and 9,487,631 in 2017. PGE notes the following:

- PGE's power transaction recording system does not distinguish purchases serving retail load from other power purchases made.
- PGE's power transaction recording system does not track the the specific liquidated damages terms and conditions. However, PGE notes that the majority of its short- and mid-term purchases are made pursuant to WSPP Schedule C. In the event of counterparty failure, PGE settlements, credit, and trading personnel work to determine the specific damages terms and conditions of the contract or enabling agreement.
- The data provided reflect only purchases made by PGE, not sales or other transactions.

August 16, 2019

TO: Greg Adams
Calpine Energy Solutions, LLC

FROM: Karla Wenzel
Manager, Pricing & Tariffs

PORTLAND GENERAL ELECTRIC
UE 358
PGE Response to Calpine Energy Solutions, LLC's Data Request No. 032
Dated August 9, 2019

Request:

Please provide PGE's total retail load (MWhs) in: (i) 2017 and (ii) 2018.

Response:

Attachment 032-A provides an excerpt from PGE's SEC 10K filing which shows the total retail load in MWhs for 2017 and 2018.

Customers and Demand—In 2018, retail energy deliveries decreased 2.5% from 2017. Residential customer deliveries which are most sensitive to fluctuations in weather, and commercial customer deliveries contributed to the decrease, while the industrial customer deliveries increased. For 2018 and 2017, the average number of retail customers and deliveries, by customer type, were as follows:

	2018		2017		Increase/ (Decrease) in Energy Deliveries
	Average Number of Customers	Energy Deliveries *	Average Number of Customers	Energy Deliveries *	
Residential	772,389	7,416	762,211	7,880	(5.9)%
Commercial (PGE sales only)	108,570	6,783	107,364	6,932	(2.2)%
Direct Access	537	647	491	623	3.9 %
Total Commercial	109,107	7,430	107,855	7,555	(1.7)%
Industrial (PGE sales only)	203	2,987	199	2,943	1.5 %
Direct Access	67	1,389	68	1,340	3.7 %
Total Industrial	270	4,376	267	4,283	2.2 %
Total (PGE sales only)	881,162	17,186	869,774	17,755	(3.2)%
Total Direct Access	604	2,036	559	1,963	3.7 %
Total	881,766	19,222	870,333	19,718	(2.5)%

* In thousands of MWh.

In 2018, heating degree-days, an indication of electricity use for heating, were 10% below the 15-year average and 19% lower than 2017. Although heating degree-days in the first quarter of 2017 were unusually high, heating degree days each quarter of 2018 were below those of the comparable quarter of 2017. Cooling degree-days, a similar indication of the extent to which customers are likely to have used electricity for cooling, although just 1% below the 2017 level, were 35% above the 15-year moving average.

Residential energy deliveries were 5.9% lower in 2018 than 2017 due largely to the effects of warmer temperatures during the winter season and a continued trend of lower use per customer, despite residential average customer growth of 1.3%. See *"Revenues"* in the 2018 Compared to 2017 section of Results of Operations within this Item 7, for further information on heating and cooling degree days.

Commercial deliveries also decreased by 1.7% largely as a result of less favorable weather conditions. Deliveries to several retail sectors decreased, including food and merchandise stores and health care, while other service sectors, including data centers, showed growth. Energy efficiency programs and efforts continues to impact growth and are likely reducing energy deliveries.

The 2.2% increase in industrial energy deliveries is due to continued increases in energy deliveries to the high-tech manufacturing sector. This increase resulted even though the Company experienced the closure of a large paper customer in October 2017, which reduced comparative deliveries in 2018.

On a weather-adjusted basis, total retail deliveries increased 0.4% from 2017 reflecting a 0.2% increase in residential deliveries, as growth in average number of customers was mostly offset by a decline in the average usage per customer, a decline of 0.4% in commercial deliveries and a 2.4% increase in industrial deliveries driven primarily by strength in the high-tech manufacturing sector.

ESSs supplied Direct Access customers with energy representing 11% of the Company's total retail energy deliveries during 2018 and 10% for 2017. The maximum retail load allowed to be supplied under the fixed three-

August 16, 2019

TO: Jesse O. Gorsuch
Alliance of Western Energy Consumers'

FROM: Karla Wenzel
Manager, Pricing and Tariffs

PORTLAND GENERAL ELECTRIC
UE 358
PGE Response to AWEC Data Request No. 028
Dated August 9, 2019

Request:

Does PGE currently make any purchases under WSPP Schedule C? If so, please provide the total MWhs purchased under this contract in 2018.

Response:

Yes. PGE actively participates in the wholesale energy market to economically dispatch its generating units and reduce customers' net variable power costs. The potential output of PGE's generating units may be economically displaced by wholesale energy market purchases, however those units remain available to provide a physical source of power if required.

As identified in the FERC Form 1, PGE's annual purchased power was 9,002,682 MWh in 2018 and 9,487,631 in 2017. PGE notes the following:

- PGE's power transaction recording system does not track the specific liquidated damages terms and conditions. However, PGE notes that the majority of its short- and mid-term purchases are made pursuant to WSPP Schedule C. In the event of counterparty failure, PGE settlements, credit, and trading personnel work to determine the specific damages terms and conditions of the contract or enabling agreement.
- PGE's power transaction recording system does not distinguish purchases serving retail load from other power purchases made.
- The data provided reflect only purchases made by PGE, not sales or other transactions.

September 19, 2019

TO: Greg Adams
Calpine Energy Solutions, LLC

FROM: Karla Wenzel
Manager, Pricing & Tariffs

PORTLAND GENERAL ELECTRIC
UE 358
PGE Response to Calpine Energy Solutions, LLC's Data Request No. 033
Dated September 13, 2019

Request:

Follow up to PGE Response to AWEC Data Request No. 028:

Please refer to PGE's statement that "PGE's power transaction recording system does not distinguish purchases serving retail load from other power purchases made."

a. For what other purposes does PGE make power purchases other than for serving retail load?

b. Please provide a narrative description for each of these other activities or purposes.

c. For each of these other activities or purposes, please indicate the overall level of transactions in MWh and revenue in 2017 and 2018.

Response:

a. PGE engages in wholesale power purchases and sales to other wholesale market participants to reduce net variable power costs for retail customers. These activities may include power purchases made to support wholesale sales to third-parties.

b. Please see the response to part a.

c. PGE objects to this request as it is unduly burdensome. Please refer PGE's response to AWEC Data Request No. 028 stating that "PGE's power transaction recording system does not distinguish purchases servicing retail load from other power purchases made." Please also refer to PGE's response to Calpine Data Request No. 031 providing PGE's annual purchased power for 2018 and 2017 as reported in FERC Form 1.

September 19, 2019

TO: Greg Adams
Calpine Energy Solutions, LLC

FROM: Karla Wenzel
Manager, Pricing & Tariffs

PORTLAND GENERAL ELECTRIC
UE 358
PGE Response to Calpine Energy Solutions, LLC's Data Request No. 034
Dated September 13, 2019

Request:

Reference PGE/200, Sims-Tinker/32, Table 1. In the Highest Load 200 hours of 2018 shown in Table 1, what proportion of PGE's retail load was served by wholesale energy purchases? Please provide the supporting calculation. If PGE does not have the precise data necessary to make this calculation, please provide the aggregate amount of retail MWh served during the Highest Load 200 hours and the aggregate amount of wholesale purchases made during the Highest Load 200 hours.

Response:

PGE objects to this request on the basis that it calls for new analysis that PGE has not performed and is unduly burdensome. Without waiving these objections, PGE responds as follows:

PGE's power transaction recording system does not track purchases in a manner that makes it possible to accurately align specific load hours with specific quantities of purchases. PGE's plant output, as defined in FERC Form 714, at the hour the annual peak demand in 2018 was approximately 2,600 MW. PGE notes that FERC Form 714 includes some, but not all of PGE's long-term contracts such as some qualifying facilities, the Pelton Re-Regulating facility, and seasonal peaking contracts PGE previously entered into. These contracts are identified in PGE's FERC Form 1; however, the Form 1 does not identify MW output during the peak load hour. PGE conversatively estimates the additional output to be no less than 100MW.

Please refer to PGE's responses to Calpine Request No. 035 for PGE's peak retail load in 2018 and Calpine Request No. 036 for PGE's available capacity during the same hour.

September 19, 2019

TO: Greg Adams
Calpine Energy Solutions, LLC

FROM: Karla Wenzel
Manager, Pricing & Tariffs

PORTLAND GENERAL ELECTRIC
UE 358
PGE Response to Calpine Energy Solutions, LLC's Data Request No. 035
Dated September 13, 2019

Request:

What was PGE's peak retail load in 2018? What hour did that occur?

Response:

PGE's peak net COS + VPO load (balancing authority load less ESS served load, net borderlines, and net losses) of 3539 MW occurred on August 9, 2018 Hour Ending 18, the same hour as the balancing authority peak load.

September 19, 2019

TO: Greg Adams
Calpine Energy Solutions, LLC

FROM: Karla Wenzel
Manager, Pricing & Tariffs

PORTLAND GENERAL ELECTRIC
UE 358
PGE Response to Calpine Energy Solutions, LLC's Data Request No. 036
Dated September 13, 2019

Request:

What was the amount of available generation resources either owned or controlled by PGE (including co-owned facilities) or under long-term contract to PGE during the peak load hour in 2018?

Response:

PGE objects to this request as it is vague and unduly burdensome. Without waiving these objections, PGE responds as follows:

PGE's plant available capacity, as defined in FERC Form 714, at the hour the annual peak demand in 2018 was 4,385 MW. PGE notes that FERC Form 714 includes some, but not all of PGE's long-term contracts such as some qualifying facilities, the Pelton Re-Regulating facility, and seasonal peaking contracts PGE previously entered into. These contracts are identified in PGE's FERC Form 1; however, the Form 1 does not identify MW available during the peak load hour. PGE conservatively estimates the additional available MWs to be no less than 100MW.

Integrated Resource Plan

JULY 2019

TABLE ES-5: Cumulative dispatchable capacity additions in the preferred portfolio

	Reference Case			Low Need			High Need		
	2023	2024	2025	2023	2024	2025	2023	2024	2025
Storage Resources									
6hr Batteries (MW)	0	37	37	0	37	37	0	37	37
Pumped Storage (MW)	0	200	200	0	200	200	0	200	200
Total Storage (MW)	0	237	237	0	237	237	0	237	237
Capacity Fill (MW)	123	79	358	0	0	0	425	423	739
Total Dispatchable Capacity (MW)	123	316	595	0	237	237	425	660	976

ES.6 PGE's Action Plan

The analysis presented in this IRP confirms that amid the rapid technological and market changes being experienced in the West, utilities, including PGE, face large uncertainties in future needs and resource economics. This IRP also demonstrates that PGE can take low-risk, near-term actions to meet near-term needs and set the company on a course to achieve critical long-term goals. In support of our goals and in alignment with our preferred portfolio, we are seeking acknowledgment of the 2019 IRP Action Plan briefly summarized below.

- **Customer resource actions.** Customer participation will be critical to achieving long-term decarbonization at the lowest cost to customers. Based on the findings of the Navigant DER Study, PGE proposes the following actions to support customer participation in demand side management programs.
  - Action 1A. Seek to acquire all cost-effective energy efficiency, which is currently forecasted by the Energy Trust of Oregon to be 157 MWa on a cumulative basis by 2025.
  - Action 1B. Seek to acquire all cost-effective and reasonable distributed flexibility, which is currently forecasted to include, on a cumulative basis:
    - 141 MW of winter demand response (Low: 73 MW, High: 297 MW).
    - 211 MW of summer demand response (Low: 108 MW, High: 383 MW).
    - 137 MW of dispatchable standby generation.
    - 4.0 MW of utility-controlled customer storage (Low: 2.2 MW, High: 11.2 MW).
- **Renewable actions.** Through portfolio analysis, PGE determined the best balance of cost and risk includes a near-term renewable action that contributes to meeting near-term energy and capacity needs as well as long-term renewable obligations and that qualifies for federal tax credits. PGE proposes to pursue the following action to acquire renewable resources:

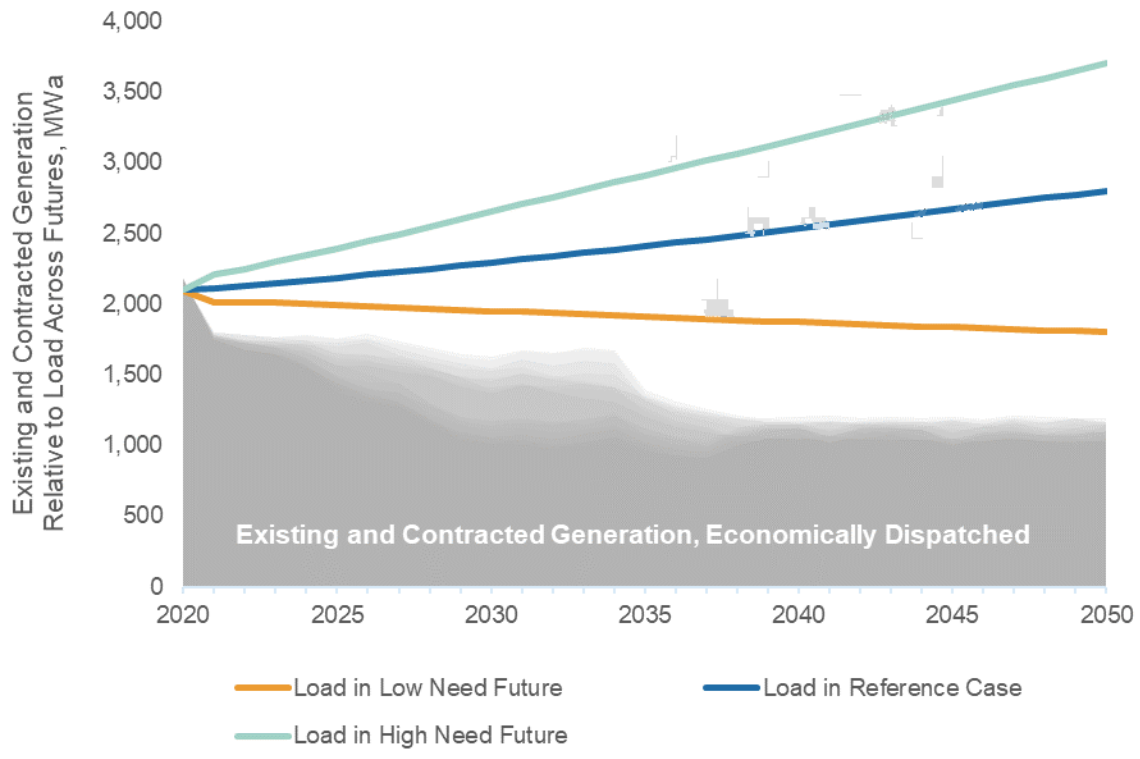
4.4.1 Market Energy Position

To inform this resource plan, PGE proposes an alternative approach to characterizing our energy position, which more specifically captures evolving market dynamics and the associated uncertainties. PGE's energy position compares forecast loads to forecast generation from existing and contracted resources and is described across 54 futures that encompass uncertainties in both PGE needs and market conditions (including carbon prices, gas prices, and WECC-wide renewable buildout).

The purpose of investigating PGE's market energy position is to identify the portion of our customers' energy needs that we anticipate to be met with resources in our portfolio versus purchases from the market and to ensure that our proposed resource actions do not result in a portfolio that is persistently long to the market into the future. Unlike the capacity adequacy assessment, which determines the minimum levels of procurement that we must undertake to meet customer need, this analysis helps to develop a balanced portfolio that would not result in making PGE overly reliant as a purchaser or as a seller on the market in the future.

Figure 4-17 compares PGE's loads and existing and contracted resources between 2020 and 2050 with no incremental resource actions beyond energy efficiency and DERs. The gray shaded area represents the total simulated generation from existing and contracted resources across all futures with the layers of lighter shading indicating variation in dispatch due to the market conditions in each future.[112]

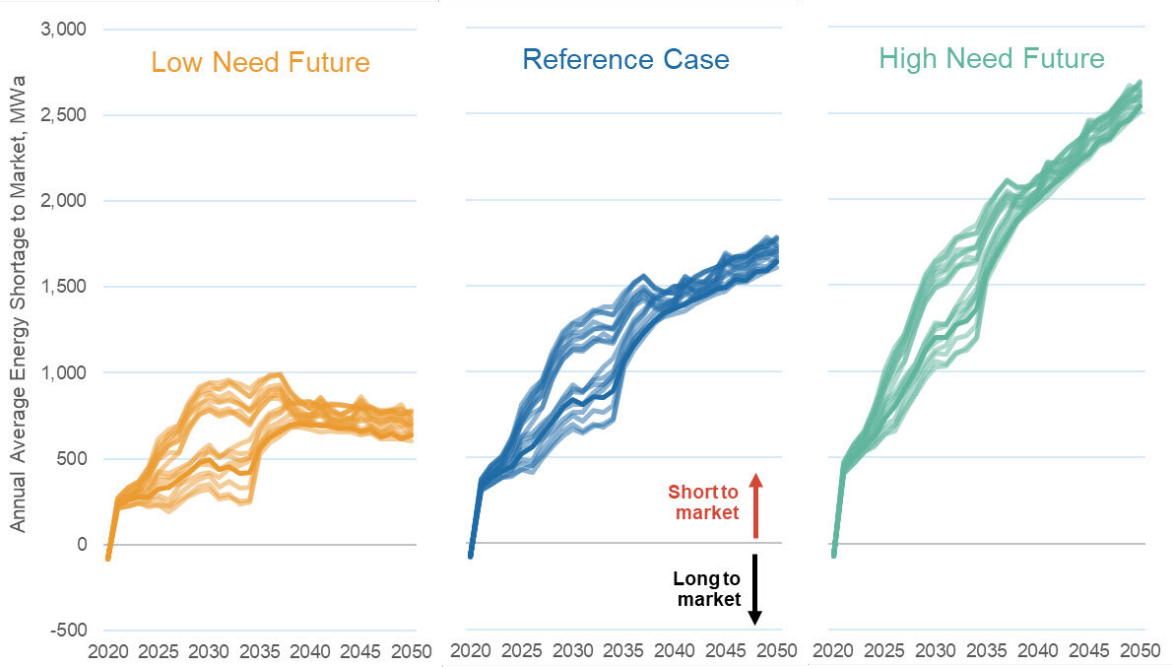
FIGURE 4-17: Load and existing and contracted generation



[112] See Section I.4.2 PGE-Zone Model for a description of how PGE simulates generation from existing resources and new resource options.

PGE's energy market position is calculated by subtracting the existing and contracted generation from the load in each future. A positive number indicates that PGE expects to be short to the market on an average annual energy basis (that is, will be a net purchaser from the market), while a negative number would indicate that PGE expects to be long to the market on an average annual energy basis (that is, will be a net seller into the market). The resulting energy market position is shown across all combinations of Need Futures and Market Price Futures in Figure 4-18.

FIGURE 4-18: Energy shortage to market across futures



In the near term, PGE's energy position is forecast to shift from a long position in 2020 to a short market position in 2021 due to the closure of Boardman and the potential impacts of carbon pricing which, for IRP analysis, is assumed to begin in 2021. As shown in Figure 4-18, PGE is generally expected to be shorter to market (increasing net market purchases) over time as loads grow and resources exit the portfolio. Therefore, resource additions that do not cause PGE to be energy long in the near-term are not expected to cause PGE to be persistently energy long into the future.

Table 4-8 summarizes PGE's near-term energy market position in the Reference Case and across the futures in 2025. Without resource actions beyond energy efficiency and DERs, PGE is expected to meet approximately 515 MWa of energy demand with purchases from the market by 2025 in the Reference Case. This energy shortage is sensitive across the Need and Market Price Futures, but still exceeds 344 MWa in 90 percent of futures.

TABLE 4-8: Energy position in 2025

	2025 Energy Position (Shortage to Market, MWa)
Reference Case	515
10th Percentile	344
90th Percentile	907

The potential market purchases described above would not mean that PGE would rely on the market for resource adequacy, rather that the energy available from the market is anticipated to be lower cost than energy from a portion of PGE's existing and contracted resource portfolio during some parts of the year. While this exposure to the market does not create a reliability risk, it does potentially introduce economic risks to customers related to the potential for high market prices. These risks are captured through the economic risk metrics described in Section 7.2.1 Scoring Metrics.

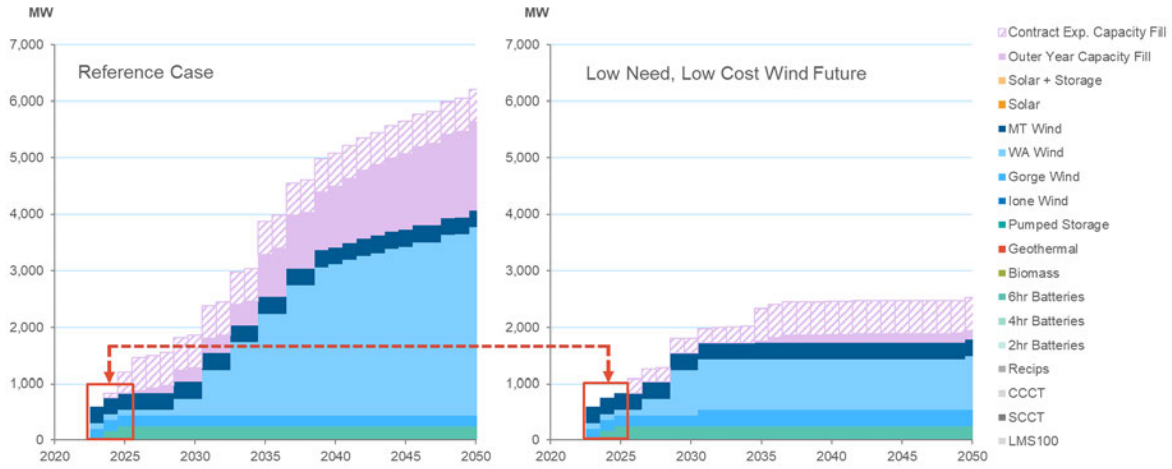
In addition to the economic risk metrics, PGE takes into consideration its forecasted energy shortages within portfolio construction and scoring. The ultimate goal of considering potential energy shortages within each of these components of the IRP is to develop a balanced portfolio that is neither overly reliant on the market nor puts PGE in a persistently long market position into the future. While the analysis described above identifies a near-term Reference Case energy shortage of 515 MWa and increasing energy shortages in later years, PGE conservatively identified 250 MWa as a reasonable maximum energy addition size for consideration of near-term actions. This assumption accounts for additional uncertainties not contemplated in this analysis and for the potential impacts of additional customer decisions that may affect PGE's energy position (see Section 4.7.2 Voluntary Renewable Program Sensitivities). This energy addition constraint was considered in the following aspects of portfolio construction and scoring:

- Portfolios that examine renewable addition size and timing test portfolios with up to 250 MWa of renewable additions (see Section 7.1.3 Renewable Size and Timing Portfolios)
- A non-traditional scoring metric (Energy Additions through 2025) screens out portfolios that add more than 250 MWa of new resources in the near term from consideration for the preferred portfolio (see Section 7.2.1 Scoring Metrics).

4.5 RPS Need

Since its inception in SB 838, the Oregon Renewable Portfolio Standard (RPS) has played a major role in driving the development of renewable resources to serve PGE customers. In 2016, SB 1547 established new escalating RPS requirements that reach 50 percent of retail sales by 2040 (see Table 4-9).

FIGURE 7-2: Example of flexible portfolio construction



In the next section, we describe some of the common design principles applied across all the portfolios examined in the 2019 IRP.

7.1.1 Portfolio Design Principles

All portfolios were designed according to the principles and constraints discussed in this section. This consistent application of constraints allows for a fair comparison across portfolios. A portfolio that does not conform with the principles described here cannot be directly compared to conforming portfolios.

7.1.1.1 Resource Adequacy

All portfolios must meet PGE's capacity needs in all years in the Reference Case. In the Low Need and High Need Futures, portfolios are required to meet resource adequacy needs beginning in 2026. The capacity needs driving this constraint are described in Section 4.3 Capacity Adequacy and the contributions of each resource option to meeting capacity needs (the capacity contribution) are described in Section 6.2.3 Capacity Value.

The portfolio optimization allows use of a generic Capacity Fill resource to meet a portion of its capacity needs. The Capacity Fill resource is priced at just above the net cost of capacity of a simple-cycle combustion turbine (SCCT) derived in Section 6.2.3 Capacity Value ($103/kW-yr). In the near term (through 2025), Capacity Fill can be used for up to the portion of PGE's capacity needs associated with the expiration of contracts. In other words, the Capacity Fill resource simulates the potential for PGE to replace the capacity that is rolling off due to contract expirations on a 1-to-1 basis. PGE's ability to replace this capacity with cost-competitive contract options will depend on the products and pricing available from counterparties in the region.

After 2025, portfolios are allowed unconstrained access to the Capacity Fill resource. If none of the resource options provide capacity at a cost lower than the net cost of a SCCT, the portfolio will meet its remaining capacity needs beginning in 2026 with the Capacity Fill resource. At a high level, the Capacity Fill resource could reflect capacity options that may be available through bilateral negotiations with counterparties in the region, from participation in demand response programs, or

from new technologies such as energy storage, should their costs become competitive with the cost of an SCCT. While the cost of the Capacity Fill resource is estimated in this analysis based on the net cost of a new SCCT, actual costs of competitive capacity options may be less expensive.

7.1.1.2 RPS Requirements

All portfolios must comply with Oregon's RPS requirements through the entire planning horizon. PGE's RPS obligations and RPS needs are described in Section 4.5 RPS Need. ROSE-E simulates the generation, banking, and retirement of Renewable Energy Credits (RECs) from RPS-eligible resources and enforces the five-year lifetime limit on banked RECs consistent with SB 1547. For each portfolio to meet RPS requirements in each future, the retired RECs in each year must meet or exceed the RPS obligation in that year. To ensure steady progress toward meeting PGE's 2040 RPS requirements and Oregon's 2050 GHG goal, PGE requires all portfolios between 2027 and 2050 across all futures to meet physical RPS compliance, such that the RECs generated in each year must meet or exceed the RPS obligation in that year.

7.1.1.3 Energy Position

PGE's energy position is described in Section 4.4.1 Market Energy Position. To ensure that resource additions do not put PGE in a persistently long energy position, we impose two energy constraints on all portfolios. First, in the Reference Case, generation from new resources may not exceed PGE's forecasted net market shortage as described in Section 4.4.1 Market Energy Position beginning in 2026. Second, in all futures, generation from new resources may not exceed PGE's forecasted net market shortage between 2041 and 2050. A small relaxation of this constraint is allowed only in the futures in which the physical RPS compliance constraint would require a portfolio to be energy long.

7.1.1.4 Procurement Constraints

For resource additions made through 2025, PGE enforces unit-size constraints for all thermal resources and pumped storage. For thermal units, resources must be added in single-unit increments, except for reciprocating engines, which must be added in 6-unit blocks. Pumped storage must be added in 100-MW increments, and renewable resources and batteries can be added in any MW size. Unit constraints are relaxed after 2025 to improve computational efficiency and because additions in that period are not being considered for inclusion in the Action Plan in this IRP. PGE excludes thermal resource additions from all portfolios after 2025 but does allow access to the Capacity Fill resource during this time.

PGE also imposes constraints on resource additions between 2026 and 2050 to approximate practical and logistical considerations around resource procurement activities. Beginning in 2026, renewable procurement is assumed to occur on a two-year cycle, so that renewable resource additions enter the portfolio in odd years. Capacity resource additions are assumed to occur on a two-year cycle that is staggered with the renewable procurement activities, resulting in capacity additions in even years. In each year beginning in 2026, resource additions are limited to 500 MW to ensure that the evaluation of near-term actions does not hinge on a presumption of heroic resource development efforts sometime in the future. This limit does not apply to Capacity Fill additions, as they do not represent new long-lived infrastructure.