OREGON PUBLIC UTILITIES COMMISSION

PACIFICORP'S 2020AS RFP INDEPENDENT EVALUATOR'S SENSITIVITY ANALYSIS REPORT

July 30, 2021

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Executive Summary

This document is PA Consulting's (PA's) Sensitivity Analysis Report as part of its role as Independent Evaluator (IE) for PacifiCorp's (PacifiCorp, PAC, or the Company) 2020 All Source RFP (2020AS RFP). PA has been retained by PAC as the IE for this Solicitation on behalf of the Public Utility Commission of Oregon (OPUC or the Commission). PA has been involved since the development of the RFP and has provided oversight to ensure the RFP process is conducted in a fair and reasonable manner and meets the Commission's requirements.

After the RFP launch, OPUC Staff, Stakeholders, and PAC discussed conducting sensitivity analyses to assess the robustness of potential resource portfolios in various market conditions. This report was developed to better understand and anticipate the ratepayer exposure of the potential resource portfolio to various risks and to determine how the potential resource portfolio differs from a portfolio that might have been tailored to particular risks or a different view of the world.

Figure 1-1 below provides an overview of the purpose and themes which were considered and evaluated in the course of evaluating this report.

Figure 1-1: Overview of Purpose

Purpose	1. To better understand and anticipate the reaction of the selected project portfolio to various risks, and to form a judgement of its robustness 2. To determine how the selected project portfolio differs from a portfolio that might have been tailored to particular risks or a different view of the world 3. To adjust or replace the selected project portfolio to obtain a portfolio that may be somewhat more costly in the base but is much more resistant to poor performance in adverse cases
Risk factors	Market liquidity; Overbuild of renewables; Low fossil price; High DER build; High load growth; Regulatory changes; Low energy price; Zero carbon price
Risk Considerations	• Regional liquidity in a low-price environment absent an ISO • Portfolio resource sizing across total and regional resources • Risk variable relationships are accurately linked / correlated • Defining / determining an appropriate and realistic downside case

Over the course of the RFP process, Staff, PAC, and PA worked to establish goals and guidelines related to the sensitivity analysis. This process began with a "test run" of the sensitivities across three portfolios of Initial Short List bids to produce a range of outputs from PAC's Planning and Risk model (PaR). Over the period from when these results were presented at a special public meeting on December 17, 2020, the analysis was refined and conducted on the bid eligible for the Final Short List (FSL). This analysis also entailed two iterations due to a combination of errors identified in certain bid models which needed to be corrected and the revision of certain variables which drive the sensitivities.

PAC delivered its FSL report to Staff and the IEs on June 8, 2021 and requested acknowledgement with a June 15, 2021 filing in OPUC docket UM 2059. PAC's workpapers (the "first analysis") included the results of a number of sensitivity cases it had developed, as well as additional sensitivities requested by OPUC Staff with the assistance of PA. PAC then discovered several issues with bidder inputs and locational definitions. PAC revised its RFP modelling and submitted a revised report and work papers on July 20 and July 21, 2021 (the "second analysis"). For the second analysis, PAC developed several additional sensitivity cases, in part to respond to questions from OPUC.

The studies that PAC developed are summarized in the following table, which represents the determination of the assumptions used by System Optimizer (SO) to select bids and the price / policy assumptions used by PaR to determine value.

Table 1-1: Price, Policy, and Bid Selection Scenario Definitions[1]

Price and Policy Scenarios		Bid Selection Scenarios	Bid Removal Scenarios
MM	Reference Case: medium gas prices, medium carbon prices	RFP	No market sales, remove Glen Canyon Solar
LN	Low gas prices, no carbon prices	RFP Final Short List	No market sales, remove Hamaker Solar + Storage
HH	High gas prices, high carbon prices	Proxy Resources Only	No market sales, remove Rock Creek 1 Wind
SL	Sensitivity 1: low market prices	---	No market sales, remove Rock Creek 2 Wind
SNS	Sensitivity 2: no market sales, medium (reference) market price	---	---
SNST	Sensitivity 3: no market sales, medium (reference) price, and PTC/ITC extension	---	---

PA's approach to this analysis was based upon evaluating and testing the following questions:

1. How can the FSL be tested as the "optimal" portfolio?
2. Which risks are critical for ratepayer protection and which are immaterial?
3. How can different scenarios be compared to quantify risks over the near, medium, and long term?
4. How can the reality of imperfect modelling and subjective decision making be reconciled?

PRIMARY OBSERVATIONS

The purpose of this report is to delve into what these models indicate, individually and collectively, and to evaluate whether the decisions made by PAC were reasonable for the purpose of establishing the least cost reliable portfolio that is optimized across a variety of scenarios. The following are the primary observations which are detailed further throughout this report:

- Between the first and second analysis conducted by PAC, the resources proposed did not change
- The first analysis resulted in the low market price / no carbon tax portfolio performing better than the SNS-MM scenario. It was determined that the cause of this was due to the proxy resources which were selected in the back half of the forecast period. Proxy selection is controllable by PAC. This led to the second analysis where the FSL portfolio incorporate low market price proxies.
- A portfolio's cost is does not capture the full picture of risk for ratepayers. For instance, a low market price optimized portfolio may represent a least cost option, however it also incurs substantially greater reliance on market purchases to ensure reliability. One on hand, over procuring resources leads to a financial burden on ratepayers, on the other hand, over reliance on market transactions requires an assumption that the energy will always be there at a reasonable price when it is needed.
- Consideration for the timing of resource implementation, value contribution, and subsequent resource additions may not be quantifiable in all cases but must be considered in order to arrive at a holistic perspective on risk. For example, the Energy Gateway South transmission line incurs a substantial cost on certain portfolios. The lifespan of a transmission asset is much longer than a

[1] Note: Each column of variables is mutually exclusive from each other column of variables.

solar or wind facility. Further, a transmission line brings with it opportunity cost considerations in that an absence of transmission capacity may preclude access to attractive acquisitions in the future.

- Across all scenarios, the revised FSL presents the least cost portfolio and reflects steps taken to mitigate controllable risks as shown in the table below.

Table 1-2: Comparison of Selected Portfolio PVRR

Case	SO Price/Policy	PaR World	Adj PVRR ($M)
MM	MM	MM	$23,968
Original FSL	SNS	MM	$23,893
LN	LN	MM	$23,828
Revised FSL	SNSLN	MM	$23,735

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1 Introduction

This document is PA Consulting's (PA) Sensitivity Analysis Report on PacifiCorp's (PacifiCorp, PAC, or the Company)[2] 2020 All Source Request for Proposals (2020AS RFP or RFP). PA served as the Independent Evaluator (IE) for the RFP, beginning with reviewing the RFP design and continuing through the entire RFP process, including the selection of the Final Short List (FSL) of bids which PAC submitted to the Oregon Public Utilities Commission (OPUC) for approval. The purpose of this document is to provide PA's review and analysis of the sensitivity modelling which PAC conducted as part of the process in selecting the FSL.

The primary goal of an Integrated Resource Plan (IRP) is the "selection of a portfolio of resources with the best combination of expected costs and associated risks and uncertainties for the utility and its customers.[3]" This guideline states that Net Present Value of Revenue Requirement (NPVRR) is the main cost metric, and that utilities must balance cost and risk over at least a 20-year planning period. PacifiCorp's 2019 IRP uses a 20-year planning horizon, from 2019 through 2038. The SO model operates by minimizing operating costs for existing and prospective new resources, subject to system load balance, reliability, and other constraints. PacifiCorp evaluates cost and risk metrics reported from PaR, comparing portfolios based on expected costs, low-probability high-cost outcomes, reliability, and CO2 emissions.

PAC describes its IRP modeling as consisting of three steps used to select a preferred portfolio: coal studies, portfolio development, and final portfolio screening[4]. PAC uses a capacity expansion model, System Optimizer (SO), to produce portfolios. In the 2019 IRP, PAC produced over 50 different unique resource portfolios informed by the coal studies. PAC uses the Planning and Risk model (PaR) to perform stochastic risk analysis of the portfolios produced by the SO model. PAC explains its IRP mandate is to assure, on a long-term basis, an adequate and reliable electricity supply at a reasonable cost and in a manner consistent with the long-term public interest. PAC seeks to account for state commission IRP requirements, the current view of the planning environment, corporate business goals, and uncertainty including known policies.

All scenarios presented as a result of PAC's analysis result in scenarios which achieve resource adequacy – meaning that all portfolio combinations achieve reliability according to PAC's requirements. PAC selected a 13% planning reserve margin level as the percentage of incremental generation, above what is needed to meet firm system demand, necessary to ensure reliable service. After accounting for the 13% target planning reserve margin, load growth, coal unit retirements from the IRP preferred portfolio, and energy efficiency savings, PAC then assesses its capacity surplus or deficit.

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[2] In discussions of RFP conduct, scoring and bid selection, references in this report to PacifiCorp or PAC are to PacifiCorp's merchant function which operates independently of PacifiCorp Transmission (PacTrans) under FERC's Standards of Conduct for Transmission Providers.

[3] In the Matter of Investigation into Integrated Resource Planning, Docket No. UM 1056, Order No. 07- 002 at Appendix A, Guidelines 1-13 (Jan 8, 2007) corrected by Order No. 07-047 (Feb 9, 2007).

[4] 2019 IRP at 171

2 Sensitivity Analysis Overview

The OPUC's role in the RFP is to safeguard the interests of the rate payer and ensure that PAC selects contracts that meet the stated need without passing excessive costs through to ratepayers. With the 2020AS RFP, PAC intended to take advantage of possibly lower project pricing due to the forthcoming expiration of eligibility for PTC and ITC. OPUC Commissioners and Staff were concerned by the potential for over-procurement. Specifically, the OPUC wanted to ensure that risks were mitigated for the ratepayer and shared with PAC where appropriate.

PAC delivered its FSL report to Staff and the IEs on June 8, 2021 and requested acknowledgement with a June 15, 2021 filing in OPUC docket UM 2059. PAC's workpapers (the "first analysis") included the results of a number of sensitivity cases it had developed, as well as additional sensitivities requested by OPUC Staff with the assistance of PA. PAC then discovered several issues with bidder inputs and locational definitions. PAC revised its RFP modelling and submitted a revised report and work papers on July 20 and July 21, 2021 (the "second analysis"). For the second analysis, PAC developed several additional sensitivity cases, in part to respond to questions from OPUC. Although PAC did not rerun all the cases requested by Staff, PA believes the key insights from Staff sensitivity runs in the first analysis remain valid.

The measure of merit for each set of bids is the projected PVRR from serving load with a portfolio containing those RFP bids and no others. Thus the "FSL portfolio" is the modelled resource portfolio containing the FSL bids. Alternatively, the "MM" portfolio is the set of resources SO selected under MM assumptions and the term "MM bids" means the RFP bids in the MM portfolio.

In general, unless the meaning is otherwise clear from context, references in this report to the "FSL bids" relate specifically to the set of RFP bids selected in the second analysis. To avoid potential confusions when addressing both analyses, "FSL(1)" will be used to refer to the RFP bids first selected and reported on June 8, and "FSL(2)" to the bids in the revised selection from July. Both sets of bids were actually identical; however, the SO resource portfolios that selected them included different sets of proxies and DR bids.

To understand the implications of possible portfolios in the future, PA and the OPUC Staff developed various sensitivities in addition the sensitivities for PAC's analysis. Between the two analyses, PAC ran 44 sensitivity combinations were (most of them appear in both analyses). These sensitivity combinations were analyzed and reviewed by PA Consulting to help understand the selection of the FSL. Table 2-1 shows the various bid selection, policy, and price scenarios for the sensitivities. The 44 sensitivity combinations PAC ran represent combinations of these various bid selection, policy, and price scenarios (albeit not exhaustively).

Table 2-1: Price, Policy, and Bid Selection Scenario Definitions

Price and Policy Scenarios		Bid Selection Scenarios	Bid Removal Scenarios
MM	Reference Case: medium gas prices, medium carbon prices	RFP	No market sales, remove Glen Canyon Solar
LN	Low gas prices, no carbon prices	RFP Final Short List	No market sales, remove Hamaker Solar + Storage
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SL	Sensitivity 1: low market prices	---	No market sales, remove Rock Creek 2 Wind
SNS	Sensitivity 2: no market sales, medium (reference) market price	---	---
SNST	Sensitivity 3: no market sales, medium (reference) price, and PTC/ITC extension	---	---

Table 2-2 below provides the list of all scenarios which were developed by PAC in the course of conducting this sensitivity analysis. This list includes scenarios which were part of PAC's first analysis in June as well as those which were either new scenarios or updated as part of PAC's second analysis in July.

Table 2-2: List of all SO and Par Stochastic Runs Completed

#	Scenario Name	Bids for SO	Price Curve in SO	Post-Selection Bid Removal	Price / Policy in PaR
1	RFMM-SLR	ALL	MM	None	SL
2	RFMM-SNSR	ALL	MM	None	SNS
3	RFMM-SNSTR	ALL	MM	None	SNST
4	RFPF-HHR	ALL	HH	None	HH
5	RFPF-LNR	ALL	LN	None	LN
6	RFPF-MMR	ALL	MM	None	MM
7	RFPF-SLR	ALL	SL	None	SL
8	RFPF-SNSR	ALL	MM-SNS	None	SNS
9	RFPF-SNSRG	ALL	MM-SNS	Glen Canyon Solar	SNS
10	RFPF-SNSRH	ALL	MM-SNS	Hamaker Solar + Storage	SNS
11	RFPF-SNSRR1	ALL	MM-SNS	Rock Creek 1 Wind	SNS
12	RFPF-SNSRR2	ALL	MM-SNS	Rock Creek 2 Wind	SNS
13	RFPF-SNSTR	ALL	MM-SNST	None	SNST
14	RFPFHH-LNR	ALL	HH	None	LN
15	RFPFHH-MMR	ALL	HH	None	MM
16	RFPFLN-HHR	ALL	LN	None	HH
17	RFPFLN-MMR	ALL	LN	None	MM
18	RFPFMM-HHR	ALL	MM	None	HH
19	RFPFMM-LNR	ALL	MM	None	LN
20	RFSNSR-HHR	ALL	MM-SNS	None	HH
21	RFSNSR-LNR	ALL	MM-SNS	None	LN
22[5]	**RFSNSR-MMR**	**ALL**	**MM-SNS**	**None**	**MM**
23	RFSNSRH-HHR	ALL	MM-SNS	Hamaker Solar + Storage	HH
24	RFSNSRH-LNR	ALL	MM-SNS	Hamaker Solar + Storage	LN
25	RFSNSRH-M	ALL	MM-SNS	Hamaker Solar + Storage	MM
26	RFSNST-MMR	ALL	MM-SNST	None	MM
27	RFSNSRF-MMR	ALL	MM-SNS	None	MM (Restricted Purchases)
28[6]	**RFSNSLNR-MMR**	**ALL**	**MM-SNS**	**None**	**MM (LN Proxies)**
29	RFSNSLNR-HHR	ALL	MM-SNS	None	HH (LN Proxies)
30	RFSNSLNR2-MMR	ALL	MM-SNS	Rock Creek 2 Wind	MM (LN Proxies)
31	RFSNSLNR1-MMR	ALL	MM-SNS	Rock Creek 1 Wind	MM (LN Proxies)
32	RFSNS-LNR	ALL	MM-SNS	None	LN
33	RFPF-MMRF	FSL Bids	MM	None	MM (Restricted Purchases)
34	RFLNRF-MMR	NONE	LN	None	MM (Restricted Purchases)
35	RNBdHH-LNR	NONE	HH	None	LN
36	RNBdHH-MMR	NONE	HH	None	MM
37	RNBdLN-HHR	NONE	LN	None	HH
38	RNBdLN-MMR	NONE	LN	None	MM
39	RNBdMM-HHR	NONE	MM	None	HH
40	RNBdMM-LNR	NONE	MM	None	LN
41	RNoBid-HHR	NONE	MM	None	HH
42	RNoBid-LNR	NONE	MM	None	LN

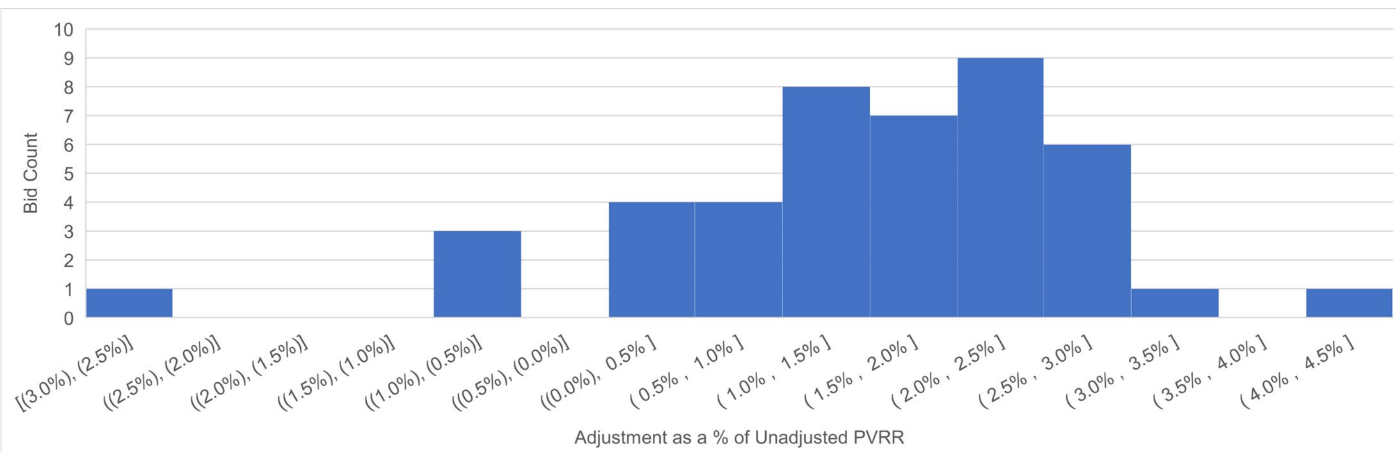
[5] The "Old" FSL as defined in PAC's June 8, 2021 presentation filed to docket UM 2059.
[6] The current FSL as defined in PAC's July 21, 2021 presentation filed to docket UM 2059. Represents the FSL bid portfolio under the SNS case with proxies reflective of a LN price/policy.

#	Scenario Name	Bids for SO	Price Curve in SO	Post-Selection Bid Removal	Price / Policy in PaR
43	RNoBid-MMR	NONE	MM	None	MM
44	RNoBid-SLR	NONE	SL	None	SL

PAC's first and second analyses were based on two computer tools that it used to construct its last Integrated Resource Plan: System Optimizer (SO) and Planning and Risk model (PaR). Each simulates the operation of a set power generators, both within and outside PAC's system, given a set of assumptions about the load forecast, gas and market price forecasts, topology, and policies. SO's simulation is less precise and sophisticated than PaR's because it is used to simulate the performance of multiple different resource mixes for PacifiCorp and select an optimal portfolio. PaR is a more detailed Monte Carlo simulation of the performance of an identified resource mix. PAC runs 50 iterations of each sensitivity case to represent uncertainties in addition to the macroeconomic ones represented in Table 2-1 (e.g., unit outages) and creates the sensitivity result output. SO and PaR both use the same database and assume the same transmission topology in their modelling; however, it is not necessary for PaR to simulate the same scenario (from Table 2-2 as was used by SO to select the resource portfolio. In that way the sensitivities show the impact of both accurate and inaccurate forecasts of future conditions.

As a PaR post-process, adjustments are made to the projected revenue requirements. On the first item, within each PaR sensitivity run, PAC produces both an adjusted and unadjusted value for the present value of revenue requirements (PVRR) over the 20-year projection horizon. The adjusted PVRR uses three adjustments that differentiate it from the unadjusted PVRR. Those adjustments are as follows: 1) a deficiency driver adjustment; 2) an operating reserve credit adjustment; and 3) a granularity adjustment. As shown in Figure 2-1 below, the impact of these adjustments generally amounts to less than 3% of the unadjusted PVRR. All figures and values in this report related to PVRR represent the adjusted values.

Figure 2-1: Histogram of Adjustment Impact on Unadjusted PVRR Across All Scenarios



The PaR output data provided in the workpapers for each PaR provides annual portfolio revenue and fixed O&M costs. The annual revenue requirement also includes return on and depreciation of rate base (capital costs). Actual annual revenue requirements reflect the timing of major investments: the revenue requirement increases when a new capital investment enters rate base. The basic Par summary data in the workpapers includes only the levelized annual capital revenue requirement, not the year-to-year variation. Illustrations and statements in this report about annual revenue requirements should be read with that in mind. Yearly variation in the capital revenue requirement does not affect the PVRR, which is the metric mostly used by both PAC and PA, and it should not significantly affect the validity of judgements based on multi-year time periods (e.g., 2020s vs. 2030s). Where comparisons are made among portfolio revenue requirement over time, it is useful to note that while the trends and relationships are useful, the implicit translation of such values to rates is not.

2.1 Initial determination of the FSL (first analysis)

Following the publication of results from the transition cluster study in April 2021, all bidders were instructed by PAC to provide "best and final" pricing reflective of interconnection costs. There was PAC undertook a multi-step decision making process to determine which bids to select and which to eliminate. The first step was the modelling process of running each bid through PAC's IRP models, which make resource selections which optimize around the goals of resource adequacy (or in other words, greatest reliability) and least cost. The IRP models were executed for several different resource scenarios, one of which was identified as a base case.

The second step PAC took was to remove the highest-price offers among those selected by the base-case IRP model run. PAC took the position that the small amount of effective capacity represented by those bids could be replaced by 2025. In fact, these bids had not been selected in a low-liquidity case (the "SNS" sensitivity case developed by OPUC staff, with reference-case load and market price assumptions but with no off system sales permitted, modelling a spot market too shallow to absorb excess energy), suggesting that those offers were reliant on market sales to support their economics and system contribution benefit. That dependence on the spot market would add risk to PAC's supply portfolio. Furthermore, since the bid portfolio in the low-liquidity case satisfied the reliability criteria, PAC should be able to replace those offers by adjusting its selection of proxy resources and DR bids (future decisions).

PAC created a shortlist that may not fully meet the RFP's stated resource need because it judges that procuring new resources in the relatively near future at materially lower cost is a low risk and economically rationale strategy – another reasonable step toward the resource plan. The initial FSL was selected through a combination of PAC's IRP modelling and PAC's review of the results and is supported by a sensitivity case.

2.2 Revised determination of the FSL (second analysis)

As noted above, PAC discovered several issues with bidder inputs and locational definitions and revised its RFP modelling. PAC reported that these issues were limited to a small number of bid models, but they still re-ran the entire FSL modelling process. PAC revised their application for acknowledgement to contain a new FSL analysis. While the set of bids selecting did not change, the supporting analysis and the path to that selection did change, and the sensitivity cases provide important insights.

We stated earlier that the SO model is less precise than PaR – an approximation. This means that a portfolio identified as lowest-cost by SO may not actually be lowest cost – when evaluated under the same price and policy assumptions a different portfolio may be better. For SO to be useful at selecting a portfolio, what is important is that the difference be small. In its review of the first analysis PA had found that the "HH" portfolio (selected by SO with high energy and carbon prices) was actually not the lowest-cost portfolio in that case according to PAR, the "MM" portfolio (selected by SO with mid-range energy and carbon prices) was also better under HH assumptions.

In the second analysis, neither the MM portfolio nor the FSL(1) (SNS) portfolio turned out to be lowest-cost under reference case assumptions, according to PaR. The PVRR of the "LN" portfolio was lower than both of theirs. PAC hypothesized that the LN case obtained this advantage because of the proxy resources and DSM bids that SO had selected for the portfolio, along with the LN bids. PAC tested this by defining an "SNSLN" portfolio: PAC ran SO under LN price/policy assumptions but constrained to consider only portfolios that included the SNS (i.e., FSL(1)) bids from the RFP, and no other RFP bids. A PaR run confirmed that the SNSLN portfolio was lower cost. Because PaR is a Monte Carlo model, PA independently confirmed that these differences are statistically significant. As shown in Table 2-3 below, the revised FSL outperforms both the MM and LN portfolios.

Table 2-3: Comparison of Selected Portfolio PVRR

Portfolio	SO Price/Policy	Reference case PVRR ($M)	PVRR with no sales permitted ($M)
MM	MM	$23,968	$25,985
SNS (Original FSL – FSL(1))	SNS	$23,893	$25,834
LN	LN	$23,828	$25,658
SNSLN (Revised FSL – FSL(2))	SNSLN	$23,735	$25,629

The presence of the LN bids in a list of candidate shortlists is significant because the LN case is the only one in which SO does not select the Energy Gateway South (EGS) project (and does not select any of the Wyoming projects contingent on its construction). The only other cases in which EGS is not selected are two sensitivities that are prevented from choosing any RFP bids at all, which test what would happen if PAC had not run the RFP. EGS has been under discussion for many years and PA believes there may still be policy questions around it, beyond bid selection. Therefore, we looked more closely at these four portfolios.

The revenue requirement difference between the four cases is small, only about 1% of the smallest value. The choice between them can also be informed by risk considerations. One risk is that PacifiCorp could wind up with a large amount of excess energy that the market cannot absorb. OPUC had defined a "no-sales" (SNS) price-policy scenario that was used in the first analysis to test the MM and FSL(1) portfolios; in the second analysis it was only used with the FSL(2) portfolio. We estimated the value that would be lost (PVRR increase) for the scenarios other than FSL(2) had such sensitivities been run in the second analysis, based on their project offsystem sales revenue in that analysis and the foregone margin percentage in the first analysis. The FSL(2) portfolio still came out least-cost, although its advantage was very small.

We then looked at the full range of PVRR values for each portfolio in different cases of the second analysis, mostly driven by energy and carbon prices (LN and HH). Figure 2-2 shows the range of outcomes (risk) for each portfolio. The LN portfolio is the most risky: it performs best in a low-energy-price outcome, as it is not burdened by the capital cost of EGS, but also worst in a high-price outcome since it lacks access to lower-cost renewables. The FSL(2) portfolio is second-best in the LN case, because of its proxy resource choices, and does not do as well as the MM or FSL(1) portfolios in a high price environment. The difference between FSL(1) and FSL(2) is not related to the RFP bids, though, but to other resources that might be acquired in the future.

Figure 2-2: Portfolio Risk (Range of PVRR outcomes by portfolio)

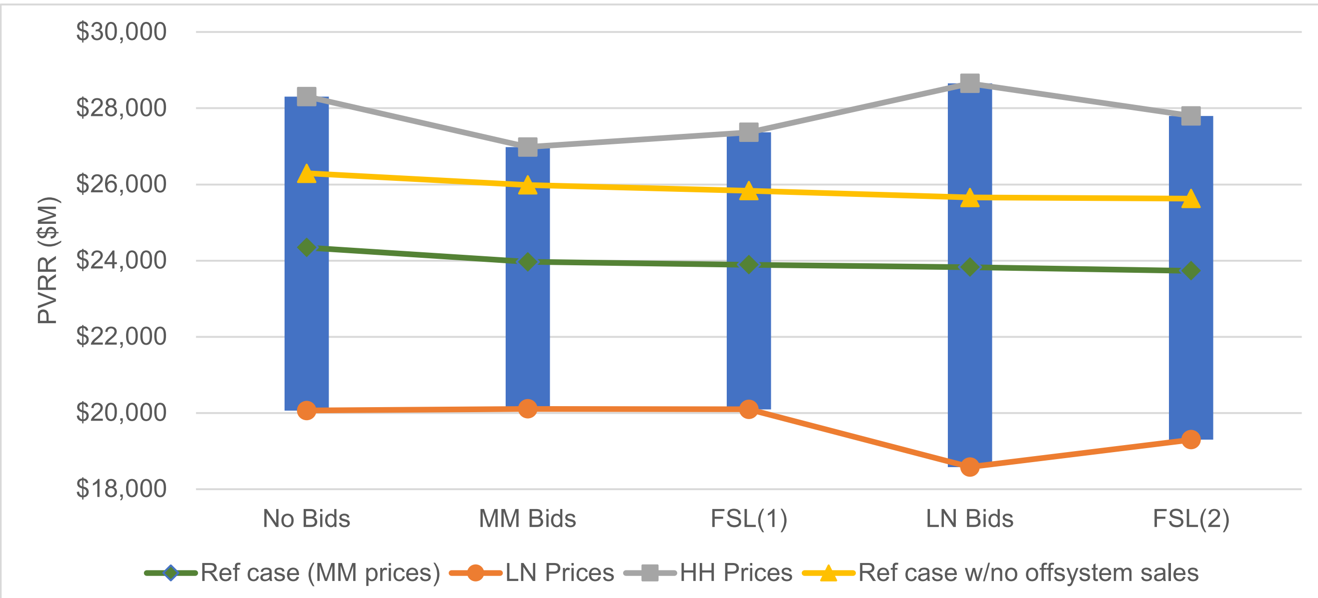
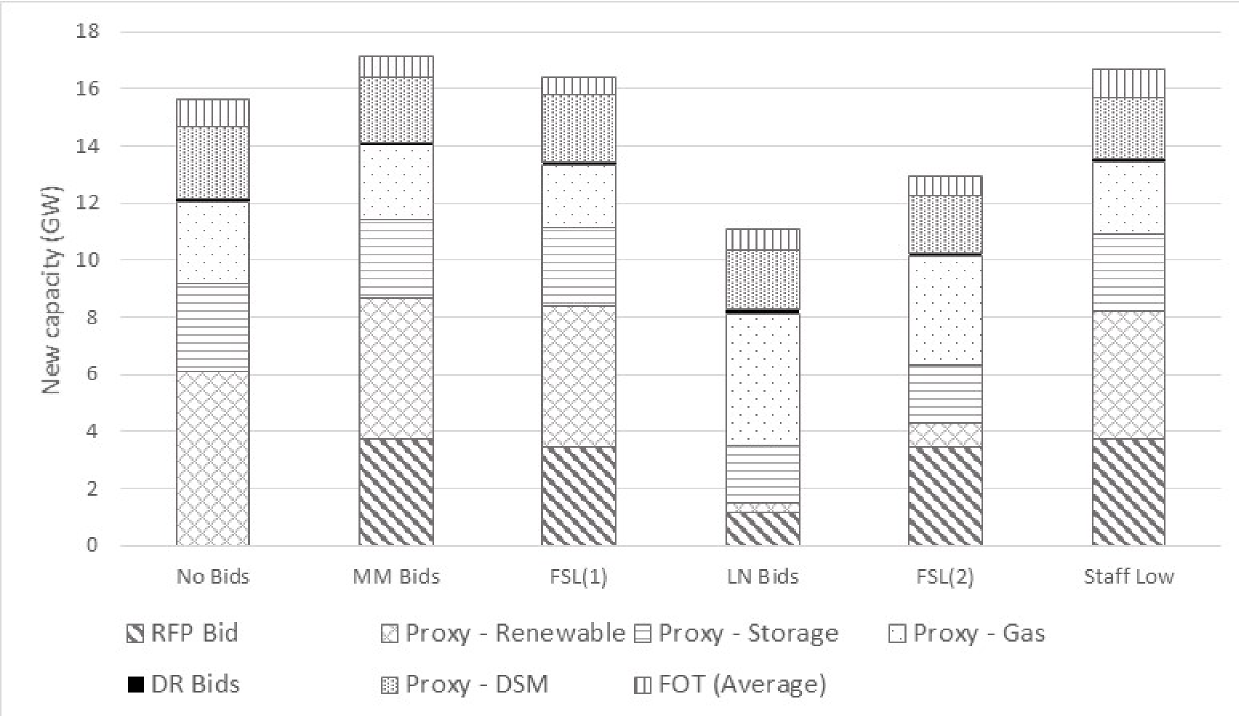


Figure 2-3 shows the projected capacity additions for each of these portfolios, along with (for comparison) and SO portfolio with no RFP bids (only proxies and DR bids) and one selected for a "Staff Low" price case. The LN case projects much less capacity than the others, because it has fewer renewable RFP bids and almost no renewable proxies, but a comparatively large amount of new gas resources (gas capacity is much more effective at meeting reliability criteria on a MW-for-MW basis). The FSL(2) portfolio also has a large amount of new gas build, about twice as much as the FSL(1) or MM portfolios; but it has the same RFP bid selection as FSL(1), differing in later additions. The Staff Low (SL) case, which is a sensitivity requested by OPUC staff, is interesting: it has low market power prices (as in LN) but a mid-range carbon price where LN has none. The carbon can also be used to represent some kind of portfolio standard for renewable or GHG-free energy and even with the low market prices it motivates a much greater use of renewable proxy resources (and selects EGS). Renewable penetration can be a matter of policy guidance not gas supply.

Figure 2-3: 2021-2038 Capacity Additions by Portfolio



3 Using Sensitivities to Further Evaluate the FSL

The review of sensitivity cases is intended to stress test the conclusion of the FSL and ensure that the selected portfolio (specifically, FSL(2)) does in fact represent the optimal portfolio. Analyzing a wide variety of candidate portfolios under a range of possible unknown but probabilistic futures allows insight into the relative risk profiles represented by different approaches to meeting system needs. The following section lays out a number of considerations which PA believes are important to analyze in terms of value, risk, and temporal implications of the selected portfolio.

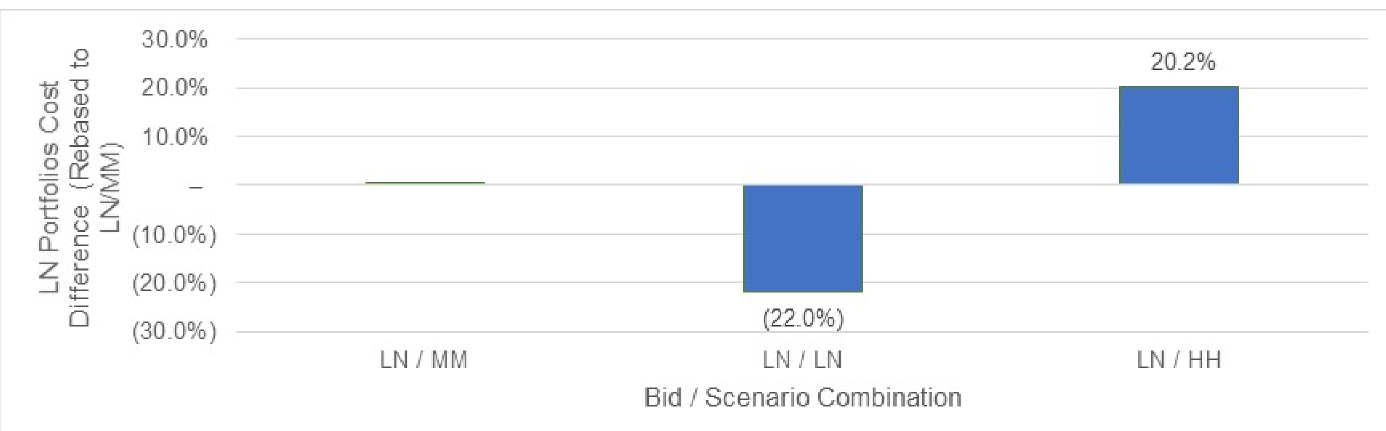
3.1 Assessing Scenario Risk

The first set of risk considerations relate to the contribution to total cost and value of PAC's resource base of the portfolio of resource additions and the variability of that cost under different price/policy scenarios. If the IRP models have not allowed an unreliable selection of resources, all else equal, a lower cost portfolio is better for rate payers. Comparison of the value (or cost) of different price/policy combinations allows for the identification of the portfolio which best achieves the least-cost, reliable portfolio. The IRP models do not only select the best RFP offers under defined conditions, but also make decisions regarding the entirety of PAC's portfolio including new fossil builds and retirements, energy efficiency, demand side management, and market transactions.

While evaluating multiple potential price/policy scenarios can be useful for stress testing, SO can only develop a procurement or portfolio under the expectation of a single policy scenario. Essentially, PAC cannot "choose" which scenario will take place, only one scenario that governs the optimization calculation when selecting resources. As such, as shown in Figure 3-1 through **Error! Reference source not found.** below, there are other "optimal: portfolios which could be constructed, but only in the context of a reference case different from the medium price / medium carbon scenario. By the same token, it is important to consider how a portfolio designed for the reference case will function in a different price/policy scenario as poor enough sensitivity-case performance could eliminate it from consideration for the reference case.

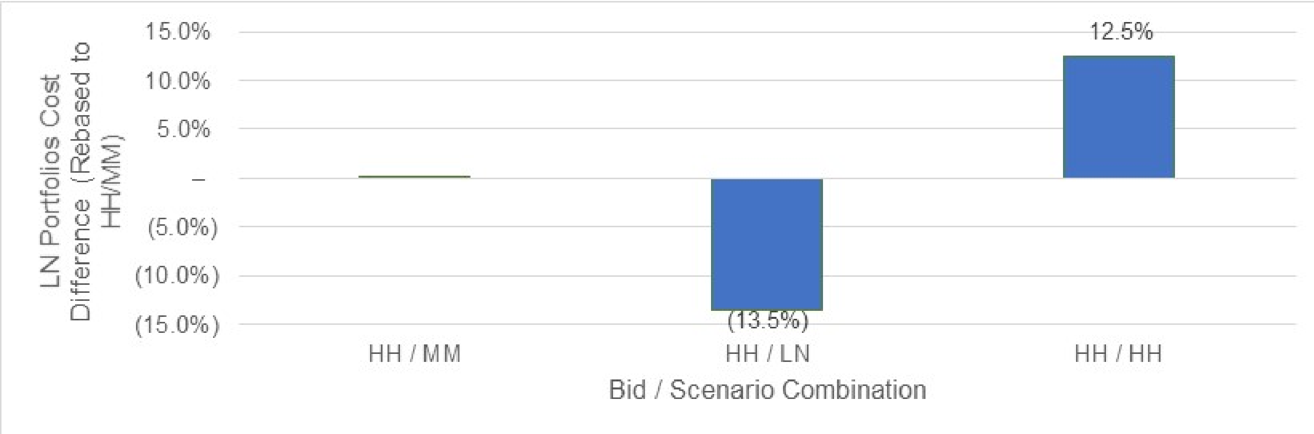
Figure 3-1 presents the impact that medium and high price/policy scenarios have upon the cost of a portfolio in which the bids were selected in anticipation of a low energy / no carbon world relative to the cost in the LN / MM case. By rebasing the alternatives and holding all but one variable constant, it is possible to assess the relative magnitude of impact that changing that one variable has upon the result. The result below is as would be expected that the bids selected when anticipating an LN world and less costly when an LN world does in fact result and more costly when an HH world results.

Figure 3-1: LN Bid Portfolios in Different Price/Policy Worlds



The "flip side" of Figure 3-1 is Figure 3-2, which evaluates the sensitivity of a portfolio of bids which are optimized for a high price environment but the reality turns out differently. Again, the proportions of positive and negative performance and the nominal effect against the reference case is intuitive.

Figure 3-2: HH Bid Portfolios in Different Price/Policy Worlds



This consideration becomes more apparent when comparing the effect that different price / policy worlds have on otherwise similar portfolios. The effect of carbon prices at the extreme ends – being either non-existent (such as in the LN case) or high – has a more significant and symmetrical impact on value of a bid portfolio. Coincidentally, the MM/MM case and the SL/SL case are nearly equivalent with PVRR's of $23,968M and $23,981M respectively.

Figure 3-3: MM Bid Portfolios in Different Price/Policy Worlds

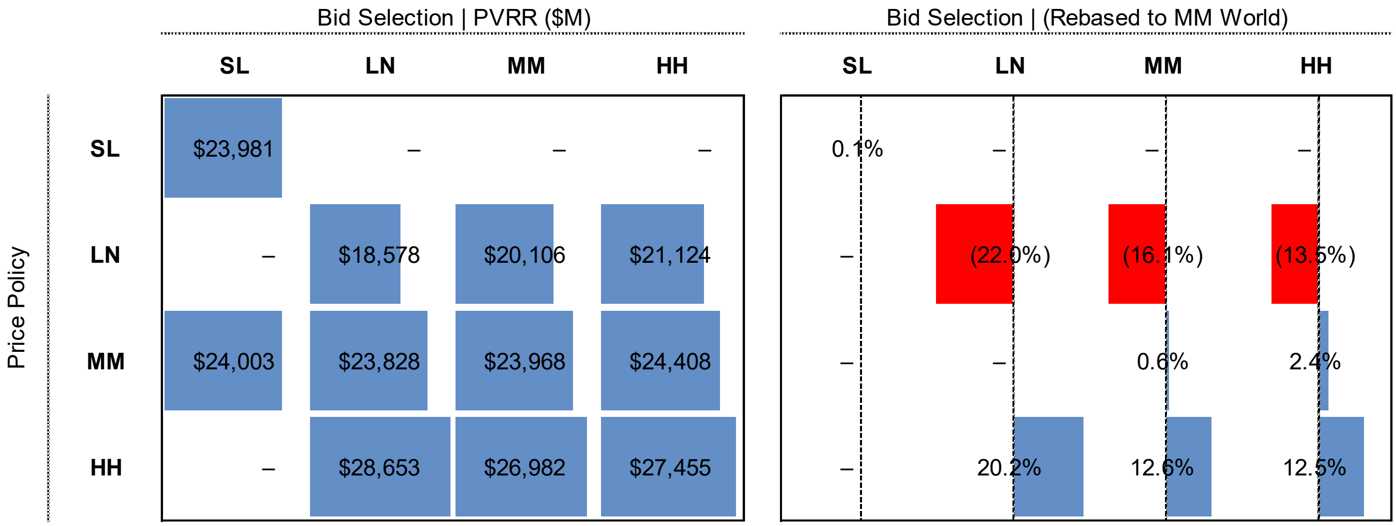
These comparisons illustrate that a bid selection which is optimized around prices higher than the actual price / policy outcome performs substantially better than the alternative combination. What is less intuitive is what this indicates about resource selection and the relationship between the economics of thermal vs. renewable resources. For example, if we are to assume a reasonable scenario where renewable resource levelized costs continue to decline over the next decade, load growth continues along with GDP, and carbon tax policy is adopted, modestly rising power prices and falling costs will be attractive for renewables and lead to thermal production decline. However, since we can't actually control this future price / policy scenario, the test is to determine whether better to err to a declining or rising price environment (or said differently to an increasingly or decreasingly attractive environment for renewables).

In addition to the above, there are three primary takeaways from the above figures:

- There is more "cushion" to err on the side of anticipating a LN world than there is to anticipate a HH world. This is expressed as the comparison between the LN / LN case being 22.0% less expensive than the LN / MM case compared to the HH / HH case being 13.4% more expensive than the HH / MM case – indicating that, all else equal, the risk of an LN portfolio driving up costs under an HH world are more than offset by the potential benefit of an LN portfolio reducing costs under an LN world. In this case the cushion is, at least in part, emanating from the LN scenario not incurring the cost to construct EGS.
- The range of potential outcomes is greater with a portfolio of LN bids (from -22.0% to +20.3%) vs. a portfolio of HH bids (from -13.5% to +12.5%) while the MM portfolio is closer to the range of HH bids than the LN bids. This indicates that the potential risk of an overly short portfolio (e.g. an LN / HH scenario) will incur high priced market purchases and likely to be also faced with a severe misalignment between the hydrocarbon-based portion of the portfolio vs. the market price of CO_2.

- Regardless of which price/policy world is anticipated, there is a consistent trend in the relationship of the bid selection, the price policy world, and the impact on the portfolio PVRR. This relationship can be read both horizontally and vertically in Figure 3-4 below.

Figure 3-4: Composite Comparison of Bid Selection / Price Policy Combinations



Reading horizontally:

- When a high price/policy world takes place, PVRR rises as bid selection move from LN to HH
- When a lower price/policy world takes place, PVRR declines as bid selection moves from LN to HH
- When the reference (MM) price/policy world takes place the impact from either a LN or HH bid selection has an immaterial impact on PVRR

Reading vertically:

- As the difference between the resulting price/policy increases from the bid selection scenario, the PVRR similarly increases across all relationships
- The magnitude of change remains proportional whether positively or negatively

3.2 Assessing Portfolio Value Over Time

One of the underlying concerns in any procurement, and specifically in as sizable of one as PAC's 2020RFP, is the risk of misalignment between when costs and benefits are paid and earned by current and future ratepayers. The optimal scenario is that the procurement results in the lowest cost reliable portfolio based upon the current outlook of market conditions and the long-term perspective on price/policy. In this result, the benefits ought to accrue to PAC's rate payers today as well as provide incremental reliability to ratepayers well into the future.

It is also important to consider the effect that transmission planning has on the differences in portfolio selection value. PAC is obligated to balance its "overall system" planning based on short term and the longer term when making transmission investments. This means PAC must be prudent in permitting, siting, and justifying new corridors, substation sites in conjunction with a portfolio selection.

Figure 3-5 below represents the annual revenue requirement expected in the reference case if the FSL portfolio is procured and compares it with the cost that would otherwise be incurred if no bids from the RFP process were selected but PAC still met its resource adequacy requirements through a combination of more expensive proxy resources, non-renewable resources, and a greater short position (Front Office Transactions). The dotted line shows the difference (avoided cost) as a percentage of the cost of the FSL case. While the avoided cost is greatest within the first three years of when the RFP resources are to be placed in service, the general trend downward is not unexpected.

Figure 3-5: Incremental Cost of Taking No RFP Bids vs. the FSL Bids[7]

[7] Cost defined as the difference in the revenue requirement between the two cases presented. Revenue requirement defined as the annual revenue requirement adjusted for fixed O&M costs and unadjusted for one-time adjustments of deficiency, operating reserve credit, and granularity adjustments which cannot be allocated across annual cashflow. Does not include real levelized fixed costs.

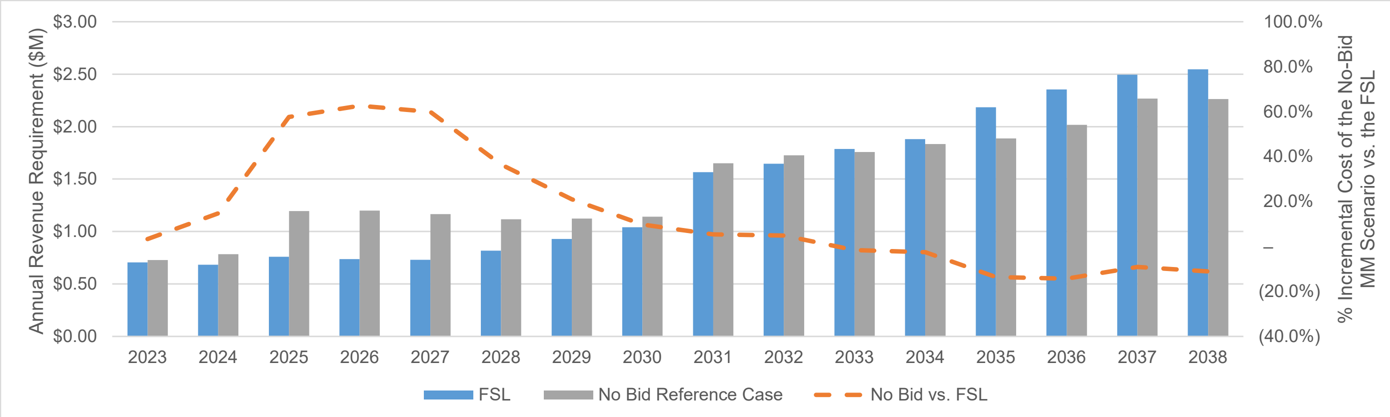
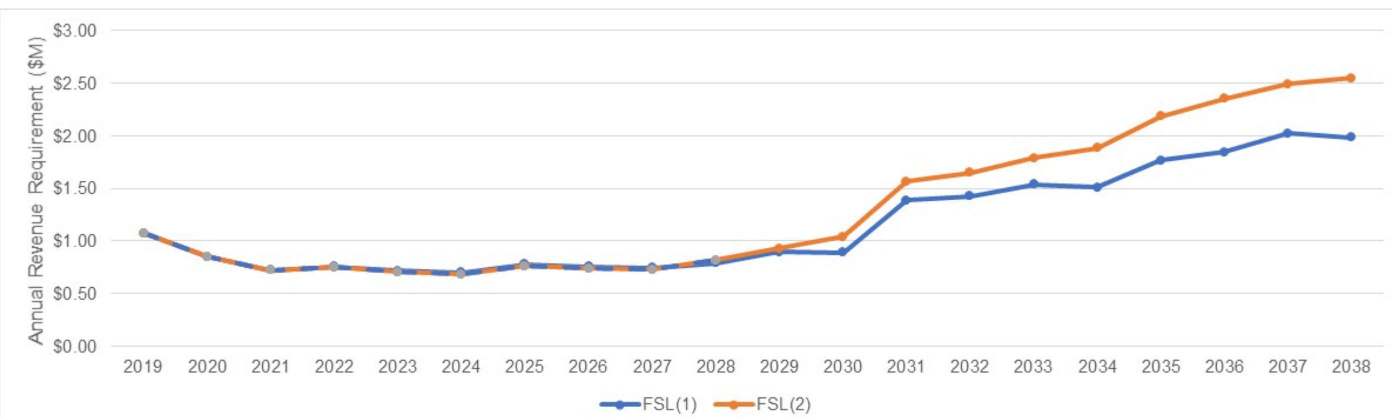


Figure 3-5 compared two very different portfolios; Figure 3-6 compares the FSL(1) portfolio against the same set of RFP bids but with proxy resources which were optimized for an LN price / policy environment (FSL(2)). Both scenarios incur the cost of EGS, however the FSL(2) portfolio entails a revenue requirement that is roughly $3.1B (nominal) the FSL(1). That is the operating or pass-through revenue requirement (excluding return on and of capital). While the shapes are similar the primary driver of this incremental cost takes place after 2033. Both portfolios are reliable, and the risk of incorrectly selecting the proxy resources to fit a price/policy scenario may be overstated since it can be mitigated by future procurements when those costs begin to appear.

Our ability to meaningfully address annual revenue requirements is limited because the workpapers provide only levelized capital costs for each portfolio, which are added to the annual sales value and fixed O&M to determine the net PVRR. We have already seen that FSL(2) performs better (has lower PVRR) than FSL(1). The capital revenue requirement of FSL(2) must be meaningfully lower than that of FSL(1) and in fact it is. That revenue requirement difference is driven by the higher costs of proxy resources in the FSL(1) portfolio. The different late-horizon portfolio choices drive the differences in Figure 3-6 and the higher capital costs of FSL(1) should start entering rate base about the time the curves in Figure 3-6 separate. The timing of capital revenue requirements could mitigate of even reverse the relationship between the curves of pass-through revenue requirements.

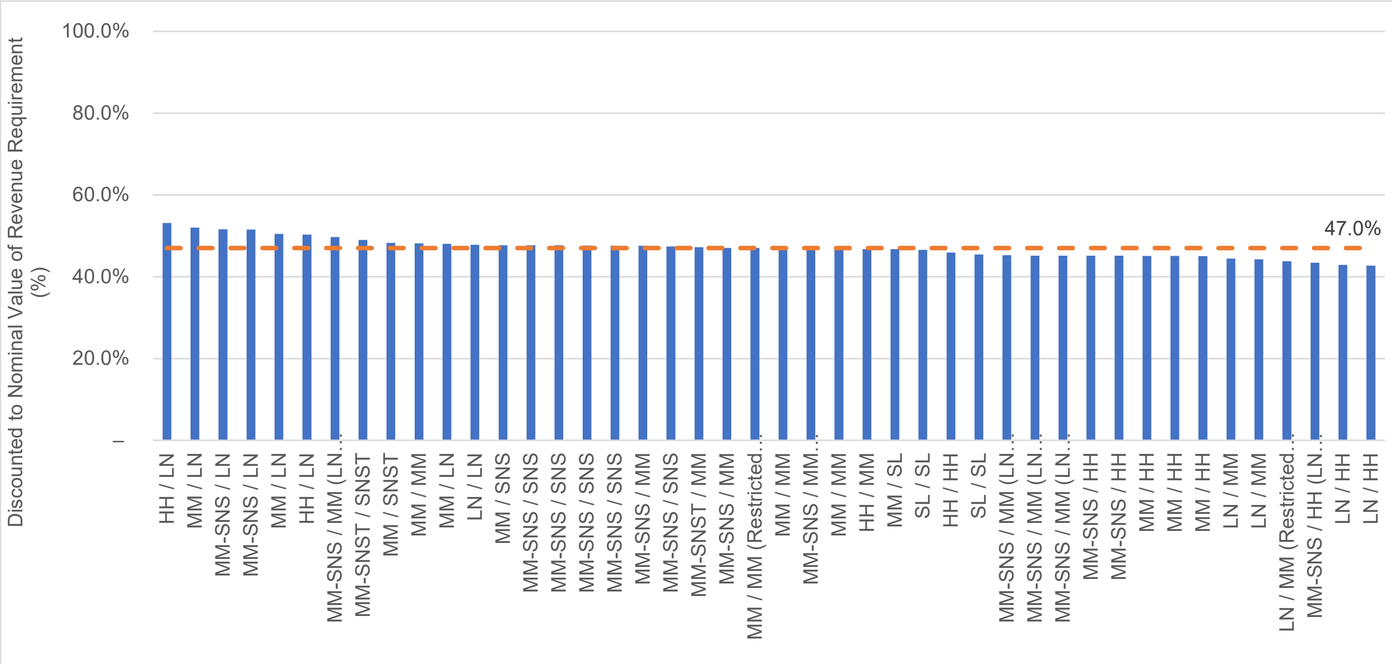
Figure 3-6: Incremental Cost of the FSL without LN Optimized Proxies



Similar to the matching principle related to managing the risk and tenor of debt products with project cashflows, it is important to aligning a resource portfolio's value over time with the timing of payments for it. One simple timing metric is the ratio of the discounted to undiscounted (or nominal) future cashflow. The result indicates how skewed a portfolio cashflow profile and its underlying real asset base is towards the first or last part of the projection period. Figure 3-7 below illustrates that the portfolios under a low gas and no carbon world are more heavily weighted towards the first half of the forecast while the opposite is generally true for portfolios encountering a high gas and high carbon world.

Perhaps the most meaningful observation is the fact that bid selection from the RFP has negligible impact on the outcome compared to the price/policy environment which dictates the value of such resources.

Figure 3-7: Effect of Scenario Selection on Revenue Requirement Timing[8]



3.3 Assessing the Risk of Off-System Sales

PAC's forecasted energy balance reflects off-system energy sales and purchases and indicates a surplus (sales exceeding purchases) until the summer of 2026, when a seasonal short energy position first appears without the addition of incremental resources to the portfolio[9]. Part of the value attributed to the incremental resources in the FSL comes from off-system sales; however, due to lower market prices, lower loads, higher WECC wide renewable additions, or other factors, the economic contribution of or even demand for these sales may be negligible or non-existent. Reliance on the margin contributed by sales can be a source of risk.

The costs of PAC's electricity supply are recovered from two sources: retail customers (the revenue requirement) and the wholesale market (off-system sales). To get an idea of the importance of sales, one can look at the fraction of the total revenue (NVP) that comes from sales. Figure 3-8 shows, for each of the portfolios that PAC examined, the revenue breakdown on the assumption that the realized price and policy scenario is the one for which the portfolio was designed. The first column (FSL(2) bids) shows the revised FSL portfolio – actually the SNS portfolio, which has RFP bids chosen based on the reference (MM) price-policy scenario but with no ability to sell off-system, filled in with proxy bids and demand response bids that would be appropriate if the LN price-policy scenario occurred. There are sales though, because it is assumed what is realized is the reference scenario *with* sales permitted. The next four columns show the revenue breakdowns expected for the four price-policy scenarios that allow sales, assuming the bid portfolio was chosen appropriately. The last column shows the revenue breakdown with no bids taken (i.e., assuming no 2020AS RFP) in the reference scenario.

[8] Calculated as the ratio of the discounted revenue requirement from 2019-2038 to the nominal (undiscounted) revenue requirement over the same period. Future cashflows discounted according to PAC's IRP models at 6.92%.
[9] Source: Page 5 of PAC's revised FSL presentation file July 20, 2021.

Figure 3-8: Retail/Wholesale Breakdown of Total Revenue Expected for Each Scenario

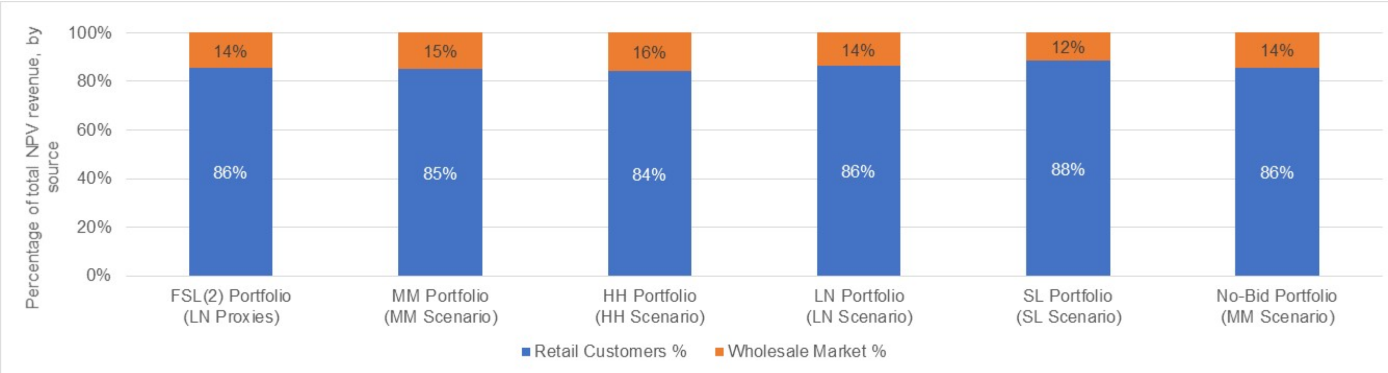


Figure 3-8 shows that the fraction of total revenues attributable to sales does not vary much across scenarios, with customer revenues representing 84% - 88% of the total. For example, in the reference scenario, if the FSL portfolio is chosen PAC expects a net present value of $4,018M in sales revenue (against a $23,735M customer revenue requirement), while if no bids were chosen in that scenario PAC would expect an NPV of $4,059M in sales revenue against a $24,345M customer revenue requirement.

To estimate the risk introduced by dependence on sales we can estimate how much the revenue requirement would have to increase if no sales could be made (the SNS scenario). This should not be as large as the sales revenue, since without sales the variable cost of the sold energy is not incurred, and the unit cost of meeting load may also go down if it allows a more efficient dispatch. Thus, we compare the NPV revenue with the MM bids in the reference case to the NPV revenue with the same bids if the "no sales" SNS case is realized. We can similarly compare the bids' NPV revenue in the reference case of the bids SO actually selected for that case (the MM portfolio) if the SNS case is realized. Note that costs of fuel and purchased power, and the carbon adder, are the same in the reference and SNS cases.

Table 3-1: Impact on Revenue Requirement if PAC Cannot Make Off-System Sales

Figures in $M	FSL / SNSLN bids	MM bids
PVRR - Sales permitted	$23,735	$23,968
PVRR - No Sales permitted	25,629*	25,985
Difference	1,895	2,018
Off System Sales (sales permitted)	4,018	4,209
Off System Sales (sales not permitted)	–	–
Difference	4,018	4,209

*There was no PAR run in the second analysis with the FSL(2) portfolio in the SNS price/policy scenario. The number is estimated base on sales revenue in the MM scenario and the percent margin on sales observed for the FSL portfolio in the first analysis.

According to Table 3-1, if PAC cannot make sales, the additional NPV cost to customers will be $1.9 billion (8.1%) if PAC takes the FSL portfolio, and $2.0 billion (8.4%) if it takes the MM portfolio. Using the FSL portfolio reduces the risk of sales by about $180 million, at a base-case cost of about $100 million.

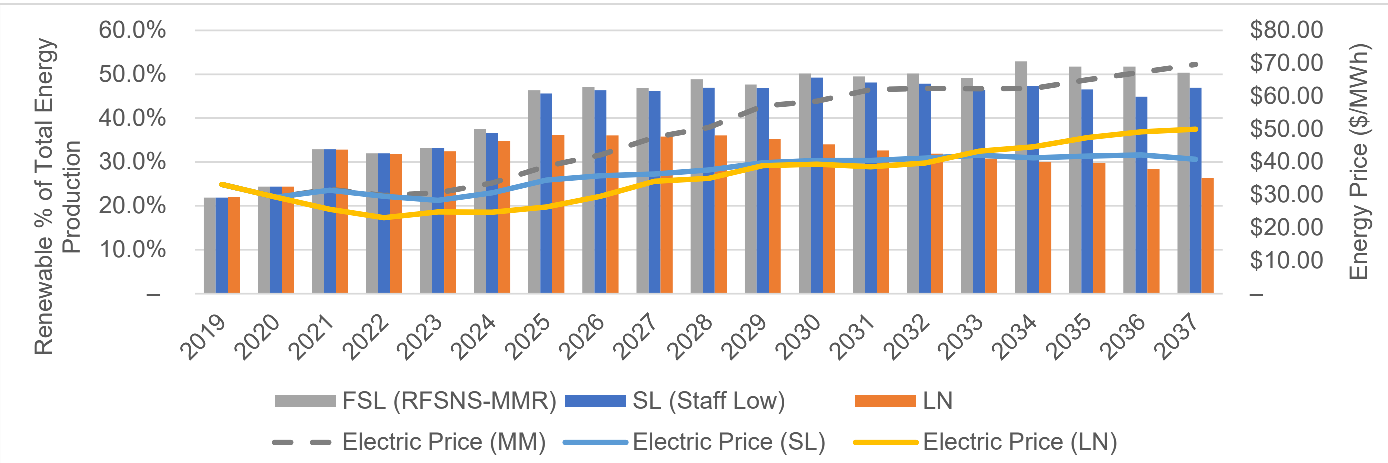
3.4 Assessing the Impact of a Low-Price Future on the FSL

High gas prices typically lead to higher electricity market prices, which would enable increased opportunities for surplus sales from PAC's thermal and renewable generation fleet. Higher sales revenue generates greater margins, which lead to reduced costs for PAC's customers. Conversely, low gas prices suppress wholesale electricity prices, reducing surplus sales revenue and increasing customer costs.

For the purpose of evaluating how much a low-price future could impact the bid value, the focus is twofold: first, on the comparison of the MM and SL price/policy scenarios with a goal of isolating the impact on the value of the bids selected under the RFP, and second, of the LN and SL price/policy scenarios to evaluate the role of decarbonization (carbon prices). Doing so is intended to highlight how much value generated by the RFP bids are dependent on gas price. In order to determine this value, the initial step is to isolate the value of the RFP bids under the MM and SL cases, which requires the comparison of the MM and SL results with and without RFP bid selections and then comparing the difference of these differences. However, all such necessary sensitivities were not developed and so a proxy for this approach assessed via the impact that low price scenarios have on renewable resources. Shown in Figure 3-9, this comparison of the FSL, SL (OPUC Staff's low market price sensitivity), and LN (PAC's low market price) renewable buildout and energy price outlook provides a view on the risk of a low (and persistently low) energy market future.

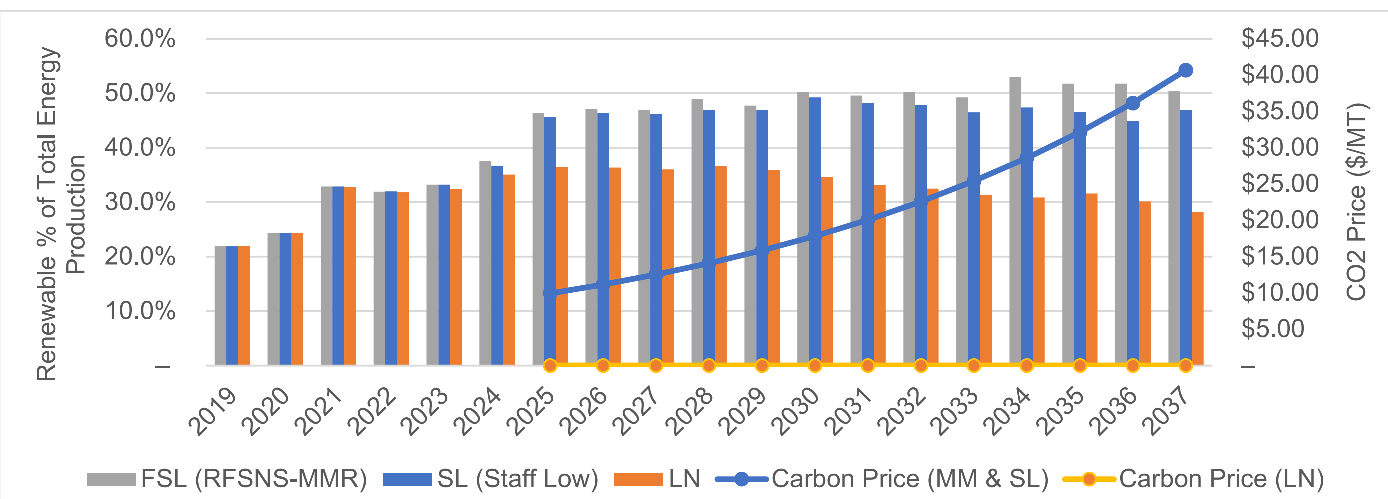
The SL electricity price is in line with the MM market price through 2022 before slightly diverging and then remaining relatively flat. In comparison, the LN case begins markedly lower than SL before increasing at a rate similar to the MM curve post 2032. Given that the SL case provides more attractive energy market prices during the period in which RFP and other new renewables are selected to supplant thermal resources, the SL portfolio is within 5% of the MM portfolio's total renewable resource base. Conversely, the LN case, without EGS available, lags behind significantly and in fact declines further with little additional renewables making economic value beyond the RFP bid selections.

Figure 3-9: Comparison of Renewable Production and Electricity Price Outlooks



While higher electricity prices make renewables generally more attractive compared to thermal resources, the magnitude of that impact is small relative to the effect that regulation has via a carbon price. As evident in Figure 3-10 below, the carbon price has a material impact on the evolution of the portfolio over time. While the MM case provides for electricity prices more than 50% higher than the SL case, the difference the grey and blue columns above is less than 10%. However, the difference between the SL case and the LN case (with the difference being that the LN case reflects a no-carbon price policy), is much more dramatic, with the LN portfolio peaking at ~36% renewable energy before declining to only 26% while the SL case remains relatively stable around 47%.

Figure 3-10: Comparison of Renewable Production and Carbon Price Outlooks[10]



[10] Note that the LN carbon price is $0.

The climate risk of a resource portfolio can be measured by its project carbon intensity, that is, CO_2 emission per MWh of energy production. Table 3-2 illustrates how the carbon intensity of the portfolio depends on both the carbon tax or policy expected when resources are acquired, and the tax or policy in effect during operation. It is based on the carbon intensity projected for 2025, when the RFP resources have become operational, but the effects of later proxies are not yet felt (averaged over all sensitivity cases except those restricted from selected any bids). It shows that the anticipated carbon price has a much more significant effect on carbon intensity than the realized price – the resource plan is much more important than the operating strategy. That is the result one would expect, since the effect of an anticipated carbon price is to motivate acquisition of non-emitting resources which have low variable cost irrespective of the realized carbon price.

Table 3-2: Carbon intensity of the PacifiCorp portfolio in 2025 (tons/MWh)

	Realized Carbon Price		
Anticipated Carbon Price	**None**	**Medium**	**High**
None	0.52	0.54	0.51
Mid-range	0.45	0.46	0.44
High	0.43	0.45	0.42

3.5 Assessing Impact of PTC/ITC Eligibility Extension

One of the eligibility requirements of this RFP process was that a project be able to achieve a December 31, 2024 commercial operation date for the purpose of securing federal ITC and PTC tax credits. Throughout the RFP process, analysis was conducted to evaluate how contracted vs. owned resources differed in value, and consequently, how much of an impact tax credits had on the bid scoring process.

In December 2020, Congress passed extensions of the PTC and ITC as part of the broader stimulus legislation (Consolidated Appropriations Act of 2021). Through 2021, there has been increasing bipartisan support for the tax credit extensions as part of broader legislative packages (as was observed in the most recent stimulus package). As such, it is reasonably likely that these tax credits will be extended again. This was the purpose for evaluating how much impact an assumption that the ITC and PTC are extended through 2030 has on the portfolio.

To evaluate the impact of a longer ITC/PTC eligibility, we need to compare portfolios which can isolate the impact of that eligibility. Under the SNS/MM case and SNST/MM case, the same RFP bids are selected. Therefore, this effectively becomes a comparison of the extensions impact on the selection of proxy resources with the expectation that, all else equal, a longer PTC sunset will allow for lower cost and a greater selection of wind resources. Also, extending eligibility for ITC will bring in a greater share of renewables and therefore less opportunity for sales. However, this only becomes evident post-2025 as renewables developed earlier would already have been eligible for the credit. Up to 2025, the demand for sales may be greater and decline thereafter once eligibility sunsets. As seen in Table 3-3 below, while this appears to be correct, by and large, since proxy resources do not come into place until after 2025, the impact that the extension has on proxy resource selection and value is modest. In effect, the tax credit eligibility extension benefits ratepayers by reducing costs by ~2.7% and increases the amount of renewable production over the forecast horizon. Due to the nature of this variable, evaluating it at this stage of the RFP does not provide significant insight, at least not without a scenario reflecting no RFP bids being selected and a SNST price / policy world.

Table 3-3: Comparison of Portfolio Profile with Assumed Tax Credit Extension

	SNS Case	SNST Case	Delta (%)
Price / Policy	MM	MM with ITC/PTC Extension	N/A
PVRR ($M)[11]	$25,987	$25,296	(2.7%)

[11] PVRR figures unadjusted for deficiency, granularity, and reserve adjustments.

	SNS Case	SNST Case	Delta (%)
Total Renewable Energy GWh (2019-2038)	512,242	521,407	1.8%

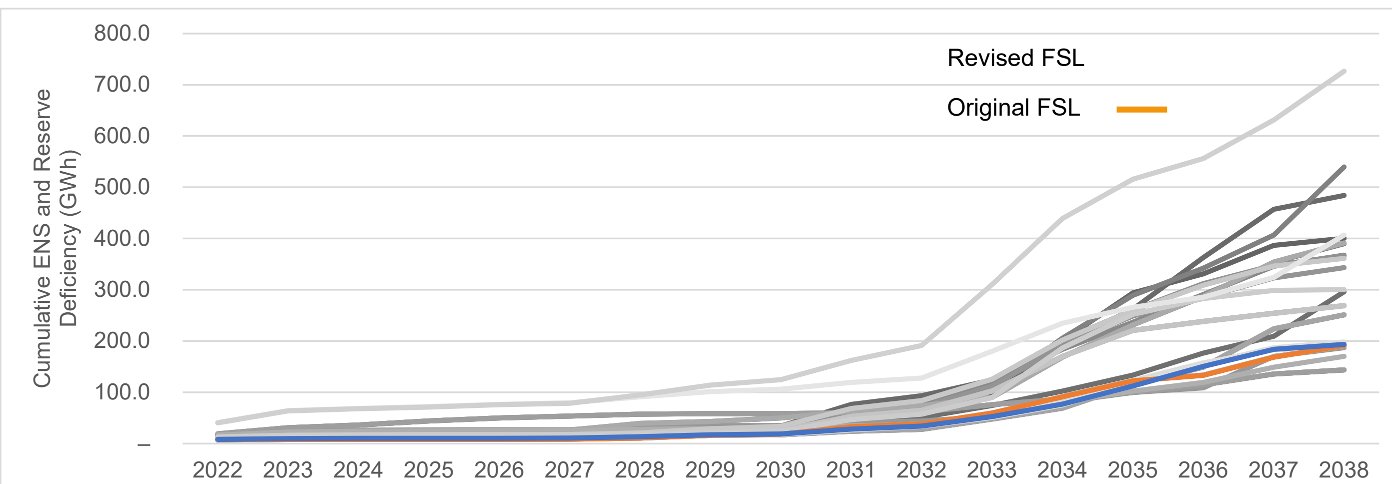
3.6 Assessing Reliability and Climate Risk

As all resulting portfolios are from PAC's IRP modeling process, the FSL selection of SNS-MM bids results in a portfolio which is reliable based on capacity metrics, but may still leave some load unserved if multiple units experience outages in peak periods. Reserve requirements may not be met even if load is. This reliability metric is represented as the composite of Energy Not Served (ENS) and reserve deficiency. Figure 3-11 shows the cumulative ENS and deficiency for each case over time Two factors can be considered: the rank of each portfolio in terms of total ENS (with reserve deficiency accounting for a minimal amount of the total) and the slope of each portfolios trend.

Two observations may be made from this view of the data:

1. Most portfolios are generally equivalent in terms of ENS and therefore the cost of ENS for the 2022-2032 period. However thereafter, the portfolios diverge substantially as certain price/policy scenarios result in the addition of thermal resources or more variable, non-dispatchable generation. The slope of the FSL accelerates in the 2033-2037 period, likely coincidental with the retirement of Huntington, Hermiston, and Gadsby. However, the selection of the FSL and the chance of incurring substantial costs and realizing such levels of ENS seems to be a low risk under the reasonable expectation that PAC will conduct further procurements for resources to come online pre-2030.
2. Not all capacity resources provide the same value. Wind and solar may provide little load carrying capability relative to their nameplate capacity. However, in addition to those resources, demand response, energy efficiency, battery storage, and hydro also have very different load carrying capability as well as economic capacity value, and their respective value should be taken into account when considering the risk and economic and social cost of unserved load. Because all resources earn the same price under forward capacity market constructs, the total costs to ratepayers to maintain a reserve margin that is above the energy only market economic target will always be higher, however, there is some risk benefit seen by customers due to the reduction of high cost outcomes (e.g., dispatch of high cost resources and scarcity pricing events).

Figure 3-11: Comparison of the FSL ENS and Deficiency vs. Alternative Portfolios



Intermittent resources have a fundamentally different resource adequacy profile from conventional resources, and this difference represents potential risks for ratepayers, both in terms of impact on reliability and the cost of unserved load.

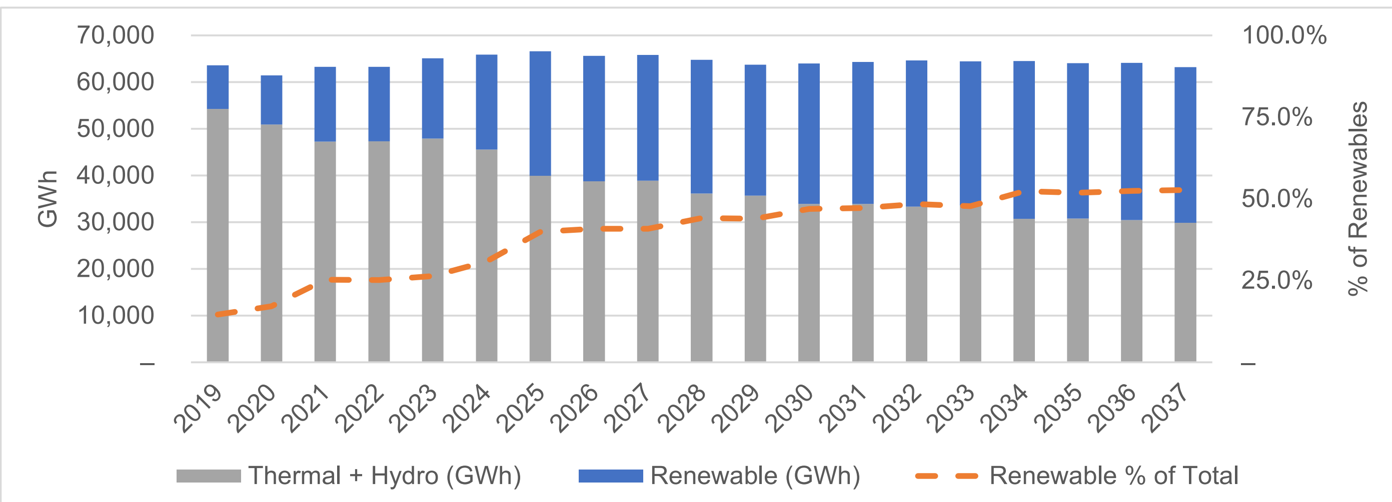
Fuel supply, transmission congestion, and shared facilities may cause thermal units in the same region to be unavailable simultaneously, but typically mechanical outages are independent. Intermittent resources such as wind and solar, however, are dependent on weather conditions which in turn are highly correlated across broad geographic areas such as Wyoming and Utah.

For example, the addition of a wind fleet with 1,000 MW capacity (nameplate) in a 50,000 MW system does not create significant reliability risk. At a higher penetration of 10,000 MW (nameplate) in a 50,000 MW system, the loss of wind resources will be a more significant issue. Because of wind's intermittency and regional correlation, the capacity value or effective load carrying capability (ELCC) of wind is already much lower than its nameplate capacity. Generally, at low penetration, the ELCC of wind should be close to the average output during peak conditions. If peak load occurs in the summer between 2:00 and 4:00 PM, a rough approximation of wind's ELCC would be the average output during these hours. At a low penetration of 1,000 MW of nameplate wind, a wind fleet ELCC of 180 MW is not likely a reliability risk. However, as the wind fleet (or other non-dispatchable, correlated, low capacity factor collection of resources) increases in size compared to the total portfolio, having an output much smaller than the average output during peak conditions has a much larger impact on the system because it would correlate to losing 1,800 MW (for example from 10,000 MW resource) of capacity - a much more significant event.

As illustrated in Figure 3-12, which portrays PAC's energy mix over time, it is easier to put this reliability risk in context: While the result of this RFP and the coinciding thermal retirements cause renewable resources to surpass 40% of total production by 2025, total energy production remains relatively constant and grows modestly 2027 onward. Oregon bill HB 2021 which requires utilities serving the state to achieve 80% and 90% reductions by 2030 and 2035, respectively, as measured against a 2010-2012 baseline of average emissions from electricity sold to retail customers. This law also prohibits the siting of new gas-fired resources. While the law categorises hydro as a renewable resource, for the purpose of this report, it is grouped with thermal due to comparable operational and system balancing attributes as we consider broader reliability risks. If hydro is categorized as a renewable resource, PAC's total renewable production achieves 50% in 2032 as opposed to 2034 illustrated below. This raises a couple questions:

1. In order to achieve compliance with HB 2021, additional renewables are likely required before 2030. How will this affect the risk and value profile of the FSL in a future system which is substantially more intermittent?
2. What will the system look like as the transition accelerates both on PAC's system and within the broader western geographic region?

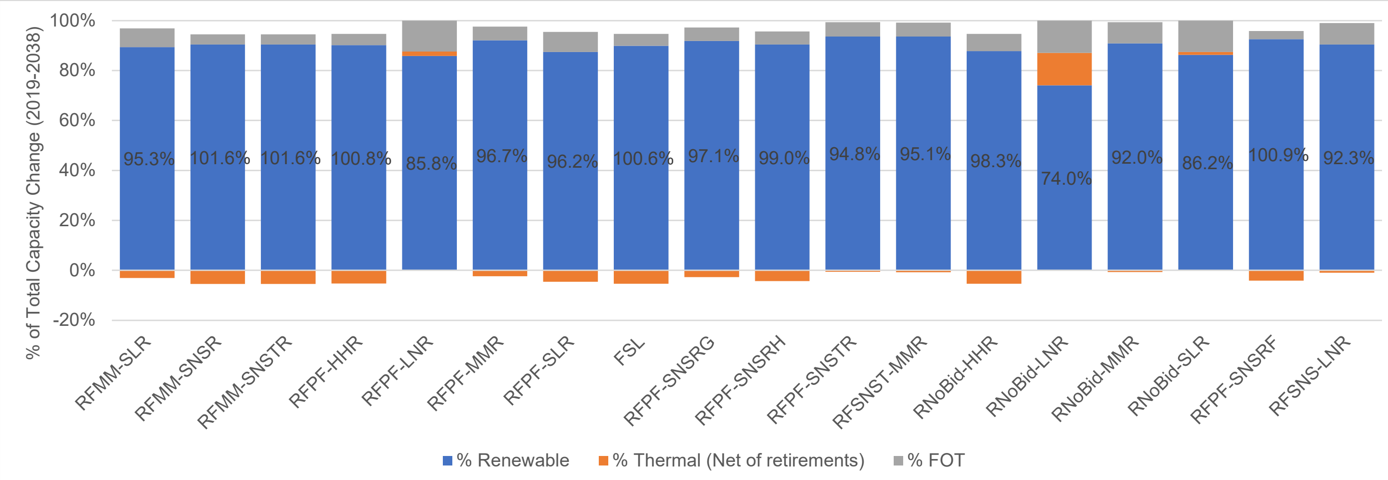
Figure 3-12: Forecast Energy Mix with the FSL Portfolio[12]



[12] Does not reflect market transactions, storage, or demand side management / energy efficiency resources.

Figure **3-13** provides a comparison across portfolio and price/policy scenarios of the type of resources which are selected over the 2019-2038 forecast period. This indicates that even in price/policy scenarios which may be more favorable to thermal resources, nearly all portfolios except for the sensitivities where no RFP bids are selected result in at least 92% of new capacity from renewable resources and the retirement of thermal.

Figure 3-13: Benchmarking Capacity Changes by Resource Type and Scenario (20 year total)



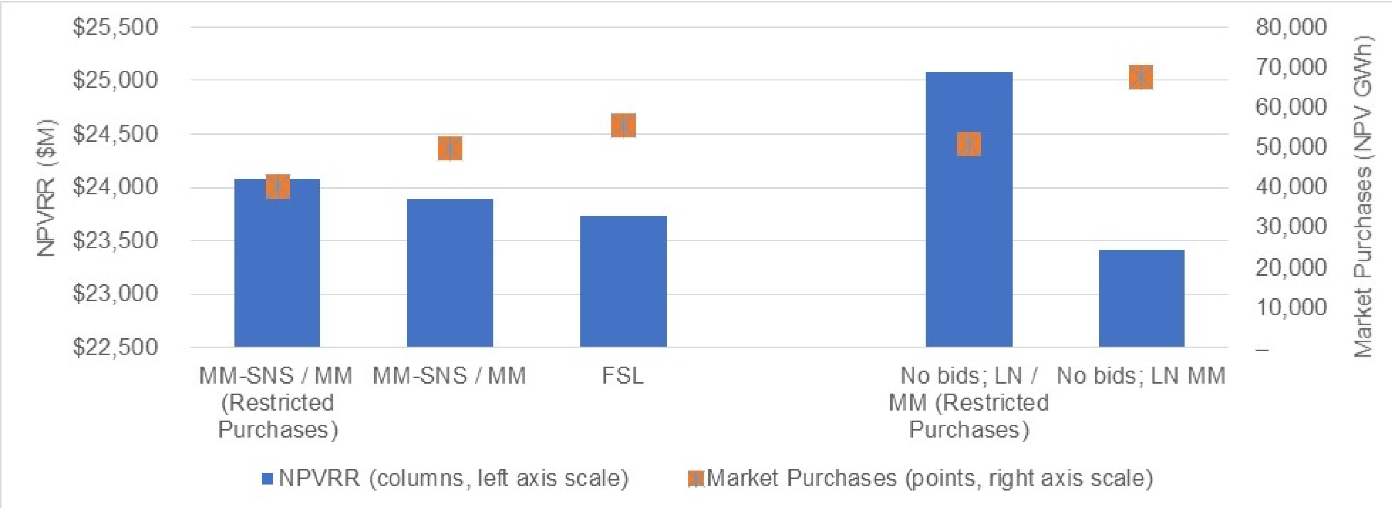
It is notable that there is only one scenario in which the bids are selected (RFPF-LNR) which does not also entail a net reduction in thermal capacity, and that is the one in which EGS is not selected. This particular case sees a ~1.7% increase of thermal capacity and over 12% of capacity coming via FOT's. From an environmental and market volatility perspective, such a scenario represents a potentially negative outcome, however this case also does not require the EGS transmission line to the be constructed. This combination may be viewed as a net negative or positive to ratepayers depending on the timeframe of when value is accrued (e.g., will the thermal resources be upgraded, and can PAC's transmission system avoid congestion issues or are both simply being delay until the next procurement cycle).

3.7 Assessing the Risk of Market Exposure

As part of PAC's revision of the FSL and the re-running of the bid models and IRP models, PAC also developed additional scenarios which lowered the IRP limits on market purchases. The purpose of these scenarios was to assess the reliance that portfolios may have upon market transactions to meet system adequacy requirements, but the purchase restrictions appear to have applied to spot energy purchases as well as market capacity purchases (FOTs). By reducing the limits, the SO model is required to select resources and proxies with less flexibility to make up any reserve margin shortfall through the market. The result of this analysis is to address a concern that the western electrical region of the US is becoming tighter and the concern that increasing levels of non-dispatchable capacity will further exacerbate the challenge of addressing reliability needs via the market.

The approximation of risk associated with market exposure and the ability to procure sufficient purchases can be illustrated by comparing scenarios with and without lower purchase limits. As shown below, between the MMSNS / MM case with restricted purchases and the equivalent without, the difference in PVRR is roughly $190M, or roughly 1% of the portfolio cost. However, the scenario without the lower limitation results in the purchasing of ~9,600GWh of market energy. This same trend, albeit more extreme, is illustrated under scenarios where no RFP bid are selected. The risk to ratepayers in turn is that either the cost of the 9,600GWh is roughly equivalent to 200MW of renewable capacity (30% capacity factor, 8760 hours / year, 18 years forecasted) and costs more than $190M to procure. Both of these figures in nominal terms appear reasonable, indicating that the risk to mitigate is related to market depth than it is economic trade-offs within the static PaR models.

Figure 3-14: Comparison of Value and Energy Purchases of Restricted Portfolios



4 Recommendations

1. PA did not find a clear statement of the need to be addressed by this RFO. Although the RFO addresses the maintenance of reliability, the specific constraints based on the portfolio were not articulated (e.g., there is clearly a reserve margin requirement enforced through most of the 2020s, but perhaps not in the 2030s). This mad the assessment of reliability risk in 3.6 more difficult; it may have been more appropriate to focus on a specific part of forecast horizon. The clearer the statement of need, the easier it will be to design tests and sensitivity cases around it.
2. In this RFP attention was directed to the risk of being unable to make sales into a thin market. There is a similar risk associated with being unable to purchase needed power and capacity. PacifiCorp did identify this late in the process and ran some sensitivities around purchase restrictions, but PA has not seen a formal definition of them. FOTs were described as representing an open capacity purchases and it would help to better understand the ability of PacifiCorp to purchase capacity products as well as the ability of both capacity and spot energy products to address the reliability need represented by an open position.
3. The Commission was also interested in the pattern of annual revenue requirements associated with a portfolio. The capital recovery (return and depreciation) revenue requirement trajectory should reflect capital additions. The basic information supplied to us included a levelized revenue requirement (which front-loads recovery of later charges) and several “adjustments”. More detail on revenue requirement timing and on the adjustments would be useful.
4. In retrospect the scenario evaluating the impact of tax credit eligibility extension may have been too limited. Improving the economics of later-arriving renewable resources did not change the bid choices and we did not feel we had enough information to determine whether that was because it was in the context of a “no-sales” portfolio or because the value of delay wasn’t great enough.
5. In the development of the revised FSL, PacifiCorp effectively employed a two-stage portfolio optimization, selecting bids based on an MM scenario and then proxy resources based on a different scenario. This is an interesting way to represent “recourse decisions” and should be used more in analyzing how plans must be structured to address unforeseen events.
6. The complexity of and the amount of data underlying this sensitivity analysis has required all parties involved to spend significant time and effort to interpret, analyze, and develop conclusions. During the FSL analysis PA did not have much contact with PacifiCorp’s analysts or analysis and then receive a sizable “data dump”. Regular contact during the analysis would help prepare the IE to review the shortlist, and even more so the sensitivity runs. By comparison, we received very little in the way of background data or “workpaper” file from the ISL analysis. If there is a future RFP with a similar initial evaluation (like that of the ISL), it would be useful if PacifiCorp shared more of the model outputs with the IE to explain its use of the models, before the FSL evaluation.
7. The RFP bids were evaluated over a 20-year horizon. Much of the difference between the value of different portfolios came from assume procurement or development of “proxies” later in the horizon. The cost and characteristics of these proxies is very uncertain. They have to be included in the portfolio to ensure that load can be reliably served through an orderly acquisition process, but the value of those proxies may have too much influence on the selection of near-term options (RFP bids). It is worth exploring ways to put greater evaluation weight on portfolio value earlier in the projection horizon or in certain key years.
8. The Commission is interested in “risk sharing”. Some of the risks involved in procurement cannot be controlled by the utility directly, such as market depth or prices. But the utility can influence how it insures against risks through controlling its open position, enforcing, and collecting on contractual penalties for delay or under-delivery, etc., which can be targets for performance-based ratemaking (PBR). The construction of EGS is a major investment for ratepayers so the completion and operational performance of Wyoming resources may be a target for PBR.

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