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May 29, 2020

VIA HAND DELIVERY

Public Utility Commission of Oregon
Filing Center
P.O. Box 1088
201 High Street SE, Suite 100
Salem, Oregon 97301

Re: Docket No. LC 74 - 2019 Integrated Resource Plan ("IRP")
Amended 2019 Integrated Resource Plan – Replacement Pages

Attention Filing Center:

The Company is writing to provide notice that a correction to certain cost information contained in the Company's Amended 2019 IRP ("IRP") filed January 31, 2020 is necessary to properly reflect the final present value resource portfolio costs presented in the plan. The need for this change was discovered while preparing information for a discovery request in a separate docket, and is related to costs associated with the Jim Bridger Power Plant ("Bridger"). While reviewing the modeling output, the Company determined that certain Bridger-related costs were inadvertently excluded from portfolios in which a Bridger unit was exited prior to the existing shutdown date of 2034.

After correcting this issue within all impacted portfolios and performing a page-by-page review of the IRP, the Company has determined that a total of seven pages require replacement. However, it is important to note that the Company's Preferred Portfolio is still identified as least-cost and least-risk, and the conclusions drawn from the analysis have not changed.

The remainder of this letter details the discovery of the omission, the impact of the correction, and the final conclusions to be drawn from the updated figures. The Company has also provided two attachments containing the corrected pages for the IRP, in both

legislative and clean format. The Company is also providing workpapers that detail the adjustments made to each of the total portfolio amounts.

I. Background

In Case No. IPC-E-19-18, Idaho Public Utilities Commission ("Commission") Staff ("Staff") requested that the Company provide a detailed annual breakdown of costs included in the Company's resource modeling associated with the Bridger plant. When the Company was preparing this information, it was determined that the final reported portfolio costs within the IRP inadvertently truncated the recovery of existing capital investment for portfolios in which a Bridger unit was retired early.[1]

To arrive at total portfolio costs within the IRP, two general steps are performed in sequence: 1) resource portfolios are developed, then 2) net power supply expenses ("NPSE") are calculated for each of the constructed portfolios to determine total portfolio costs.

In the first step, portfolios are constructed through a combination of the AURORA model's Long-Term Capacity Expansion ("LTCE") functionality and subsequent manual refinements. Due to computing bandwidth and model capabilities, this step is performed by analyzing one week per month per year for 20 years within the LTCE model. Then, as further discussed in Chapter 9 of the IRP, starting from the LTCE portfolios, manual refinements are applied to determine if portfolios can be further optimized for Idaho Power's service area. As discussed further below, this step properly modeled Bridger end-of-life costs.

In the second step, once the portfolios are constructed, more granular hourly interval modeling is performed to determine the NPSE associated with each of the portfolio buildouts. Because this second step is not making resource decisions while simultaneously calculating portfolio costs, the computing requirements are less substantial, thus allowing the Company to utilize a more granular 8,760-hours-per-year approach.

The truncation of costs occurred in the second step and resulted from the way AURORA accounts for fixed costs in the modeling process, and how these costs are ultimately reflected in the modeling output. Under the standard modeling logic used by AURORA, fixed costs must be input in the model as annual amounts. Therefore, costs associated with existing capital investment at the various Bridger units were required to be converted to annual recovery amounts between 2019 and the current Bridger end-of-life date of year-end 2034. To account for the accelerated recovery of existing investments in the event of a unit shutting down prior to 2034, an additional input was

[1] Within the context of this letter, the reference to an "early" Bridger unit retirement means any unit that is retired prior to the existing shutdown date of 2034.

required that represents the net book value ("NBV") of existing capital at the end of each year in the modeling period. The inclusion of the NBV input is necessary to ensure that the final present value portfolio costs reflect all associated non-avoidable costs when determining whether or not a unit should be shut down early.[2]

The NBV of certain retired Bridger units was inappropriately excluded from the total portfolio costs reported in the IRP thereby understating the total portfolio costs. In the event that a unit was shut down early, the costing model simply zeroed out the annual cost associated with that unit for each year after the shutdown date, without taking into account the NBV of existing capital at that time, even though cost recovery would still be required for the uncollected portion of existing capital. In other words, the annual cost recovery stream for existing capital was *truncated* rather than *accelerated.* This resulted in these costs being excluded from portfolios that contained early Bridger unit retirements. In examining the output of the AURORA costing model through the aforementioned discovery process, the Company determined that the truncated fixed costs should have been added back to the modeling output after-the-fact to reflect all costs associated with these portfolios.

It is important to note that the truncation of costs existed in the second step in the process when the Company was performing the more granular NPSE runs to determine total portfolio costs. This omission did not impact the optimization of resource portfolios determined by the LTCE modeling nor the resource decisions made in the subsequent manual portfolio development process.

II. **Corrected Results**

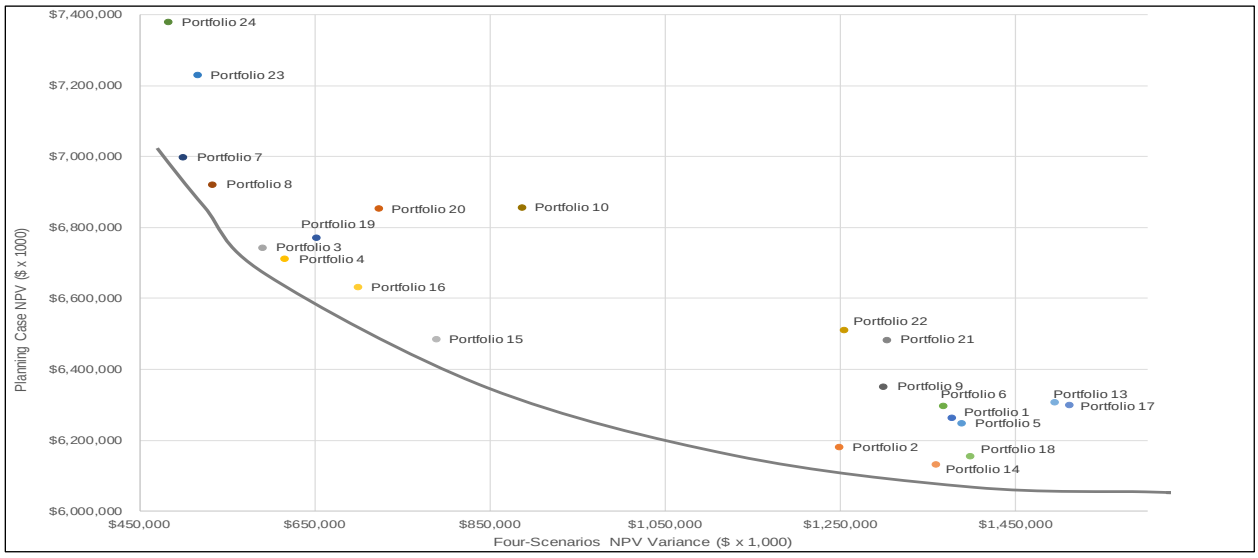
As mentioned previously, Idaho Power's correction of the cost omission impacts seven pages of the IRP that included or were based on total portfolio costs. Upon recognition of the omission, the Company performed a thorough review of the revised results to determine components of the IRP impacted by the correction. The intent of this review was to determine whether any of the conclusions or decisions from the IRP required revision. As discussed further in this section, the Company has determined the corrected analysis does not impact the final conclusions contained in the IRP. To make this determination, the Company revisited the three primary steps in the decision-making process that were based on total portfolio cost: 1) portfolios selected for manual optimization, 2) selection of the Preferred Portfolio, and 3) development of the near-term action plan.

[2] This methodology reflects the standard regulatory cost recovery approach of recovering the costs of an asset over its useful life. As discussed with the IRP Advisory Council, the Company believes this modeling approach is appropriate given the lack of an existing alternative cost recovery mechanism.

1. Portfolios selected for Manual Optimization

The selection of portfolios for further manual optimization was based in part on the information provided in Figure 9.1 of the IRP, which contains two axes: one reflecting total portfolio cost, and the other reflecting risk variance as determined by the standard deviation of each portfolio modeled under four different futures. The original chart is provided below:

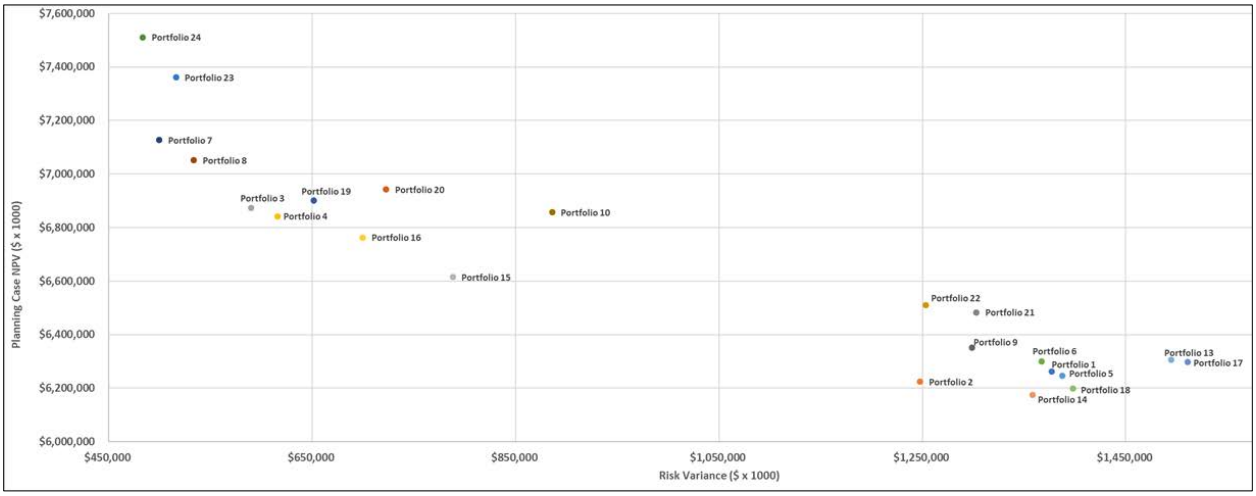
Figure 9.1 – Amended 2019 IRP



As described in more detail on pages 108 and 109 of the IRP, the Company selected portfolios 2, 4, 14, and 16 for further evaluation given their relative performance from both a total cost and risk perspective.

Because Figure 9.1 is based on total portfolio cost and variance, it was impacted by the corrected data. Therefore, the Company developed the corrected chart, as provided below:

Corrected Figure 9.1



The above information demonstrates that the selection of the preferred portfolio would have been the same had the corrected information been known at the time the IRP was developed. As shown on this chart, Portfolios 2, 4, 14, and 16 still perform well with regard to both total cost and risk relative to other portfolios. While the correction caused some movement in the data points plotted within this figure, the Company's initial conclusions remain valid.

2. Selection of the Preferred Portfolio

Following the selection of Portfolios 2, 4, 14, and 16, the Company performed the manual optimization process that was primarily based on preserving the 15-percent planning margin while modifying the exit dates for the various Bridger units. Because total portfolio costs were an *output* of this step rather than an *input*, the modeling decisions made in this step were not impacted by the new data. However, once the manual adjustments were complete, the final portfolios were compared utilizing total cost as a key metric, thus having the potential to impact the Company's selection of its Preferred Portfolio. Ultimately, as discussed further below, the Company determined that the same Preferred Portfolio identified in the IRP remains the least-cost, least-risk option once all costs are appropriately considered.

The table below contains a summary of total net present value portfolio costs utilizing the corrected data, as compared to the original amounts contained in the IRP. While this table contains summary data under the Planning Gas-Planning Carbon scenario, the full corrected table under each of the modeled scenarios (Planning Gas-Panning Carbon, High Gas-Planning Carbon, Planning Gas-High Carbon, and High Gas-High Carbon) is provided in the attached replacement pages.

Total Portfolio Cost Comparison
Ranked by Total Cost
Corrected vs. Amended IRP
Planning Gas-Planning Carbon
($000's)

Corrected		Amended IRP	
P16-4	$6,127,043	P16-4	$5,996,478
P16-2	$6,128,474	P14-4	$6,012,329
P14-3	$6,132,463	P14-5	$6,026,339
P16-1	$6,139,322	P16-2	$6,033,966
P16-3	$6,140,885	P14-6	$6,040,012
P14-4	$6,142,894	P14-2	$6,050,117
P14-2	$6,144,625	P14-3	$6,068,301
P14-1	$6,148,128	P16-1	$6,069,778
P14-5	$6,150,717	P16-3	$6,076,723
P14-6	$6,158,834	P14-1	$6,078,583
P2-3	$6,207,994	P2-4	$6,103,118
P2-1	$6,214,646	P2-5	$6,117,622
P2-2	$6,224,380	P2-6	$6,129,786
P2-4	$6,233,683	P2-2	$6,129,872
P4-3	$6,234,937	P2-3	$6,143,832
P2-5	$6,241,999	P2-1	$6,145,102
P2-6	$6,248,609	P4-4	$6,151,167
P4-1	$6,252,296	P4-2	$6,160,188
P4-2	$6,254,696	P4-3	$6,170,775
P4-4	$6,281,731	P4-1	$6,182,752

The column titled "Corrected" contains the corrected total portfolio costs ranked by relative performance, while the column titled "Amended IRP" contains total portfolio costs as included in the 2019 Amended IRP. While the "Amended IRP" values contain the aforementioned omission and should not be compared to the absolute costs contained in the "Corrected" column, the Company is providing this side-by-side comparison to support the following discussion of why the corrected information does not result in a modification of the Preferred Portfolio.

For a number of reasons, the Company determined that it still would have selected Portfolio 16(4) as the Preferred Portfolio had the corrected total portfolio costs been known at the time the Amended IRP was prepared. First, Portfolio 16(4) remains the least-cost portfolio under planning assumptions. The margin between this portfolio and the next-best option is smaller: in the 2019 Amended IRP, Portfolio 16(4) outperformed Portfolio 14(4) by approximately $16 million, while in the corrected results, Portfolio 16(4)

outperformed the next-best performing portfolio (P16(2)) by $1.4 million. While this gap is relatively narrow, the only differences between the corrected 16(4) and 16(2) are related to the retirement timing of the final Bridger unit in the 2030's. Examining the next-best option not based on Portfolio 16 (i.e. Portfolio 14(3)), the cost gap widens to $5.4 million. Similarly, the primary differences between Portfolio 14(3) and the Preferred Portfolio are also related to Bridger unit retirement decisions beyond 2030. While the cost margins are relatively less under the corrected results, Portfolio 16(4) is still the least cost option, and other high-performing options presented no compelling reason to consider a shift in the preferred choice.

The Company also examined the significance of the corrected information with regard to the Boardman-to-Hemingway transmission line ("B2H"), and determined that the corrected results still support the selection of the Preferred Portfolio. To support this conclusion, the Company considered the cost differences between the lowest cost portfolios with and without B2H. In the 2019 Amended IRP, the difference between the Preferred Portfolio and the best-performing non-B2H portfolio was $106.6 million, while after the correction this gap narrowed to $81 million; these results still support the selection of Portfolio 16(4) as the preferred option for Idaho Power and its customers.

3. Evaluation of the Near-Term Action Plan (2019-2026)

After performing the step-by-step review detailed above, the Company determined that the Near-Term Action Plan for the time period 2019-2026 is not impacted by the corrected information. While the margins between the top-performing portfolios narrowed relative to what was included in the IRP filing, Portfolio 16(4) was still the top performer, with the next best option being identical within the action plan window. Aside from Bridger unit exit dates, another key component of the action plan is the construction of the B2H transmission line, which is supported by a margin of over $80 million over the best performing non-B2H option.

III. Conclusion

The Company strives to produce accurate and reliable planning results and regrets any impact that this required correction may have on the IRP review process. Idaho Power would however like to emphasize that this correction is solely related to the total portfolio costs presented on the seven pages included in the attachments, while all other components – including the LTCE modeling and manual portfolio construction, as well as associated inputs – remain valid. The conclusions drawn by the Company as discussed in the 2019 Amended IRP have not changed, as the Company still believes that Portfolio 16(4) is the least-cost, least-risk option to reliably serve Idaho Power's customers into the future.

Please contact me at (503) 595-3925 if you have any questions.

Very truly yours,

Lisa Rackner

LFR:wlm

Docket LC 74

2019 Amended IRP - Replacement Pages - Legislative

Table 9.2 AURORA hourly simulations

	Planning Carbon	High Carbon
Planning Gas	X	X
High Gas	X	X

The purpose of the AURORA hourly simulations is to compare how portfolios perform under scenarios different from the scenario assumed in their design. For example, a portfolio designed under Planning Gas and Planning Carbon should perform better relative to other portfolios under a Planning Gas and Planning Carbon scenario than under a High Gas and High Carbon scenario. The compiled results from the four hourly simulations are shown in Table 9.3.

Table 9.3 2019 IRP WECC-optimized portfolios, NPV years 2019–2038 ($ x 1,000)

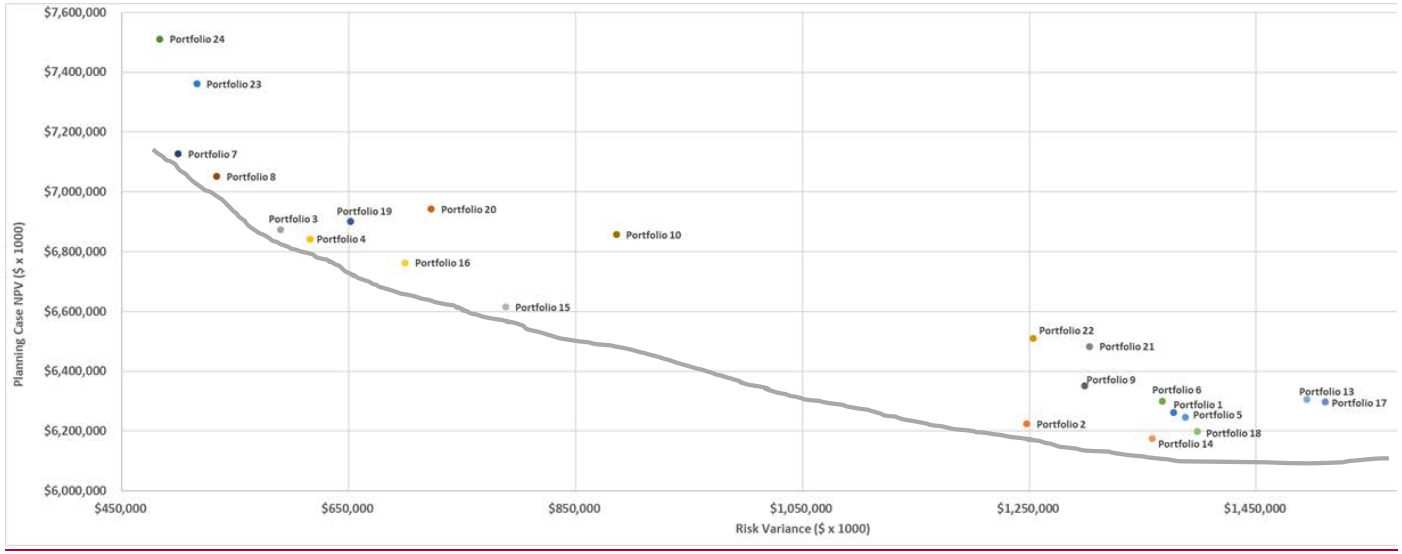
NPV ($ x 1000)	Planning Gas—Planning Carbon	High Gas—Planning Carbon	Planning Gas—High Carbon	High Gas—High Carbon
Portfolio 1	$6,262,350 ~~$6,262,350~~	$6,983,921 ~~$6,983,921~~	$8,615,746 ~~$8,615,746~~	$9,785,216 ~~$9,785,216~~
Portfolio 2	$6,223,789 ~~$6,180,898~~	$7,093,879 ~~$7,050,988~~	$8,311,531 ~~$8,268,640~~	$9,526,968 ~~$9,484,077~~
Portfolio 3	$6,874,144 ~~$6,743,579~~	$7,341,288 ~~$7,210,723~~	$7,889,371 ~~$7,758,806~~	$8,448,550 ~~$8,317,985~~
Portfolio 4	$6,842,290 ~~$6,711,725~~	$7,316,957 ~~$7,186,392~~	$7,895,248 ~~$7,764,683~~	$8,484,150 ~~$8,353,585~~
Portfolio 5	$6,247,134 ~~$6,247,134~~	$6,965,305 ~~$6,965,305~~	$8,640,298 ~~$8,640,298~~	$9,783,543 ~~$9,783,543~~
Portfolio 6	$6,300,335 ~~$6,295,506~~	$6,995,951 ~~$6,991,122~~	$8,675,861 ~~$8,671,032~~	$9,772,529 ~~$9,767,701~~
Portfolio 7	$7,127,612 ~~$6,997,047~~	$7,465,617 ~~$7,335,052~~	$8,013,583 ~~$7,883,018~~	$8,429,059 ~~$8,298,494~~
Portfolio 8	$7,051,976 ~~$6,921,411~~	$7,439,290 ~~$7,308,725~~	$7,976,251 ~~$7,845,686~~	$8,460,322 ~~$8,329,757~~
Portfolio 9	$6,351,648 ~~$6,351,648~~	$6,960,567 ~~$6,960,567~~	$8,563,652 ~~$8,563,652~~	$9,640,438 ~~$9,640,438~~
Portfolio 10	$6,857,192 ~~$6,857,192~~	$7,075,085 ~~$7,075,085~~	$8,319,929 ~~$8,319,929~~	$9,006,307 ~~$9,006,307~~
Portfolio 11	$8,046,481 ~~$7,936,126~~	$8,000,950 ~~$7,890,594~~	$8,622,632 ~~$8,512,277~~	$8,669,388 ~~$8,559,033~~
Portfolio 12	$7,971,543 ~~$7,866,893~~	$7,955,809 ~~$7,851,159~~	$8,513,342 ~~$8,408,693~~	$8,608,133 ~~$8,503,484~~
Portfolio 13	$6,298,486 ~~$6,298,486~~	$7,084,234 ~~$7,084,234~~	$8,966,855 ~~$8,966,855~~	$10,126,243 ~~$10,126,243~~
Portfolio 14	$6,174,321 ~~$6,131,430~~	$7,124,752 ~~$7,081,861~~	$8,469,873 ~~$8,426,982~~	$9,764,847 ~~$9,721,956~~
Portfolio 15	$6,614,981 ~~$6,484,416~~	$7,316,209 ~~$7,185,644~~	$7,911,042 ~~$7,780,477~~	$8,760,622 ~~$8,630,057~~

Portfolio 16	$6,763,329 ~~$6,632,764~~	$7,335,705 ~~$7,205,140~~	$7,932,719 ~~$7,802,154~~	$8,646,724 ~~$8,516,159~~
Portfolio 17	$6,306,492 ~~$6,306,492~~	$7,084,799 ~~$7,084,799~~	$8,943,907 ~~$8,943,907~~	$10,093,639 ~~$10,093,639~~
Portfolio 18	$6,198,529 ~~$6,155,638~~	$7,100,577 ~~$7,057,686~~	$8,684,580 ~~$8,641,689~~	$9,817,930 ~~$9,775,039~~
Portfolio 19	$6,901,220 ~~$6,770,655~~	$7,417,954 ~~$7,287,389~~	$8,009,460 ~~$7,878,895~~	$8,644,820 ~~$8,514,255~~
Portfolio 20	$6,942,680 ~~$6,852,642~~	$7,401,825 ~~$7,311,787~~	$8,170,117 ~~$8,080,079~~	$8,830,530 ~~$8,740,492~~
Portfolio 21	$6,483,530 ~~$6,483,530~~	$7,074,327 ~~$7,074,327~~	$8,795,307 ~~$8,795,307~~	$9,733,627 ~~$9,733,627~~
Portfolio 22	$6,511,244 ~~$6,511,244~~	$7,064,598 ~~$7,064,598~~	$8,722,004 ~~$8,722,004~~	$9,634,701 ~~$9,634,701~~
Portfolio 23	$7,361,418 ~~$7,230,853~~	$7,715,737 ~~$7,585,172~~	$8,281,876 ~~$8,151,311~~	$8,705,303 ~~$8,574,738~~
Portfolio 24	$7,511,054 ~~$7,380,489~~	$7,811,640 ~~$7,681,075~~	$8,359,016 ~~$8,228,451~~	$8,761,633 ~~$8,631,068~~

Under the Planning Gas and Planning Carbon scenario, P14 has the lowest NPV value of the 24 WECC-optimized portfolios at $6,174~~31,430~~321,000.

Figure 9.1 takes the information in Table 9.3 and compares all 24 portfolios on a two-axis graph that shows NPV cost under the planning scenario and the four-scenario standard deviation in NPV costs. The y-axis displays the NPV values under Planning Gas and Planning Carbon, and the x-axis displays the four-scenario standard deviation in NPV costs for the four scenarios shown in Table 9.3. Note that all cost scenarios are given equal weight in determining the four-scenario standard deviation. Idaho Power does not believe that each future has an equal likelihood, but for the sake of simplicity presented the results assuming equal likelihood to provide an idea of the variance in NPV costs associated with the four modeled scenarios.

Figure 9.1 shows that P14 is the lowest-cost portfolio under Planning Gas and Planning Carbon, although its four-scenario standard deviation is higher than some other portfolios. Conversely, P 24 has the lowest four-scenario standard deviation, but the highest expected cost under Planning Gas and Planning Carbon. Portfolios plotted along the lower and left edge of Figure 9.1 represent the efficient frontier in this graph of cost versus cost standard deviation. Moving vertically, portfolios plotting above the efficient frontier are considered to have equivalent cost variance, but higher expected cost. Moving horizontally, portfolios plotting to the right of the efficient frontier are considered to have equivalent expected cost, but greater potential cost variance.


$7,600,000
$7,400,000
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Planning Case NPV ($ x 1000)
$450,000
$650,000
$850,000
$1,050,000
$1,250,000
$1,450,000
Risk Variance ($ x 1000)
Portfolio 24
Portfolio 23
Portfolio 7
Portfolio 8
Portfolio 3
Portfolio 19
Portfolio 20
Portfolio 4
Portfolio 10
Portfolio 16
Portfolio 15
Portfolio 22
Portfolio 21
Portfolio 9
Portfolio 6
Portfolio 1
Portfolio 5
Portfolio 13
Portfolio 17
Portfolio 2
Portfolio 18
Portfolio 14

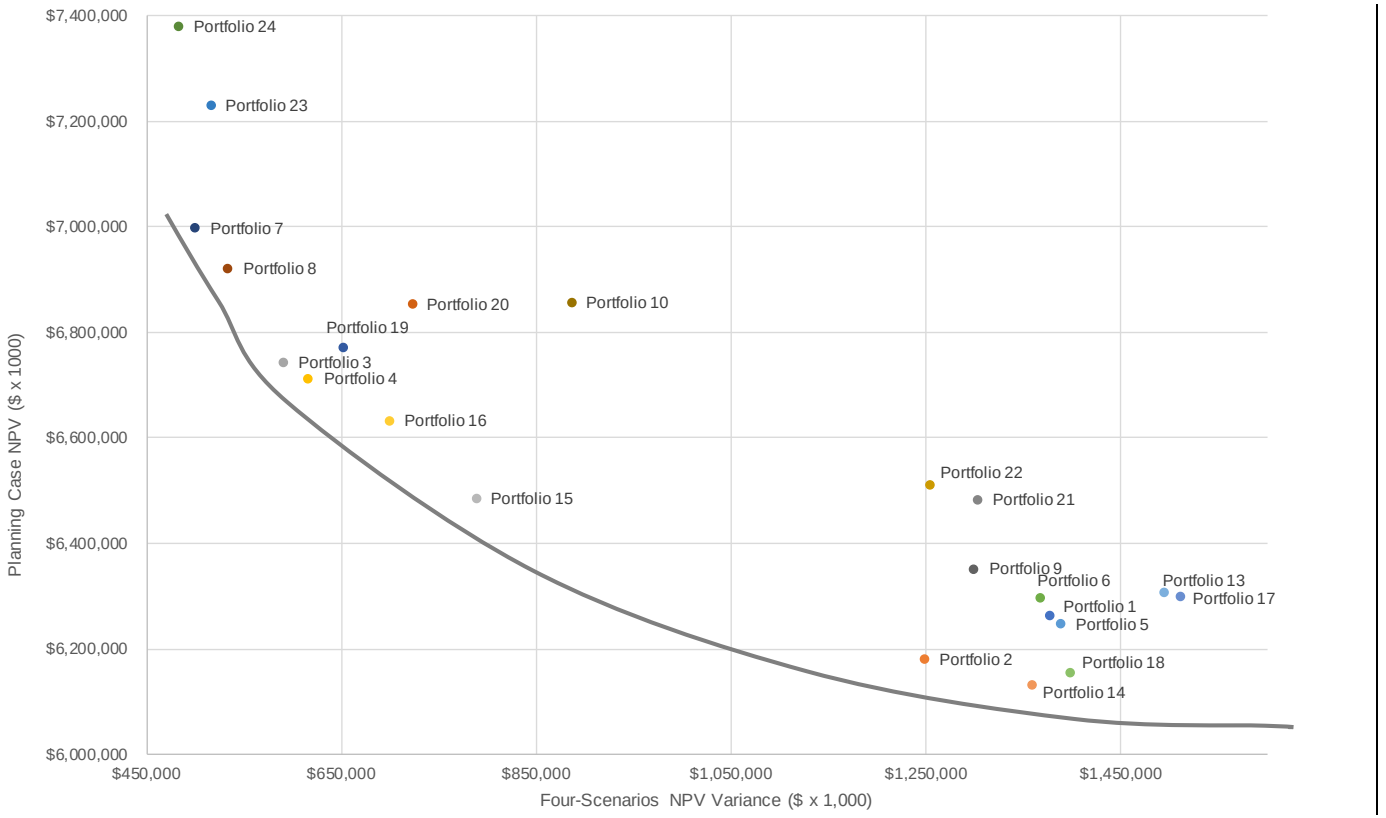

Figure 9.1 NPV cost versus cost variance

Based on these results, Idaho Power selected the following four WECC-optimized portfolios for manual adjustment with the objective of further reducing Idaho Power-specific portfolio costs:

- Portfolio 2 (Planning Gas, Planning Carbon, without B2H)
- Portfolio 4 (Planning Gas, High Carbon, without B2H)
- Portfolio 14 (Planning Gas, Planning Carbon, with B2H)
- Portfolio 16 (Planning Gas, High Carbon, with B2H).

Manually Built Portfolios

The manual adjustments to the selected four WECC-optimized portfolios specifically focused on evaluating Jim Bridger coal unit exit scenarios. In addition, a 15-percent planning margin was preserved while generally retaining the resource mix of the WECC-optimized portfolio. Table 9.4 shows the six selected Jim Bridger exit scenarios studied.

Table 9.4 Jim Bridger exit scenarios

Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
2022	2022	2022	2022	2023	2024
2026	2026	2028	2026	2026	2026
2034	2028	2034	2028	2028	2028
2034	2034	2034	2030	2030	2030

The Jim Bridger exit scenarios (1), (2), (3), and (4) focused on evaluating exit scenarios for the second, third and fourth units, while scenarios (5) and (6) focused on evaluating the exit date associated with the first Jim Bridger unit. Scenarios (5) and (6) centered on portfolios developed under a planning natural gas, planning carbon future, or P2 and P14. Thus, the complete set of manually built portfolios consists of the following:

- P2 derived portfolios—P2(1), P2(2), P2(3), P2(4), P2(5), P2(6)
- P4 derived portfolios—P4(1), P4(2), P4(3), P4(4)
- P14 derived portfolios—P14(1), P14(2), P14 (3), P14 (4), P14 (5), P14 (6)
- P16 derived portfolios—P16(1), P16(2), P16(3), P16(4)

Manual adjustments yielded the portfolio cost changes for P2 (decreases and increases).

Table 9.5 Jim Bridger exit scenario cost changes for P2

Scenarios	1	2	3	4	5	6	Average
Planning Gas, Planning Carbon	-0.1%~~-0.6%~~	0.0%~~-0.8%~~	-0.3%~~-0.6%~~	0.2%~~-1.3%~~	0.3%~~-1.0%~~	0.4%~~-0.8%~~	0.1%~~-0.9%~~
High Gas, Planning Carbon	1.4%~~1.0%~~	2.6%~~1.9%~~	0.6%~~0.3%~~	3.8%~~2.6%~~	3.7%~~2.6%~~	3.6%~~2.5%~~	2.6%~~1.8%~~

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Planning Gas, High Carbon	-2.0%-2.4%	-3.9%-4.6%	-1.7%-1.9%	-4.4%-5.5%	-4.3%-5.3%	-4.2%-5.2%	-3.4%-4.1%
High Gas, High Carbon	-1.5%-1.8%	-2.7%-3.3%	-1.4%-1.6%	-2.9%-3.9%	-2.9%-3.7%	-2.8%-3.6%	-2.4%-3.0%
Average	-0.9%	-1.7%	-1.0%	-2.0%	-1.9%	-1.8%	-1.5%

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As demonstrated in the tables above, the LTCE model performed reasonably well in developing low cost portfolios for Idaho Power's service area. However, Idaho Power was able to further lower overall portfolio costs through the manual refinements detailed above. Based on these results, the company is confident that its preferred portfolio detailed in Chapter 10 achieves the low cost, low risk objective of the IRP.

Manual adjustments yielded the following portfolio cost changes for P4 (decreases and increases):

Table 9.6 Jim Bridger exit scenario cost changes for P4

Scenarios	1	2	3	4	Average
Planning Gas, Planning Carbon	-8.6%-7.9%	-8.6%-8.2%	-8.9%-8.1%	-8.2%-8.4%	-8.6%-8.1%
High Gas, Planning Carbon	-2.5%-1.7%	-1.8%-1.3%	-3.1%-2.2%	-0.4%-0.4%	-2.0%-1.4%
Planning Gas, High Carbon	1.8%2.7%	0.0%0.5%	1.7%2.6%	-0.2%-0.2%	0.9%1.4%
High Gas, High Carbon	8.5%9.4%	6.8%7.3%	8.7%9.6%	6.6%6.7%	7.6%8.2%
Average	-0.2%0.6%	-0.9%-0.4%	-0.4%0.5%	-0.5%-0.6%	-0.5%0.0%

Manual adjustments yielded the following portfolio cost changes for P14 (decreases and increases):

Table 9.7 Jim Bridger exit scenario cost changes for P14

Scenarios	1	2	3	4	5	6	Average
Planning Gas, Planning Carbon	-0.4%-0.9%	-0.5%-1.3%	-0.7%-1.0%	-0.5%-1.9%	-0.4%-1.7%	-0.3%-1.5%	-0.5%-1.4%
High Gas, Planning Carbon	1.4%1.0%	2.1%1.4%	1.0%0.7%	2.9%1.7%	2.8%1.7%	2.7%1.6%	2.1%1.3%
Planning Gas, High Carbon	-1.3%-1.7%	-3.1%-3.8%	-1.0%-1.3%	-4.4%-5.4%	-4.2%-5.2%	-4.2%-5.1%	-3.0%-3.7%
High Gas, High Carbon	-0.9%-1.2%	-2.7%-3.3%	-0.2%-0.4%	-3.6%-4.5%	-3.6%-4.4%	-3.5%-4.3%	-2.4%-3.0%
Average	-0.3%-0.7%	-1.1%-1.8%	-0.2%-0.5%	-1.4%-2.5%	-1.3%-2.4%	-1.3%-2.3%	-0.9%-1.7%

Manual adjustments yielded the following portfolio cost changes for P16 (decreases and increases):

Table 9.8 Jim Bridger exit scenario cost changes for P16

Scenarios	1	2	3	4	Average
Planning Gas, Planning Carbon	-9.2%-8.5%	-9.4%-9.0%	-9.2%-8.4%	-9.4%-9.6%	-9.3%-8.9%
High Gas, Planning Carbon	-2.3%-1.5%	-1.7%-1.2%	-2.8%-2.0%	-0.8%-0.9%	-1.9%-1.4%
Planning Gas, High Carbon	2.6%3.4%	0.7%1.2%	2.5%3.4%	-0.1%-0.1%	1.4%2.0%
High Gas, High Carbon	10.0%10.8%	8.3%8.8%	10.1%11.0%	7.4%7.5%	8.9%9.5%
Average	0.2%1.1%	-0.5%0.0%	0.1%1.0%	-0.8%-0.8%	-0.2%0.3%

The costs for the manually built portfolios under the four natural gas and carbon scenarios are provided in Table 9.9.

Table 9.9 2019 IRP manually built portfolios, NPV years 2019–2038 ($ x 1,000)

NPV ($ x 1000)	Planning Gas—Planning Carbon	High Gas—Planning Carbon	Planning Gas—High Carbon	High Gas—High Carbon
P2-1	$6,214,646$6,145,102	$7,191,103$7,121,558	$8,143,812$8,074,268	$9,386,183$9,316,639
P2-2	$6,224,380$6,129,872	$7,277,139$7,182,632	$7,986,643$7,892,135	$9,265,187$9,170,679
P2-3	$6,207,994$6,143,832	$7,133,215$7,069,053	$8,173,037$8,108,875	$9,394,396$9,330,234
P2-4	$6,233,683$6,103,118	$7,363,620$7,233,055	$7,946,693$7,816,128	$9,247,321$9,116,756
P14-1	$6,148,128$6,078,583	$7,223,413$7,153,869	$8,356,333$8,286,789	$9,678,095$9,608,551
P14-2	$6,144,625$6,050,117	$7,272,017$7,177,509	$8,203,655$8,109,147	$9,498,540$9,404,032
P14-3	$6,132,463$6,068,301	$7,193,333$7,129,172	$8,384,001$8,319,839	$9,743,204$9,679,042
P14-4	$6,142,894$6,012,329	$7,332,295$7,201,730	$8,101,415$7,970,850	$9,414,654$9,284,089
P4-1	$6,252,296$6,182,752	$7,133,892$7,064,347	$8,040,012$7,970,468	$9,204,273$9,134,728
P4-2	$6,254,696$6,160,188	$7,186,760$7,092,252	$7,895,513$7,801,005	$9,058,868$8,964,360
P4-3	$6,234,937$6,170,775	$7,089,312$7,025,150	$8,032,887$7,968,725	$9,218,379$9,154,217
P4-4	$6,281,731$6,151,167	$7,285,775$7,155,210	$7,882,458$7,751,893	$9,043,868$8,913,303
P16-1	$6,139,322$6,069,778	$7,164,787$7,095,243	$8,137,558$8,068,014	$9,507,231$9,437,687
P16-2	$6,128,474$6,033,966	$7,212,430$7,117,922	$7,991,379$7,896,872	$9,362,875$9,268,367
P16-3	$6,140,885$6,076,723	$7,127,226$7,063,064	$8,129,659$8,065,497	$9,515,841$9,451,679
P16-4	$6,127,043$5,996,478	$7,274,178$7,143,613	$7,922,348$7,791,783	$9,283,140$9,152,575
P2-5	$6,241,999$6,117,622	$7,358,157$7,233,779	$7,952,375$7,827,998	$9,254,151$9,129,774
P2-6	$6,248,609$6,129,786	$7,349,519$7,230,697	$7,959,204$7,840,382	$9,257,987$9,139,164
P14-5	$6,150,717$6,026,339	$7,325,242$7,200,864	$8,109,990$7,985,612	$9,416,194$9,291,816
P14-6	$6,158,834$6,040,012	$7,317,331$7,198,508	$8,118,130$7,999,308	$9,421,122$9,302,299

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Under the Planning Gas and Planning Carbon scenario, P16(4) has the lowest NPV value of the 204 ~~WECC optimized~~manually built portfolios at $65,996127,478043,000.

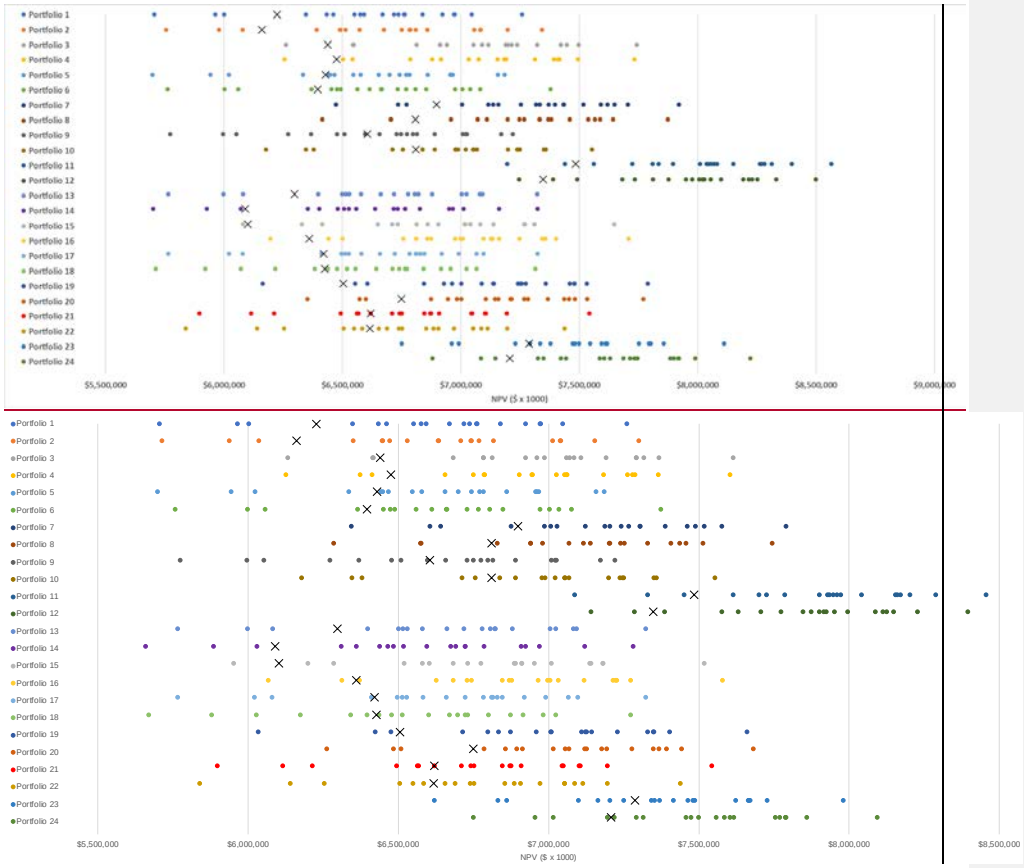
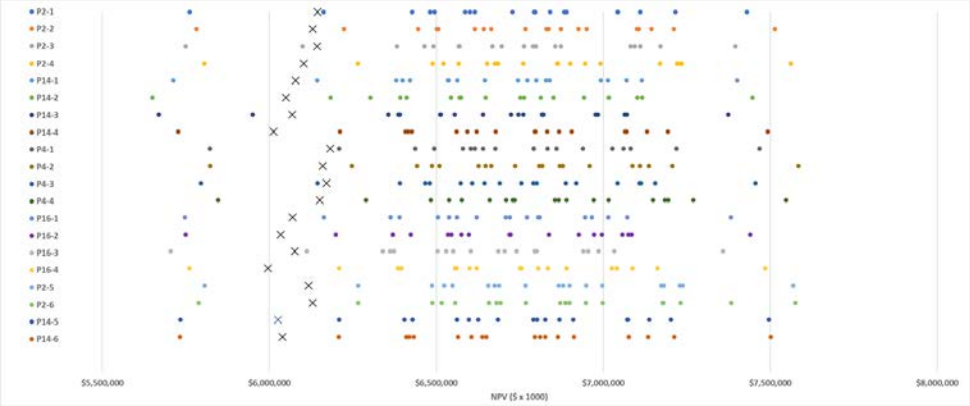


Figure 9.5 Portfolio stochastic analysis, total portfolio cost, NPV years 2019–2038 ($x 1,000)

The horizontal axis on Figure 9.5 represents the portfolio cost (NPV) in millions of dollars, and the 24 portfolios are represented by their designation on the vertical axis. Each portfolio has 20 dots for the 20 different stochastic iterations scattered across different NPV ranges. The Xs designate the Planning Gas Planning Carbon scenario that was performed for each portfolio.

The distribution of 20-year NPV portfolio costs for the set of 20 manually built portfolios is shown in Figure 9.6.


P2-1
P2-2
P2-3
P2-4
P14-1
P14-2
P14-3
P14-4
P4-1
P4-2
P4-3
P4-4
P16-1
P16-2
P16-3
P16-4
P2-5
P2-6
P14-5
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NPV ($ x 1000)

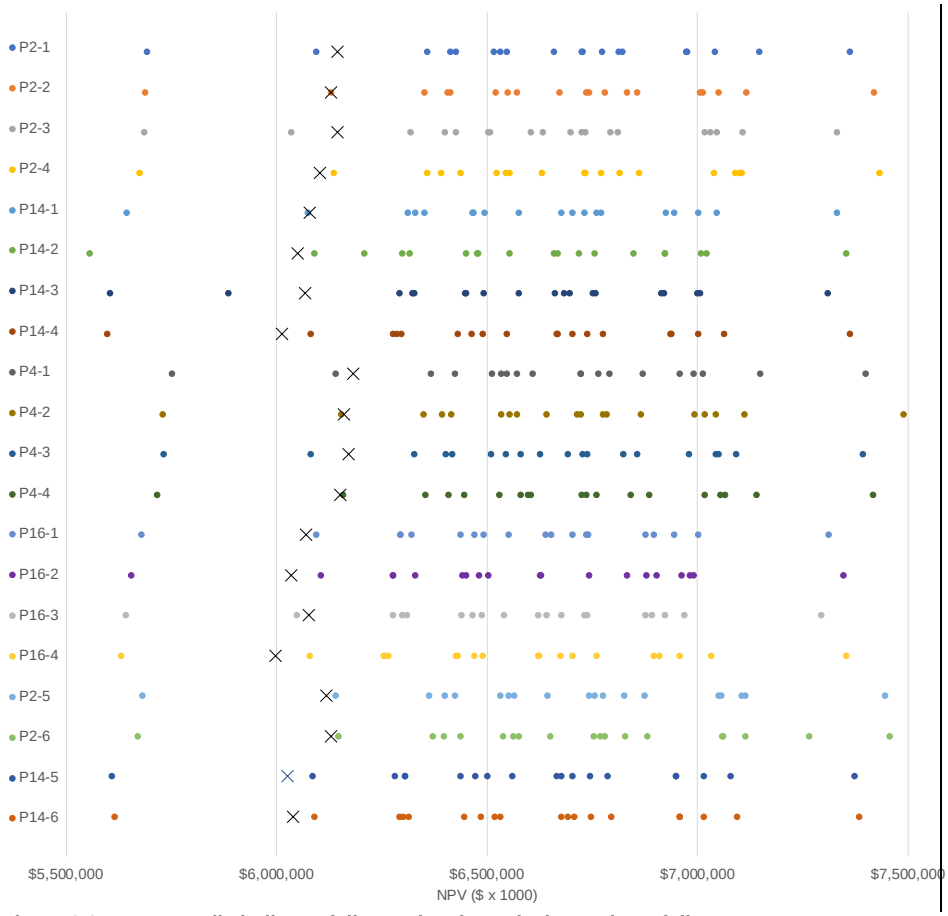

Figure 9.6 **Manually built portfolio stochastic analysis, total portfolio cost, NPV years 2019–2038 ($x 1,000)**

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Table 9.2 AURORA hourly simulations

	Planning Carbon	High Carbon
Planning Gas	X	X
High Gas	X	X

The purpose of the AURORA hourly simulations is to compare how portfolios perform under scenarios different from the scenario assumed in their design. For example, a portfolio designed under Planning Gas and Planning Carbon should perform better relative to other portfolios under a Planning Gas and Planning Carbon scenario than under a High Gas and High Carbon scenario. The compiled results from the four hourly simulations are shown in Table 9.3.

Table 9.3 2019 IRP WECC-optimized portfolios, NPV years 2019–2038 ($ x 1,000)

NPV ($ x 1000)	Planning Gas—Planning Carbon	High Gas—Planning Carbon	Planning Gas—High Carbon	High Gas—High Carbon
Portfolio 1	$6,262,350	$6,983,921	$8,615,746	$9,785,216
Portfolio 2	$6,223,789	$7,093,879	$8,311,531	$9,526,968
Portfolio 3	$6,874,144	$7,341,288	$7,889,371	$8,448,550
Portfolio 4	$6,842,290	$7,316,957	$7,895,248	$8,484,150
Portfolio 5	$6,247,134	$6,965,305	$8,640,298	$9,783,543
Portfolio 6	$6,300,335	$6,995,951	$8,675,861	$9,772,529
Portfolio 7	$7,127,612	$7,465,617	$8,013,583	$8,429,059
Portfolio 8	$7,051,976	$7,439,290	$7,976,251	$8,460,322
Portfolio 9	$6,351,648	$6,960,567	$8,563,652	$9,640,438
Portfolio 10	$6,857,192	$7,075,085	$8,319,929	$9,006,307
Portfolio 11	$8,046,481	$8,000,950	$8,622,632	$8,669,388
Portfolio 12	$7,971,543	$7,955,809	$8,513,342	$8,608,133
Portfolio 13	$6,298,486	$7,084,234	$8,966,855	$10,126,243
Portfolio 14	$6,174,321	$7,124,752	$8,469,873	$9,764,847
Portfolio 15	$6,614,981	$7,316,209	$7,911,042	$8,760,622
Portfolio 16	$6,763,329	$7,335,705	$7,932,719	$8,646,724
Portfolio 17	$6,306,492	$7,084,799	$8,943,907	$10,093,639
Portfolio 18	$6,198,529	$7,100,577	$8,684,580	$9,817,930
Portfolio 19	$6,901,220	$7,417,954	$8,009,460	$8,644,820
Portfolio 20	$6,942,680	$7,401,825	$8,170,117	$8,830,530
Portfolio 21	$6,483,530	$7,074,327	$8,795,307	$9,733,627
Portfolio 22	$6,511,244	$7,064,598	$8,722,004	$9,634,701
Portfolio 23	$7,361,418	$7,715,737	$8,281,876	$8,705,303
Portfolio 24	$7,511,054	$7,811,640	$8,359,016	$8,761,633

Under the Planning Gas and Planning Carbon scenario, P14 has the lowest NPV value of the 24 WECC-optimized portfolios at $6,174,321,000.

Figure 9.1 takes the information in Table 9.3 and compares all 24 portfolios on a two-axis graph that shows NPV cost under the planning scenario and the four-scenario standard deviation in NPV costs. The y-axis displays the NPV values under Planning Gas and Planning Carbon, and the x-axis displays the four-scenario standard deviation in NPV costs for the four scenarios shown in Table 9.3. Note that all cost scenarios are given equal weight in determining the four-scenario standard deviation. Idaho Power does not believe that each future has an equal likelihood, but for the sake of simplicity presented the results assuming equal likelihood to provide an idea of the variance in NPV costs associated with the four modeled scenarios.

Figure 9.1 shows that P14 is the lowest-cost portfolio under Planning Gas and Planning Carbon, although its four-scenario standard deviation is higher than some other portfolios. Conversely, P 24 has the lowest four-scenario standard deviation, but the highest expected cost under Planning Gas and Planning Carbon. Portfolios plotted along the lower and left edge of Figure 9.1 represent the efficient frontier in this graph of cost versus cost standard deviation. Moving vertically, portfolios plotting above the efficient frontier are considered to have equivalent cost variance, but higher expected cost. Moving horizontally, portfolios plotting to the right of the efficient frontier are considered to have equivalent expected cost, but greater potential cost variance.

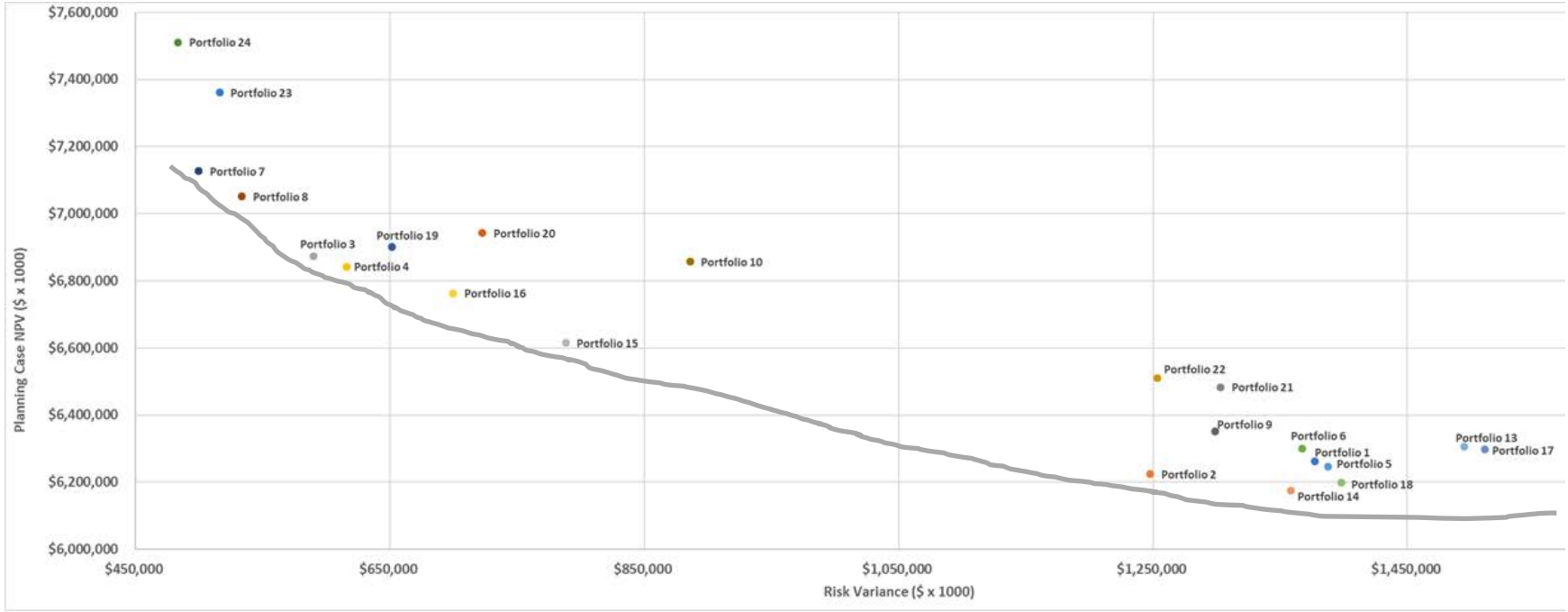

Figure 9.1 NPV cost versus cost variance

Based on these results, Idaho Power selected the following four WECC-optimized portfolios for manual adjustment with the objective of further reducing Idaho Power-specific portfolio costs:

- Portfolio 2 (Planning Gas, Planning Carbon, without B2H)
- Portfolio 4 (Planning Gas, High Carbon, without B2H)
- Portfolio 14 (Planning Gas, Planning Carbon, with B2H)
- Portfolio 16 (Planning Gas, High Carbon, with B2H).

Manually Built Portfolios

The manual adjustments to the selected four WECC-optimized portfolios specifically focused on evaluating Jim Bridger coal unit exit scenarios. In addition, a 15-percent planning margin was preserved while generally retaining the resource mix of the WECC-optimized portfolio. Table 9.4 shows the six selected Jim Bridger exit scenarios studied.

Table 9.4 Jim Bridger exit scenarios

Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
2022	2022	2022	2022	2023	2024
2026	2026	2028	2026	2026	2026
2034	2028	2034	2028	2028	2028
2034	2034	2034	2030	2030	2030

The Jim Bridger exit scenarios (1), (2), (3), and (4) focused on evaluating exit scenarios for the second, third and fourth units, while scenarios (5) and (6) focused on evaluating the exit date associated with the first Jim Bridger unit. Scenarios (5) and (6) centered on portfolios developed under a planning natural gas, planning carbon future, or P2 and P14. Thus, the complete set of manually built portfolios consists of the following:

- P2 derived portfolios—P2(1), P2(2), P2(3), P2(4), P2(5), P2(6)
- P4 derived portfolios—P4(1), P4(2), P4(3), P4(4)
- P14 derived portfolios—P14(1), P14(2), P14 (3), P14 (4), P14 (5), P14 (6)
- P16 derived portfolios—P16(1), P16(2), P16(3), P16(4)

Manual adjustments yielded the portfolio cost changes for P2 (decreases and increases).

Table 9.5 Jim Bridger exit scenario cost changes for P2

Scenarios	1	2	3	4	5	6	Average
Planning Gas, Planning Carbon	-0.1%	0.0%	-0.3%	0.2%	0.3%	0.4%	0.1%
High Gas, Planning Carbon	1.4%	2.6%	0.6%	3.8%	3.7%	3.6%	2.6%
Planning Gas, High Carbon	-2.0%	-3.9%	-1.7%	-4.4%	-4.3%	-4.2%	-3.4%
High Gas, High Carbon	-1.5%	-2.7%	-1.4%	-2.9%	-2.9%	-2.8%	-2.4%

Average	-0.9%	-1.7%	-1.0%	-2.0%	-1.9%	-1.8%	-1.5%

As demonstrated in the tables above, the LTCE model performed reasonably well in developing low cost portfolios for Idaho Power's service area. However, Idaho Power was able to further lower overall portfolio costs through the manual refinements detailed above. Based on these results, the company is confident that its preferred portfolio detailed in Chapter 10 achieves the low cost, low risk objective of the IRP.

Manual adjustments yielded the following portfolio cost changes for P4 (decreases and increases):

Table 9.6 Jim Bridger exit scenario cost changes for P4

Scenarios	1	2	3	4	Average
Planning Gas, Planning Carbon	-8.6%	-8.6%	-8.9%	-8.2%	-8.6%
High Gas, Planning Carbon	-2.5%	-1.8%	-3.1%	-0.4%	-2.0%
Planning Gas, High Carbon	1.8%	0.0%	1.7%	-0.2%	0.9%
High Gas, High Carbon	8.5%	6.8%	8.7%	6.6%	7.6%
Average	-0.2%	-0.9%	-0.4%	-0.5%	-0.5%

Manual adjustments yielded the following portfolio cost changes for P14 (decreases and increases):

Table 9.7 Jim Bridger exit scenario cost changes for P14

Scenarios	1	2	3	4	5	6	Average
Planning Gas, Planning Carbon	-0.4%	-0.5%	-0.7%	-0.5%	-0.4%	-0.3%	-0.5%
High Gas, Planning Carbon	1.4%	2.1%	1.0%	2.9%	2.8%	2.7%	2.1%
Planning Gas, High Carbon	-1.3%	-3.1%	-1.0%	-4.4%	-4.2%	-4.2%	-3.0%
High Gas, High Carbon	-0.9%	-2.7%	-0.2%	-3.6%	-3.6%	-3.5%	-2.4%
Average	-0.3%	-1.1%	-0.2%	-1.4%	-1.3%	-1.3%	-0.9%

Manual adjustments yielded the following portfolio cost changes for P16 (decreases and increases):

Table 9.8 Jim Bridger exit scenario cost changes for P16

Scenarios	1	2	3	4	Average
Planning Gas, Planning Carbon	-9.2%	-9.4%	-9.2%	-9.4%	-9.3%
High Gas, Planning Carbon	-2.3%	-1.7%	-2.8%	-0.8%	-1.9%
Planning Gas, High Carbon	2.6%	0.7%	2.5%	-0.1%	1.4%
High Gas, High Carbon	10.0%	8.3%	10.1%	7.4%	8.9%
Average	0.2%	-0.5%	0.1%	-0.8%	-0.2%

The costs for the manually built portfolios under the four natural gas and carbon scenarios are provided in Table 9.9.

Table 9.9 2019 IRP manually built portfolios, NPV years 2019–2038 ($ x 1,000)

NPV ($ x 1000)	Planning Gas—Planning Carbon	High Gas—Planning Carbon	Planning Gas—High Carbon	High Gas—High Carbon
P2-1	$6,214,646	$7,191,103	$8,143,812	$9,386,183
P2-2	$6,224,380	$7,277,139	$7,986,643	$9,265,187
P2-3	$6,207,994	$7,133,215	$8,173,037	$9,394,396
P2-4	$6,233,683	$7,363,620	$7,946,693	$9,247,321
P14-1	$6,148,128	$7,223,413	$8,356,333	$9,678,095
P14-2	$6,144,625	$7,272,017	$8,203,655	$9,498,540
P14-3	$6,132,463	$7,193,333	$8,384,001	$9,743,204
P14-4	$6,142,894	$7,332,295	$8,101,415	$9,414,654
P4-1	$6,252,296	$7,133,892	$8,040,012	$9,204,273
P4-2	$6,254,696	$7,186,760	$7,895,513	$9,058,868
P4-3	$6,234,937	$7,089,312	$8,032,887	$9,218,379
P4-4	$6,281,731	$7,285,775	$7,882,458	$9,043,868
P16-1	$6,139,322	$7,164,787	$8,137,558	$9,507,231
P16-2	$6,128,474	$7,212,430	$7,991,379	$9,362,875
P16-3	$6,140,885	$7,127,226	$8,129,659	$9,515,841
P16-4	$6,127,043	$7,274,178	$7,922,348	$9,283,140
P2-5	$6,241,999	$7,358,157	$7,952,375	$9,254,151
P2-6	$6,248,609	$7,349,519	$7,959,204	$9,257,987
P14-5	$6,150,717	$7,325,242	$8,109,990	$9,416,194
P14-6	$6,158,834	$7,317,331	$8,118,130	$9,421,122

Under the Planning Gas and Planning Carbon scenario, P16(4) has the lowest NPV value of the 20 manually built portfolios at $6,127,043,000.

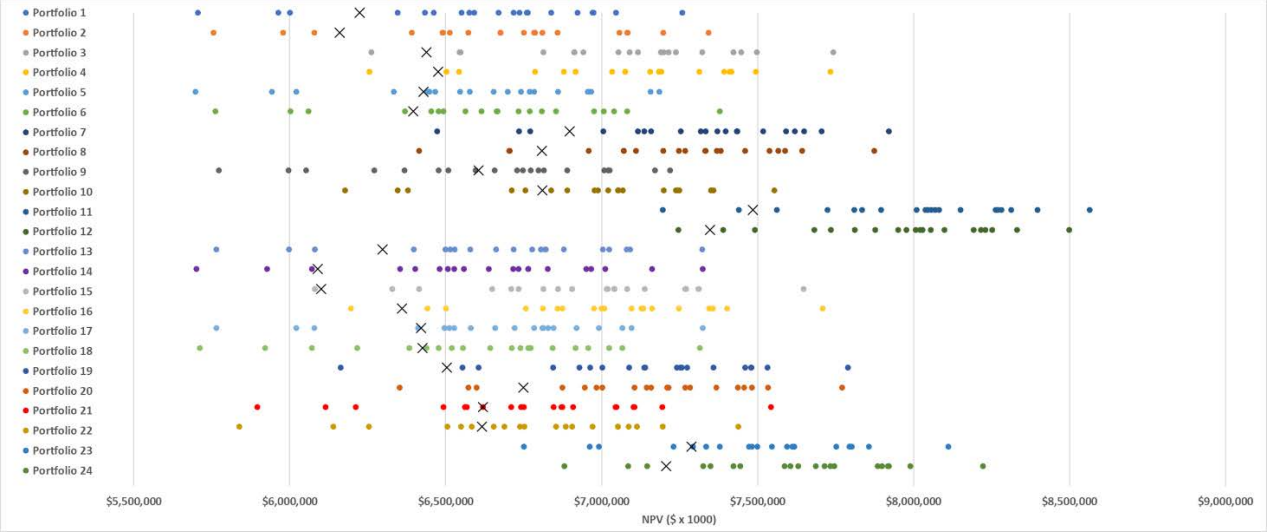

Figure 9.5 Portfolio stochastic analysis, total portfolio cost, NPV years 2019–2038 ($x 1,000)

The horizontal axis on Figure 9.5 represents the portfolio cost (NPV) in millions of dollars, and the 24 portfolios are represented by their designation on the vertical axis. Each portfolio has 20 dots for the 20 different stochastic iterations scattered across different NPV ranges. The Xs designate the Planning Gas Planning Carbon scenario that was performed for each portfolio.

The distribution of 20-year NPV portfolio costs for the set of 20 manually built portfolios is shown in Figure 9.6.

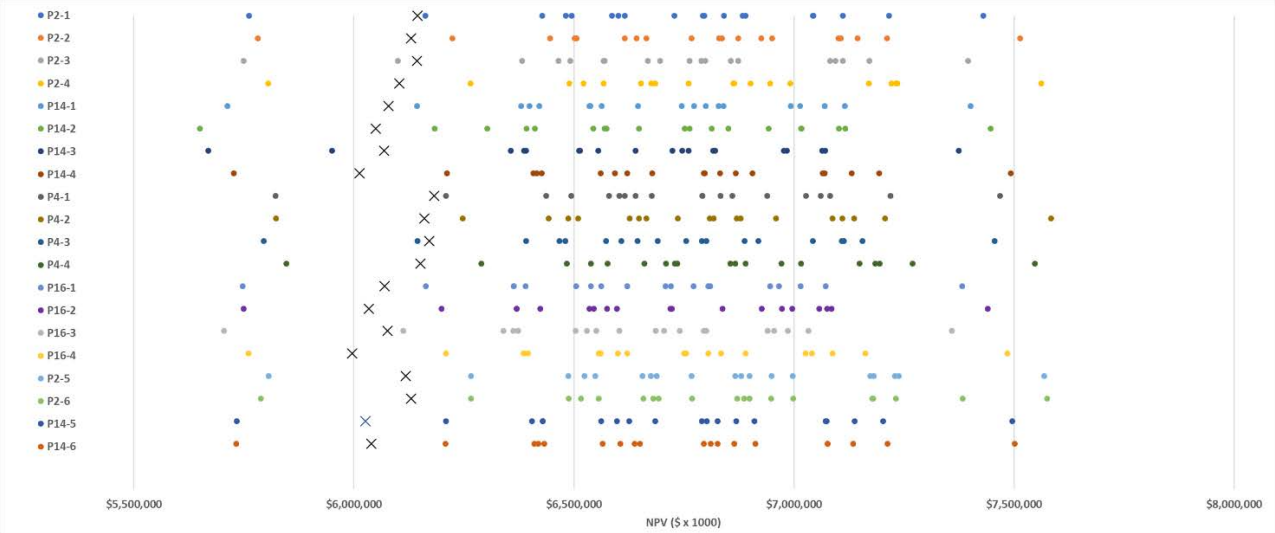

Figure 9.6 Manually built portfolio stochastic analysis, total portfolio cost, NPV years 2019–2038 ($x 1,000)