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BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

In the Matter of PacifiCorp's 2023 Integrated Resource Plan	Docket No. 23-035-10

SIERRA CLUB'S OPENING COMMENTS ON PACIFICORP'S 2023 INTEGRATED RESOURCE PLAN

Public Version

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I. INTRODUCTION

Sierra Club appreciates the opportunity to provide comment on PacifiCorp's ("Company") 2023 Integrated Resource Plan ("IRP"). These comments, prepared with the assistance of Strategen Consulting, build upon the feedback offered in prior rounds of stakeholder comment and put forth new analysis and recommendations on how to enhance the Company's final plan. The comments and recommendations contained herein are based on a thorough review of the Company's 2023 IRP, as well as a comprehensive examination of public and confidential workpapers provided by the Company following multiple rounds of discovery.

Sierra Club is encouraged by some of the results of PacifiCorp's 2023 IRP analysis, which reflect significant improvements compared to the previous 2021 IRP. For example, the Preferred Portfolio and each portfolio variant contain significantly more energy storage and renewable energy resources, underscoring their increasing cost-effectiveness, particularly after the passage of the Inflation Reduction Act ("IRA"). The Company also improved its methodology in some key areas, such as its consideration of energy storage locations and configurations. The Company's new "shared interconnection" approach to energy storage allows not only standalone storage but also hybrid configurations and surplus interconnection. This allows for the more efficient addition of clean energy resources because more generation can be added to an existing interconnection without requiring potentially cost-prohibitive additional

transmission lines. As discussed below, Sierra Club recommends additional improvements to this process. Sierra Club also appreciates the additional transparency provided regarding cluster resources, which provides valuable information for renewable energy developers about the value and cost (e.g., for network upgrades) of certain project locations on PacifiCorp's system.

While Sierra Club notes improvements in the 2023 IRP, concerns remain—some new to the 2023 IRP cycle, others persisting from the 2021 IRP—despite Sierra Club's best efforts to raise these issues throughout the PacifiCorp-led public input process. These issues are likely resulting in the Preferred Portfolio unreasonably extending the useful lives of PacifiCorp's coal fleet and relying on gas conversions, non-emitting peakers, and nuclear energy to meet reliability needs, rather than proven, clean technologies. Discussed in detail below, some of these major concerns include the following:

- The failure to sufficiently incorporate the benefits of the IRA, particularly the Energy Infrastructure Reinvestment ("EIR") program which has the potential to save *billions* of dollars for PacifiCorp customers through low-cost financing.
- The significance of PacifiCorp's "reliability adjustments," which dominate both the Preferred Portfolio and each portfolio variant and result in the extension of thermal generating resources (particularly coal).
- "Granularity adjustments" and coal fuel pricing resulting in the over-valuing of coal in the PLEXOS model, which may have the effect of inappropriately extending the life of certain existing coal units, even before PacifiCorp manually extended their useful lives through "reliability adjustments."
- The reliance on gas conversions without a demonstration that PacifiCorp has access to firm pipeline capacity necessary to support these resource additions.
- The failure to analyze high-performing portfolios against all price-policy scenarios.

Throughout these comments, Sierra Club elaborates on these major concerns, as well as others.

II. SUMMARY OF RECOMMENDATIONS

Sierra Club recommends that the Public Service Commission of Utah ("Commission") acknowledge PacifiCorp's 2023 IRP as it relates to planned new renewable resources but not extend acknowledgement to PacifiCorp's planned coal resource retirements, gas conversions, or nuclear additions. These aspects of the plan are extremely risky for ratepayers and are not justified for the reasons below. Conversely, the addition of new, clean resources can significantly reduce costs for customers. Sierra Club is highly concerned that PacifiCorp chose to "pause" its 2022 all-source request for proposals ("RFP") at the eleventh hour, and especially after having the results of the 2023 IRP, which indicate an even greater need for new renewable resources than was forecasted in the 2021 IRP. **The Commission should direct PacifiCorp to move forward with the 2022 all-source RFP as soon as possible.**

The Commission should further use this opportunity to direct PacifiCorp to take the following actions:

- Inflation Reduction Act:
    - Incorporate financing opportunities made available under the EIR program, which can enable the closure of coal plants, the replacement of fossil resources with cleaner alternatives, and the development of transmission infrastructure. Sierra Club's analysis demonstrates that the EIR can save ratepayers billions of dollars, and the Commission should direct PacifiCorp to incorporate this program as soon as possible, within this IRP cycle. Specifically, PacifiCorp should conduct:
        - A scenario in which transmission network upgrade costs in Cluster Areas 1, 2, 4, 12, and 14 are reduced by 10 percent; and
        - A scenario in which EIR financing is assumed for early retirement and replacement of Jim Bridger Units 3 and 4, Huntington, Hunter, and Wyodak.
    - Apply tax bonus credits available for "energy communities" to all qualifying communities, including communities in Oregon that the Company inappropriately excluded.
    - Correct inaccuracies and update its Supply-Side Resource workpapers to include the Investment Tax Credits ("ITC") and Production Tax Credits ("PTC") granted under the IRA for storage resources.

- Reliability and Granularity Adjustments:
    - Provide further clarification on its methodology for reliability adjustments, with specific identification of, and justifications for, the resource additions and modifications to the timeline of optimally selected asset retirements.
    - Provide an explanation, in the next IRP, for why the long-term ("LT") model produces significant energy shortfalls identified in the short-term ("ST") model that must be manually addressed.
    - Provide stakeholders with an opportunity to recommend alternative reliability adjustments to those included in PacifiCorp's 2023 Preferred Portfolio, such as the alternatives recommended in Section V. These alternatives should be evaluated in parallel to those selected by PacifiCorp, with an opportunity for revisions.
    - Provide further clarification on the values used as part of the granularity adjustments and base coal units' granularity adjustment on the total fuel costs, rather than incremental or marginal fuel costs.

- Coal Pricing and Retirement Schedules:
    - Align the base tier coal price for the Jim Bridger plant with pricing contained the Company's 2023 Jim Bridger Long Term Fuel Supply Plan.
    - Reevaluate the economic retirement dates of units at the Jim Bridger, Hunter, Huntington, and Wyodak plants, in light of the many issues raised in these comments.

- Portfolio Variants and Cluster Resources:
    - Complete model runs of the P01-JB3-4 GC, P04-Huntington RET28, and P17-Col3-4 RET25 variants under all of the different price and policy scenarios.
    - Complete portfolio variants that force the model to incrementally select additional cluster study resources from Cluster Areas 1, 2, 4, 12, and 14.
    - Reassess variants P18-Cluster East and P19-Cluster West by reoptimizing resource selections, portfolio composition, costs, and risks through the LT model.

- Gas Conversions:
    - Complete an assessment of the availability and cost of firm interstate pipeline capacity necessary to fully execute its plan for natural gas conversions.

- Surplus Interconnection:
    - Allow for non-variable energy resource hybridization at interconnection surpluses. In other words, allow storage to be paired with not only new renewable resources but also existing fossil resources.

- Carbon dioxide ("CO_2") Pricing:
    - Increase the "medium" CO_2 price to account for increasing environmental regulations impacting the Company's fleet.

- Natrium and Proxy Nuclear Resources:
    - Replace assumed nuclear resources in the Preferred Portfolio with alternative clean energy resources that would still enable PacifiCorp to meet reliability requirements, such as those identified by Sierra Club in Section V.

III. INFLATION REDUCTION ACT

Throughout the IRP process, Sierra Club suggested several ways in which PacifiCorp should incorporate provisions of the IRA into its modeling. Here, Sierra Club reiterates and expands upon its IRA recommendations, specifically: the EIR program, the energy communities bonus tax credit, and the application of ITC and PTC to eligible assets.

A. The Energy Infrastructure Reinvestment Program Could Reduce PacifiCorp's Financing Costs for New Transmission and Replacing Fossil Energy with Clean by Billions of Dollars.

Included in Congress's passage of the IRA, the EIR program authorizes the United States Department of Energy ("DOE") to guarantee up to $250 billion in loans for projects that either (1) retool, repower, repurpose, or replace energy infrastructure that has ceased operations, or (2) enable operating energy infrastructure to avoid, reduce, utilize, or sequester air pollutants or anthropogenic emissions of greenhouse gases. Because these loans would be guaranteed by the federal government, they would come with much lower interest rates than traditional financing. Indeed, representatives from DOE's Loan Programs Office ("LPO"), which administers EIR financing, indicated that interest rates are available at the current Treasury rate + 3/8ths (0.375) percent + risk-based charge. This is much lower than traditional financing, and according to LPO representatives, typically lowers a utility's cost of capital by between 100 and 140 basis points.

In this way, the EIR serves as an opportunity to secure new financing at very favorable terms and/or refinance existing debt (such as remaining debt on fossil assets) at more favorable terms, thereby lowering ratepayers' debt obligations. According to Jigar Shah, Director of DOE's LPO, "*EIR is as vast as utilities' needs and domains* and includes financing for investments in operating systems as well as retired assets. The program is technology-agnostic,

meaning LPO can *finance entire Integrated Resource Plans* as long as they relate to existing or legacy infrastructure."[1] EIR financing is only available until September 2026,[2] meaning that interested parties must act quickly, but loan disbursements will be available through 2031, covering much of the 2023 IRP's time horizon. Nevertheless, PacifiCorp did not adjust its cost assumptions in the 2023 IRP to account for EIR financing.

1. Sierra Club's analysis shows that the EIR could reduce or avoid transmission update costs and coal plant retirement costs by over $13 billion dollars.

Throughout the stakeholder process, Sierra Club provided information to PacifiCorp on multiple occasions (discussed further below) demonstrating the dramatic financial impact that the EIR could have on reducing both transmission upgrade and coal plant retirement costs, when the Company's coal fleet is replaced with clean energy. Specifically, Sierra Club provided PacifiCorp with a preliminary analysis suggesting that EIR financing could reduce financing costs by approximately 30 percent compared to traditional utility financing,[3] assuming that PacifiCorp would be able to reduce its cost of capital for associated projects from 7 percent (traditional utility financing at weighted average cost of capital) to 4 percent (EIR financing) which would be reasonable for a government-backed loan. This cost reduction could be applied to both transmission upgrades needed to support new clean energy as well as the retirement of PacifiCorp's coal plants when they are replaced with clean energy resources.

Since Sierra Club provided its preliminary analysis, it has met with DOE representatives and, as noted above, understands that EIR financing would likely reduce utility financing costs by

[1] *See* Jigar Shah, *Tapping into DOE's $250B of Loan Auth. for Projects that Reinvest in U.S. Clean Energy Infrastructure,* Util. Drive (July 6, 2023), *available at* https://www.utilitydive.com/news/department-of-energy-doe-250-billion-loan-authority-solar-wind-storage-nuclear-clean-energy/653530/ (emphasis added).
[2] U.S. Dep't of Energy, Loan Programs Off., *Energy Infrastructure Reinvestment Fin., available at* https://www.energy.gov/lpo/energy-infrastructure-reinvestment-financing#:~:text=This%20program%20will%20guarantee%20loans,anthropogenic%20emissions%20of%20greenhouse%20gases.
[3] Sierra Club, *Stakeholder Feedback Form* (Dec. 2022), included as Attachment 1 [hereinafter "Sierra Club Dec. Stakeholder Feedback Form"].

between 100 and 140 basis points. While this level of savings is smaller than Sierra Club initially predicted, it would still translate to *billions* of dollars in savings. For instance, regarding transmission, if PacifiCorp were to apply a 10 percent cost reduction to just Cluster Areas ("CAs") 1, 2, 4, 12, and 14, as Sierra Club estimates would be possible if using EIR financing, it would reduce transmission upgrade costs by approximately **$2.8 billion**. Sierra Club focused on these specific CAs because they have some of the costliest network upgrade costs (estimated to be approximately $18.9 billion) while also having significant clean energy potential. CAs 1, 2, and 4 (which roughly correspond to the Wyoming region) include over 9,000 megawatts ("MW") of generation resources, including almost 4,000 MW of wind, and CAs 12 and 14 (in Utah) include over 3,000 MW of solar generation resources. Assigning extraordinarily high transmission costs to clean energy resources in these CAs likely caused at least some of these clean resources to not be selected and which may in turn have limited the amount of cost-effective coal retirements that might otherwise have been selected by the PLEXOS model. In this context, incorporation of the EIR, even conservatively, would have significantly impacted resource selection and scenario analysis.

The EIR could also help avoid certain transmission costs altogether when adding new resources identified in these clusters if PacifiCorp is able to retire existing generation resources and utilize its existing transmission capability for new clean resources. If, for example, the Jim Bridger plant (of which PacifiCorp's share equates to approximately 1,400 MW) were to retire prior to 2030, then the Company's transmission system would be able to support a large share of the 2,200 MW of wind currently seeking interconnection in Cluster Area 4, without the need to invest over **$9 billion** in network upgrades, as currently estimated to be needed. This represents a vast improvement in the project economics, making both the early retirement and wind additions

more likely to be selected by the LT PLEXOS model. This scenario is likely since the Federal Energy Regulatory Commission ("FERC") recently approved revisions to PacifiCorp's Open Access Transmission Tariff ("OATT") on January 10, 2023, which includes a new generator replacement process that could facilitate such replacement. Moreover, the project economics of the wind resource additions could be even further improved if those wind projects themselves qualified for financing under the EIR program, which is likely since their addition would replace higher emitting resources.

Regarding the retirement of fossil resources and replacement with clean energy, using the EIR to retire and replace four of PacifiCorp's coal plants by 2025 would also likely result in net present value ("NPV") cost savings to customers on the order of **$1.6 billion**. These cost savings were calculated assuming a 120-basis point reduction in financing cost, as DOE suggested is likely.

Table 1: Recommended EIR-Related Savings for Early Retirement for Selected Coal Plants[4]

Retiring Coal Plant	EIR NPV Savings
Jim Bridger Unit 3 & 4	$512 million
Huntington	$507 million
Hunter	$439 million
Wyodak	$154 million
Total Savings	**$1.6 billion**

[4] These are conservative estimates that do not incorporate the abated costs of likely selective catalytic reduction requirements or gas conversion.

Collectively, utilizing EIR financing for only a subset of PacifiCorp's transmission costs and retirement of four of its coal plants would save customers **$13.4 billion** compared to PacifiCorp's estimates in the 2023 IRP.

2. The Commission must order PacifiCorp to evaluate the EIR as soon as possible.

PacifiCorp could dramatically reduce clean energy transition costs by aggressively pursuing EIR financing. Yet, despite Sierra Club's multiple attempts to bring this to the Company's attention, the Company refused to adjust its IRP to account for EIR financing. Sierra Club provides a brief overview of its attempts to convince PacifiCorp to evaluate the EIR to demonstrate why it is critically important for the Commission to specifically direct PacifiCorp to adjust its anticipated transmission and coal retirement costs to reflect the EIR and to do so as soon as possible. Ideally, PacifiCorp would update its IRP analysis prior to the Commission's acknowledgment decision. Alternatively, the Commission could order PacifiCorp to analyze the EIR in a supplemental filing in this docket, before its 2025 IRP (at which point it would likely be too late to meet the September 2026 deadline to apply for EIR financing).

Sierra Club first brought the EIR to the Company's attention in December 2022, when Sierra Club provided a feedback form to the Company describing the program and suggesting that PacifiCorp reduce its anticipated transmission upgrade costs by 30 percent.[5] The Company did not meaningfully engage with Sierra Club's suggestion at that time, but in January 2023, the Company met with Sierra Club, where we again raised the EIR. Taking the Company's feedback that it did not believe that a 30 percent reduction to all transmission upgrade costs was appropriate, Sierra Club provided a second stakeholder feedback form on January 18, 2023,[6] this

[5] Sierra Club Dec. Stakeholder Feedback Form.
[6] Sierra Club, *Stakeholder Feedback Form* (Jan. 2023), included as Attachment 2.

time refining the recommended 30 percent EIR cost reduction specifically to CAs 1, 2, 4, 12, and 14, for the reasons discussed above. Once again, PacifiCorp indicated they believe that their current approach is appropriate to address this issue.[7]

In comments on PacifiCorp's initial 2023 IRP in this docket, Sierra Club continued to point out the potential cost savings of assuming the availability of EIR financing for certain transmission upgrade costs and further provided analysis on the potential cost savings the EIR could provide when retiring the Company's coal plants. In response, PacifiCorp again declined to adjust its 2023 IRP. The Company stated that the EIR is likely to "have project-specific requirements that are beyond the scope of the supply-side resource estimates considered in PacifiCorp's IRP process," and that it would "look to take advantage of available opportunities to reduce costs for customers" as they begin to procure specific clean resources like those identified in the 2023 IRP preferred portfolio.[8] Finally, in response to Sierra Club's comments on the 2023 IRP filed in Oregon, PacifiCorp stated that "details of the EIR will be communicated in the next IRP."

While Sierra Club understands that the specific loan applications under the EIR will require project-specific analysis, it is unclear why PacifiCorp concluded that the EIR program is beyond the scope of the IRP or why it is sufficient to wait until the 2015 IRP. As noted above, the director of the Department of Energy's Loan Program Office recently explained that the EIR "*can finance entire Integrated Resource Plans*," and the same article included specific examples of hypothetical projects, including:

[7] PacifiCorp Response to Jan. 18, 2023 Stakeholder Feedback Form (Feb. 13, 2023).
[8] PacifiCorp Response to Sierra Club's Comments on PacifiCorp's Initial 2023 Integrated Res. Plan Utah Docket No. 23-035-10 [hereinafter "PacifiCorp Response to Sierra Club's Comments"].

- "Fossil replacement with solar and storage: An independent power producer owns the site of a 300-MW coal-fired power plant that has ceased operations. The plant has been demolished, but the interconnection and road infrastructure remain. The company plans to reuse the site and repurpose the existing interconnection to build 30 MW of solar and 250 MW of 4-hour battery storage. The project is eligible for, and the company is exploring, relevant federal Investment Tax Credits. The company has developed a plan to retrain and provide new employment opportunities for plant employees. The company is seeking a loan guaranteed by LPO to support construction of the solar and storage, which will be repaid through a combination of tax credits and revenue from the new solar-plus-storage facility. A portion of the loan will also be used to finance the remediation of several on-site coal ash ponds."

- "Transmission reconductoring: A utility plans to upgrade several high-voltage transmission lines through reconductoring. The utility estimates that replacing the conductive core of older transmission lines will double the electricity carrying capacity compared to the existing conductors, while reducing line losses by up to 50%. The reconductoring plan will retool the existing towers and utilize established rights-of-way. This investment will significantly increase the utility's ability to interconnect new clean energy generation without requiring the time and expense associated with the permitting and construction of new transmission lines. The reconductoring plan has received regulatory approval for cost recovery, which LPO considers sufficient to ensure reasonable prospect of repayment on the loan."

Sierra Club's repeated attempts to encourage the Company to update its IRP to consider the EIR program has been of no avail. Given the potential material impacts EIR program consideration would have on the costs associated with resource development in areas with significant renewable potential, Sierra Club continues to recommend the inclusion of these attributes in this IRP.

Accordingly, the Commission should direct the Company to complete the following scenarios as soon as possible:

- A scenario in which the transmission network upgrades associated with developing resources in CAs 1, 2, 4, 12, and 14 are reduced by 10 percent to account for the EIR program. In addition, for said scenario, the Company should ensure that all CAs that experience a coal plant retirement should see their cluster resources and the un-depreciated coal plant receive low-cost financing.

- A scenario in which EIR financing is assumed for early retirement and replacement of Jim Bridger Units 3 and 4, Huntington, Hunter, and Wyodak.

B. Energy Community Tax Credit Bonus

In addition to expanding and extending the availability of the ITC and PTC for clean energy resources, the IRA also provides tax bonus credits if certain conditions are met, including building new clean energy in "energy communities." Energy communities are broadly defined to include: (1) any census tract where a coal mine or coal-fired power plant has closed since 2009 (as well as a directly adjacent census tracts); (2) brownfield sites; and (3) metropolitan statistical areas or non-metropolitan statistical areas that (a) have an unemployment rate at or above the national average for the previous year; and have either (b) 0.17 percent or greater direct employment related to the extraction, processing, transport, or storage of coal, oil, or gas, *or* (c) 25 percent or greater local tax revenues related to the extraction, processing, transport, or storage of coal, oil or gas. The energy communities bonus credit adds 10 percent on top of the 30 percent tax credit received from the ITC and PTC.

While PacifiCorp did not initially factor in this tax credit bonus to its 2023 IRP, Sierra Club appreciates that the Company eventually incorporated the bonus for eligible communities in Utah South and Wyoming. Unfortunately, despite Sierra Club's repeated requests, PacifiCorp has not assigned the 10 percent energy community credit to eligible projects in Northern Oregon, specifically the proxy wind energy located in Arlington, Oregon.[9] The broad area around Arlington, an area of significant wind energy resources and wind farms that have already been developed, qualifies as an energy community because it squarely meets the applicable definition: Arlington, and much of the surrounding area, is either in, or directly adjacent to, a census tract with a coal closure since 1999, namely the Boardman coal plant, which is just 20 miles from

[9] *See* PacifiCorp, 2023 Integrated Res. Plan (Amended Final), Volume 1 at Table 7.1, Pub. 2023 Supply-Side Res. (May 31, 2023) [hereinafter "PacifiCorp 2023 Amended IRP"]. Table listing wind energy in Arlington, Or. as a proxy supply-side resource.

Arlington and closed down in 2020. This eligibility is reflected in a DOE online tool mapping census tracts eligible as energy communities.[10]

Given northern Oregon's eligibility for the energy community tax credit bonus, Sierra Club urged PacifiCorp to include this attribute for resources in northern Oregon, to which PacifiCorp responded that "opportunities in the west are significantly narrower for PacifiCorp, however, the applicability of the energy community bonus will continue to be developed."[11] Sierra Club urges the Company to update its modeling assumptions and capture the energy community tax credit bonus for projects in the Northern Oregon region.

Sierra Club further recommends that PacifiCorp incorporate the energy community tax credit bonus for all resources located in Wyoming that are within the area modeled by the Company as the Northern Utah bubble within Cluster Area 7. Slides 50 and 51 presented for the December 1, 2022, Public Interest Meeting show a map of the areas modeled for Cluster Study 2, as well as the amount of resources in the queue for each area. Cluster Area 7, the location of which is noted as NUT (presumed by Sierra Club to denote Northern Utah), extends from northern Utah into southwest Wyoming and includes a proposed total of 1,418 MW of new generation. The Cluster 2, Cluster Area 7 Report indicates that the cluster area includes the Trona area and Naughton area, both of which are in southeast Wyoming.[12] In fact, 1,218 of the 1,418 MW (86 percent) proposed in this Cluster Area are in Wyoming. Being in Wyoming, these upgrades and resources would almost certainly be eligible for the energy community bonus, given that every census tract in the state is considered an energy community. Including the

[10] *See* U.S. Dep't of Energy, Nat'l Energy Tech. Lab'y, *Energy Cmty. Tax Credit Bonus* (Apr. 4, 2023), *available at* https://arcgis netl.doe.gov/portal/apps/experiencebuilder/experience/?id=a2ce47d4721a477a8701bd0e08495e1d.
[11] PacifiCorp Response to Sierra Club's Comments. Sierra Club also raised the same issue in comments before the Oregon Public Utility Commission.
[12] PacifiCorp, Generation Interconnection, Cluster 2 Study Rep., Cluster Area 7 (Aug. 3, 2023), *available at* http://www.oasis.oati.com/woa/docs/PPW/PPWdocs/2022CA7CS2.pdf.

energy community bonus for these resources could significantly reduce their cost, possibly leading PacifiCorp's model to select them. For these reasons, Sierra Club urges the Commission to require the Company to consider the energy community tax credit bonus for all resources located in Wyoming that are part of the Northern Utah region within Cluster Area 7.

C. Missing ITC/PTC Tax Credits

In a recent discovery round, Sierra Club asked the Company why their supply-side resource work paper did not include ITC and PTC granted under the IRA for storage and standalone solar resources.[13] In response, PacifiCorp indicated that this was due to an oversight and that, while they are not listed in this work paper, they are incorporated in the PLEXOS model for these proxy resources. While we appreciate the Company's candor, we do not want this disconnect between datasets to set any precedent. For the sake of transparency, Sierra Club respectfully requests that the Company update its publicly available data to correct this oversight and accurately indicate the costs associated with storage resources given the ITC and PTC granted under the IRA.

IV. RELIABILITY ADJUSTMENTS

A. Overview

Generally speaking, in utility resource planning, the vast majority of analyses include steps to ensure that the resulting portfolios are reliable. Usually, reliability requirements are incorporated in the initial resource selection step, within the capacity expansion model, by establishing a minimum planning reserve margin ("PRM"). Once the PRM is identified, it becomes an adder to the load requirements the capacity expansion model is trying to meet by adding incremental capacity (*i.e.*, selecting new resources to be built) in a cost-effective manner.

[13] PacifiCorp Response to Sierra Club Data Request 11 in Oregon Public Utilities Commission Docket LC 82 (including in Attach Sierra Club 1.1-1 1st SUPP). All public data request responses referenced herein are compiled and included as Attachment 3.

Once the capacity expansion model identifies a portfolio that meets the PRM requirement, the portfolio is then tested in the production cost step. In this step, the portfolio's operations are simulated with finer temporal resolution. In some cases, an IRP can also include an additional modeling step in which the production cost run is conducted under several weather scenarios to test the reliability of the portfolio under extreme events. If the portfolio exhibits energy shortages due to the additional temporal resolution, additional manual adjustments (*i.e.*, the inclusion resources selected outside of the initial cost-minimizing optimization) might be added to ensure reliability.

PacifiCorp follows a similar methodology as described above; however, Sierra Club's review reveals that PacifiCorp's additional manual adjustments to ensure reliability are quite significant and merit particular attention.

At the beginning of their modeling process, the Company developed a variety of input assumptions that were fed into the PLEXOS LT model, a capacity expansion model with a 20-year planning horizon. The LT model is a capacity expansion model that identifies the least-cost resource portfolio that can meet the projected energy and capacity needs, inclusive of the PRM and under applicable policy constraints. The resource portfolios produced in the initial LT runs are then analyzed in the PLEXOS ST model (a production cost model) to more accurately simulate the operations and resulting costs and emissions of each portfolio.[14] Simulating the operations of the portfolio with greater time resolution in the ST model also allows for the identification of hours during which each portfolio experienced energy shortfalls, (*i.e.*, intervals in which the energy generated or purchased within the hour could not meet the energy demand within the hour).

[14] PacifiCorp also used the PLEXOS Medium-Term schedule ("MT") to perform a stochastic risk analysis of the portfolios, but this step is less relevant for the reliability adjustments discussed in this section.

While the existence of shortfalls in the ST run (which were not present in the initial LT runs) can be reasonably attributed to the different resolutions of the two models, Sierra Club has concerns about the magnitude of the shortfalls, which is discussed later in this section. To address the reliability concerns represented by these shortfalls, PacifiCorp made certain additional manual adjustments (*i.e.*, resource additions/subtractions performed by Company staff, not selected endogenously by the LT model) to the "initial LT portfolios."[15] These modified portfolios were named the final "reliable LT portfolios." Once those adjustments were decided by PacifiCorp, the adjusted "reliable" portfolio was re-run through the LT-step simply to calculate the fixed costs (*i.e.*, no new resource selections were made). This process was followed for almost all the portfolios presented (i.e., each variant is a "reliable LT portfolio" variant). As a final step, each reliable LT portfolio was also run through the ST model to create an hourly optimal dispatch to calculate the operating costs and emissions.

Throughout PacifiCorp's stakeholder input process in both the 2021 and 2023 IRP cycles, Sierra Club repeatedly requested that PacifiCorp provide more transparency into the methodology for making the aforementioned manual reliability adjustments. Despite these requests, the methodology PacifiCorp undertook for making these reliability adjustments is not well documented in the 2023 IRP, just as it was not well documented in the 2021 IRP. In Chapter 8 of the IRP (page 223), a very brief section explains the need for adjustments, with a single sentence referring to the process that PacifiCorp followed: "Because of the performance limitations of capacity expansion optimization, the ST model is leveraged to refine the portfolio to achieve a final balanced and reliable mix of resources […]." Although PacifiCorp portrays these changes as minor portfolio refinements through the 2023 IRP, the reliability adjustments

[15] *See* PacifiCorp 2023 Amended IRP at 223; PacifiCorp Response to Sierra Club Data Request 25, included in Attachment 3.

represent a very substantial number of manual additions, delays, subtractions, and other changes to the resource decisions that the PLEXOS LT optimization model initially selected.

To put this concern into perspective and before diving into the specifics for each portfolio, Sierra Club identified the following adjustments to the initial Base Portfolio variant during the 2024-2033 period:[16]

- Additions:
  - 2,971 MW of battery (short duration) storage
  - 2,767 MW of delayed coal retirements, (including Hunter 1-3, Huntington 1-2, Wyodak, and Jim Bridger 3)
  - 1,000 MW of nuclear
  - 886 MW of solar
  - 873 MW of delayed gas retirements (including Jim Bridger 1-2)
  - 606 MW of non-emitting peakers
  - 120 MW, annual average front office transaction (summer)
  - 52 MW of energy efficiency

- Subtractions:
  - 1,873 MW of wind
  - 332 MW of battery (long duration) storage
  - 216 MW of annual average front office transaction (winter)
  - 7 MW of Demand Response ("DR")

Sierra Club recognizes that computational and modeling limitations require manual adjustments in certain cases and commends PacifiCorp for its interest and effort in achieving resource portfolios that can meet reliability and cost-effectiveness standards. However, after reviewing the magnitude of the shortfalls of the initial portfolios and the level of adjustments, Sierra Club is particularly concerned that <u>despite the elaborate modeling process that PacifiCorp developed to construct its initial resource portfolios, the final reliable portfolios are in fact dominated by the Company's manual reliability adjustments, for which there is little to no transparency</u>.

[16] PacifiCorp, 2023 Integrated Res. Plan, Pub. Data Disc at File LT_7359_23I.LT.RP.20.PA1_.EP.MM.PP-D3 29.

Additionally, the impact of PacifiCorp's adjustments in the final portfolios is disproportionate to the documentation presented. Over the course of a 400-page filing, the Company dedicated a single sentence to the method behind changes of several thousand MWs over the planning period. The lack of proper documentation regarding the reliability adjustments completed has made it materially difficult to understand the reasoning behind them. Moreover, the opacity of this process has also limited stakeholders' ability to validate portfolios and offer more meaningful methodological comments and recommendations. There is also reason to believe the adjustments are somewhat subjective, introducing potential bias into the modeling process and limiting the model's ability to make its own optimal trade-offs in resource selection. In addition to our concerns about the overall methodology, the lack of transparency, and the impact on the portfolio composition, Sierra Club is also concerned that these manual changes—which differ by variant—might be impacting costs differently per variant, resulting in a distorted ranking of all variants considered. This is of special importance considering that, undoubtedly, delayed retirements or an early gas conversion can have significantly material impacts on cost estimates.

To illustrate the magnitude of those out-of-model adjustments and the influence they have on the final presented portfolios, the remainder of this section provides Sierra Club's comparative analysis of initial and reliable portfolios for three variants: the (1) Base Portfolio, (2) the Huntington Retirement by 2028, and (3) the Jim Bridger Gas Conversion by 2026 variants. All of these include substantial adjustments between runs and seek to cover shortfalls through different proxy resource strategies. Please note that the following review is done based on our best interpretation of file mapping, given PacifiCorp's proprietary and often complex file naming conventions. In Section V, Sierra Club provides quantitative analysis supporting a set of

"alternative adjustments" that similarly address the reliability shortfalls that PacifiCorp identified and could have been used in lieu of those selected by PacifiCorp.

B. Reliability Adjustments in the Base Portfolio

Sierra Club reviewed PLEXOS data for the initial and reliable LT runs of the Base Portfolio[17] and there are notable adjustments to resource additions as well as coal retirements and conversions. Table 2 presents the optimally selected and manually adjusted actions for each of the coal units. [18]

Table 2: Base Portfolio Thermal Plant Retirements & Conversions

Coal Unit	Initial	Reliable
Dave Johnston 1,2	Retires end of 2028	
Dave Johnston 3	Retires end of 2027	
Dave Johnston 4	Gas Conversion Retires end of 2039	Retires end of 2039
Jim Bridger 1	Gas Conversion in 2024 Retires end of 2030	Gas Conversion in 2024 Retires end of 2037
Jim Bridger 2	Gas Conversion in 2024 Retires end of 2029	Gas Conversion in 2024 Retires end of 2037
Jim Bridger 3	Retires end of 2025	Gas Conversion in 2030 Retires end of 2037
Jim Bridger 4	Retires end of 2031	Gas Conversion in 2030 Retires end of 2037
Hunter 1	Retires end of 2030	SNCR Retires end of 2031

[17] 2023 IRP Public Data Disc: Initial LT: *LT_6530_23I.LT.IR.20.PA0_.EP.MM.Base*
Reliable LT: *LT_7359_23I.LT.RP.20.PA1_.EP.MM.PP-D3 29.*

[18] Note that according to PacifiCorp's response to Sierra Club Data Request 25, the Preferred Portfolio was based on an initial model run identified as "Base Limited," rather than the "Base" Portfolio evaluated here. It is not clear to Sierra Club what distinguishes the initial Base Limited and initial Base model runs. Upon a preliminary review, it appears that the initial Base Limited portfolio requires fewer reliability adjustments than the Base portfolio, however there are still substantial changes. Additionally, the other variants that Sierra Club analyzed have adjustments similar in magnitude to the Base portfolio.

Hunter 2	Retires end of 2030	SNCR Retires end of 2032
Hunter 3	Retires end of 2029	SNCR Retires end of 2032
Huntington 1	Retires end of 2029	SNCR Retires end of 2032
Huntington 2	Retires end of 2025	SNCR Retires end of 2032
Naughton 1	Gas Conversion in 2026 Retires end of 2031 and 2032	Gas Conversion in 2026 Retires end of 2036
Naughton 2	Gas Conversion in 2026 Retires end of 2036	
Wyodak	Gas Conversion in 2027 Retires end of 2039	SNCR Retires end of 2039

Most notable are the adjustments for Jim Bridger 3 and 4, Huntington 2, Hunter 1 and 2, and Wyodak:

- In the initial LT run, Jim Bridger 3 was selected to retire at the end of 2025 while Unit 4 was set to retire at the end of 2031. For the reliable LT run, the Company's reliability adjustments included converting Jim Bridger 3 and 4 to gas by 2030 with retirement delayed to the end of 2037.

- In the initial LT run, Wyodak was set to convert to gas in 2027 whereas in the reliable LT run, Wyodak is coupled with selective noncatalytic reduction ("SNCR") until its retirement at the end of 2039. This change for Wyodak is especially intriguing, given that there is no apparent reliability benefit between converting Wyodak to gas and continuing to operate Wyodak on coal with the installation of SNCR.

- In the initial LT run, Hunter Units 1 and 2 were selected to retire at the end of 2030, while Hunter 3 was selected to retire in 2029. In the reliable run, these retirement dates were adjusted to 2031 for Unit 1 and 2032 for Units 2 and 3, all after installing SNCR.

In addition to the adjustments to the coal operations, PacifiCorp seems to have made significant adjustments to other resources as well that are both notable and concerning. For instance, in certain cases, resources such as wind were reduced rather than increased because of this adjustment process, which is counterintuitive from a reliability perspective and raises

additional questions about the reasoning behind the changes. Table 3 below summarizes the differences in cumulative installed capacity throughout the planning horizon between the initial and reliable LT runs that led to the development of the Base Portfolio, i.e., the manual resource additions as determined by the Company.

Table 3: Difference in Installed Capacity (MW) between Initial and Reliable LT Runs for the Base Portfolio

Resource	2023-2030	2031-2036	2037-2042	Total
Non-emitting Peaker	606	345	289	1,240
Nuclear	0	1,000	0	1,000
Coal to Gas	791	514	-1,305	0
Coal – EOL[19]	1,729	1,038	-330	2,437
Battery	2,821	150	773	2,184
Battery - LDES	-482	632	200	350
Wind	2,469	-4,342	540	-1,333
Solar	563	623	0	1,186

Positive values indicate incremental (over the initial portfolio) installed capacity in the period. Negative values indicate the reduction or elimination of resource capacity.

As requested through discovery,[20] Sierra Club is interested in a detailed explanation of the Company's methodology behind all reliability adjustments (resource additions and subtractions) for each portfolio studied, importantly including a justification for abandoning the gas conversion of Wyodak in 2027 in favor of SNCR and the delayed retirement of Jim Bridger and Hunter units.

[19] "Coal End of Life" should be interpreted as the difference in coal plant capacity that was removed from the system between runs. Thus, a positive number represents coal retirements selected in the initial portfolio that were delayed or avoided in the final reliable portfolio. This includes plant retirements whose lives were extended after installation of SNCR.

[20] PacifiCorp Response to Sierra Club Data Request 27, included in Attachment 3.

C. Reliability Adjustment in Huntington Retirement by 2028 Portfolio ("Huntington RET 2028")

In this section, we provide a more comprehensive analysis of the Huntington 2028 variant. Table 4 below summarizes the ST shortfall data for the Huntington RET 2028 initial LT variant.

Table 4: Huntington RET 2028 Shortfall Data – All Regions/Periods [Confidential]

[redacted]

As a preliminary matter, Sierra Club is concerned with the magnitude of these shortfalls. Although we recognize that a portfolio developed through a capacity expansion model that has limited temporal resolution can present shortfalls when run through a much higher temporal resolution production cost model like the ST model, the magnitude of those shortfalls raises questions about the robustness of the Company's initial modeling altogether. For example, in 2031, the initial LT run results in a portfolio that presents a shortfall of almost [redacted] during an evening in July, or about [redacted] percent of the peak load in July of that year which was projected to be [redacted]. Proportionally, this shortfall is quite significant and raises questions as to whether the initial LT runs were properly tailored to solve for the reserve margin during critical time periods. Figure 1 below shows all of the shortfalls that the system experiences based

on the ST run of the initial portfolio: [redacted] hours amounting to [redacted] of unmet energy in 2031—the highest of any year in the planning horizon.

Figure 1: Huntington RET 2028 Shortfall Data – 2031 Unmet Energy [Confidential]

In its next IRP, the Company should explain what steps it has taken to understand why this is happening and how it could be mitigated. An elaborate and resource-intensive process that results in unreliable portfolios that are ultimately overwritten by the Company's hand-picked choices is inefficient and not aligned with the goal of cost-minimization.

As with all other variants, PacifiCorp made resource adjustments to develop a "reliable" portfolio addressing the Huntington 2028 variant shortfalls. Table 5 describes the thermal plant retirements and conversions for this portfolio across the entire planning horizon. Table 6 below shows the difference in installed capacity between the initial and reliable LT runs for the Huntington RET 2028 portfolio for the entire planning horizon.

Table 5: Huntington RET 2028 Thermal Plant Retirements & Conversions

	Initial	**Reliable**
Dave Johnston 1,2	Retires end of 2028	
Dave Johnston 3	Retires end of 2027	
Dave Johnston 4	Gas Conversion Retires end of 2039	Retires end of 2039
Jim Bridger 1	Gas Conversion in 2024 Retires end of 2030	Gas Conversion in 2024 Retires end of 2037
Jim Bridger 2	Gas Conversion in 2024 Retires end of 2029	Gas Conversion in 2024 Retires end of 2037
Jim Bridger 3	Retires end of 2025	Gas Conversion in 2030 Retires end of 2037
Jim Bridger 4	Retires end of 2031	Gas Conversion in 2030 Retires end of 2037
Hunter 1	Retires end of 2029-2030	SNCR Retires end of 2031
Hunter 2	Retires end of 2029	SNCR Retires end of 2032
Hunter 3	Retires end of 2029	SNCR Retires end of 2032
Huntington 1	Retires end of 2029	SNCR Retires end of 2027
Huntington 2	Retires end of 2028	SNCR Retires end of 2032

Naughton 1	Gas Conversion in 2026 Retires end of 2035-2036	Gas Conversion in 2026 Retires end of 2036
Naughton 2	Gas Conversion in 2026 Retires end of 2036	

Table 6: Difference in Installed Capacity (MW) between Initial and Reliable LT Runs for Huntington RET 2028

Resource	2023-2030	2031-2036	2037-2042	Total
Non-emitting Peaker	606	345	289	1,240
Nuclear	0	1000	0	1,000
Coal to Gas	790	396	-1187	0
Coal - EOL	2,028	739	-330	2,437
Battery	4642	-768	-1400	2,474
Battery - LDES	-2000	2000	200	200
Wind	2469	-4906	540	-1,897
Solar	888	891	0	1,779

Leading up to 2030, the year with the highest peak of unserved energy, the Company's adjustments include the following:

- Add 606 MW of non-emitting peakers.
- Increase investment in short-duration batteries (4.6 GW), while opting out of 2 GW of long-duration storage.
- Accelerate investment in renewable resources (2.5 GW for wind, 890 MW for solar).
- Delay the retirement of Jim Bridger 3 (350 MW) from the initially optimized retirement year at the end of 2025 to 2037, after converting it to gas in 2030.
- Delay the retirement of Huntington 2 (450 MW) from the initially optimized retirement year of (end of) 2028 to 2032.

- Delay retirement of all Hunter units from the initially optimized retirement years of 2030 for Unit 1 (418 MW) and 3 (470 MW) and 2031 for Unit 2 (268 MW) to Hunter Units 1 and 3 using SNCR in 2033 and Unit 1 in 2032.

By 2030, PacifiCorp will add 4.6 GW of dispatchable resources and nearly 3.5 GW of solar and wind resources in addition to the initial plan. The additional renewable energy and storage additions (with installed capacity for these resources reaching 8 GW) could be sufficient to cover the shortfall observed in 2031. However, PacifiCorp has included several hundred MWs of non-emitting peakers and keeps online uneconomic coal units (Jim Bridger, Huntington, Hunter). Deviating from the economic retirement date, especially when it appears unnecessary from a reliability perspective, will create additional costs and risks for ratepayers. Additionally, converting Hunter units to SNCR rather than selective catalytic reduction ("SCR") impacts the Company's ability to meet future emission reduction standards, as discussed below in Section IV.E.

D. Reliability Adjustments for Jim Bridger Gas Conversion 2026 ("JB GC 2026")

Sierra Club reviewed the Jim Bridger Gas Conversion by 2026 variant because it was the only portfolio that scored within the top five of each metric among the portfolios studied and even outperformed the Preferred Portfolio.[21] Sierra Club's analysis of the JB GC 2026 variant LT runs (initial versus reliable) found that by 2030, the following manual reliability adjustments were made:

- Additions:
  - 4,273 MW of battery (short duration) storage
  - 880 MW of solar
  - 100 MW of delayed gas end of life retirements
  - 606 MW of non-emitting peakers
  - 10 MW of Demand Response

[21] PacifiCorp 2023 Amended IRP at 268, Table 9.14.

- Subtractions:
    - 678 MW of wind
    - 350 MW of battery (long duration) storage
    - 2 MW of energy efficiency

Table 7 below describes the thermal plant retirements and conversions for this portfolio across the entire planning horizon. Table 8 shows the difference in installed capacity between the initial and reliable LT runs for the JB GC 2026 portfolio for the entire planning horizon

Table 7: JB GC 2026 Thermal Plant Retirements & Conversions

Resource	*Initial*	*Reliable*
Dave Johnston 1,2	Retires end of 2028	
Dave Johnston 3	Retires end of 2027	
Dave Johnston 4	Retires end of 2039	
Jim Bridger 1	Gas Conversion 2024 Retires end of 2030	Gas Conversion 2024 Retires end of 2037
Jim Bridger 2	Gas Conversion 2024 Retires end of 2029	Gas Conversion 2024 Retires end of 2037
Jim Bridger 3	Retires end of 2025	Gas Conversion 2026 Retires end of 2037
Jim Bridger 4	Retires end of 2031	Gas Conversion 2026 Retires end of 2037
Hunter 1	Retires end of 2029	SNCR Retires end of 2031
Hunter 2	Retires end of 2030	SNCR Retires end of 2032
Hunter 3	Retires end of 2029	SNCR Retires end of 2032
Huntington 1	Retires end of 2029	SNCR Retires end of 2032
Huntington 2	Retires end of 2025	SNCR Retires end of 2032

Naughton 1	Gas Conversion 2026 Retires end of 2035-2036	Gas Conversion 2026 Retires end of 2036
Naughton 2	Gas Conversion 2026 Retires end of 2036	Gas Conversion 2026 Retires end of 2036
Wyodak	Gas Conversion 2027 Retires end of 2039	SNCR Retires end of 2039

Table 8: Difference in Installed Capacity (MW) between Initial and Reliable LT Runs for JB GC 2026

Resource	2023-2030	2031-2036	2037-2042	Total
Non-emitting Peaker	606	345	289	1240
Nuclear	0	1000	0	1000
Coal to Gas	91	394	-1184	-699
Coal - EOL	2147	620	-330	2437
Battery	4,273	-647	-1302	2324
Battery - LDES	-2000	2150	200	350
Wind	2,470	-4,903	540	-1893
Solar	880	892	0	1772

E. Reliability Adjustments Assuming SNCR at Hunter and Huntington Plants

As discussed above, PacifiCorp's reliability adjustments delayed the retirement of all three Hunter units and both Huntington units as originally forecasted in the LT model, in favor of longer operating lives and the installation of SNCR. The inclusion of SNCR was presumably made in order to comply with the U.S. Environmental Protection Agency's ("EPA") Good Neighbor Plan ("Plan"),[22] which requires significant nitrogen oxide ("NOx") emission reductions

[22] PacifiCorp has referred to the Good Neighbor Plan as the "Ozone Transport Rule," which is not a title for the rule used by EPA.

in the near term. As Sierra Club has noted numerous times, installation of SNCR will not comply with the Good Neighbor Plan, which bases emission allowances upon the assumption that SCR will be installed on pollution sources.

Specifically, EPA's Good Neighbor Plan is a federal implementation plan that requires 23 upwind states, including Utah, to reduce emissions of the ozone precursor NOx from electric generating units, like Hunter and Huntington, in accordance with EPA's 2015 ozone National Ambient Air Quality Standards ("NAAQS"). Under the Plan, states are allocated emission budgets. Between 2025 and 2026, Utah's NOx emission budget drops from 15,917 tons to 6,258 tons, and in 2027, the limit drops further to just 2,593 tons.[23] Starting within one year of installation of SCR, but no later than 2030, daily backstop limitations come into effect, in which coal units must surrender allowances at a 3:1 ratio for each instance in which the unit exceeds, by more than 50 tons, a daily average NOx emission rate of 0.14 lb/mmBtu during the ozone season.[24] This control stringency reflects "EPA's determination . . . [that] installation and operation of SCR controls on all such large coal-fired [electric generating units] is appropriate to address states' good neighbor obligations with respect to the 2015 ozone NAAQS."[25]

In other words, electric generating units in Utah will be required to significantly reduce NOx emissions during the ozone season, based on EPA's determination that SCR controls are required to meet a state's Clean Air Act obligations. SNCR, which is well known to be significantly less effective at reducing NOx emissions than SCR, is unlikely to meet these required emissions reductions. PacifiCorp's own calculations estimate that SCNR will reduce

[23] *See* U.S. Env't. Prot. Agency, State Budgets under the Good Neighbor Plan for the 2015 Ozone NAAQS (Mar. 15, 2023), *available at* https://www.epa.gov/csapr/state-budgets-under-good-neighbor-plan-2015-ozone-naaqs.
[24] 88 Fed. Reg. 36,654, 36,767 (June 5, 2023).
[25] *Id.*

emissions at Hunter and Huntington by approximately [redacted] percent,[26] whereas installation of SCR would reduce emissions by between approximately [redacted] percent at these plants.[27] Accordingly, a Preferred Portfolio that is premised upon SNCR complying with EPA's Good Neighbor Plan is bound to violate federal law.

It is unsurprising that PacifiCorp's Preferred Portfolio is premised upon a compliance strategy that would not meet federal Clean Air Act requirements, because the Company has already indicated that it is not planning to comply *at all* due to litigation uncertainty.[28] Such a strategy is not in ratepayers' interest, as a clear trend has been established towards increasing federal regulation of coal units. Moreover, the Good Neighbor Plan is likely to become operative in Utah in 2024.

Two separate sets of cases impact the Good Neighbor Plan's application in Utah but neither relieves PacifiCorp of its Clean Air Act obligations. First is PacifiCorp and the State of Utah's challenges to EPA's disapproval of Utah's state implementation plan ("SIP") addressing cross state air pollution, which found that no emission reductions were necessary to address Utah's contributions to ozone pollution in Colorado. These cases have been consolidated and are currently pending in the U.S. Court of Appeals for the Tenth Circuit ("Tenth Circuit"), which issued an initial stay of the SIP disapproval.[29] Despite this initial stay, no final opinions have been issued, and a full merits panel will reconsider the stay, as well as whether to dismiss the

[26] PacifiCorp Response to Sierra Club Data Request 20, included in Attachment 3.
[27] PacifiCorp Conf. Response to Sierra Club Data Request 22, included in Attachment 3.
[28] PacifiCorp Response to Sierra Club Data Request 37, included in Attachment 3 (stating that due to the federal court stay of EPA's disapproval of Utah's ozone state implementation plan, "Utah is not currently subject to the federal ozone interstate rule."). *See also PacifiCorp 2022 All-Source Request for Proposals Notice (2022AS RFP)* (Sept. 29, 2023), *available at* https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/suppliers/rfps/pacificorps-2022-all-source-request-for-proposals/2022AS_RFP_Notice_September_29_2023.pdf (announcing that PacifiCorp has chosen to "pause" the 2022 all-resource request for proposals, in part, due to "[a] federal court's stay of the U.S. Environmental Protection Agency's proposed ozone transport rule.")

case or transfer it to the U.S Court of Appeals for the District of Columbia Circuit ("D.C. Circuit"), with a final opinion likely to be issued in 2024. These consolidated cases impact the Good Neighbor Plan in Utah because EPA's disapproval of Utah's SIP serves as one basis to include Utah in the federal Good Neighbor Plan. Additionally, and unlike in many other states covered by the Good Neighbor Plan, a second basis exists for Utah because the state submitted its SIP over a year late and after EPA had already issued a "finding of failure to submit." This finding triggered a two-year window for EPA to issue a federal plan for the state, which EPA did by issuing the Good Neighbor Plan. Due to Utah's failure to timely submit a SIP, the Good Neighbor Plan applies in Utah until the state submits *and EPA approves* a replacement SIP.[30] In other words, in order for Utah's late-submitted and disapproved SIP to take the place of the Good Neighbor Plan, the Tenth Circuit must specifically direct EPA to approve the state plan, rather than the more typical course of action where a court would either vacate an agency action or remand the action back to the agency for further proceedings. Vacatur or remand would not result in an approved Utah SIP, meaning that the Good Neighbor Plan would still apply.

The second relevant set of cases is the State of Utah and PacifiCorp's challenges (along with other parties) to the Good Neighbor Plan itself, filed in the D.C. Circuit. If challenges to the Good Neighbor Plan succeed in the D.C. Circuit, this could mean that the Good Neighbor Plan would not apply in any state, including Utah. While these cases are still in their early stages, the D.C. Circuit recently denied several parties' requests for stays of the Plan, meaning that the Plan will go into the effect during the pendency of the D.C. Circuit challenges.

Accordingly, there is a high likelihood that the Good Neighbor Plan will become effective in Utah in 2024, and, when it does, its requirements will not be met with SNCR.

[30] 42 U.S.C. § 7410(c)(1), (k)(3).

Accordingly, a Preferred Portfolio that extends the lives of Hunter and Huntington must include the assumption that SCR will be installed. PacifiCorp's apparent chosen strategy of ignoring Good Neighbor Plan requirements puts ratepayers at risk that when these requirements go into effect, as PacifiCorp will not have available resources to serve load while simultaneously complying with NOx emission reductions.

V. ALTERNATIVE RELIABILITY ADJUSTMENTS ANALYSIS

A. Overview and Objectives

As described above, Sierra Club is concerned about the lack of explanation for PacifiCorp's methodology in selecting reliability adjustment resources, particularly as many of PacifiCorp's reliability adjustments extend the lives of uneconomic fossil resources. It is not clear what criteria the Company used to add or subtract resources from the initial LT portfolio run to arrive at the final reliable portfolio run. While PacifiCorp did provide some additional explanation in response to Sierra Club Data Request 27,[31] this was insufficient to describe many key considerations. For example, PacifiCorp's response makes no attempt to explain how or why it extended the life of certain existing thermal resources as a reliability adjustment. Additionally, there is no explanation for why certain resources (*e.g.*, nuclear) were selected to address long duration needs over others (*e.g.*, geothermal). Furthermore, there was no meaningful attempt to add demand-side resources as a reliability adjustment which could provide a similar benefit as the long-duration supply-side resources.

PacifiCorp's focus appears to have been simply addressing the hourly shortfalls identified in the ST model without specifically optimizing the reliability resource additions for cost, reduced greenhouse emissions, or any other metric. Indeed, PacifiCorp has not provided analysis

[31] PacifiCorp Response to Sierra Club Data Request 27, included in Attachment 3.

demonstrating that the reliability adjustments the Company made were optimal from a cost or public policy perspective. In fact, many potentially viable sets of reliability adjustments could conceivably address the reliability shortfall issues identified through the initial portfolio ST model run. This contrasts with the results that PacifiCorp presents in its IRP, which suggest that there is only *one* set of viable reliability adjustments that can achieve a final reliable portfolio.

To demonstrate that there are alternative portfolio adjustments that are equally viable (and which may even be preferable to PacifiCorp's chosen adjustments), Sierra Club commissioned Strategen to conduct a detailed quantitative analysis of the 8,760 hourly shortfall data that PacifiCorp provided in its supporting data disks. The analysis focused on the Huntington 2028 variant because Sierra Club had access to the most data for this variant and explored other adjustment options that could address the reliability issues of this variant's initial portfolio while also considering the impact on system costs and emissions. While this is not a comprehensive analysis, it provides an illustrative, reliable portfolio that also relies primarily on clean resources. Specifically, the illustrative portfolio adds resources to the initially optimized one up to the point of eliminating the observed shortfalls and without extending the life of uneconomic thermal units.

B. Analysis Methodology

The starting point for the analysis was the 8,760 hourly data PacifiCorp provided from its initial ST model runs performed on the initial LT portfolio. This data included hourly shortfalls reflecting unserved energy for both the Pac East and Pac West systems. As mentioned, the initial focus was on the Huntington 2028 variant, which was labeled as "PC0 MMHTG2 2028" in the data files. In examining this data, Strategen determined that the largest amount of unserved energy (both annual MWh and peak MW) appears to occur in the year [redacted]. The table below

summarizes these shortfalls across each month (rows) and hour of the day (columns) in [redacted] for the initial Huntington 2028 portfolio:

Table 9: Total Initial Unserved Energy (Sum of MWh) [Confidential]

[redacted]

These hourly shortfall periods were then targeted for reduction via the set alternative reliability adjustments that Strategen developed through its analysis. To perform this analysis, Strategen developed representative 8760 hourly generation profile data for each of a variety of candidate resources, including:

- Solar plus storage
- Offshore wind
- Onshore Wind
- Long-duration energy storage
- Energy efficiency
- Demand response
- Advanced geothermal

These resources were chosen because they represent a diversity of clean energy resources with complementary characteristics and output profiles that, in combination, are anticipated to be able to meet a range of shortfall needs. Additionally, in our assessment these resources do not produce emissions of CO_2 or other pollutants as do many of the adjustments that PacifiCorp selected such as extending the life of coal resources. Finally, they all have some degree of commercial viability. While some technologies such as long-duration storage and advanced geothermal are still relatively new, both of these are quickly progressing and already have

existing contractual obligations, which contrasts with technologies such as small modular reactor nuclear and non-emitting peakers.

C. Illustrative Results

Through an iterative approach, varying amounts of these candidate resources were added to the [redacted] hourly generation profile until there was no longer any remaining unserved energy. Below are two illustrative examples of different sets of adjustments that were sufficient to transform the initial Huntington 2028 portfolio into a final reliable portfolio (i.e., no unserved energy).

Table 10: Illustrative Example of Alternative Portfolio

Reliability Resource Additions		
(MW input values can be modified)		
Type	**MW**	
Solar + Storage	507	
Wind	2469	
Offshore Wind	0	
Battery	1535	
LDES	600	
EE	150	
DR	150	
GEO	500	
Initial Unserved Energy (MWh)		578,163
Final Unserved Energy (MWh)		-
% Reduction		100%

Additionally, an alternative clean, reliable portfolio could add the following resources:

Table** 11: **Illustrative Example of Alternative Portfolio

(MW input values can be modified)		
Type	**MW**	
Solar + Storage	650	
Wind	1200	
Offshore Wind	1200	
Battery	1635	
LDES	500	
EE	100	
DR	100	
GEO	320	
Initial Unserved Energy (MWh)		578,163
Final Unserved Energy (MWh)		-
% Reduction		100%

The first set of adjustments shown above includes several of the same adjustments that PacifiCorp included in its final reliable portfolio through [redacted], including those for wind, solar and incremental storage levels.[32] In addition to these, the first alternative portfolio included incremental additions of geothermal and demand side resources, while not including any non-emitting peakers or incremental nuclear additions.

Notably, these alternative sets of resource adjustments developed by Sierra Club to arrive at a final reliable portfolio in [redacted] *do not include any of the following* adjustments that PacifiCorp made to its thermal resources to arrive at its own final reliable portfolio:

- Jim Bridger 3 coal operation extends through 2030, then GC through 2038 (versus retiring in 2026)
- Jim Bridger 4 GC in 2030 through 2038 (versus retiring 2032)
- Huntington 2 coal operation extends through 2033 via SNCR (versus retiring in 2029)
- Hunter 1 coal operation extends through 2032 via SNCR (versus retiring in 2030)
- Hunter 2 coal operation extends through 2033 via SNCR (versus retiring in 2031)
- Hunter 3 coal operation extends through 2033 via SNCR (versus retiring in 2030)
- Wyodak coal operation extends through 2040 via SNCR (versus GC in 2027)

[32] A portion of the storage adjustment in the alternative portfolio includes long-duration storage (in lieu of short duration) that is co-located with solar.

- Jim Bridger 1-2 gas operation extends through 2038 (versus retiring in 2030/2031)

These two examples of an alternative, reliable portfolios, are presented to demonstrate that reliability can be met with clean resources, rather than extending the useful lives of fossil resources through SNCR, which likely will not comply with federal law, or gas conversions, which may not be a shared resource with all PacifiCorp states.. It is worth noting that these alternative portfolios are not necessarily the *optimal* or *only* alternative reliable portfolio.[33] However, it does illustrate that the set of solutions is vaster than suggested by the Company, as there may be a variety of alternatives beyond what PacifiCorp presented for achieving a reliable portfolio and that these alternatives are worthy of further consideration and evaluation by the Commission and interested parties. In fact, other incremental resources including offshore wind, additional geothermal, demand side resources, additional long duration storage, and other technologies could lead to reliable portfolios that can outperform the Preferred Portfolio in emissions, costs, and risk.

Strategen also reviewed the ancillary services violations during [redacted]. In the few instances in which the system experienced a violation, there was a shortage in the regulation capacity, mainly in the East side. The violations, as reported, remained below 700 MW and did not necessarily coincide with the energy shortages. These could be addressed to a large degree by the storage additions, or incremental storage as needed.

VI. GRANULARITY ADJUSTMENTS

In addition to making post-modeling resource adjustments to achieve a final reliable portfolio as described above, PacifiCorp's analysis also included certain pre-modeling

[33] Notably, PacifiCorp makes reliability adjustments outside of any traditional economic analysis or "least cost" optimization framework. It is possible that Sierra Club's proposed alternative portfolios would be lower cost than PacifiCorp's reliability adjustments, given the Company's reliance on resources like nuclear and "non-emitting peakers," the costs of which are not only high but also speculative.

adjustments to its resource cost assumptions that were intended (at least in part) to steer the initial resource selection process towards a more reliable initial LT portfolio. This occurs through the Company's application of "granularity adjustments" to the resource costs inputs of the initial LT model runs. Whereas reliability adjustments are made after reviewing identified shortfalls from the ST model, the granularity adjustments are inputted to the LT model.

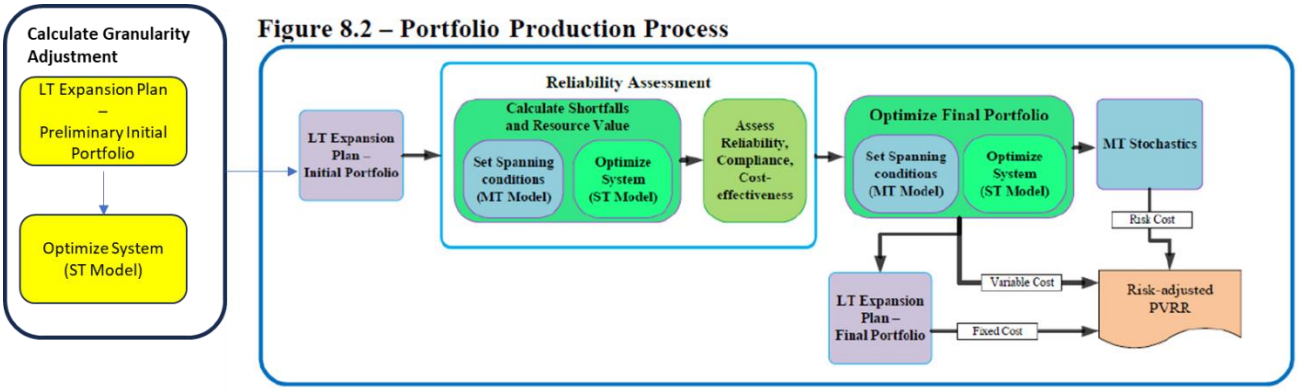
The granularity adjustment is intended to reflect the flexibility value that a resource's operation may provide to the grid; that is, it reflects the resource's responsiveness to grid needs at the 8760 hourly level which would not be fully captured by the LT model which is based on a less granular time series. By reflecting 8760 hourly values, the granularity adjustment is designed to more fully capture both the economic value of resource flexibility (e.g., the ability of a battery to quickly ramp its output up and down) as well as the economic value of short-duration output during critical reliability hours (e.g., the ability of a gas peaker to dispatch from 6 to 8 p.m. on a hot summer day).

In principle, Sierra Club is generally supportive of the concept of a granularity adjustment since it likely better reflects the full economic value of non-emitting resources like battery storage, which provide substantial flexibility to the system. However, Sierra Club is concerned that PacifiCorp's granularity adjustment calculations were performed in a way that incorrectly and artificially reduces the cost of coal resources. This in turn may have led to distorted results in the initial LT portfolios whereby the economic retirement dates for coal resources were artificially extended, *even before* subsequent reliability adjustments were made to further extend the lives of those resources.

To calculate the granularity adjustment values, PacifiCorp conducted a separate analysis step even prior to developing its initial LT portfolios (here we refer to this as the "preliminary

initial portfolio," which is distinct from the "initial portfolio"). This separate analysis step is not reflected in the IRP's Figure 8.2 which summarizes the Portfolio Production Process. A modified version of Figure 8.2 is provided below with this separate analysis step shown on the left-hand side (yellow boxes).

Figure 2: Modified Version of Figure 8.2



As PacifiCorp explained, this calculation reflects the "difference in economic value between an hourly 8760 cost calculation in ST modeling, and the seven-block per month representation used in the LT model."[34] More specifically, for each resource type, the granularity adjustment reflects the difference in net revenues generated by the resource when comparing the ST model results and the LT model results of the preliminary initial portfolio. This difference in net revenues is then converted to an annual $/kW-yr cost adjustment factor that is applied to each resource during the initial portfolio selection process for subsequent LT model runs. For example, if a battery's flexibility allows it to generate more revenue during the hourly ST model than what the preliminary initial LT model suggested, the granularity adjustment would be in the form of a downward (i.e., negative) adjustment to the battery's resource cost in the initial

[34] PacifiCorp 2023 Amended IRP at 223.

portfolio LT model run. This downward adjustment would make the battery more attractive for economic selection in subsequent initial portfolio LT model runs.

PacifiCorp's IRP filings and supporting data disks did not identify the specific granularity adjustments for each resource type (despite Sierra Club's requests during the public input process); however, the adjustment values were subsequently provided as an attachment to Sierra Club Data Request 3. PacifiCorp confirmed that the Company limited the adjustment to +/- $[redacted]/kW-yr. A summary table of the adjustment values for several resource types are provided in Attachment 5 to these comments.

Based on Sierra Club's review of the granularity adjustment values provided by PacifiCorp, there are several values that appear counterintuitive and without a clear explanation.[35] First and foremost, Sierra Club is concerned that virtually all of the existing coal units tend to have relatively large negative granularity adjustments, often reaching the minimum value of - $[redacted]/kW-yr through 2030 and even beyond in some cases. This trend is at odds with the fact that most coal units are relatively inflexible and would likely not be capable of fast ramping activities that would allow them to quickly adjust their economic dispatch. Thus, in contrast to a resource like a battery, it is unclear why the ST model would demonstrate greater net revenues for coal resources than the LT model.

One possibility that Sierra Club considered is the fact that the ST model could be dispatching coal resources during a small number of scarcity hours with extremely high market prices that were not present in the LT model. However, if that were the underlying cause of the large adjustments for coal, then one would expect a similarly large granularity adjustment to be

[35] Unfortunately, as of October 6, 2023 Sierra Club has not received an accessible version of the underlying workpapers used to calculate the granularity adjustment. Thus, this review is based solely on the hard-coded values provided in PacifiCorp Response to Sierra Club Data Request 3, included in Attachment 3.

present for natural gas resources which could also be dispatching during scarcity hours. In fact, due to their faster ramping times, natural gas resources would likely have even greater flexibility to ramp up their dispatch during these scarcity hours than coal. Instead, counterintuitively, many candidate natural gas resources appear to have substantially less favorable granularity adjustments than similarly situated coal resources. An example of this is shown in Table 12 below.

Table 12: Granularity Adjustments Applied to Select Coal and Natural Gas Plants, 2023-2031 ($/kW-yr) [Confidential]

The Company explained in response to Sierra Club Data Request 29 that later year differences are related to the "very different operating and dispatch characteristics of different resource types."[36] Sierra Club does not contest that the resources represented in Table 12 above

[36] PacifiCorp Conf. Response to Sierra Club Data Request 29 at (f) in Oregon Public Utilities Commission Docket LC 82 (including in Attach Sierra Club 1.1-1 3rd SUPP). All confidential data request responses referenced herein are compiled and included as Attachment 4.

have different operating and dispatch characteristics, however PacifiCorp's explanation is insufficient and confusing. Factors such as long start-up times and costs, minimum power outputs, and ramping times can impact an asset's ability to provide hourly or sub-hourly dispatch flexibility. All of these factors hinder a coal unit's ability to rapidly respond to grid needs. Follow up discovery questions on this issue yielded no additional information from the Company.[37] Thus, Sierra Club remains concerned at the potential overestimation of the granularity adjustment for coal units in the Company's territory.

One possible driver of this overestimation is the fact that the Company's net revenue calculation appears to be based upon incremental/marginal fuel costs instead of the total fuel costs incurred by the coal resources.[38] While incremental fuel costs may be appropriate for short-run dispatch decisions, they are inappropriate for calculating net revenues in a long-term planning context. Instead, any net revenues used to calculate the granularity adjustment calculation should be based on the total fuel costs since this reflects the full economic cost borne by PacifiCorp customers. Going forward, Sierra Club recommends that PacifiCorp revise its approach to calculating the granularity adjustment for coal resources accordingly. Additionally, Sierra Club continues to recommend that PacifiCorp provide greater transparency around its calculation of the granularity adjustment in future IRPs.

VII. COAL PRICES AND UNIT RETIREMENTS

A. Coal Pricing for Jim Bridger, Hunter, and Huntington

Through its engagement in both past IRP proceedings and annual fuel cost adjustment proceedings in Oregon, Sierra Club has raised numerous concerns regarding PacifiCorp's

[37] *See* PacifiCorp Response to Sierra Club Data Request 41(a), included in Attachment 3 (Question: "Please provide an intuitive explanation for why some coal units had larger granularity adjustments than gas units at the same location." Answer: "Generically, coal and gas units have different costs and operating characteristics leading to different resource values in the PLEXOS model . . .").
[38] *See* PacifiCorp Response to Sierra Club Data Request 29 at (e), 35 at (d), included in Attachment 3.

modeling assumptions of coal fuel costs. While PacifiCorp's coal fuel assumptions in the 2023 IRP appear to have improved relative to the 2021 IRP, Sierra Club continues to have concerns about assumptions for coal fuel associated with the Jim Bridger plant. These concerns are two-fold.

First, contrary to Sierra Club's recommendations, PacifiCorp's model assumptions regarding coal pricing were not particularly transparent. For example, the Master Input files PacifiCorp provided as part of the data disks with its initial filing seem to suggest that a minimum "take-or-pay" tonnage level of coal associated with the Jim Bridger plant through 2028, despite no such minimums existing. The table below summarizes the minimum tons of coal indicated in the Master Input file:[39]

Table 13: Minimum tons of coal assumed within the 2023 IRP, 2023-2028 [Confidential]

Through subsequent discovery, PacifiCorp clarified that "PLEXOS does not model a take-or-pay provision for the Jim Bridger plant in PacifiCorp's 2023 Integrated Resource Plan (IRP) and does not enforce minimum coal purchases."[40] PacifiCorp's response further explained

[39] CONF_Scenario Master_BaseCase 2023 IRP Base (Inputs)-1-11-23-Colstrip-Update.xlsx, "10 - Coal Cost Incremtl by Vol".
[40] PacifiCorp Redacted Response to Sierra Data Request 35 at (b), included in Attachment 3.

that the Master Input file initially provided did not actually contain the coal prices the Company used for the Hunter, Huntington, and Jim Bridger and that instead they "incorporated recent information." As of this filing, Sierra Club is unable to confirm what "recent information."[41] PacifiCorp ultimately incorporated into its PLEXOS modeling for these three plants; however, we believe that PacifiCorp's response to Sierra Club Data Request 9 (included in Attachment 3) provides the coal pricing used in the model.

Second, upon reviewing this information, Sierra Club is still concerned that even if a minimum volume is not enforced at Jim Bridger as PacifiCorp has stated, the Company assumed distorted pricing that would achieve a similar effect. In fact, PacifiCorp's modeling assumptions for the initial volume tier ("base tier") in its response to Sierra Club Data Request 9 are much *lower* than what its own Long-Term Fuel Supply Plan ("LTFSP") projects. This discrepancy is perplexing, given PacifiCorp's prior statements regarding the interdependency of the IRP and LTFSP, including that "[t]he Company prepared its 2023 Fuel Plan to assess and identify fueling options for the Jim Bridger plant, *including pricing assumptions and mine plan options developed as a basis for the 2023 IRP*."[42]

The assumed coal pricing is likely to underestimate the true cost of operating the Jim Bridger plant in PacifiCorp's IRP model, which would lead to excess dispatch of the plant in PLEXOS, inflating its overall value and thereby leading to a retirement date that is later than optimal. For these reasons, the Commission should apply caution when evaluating PacifiCorp's proposed date of 2030 for retirement or conversion of the Jim Bridger units 3 and 4. Instead, the earlier timeframe of 2026 is likely more optimal for one or both units. Given that 2026 is less

[41] *Id.* at (a).
[42] Or. Pub. Util. Comm'n, Docket UE 420, PacifiCorp Opening Brief at 26 (citing the rebuttal testimony of James Owen, PAC/500 at Owen/29) (Sept. 22, 2023) (emphasis added).

than 3 years away, it is important that the Commission direct PacifiCorp to adjust its modeling assumptions and reevaluate Jim Bridger's future as soon as possible.

Similar pricing effects could also be in place for Hunter and Huntington, however Sierra Club has not evaluated these.

B. Unit Retirement Considerations

Throughout our analysis of the 2023 IRP, a number of issues were identified that bear upon the ultimate retirement dates of several coal units as selected in the Preferred Portfolio. These include the following:

- **Excess costs or other limitations on replacement resource options:** Excessively high transmission network upgrade costs may limit wind and solar from displacing existing coal (especially since EIR was not considered as an offsetting factor).
- **Reliability adjustments:** Modifications extend the life of certain coal units beyond the date selected by the initial LT model run. These adjustments are selected despite other viable adjustment options available as demonstrated above.
- **SNCR installation:** Assumptions were implicitly made that PacifiCorp can comply with pollution reduction requirements through the installation of SNCR, as assumption that is not aligned with federal regulatory requirements.
- **Inflated granularity adjustments:** Likely delays the endogenous retirement date selected in the initial LT model runs.
- **Excessively low coal prices at Jim Bridger:** As described above, this likely underestimates the cost, and inflates the value of this plant.

While each of these considerations may not have a decisive effect on its own, in combination they may be causing PacifiCorp's analysis to suggest a later coal retirement date than what is optimal. This is especially true for certain units, such as Jim Bridger 3 and Huntington 2, both of which would have retired in 2026 timeframe (according to the Base Portfolio initial run) but for PacifiCorp's reliability adjustment process. This is true for these units even with the other errors Sierra Club identified (e.g., failure to consider financial impacts of the EIR) going uncorrected.

Given the potential for these modeling factors to unnecessarily prolong the life of certain coal units, thereby driving up costs for ratepayers, Sierra Club recommends that the Commission direct PacifiCorp to update its IRP modeling as recommended in these comments as soon as possible and consider the following as potential candidates for economic retirement prior to 2030: Hunter 1-2, Huntington 1-2, Jim Bridger 3-4, Wyodak.

VIII. PORTFOLIO VARIANTS

In its 2023 IRP, the Company evaluates a series of portfolio variants derived from the public input process. The preferred portfolio variants were all developed as variations of the preferred portfolio run under medium natural gas and carbon price assumptions. Altogether, 24 preferred portfolio variants were studied and described within the 2023 IRP, collectively referred to as "P Variants." Sierra Club recognizes and appreciates PacifiCorp's attention to stakeholder feedback and its consideration of several potential futures and circumstances. In particular, we are appreciative of the various scenarios that consider early coal retirements. In fact, we think it is especially noteworthy that variant P01-JB3-4 GC, which includes the early retirement of Jim Bridger 3 and 4 (to be converted to gas), outperforms the Preferred Portfolio on all of the key metrics that PacifiCorp established.[43] Moreover, it is the only portfolio that performs in the top 5 of these metrics.

Nevertheless, Sierra Club has additional concerns regarding the Company's approach to its variant scenario analysis and its approach comparing the results of this analysis.

A. Running Variants Against Price-Policy Scenarios

Sierra Club commends PacifiCorp for examining a number of preferred portfolio variants but notes that many of these variants were not assessed against certain price scenarios.

[43] *See* PacifiCorp 2023 Amended IRP at Table 9.14.

Specifically, a number of variants with earlier coal retirements—such as P01-JB3-4 GC, P04-Huntington RET28, and P17-Col3-4 RET25—performed similarly or even better than the preferred portfolio ("P-MM") under a number of categories, yet these variants were only run against the medium natural gas - medium carbon price scenario ("MM"). Given the similar rankings between these scenarios and P-MM (i.e., the preferred portfolio), Sierra Club has previously recommended that PacifiCorp run these variants against all five price scenarios (P-MM, P-MN, P-HH, P-LN, P-SC). In the May 31 Amended IRP PacifiCorp ran P01 additionally under the medium gas - zero CO_2 scenario but did not run it or other suggested portfolios under any additional scenarios. Sierra Club continues to recommend that these variants be run under all price policy scenarios given their strong performance across all categories in order to conduct a more robust comparison and assessment of key resource decisions.

B. Lack of Reoptimization Among Variant Portfolios

Several variant portfolios were not reoptimized after significant changes were made, thereby reducing confidence in their results. For example, as discussed in more detail in the subsequent section, the P18 and P19 scenarios appear to simply add cluster resources and associated transmission costs without any consideration of whether other resources and associated costs could be removed by "reoptimizing" the portfolio. Such reoptimization would ideally be done through a subsequent LT model run in PLEXOS; however, according to the Company's response to Sierra Club Data Request 25 this was not done. In these cases, new costs are simply added on to the existing Preferred Portfolio. As such, this does not reflect a fair "apples to apples" comparison since the Preferred Portfolio was optimized via the PLEXOS LT model. Sierra Club is concerned that a similar lack of reoptimization is present across a much larger number of the variants than what PacifiCorp has presented. If so, this casts significant

doubt on the comparative rankings that PacifiCorp has provided, such as those in Table 9.14 of the IRP.

IX. LIMITED ANALYSIS AND TRANSPARENCY FOR CLUSTER RESOURCES

The Company's 2023 IRP reflects the results of its cluster study process, which simultaneously evaluates proposed resource additions in a given area in order to identify collective transmission solutions that can allow resource projects to move forward in a timely fashion. This is done endogenously in the Company's PLEXOS model, which has been enhanced to leverage the cluster study data to inform the amounts, types, and locations of proxy resources so as to align with probable near-term transmission projects. With these inputs and model architecture, the Company can consider a variety of factors, including:

- New incremental transmission options tied to resource selections
- Existing transmission rights tied to the use of post-retirement brownfield sites
- Costs associated with these transmission options
- Transmission options that interact with multiple areas and/or resources

There is a significant amount of renewable resources examined in the cluster study process, with at least 24,994 MW eligible for selection in the 2023 IRP (13,489 MW of cluster study generators and 11,505 MW of cluster study battery storage). However, the analysis that PacifiCorp conducts for these resources as well as the transparency behind it is severely limited.

A. Clarity on Cluster Resources Available for Selection

In PacifiCorp's Response to Sierra Club Data Request 31 PacifiCorp provides a table listing the sum of both the selected and possible Cluster 1, Cluster 2, and serial cluster resources. The numbers provided in this response are significantly lower than what was presented in the December 1, 2022 Public Input Meeting ("PIM") for the 2023 IRP.[44] Slide 51 from this meeting

[44] PacifiCorp, 2023 Integrated Res. Plan Public-Input Meeting (Dec. 1, 2022), *available at* https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2023-irp/PacifiCorp_2023_IRP_PIM_Dec_1_2022.pdf.

suggests that Cluster Study 2 alone included 39,591 MW requested. The data request response, however, only lists 24,994 MW as eligible for selection in the 2023 IRP (13,489 MW of cluster study generators and 11,505 MW of cluster study battery storage), of which approximately 5,928 MW of generators and 4,760 MW of battery storage were selected in the preferred portfolio.[45] On a more granular scale, the Yakima bubble, for example, has 1,631 MW listed in the PIM slide, while the sum of possible generators listed in the discovery response is only 450 MW. Table 14 illustrates the disparity on a more granular level, comparing the sum of possible generator and battery resources eligible for selection in the 2023 IRP for certain regions and the total resources listed in the PIM for cluster areas understood to be part of the corresponding region.

Table 14: Difference in Available Megawatts of Cluster Resources for Select Bubble Areas

Bubble Area	**SC 31[46]**	**PIM Cluster Study 2 Summary[47]**
YAK (Yakima)	899.98	1,631
SOR (Southern Oregon)	999	2,349
GOE (Goshen)	1,095	1,493

Going forward, Sierra Club recommends that PacifiCorp clarify any discrepancies between what cluster resources were considered at earlier stages of the stakeholder process and what was ultimately selectable by the model.

B. Lack of Cluster Variants

PacifiCorp includes only two variants, P18-Cluster East and P19-Cluter West, that force the model to incrementally select additional cluster study resources from certain cluster areas.

[45] PacifiCorp Response to Sierra Club Data Request 31, included in Attachment 3.
[46] Sum of the combined available generator and battery storage resources in megawatts. Sierra Club understands these are not necessarily fully additive, but the sum listed here depicts the greatest possible number that the data could feasibly represent.
[47] Based on Sierra Club's presumed cluster area associated with each bubble. No more than one cluster area is included for these amounts, and the location associated with each cluster area exactly matches the locations provided in the discovery response.

These two variants include only a small subset of the total cluster resources available. Specifically, P18-Cluster East enables Cluster 1 Clover transmission in Area 5/6/7, and P19-Cluster West enables Cluster 1 Area 12 transmission and resources. Sierra Club is concerned that this represents an extremely limited number of the total cluster resources available and appears to exclude Cluster 2 resources entirely. Given the large number of resources available throughout the remaining clusters, Sierra Club recommends considering additional variants that consider more cluster resources within the model in this way, and particularly recommends that at least some amount of transmission and resources from Cluster Study 2 are examined.

Consideration of other variants is warranted given that the two variants focused on cluster modifications materially reduce greenhouse gas ("GHG") emissions and market reliance by deploying incremental zero-carbon resources. Notably, P18 ranks second among all variants in terms of total GHG reductions. As noted previously, the Company has modeled such scenarios in only a subset of CAs, meaning that additional analyses could identify variants that are more aligned with ratepayer interests. Consistent with other comments contained herein, Sierra Club recommends consideration of CA 1, 2, 4, 12, and 14 for these variants. Moreover, the development costs (including transmission) in these CAs could be further facilitated by the aforementioned EIR program. For these reasons, the Company should consider other variants in the vein of P18-Cluster East and P19-Cluster West, ideally impacting CAs 1, 2, 4, 12, and 14 from Cluster Study 2.

C. PacifiCorp Did Not Re-Optimize the Preferred Portfolio for P18 and P19 Variants, Likely Inflating the Costs of P18 and P19.

Although the 2023 IRP states that "the portfolio is re-optimized . . . to evaluate portfolio impacts, costs and risks[,]" for both the P18 and P19 variants,[48] the Company has since indicated

[48] PacifiCorp 2023 Amended IRP at 246.

to Sierra Club, via a data request response, that it, in fact, did not reoptimize the portfolio resources for these variants. According to the Company's data response, "the purpose of these [P18 and P19] studies was not to re-optimize the entirety of the capacity expansion portfolio selection, but to explore if additional transmission capacity, exogenously added, plus enabled renewable resources, was cost effective."[49] This suggests that in these variants PacifiCorp studied the cost impact of adding additional cluster study resources to the existing preferred portfolio, rather than initially including these resources, and conducting the optimization model with their inclusion.

The difference between re-optimizing and not is material and could significantly impact the relative ranking of each of these variants. Creating variants in a way that disallows re-optimization, as described by the Company in response to Sierra Club's data request, eliminates the possibility that other resources might be dropped from the initial portfolio because of the addition of incremental cluster resources. As such, PacifiCorp's approach almost certainly inflates the cost of the variant relative to the Preferred Portfolio because it is cost-additive, not cost-minimizing. In essence, such a methodology does not identify a cost-effective portfolio as it cannot remove redundant resources and their costs based on the potential displacement of needs from additional cluster capacity. Costs for 2,173 MW and 499 MW of co-located solar and storage for variants P18 and P19 respectively as well as their associated network upgrade costs are added to the portfolios without costs from other resources being displaced. PacifiCorp indicated that the purpose of variants P18 and P19 was to "assess the magnitude of [a higher present value of revenue requirements][ ] for determining possible least-regret paths to consider for the preferred portfolio."[50] However, because PacifiCorp has not evaluated these variants on

[49] PacifiCorp Response to Sierra Club Data Request 25, included in Attachment 3.
[50] PacifiCorp Response to Sierra Club Data Request 43, included in Attachment 3.

an even playing field with the Preferred Portfolio, it is not known whether P18 and P19 would actually *reduce* costs. Given the limitations of the Company's methodology as described in discovery, Sierra Club respectfully requests the Commission direct the Company to reassess variants P18 and P19 in a manner that allows for full re-optimization of resource selection, portfolio composition, costs, and risks following the addition of modeled transmission expansions.

D. PacifiCorp Did Not Consider Cost Savings Available Through the Energy Infrastructure Reinvestment Program for Variants P18 or P19.

In addition to the cost additive methodology which PacifiCorp used to evaluate the P18 and P19 variants, PacifiCorp also did not evaluate use of the EIR program to reduce network upgrade costs associated with the cluster resources in these variants. The upgrade costs would almost certainly qualify for EIR financing because they would be necessary specifically to enable resources that would reduce greenhouse gas emissions.

The total associated network upgrade costs for the cluster areas included in variants P18 and P19 are $539.5 million and $218.8 million respectively. If financing based on the EIR, as described above, were applied to these costs, PacifiCorp could expect to see significant NPV cost savings of **$163 million** (P18) and **$66 million** (P19) relative to financing under the Company's WACC, which would result in stronger performance for P18 and P19 relative to the other variant portfolios.

Table 15: Total Associated Network Upgrade Costs for P18 & P19

Variant	Bubble Location	Cluster Area	Network Upgrade Costs ($M)
P18			
	Clover	CA5	$214.3
	Southeast Utah	CA6	$313.1
	Southwest Utah	CA7	$12.1
	Total		**$539.5**
	Total Minus EIR Savings		**$376.5**
P19			
	Southern Oregon/Northern California	CA12	$218.8
	Total		**$218.8**
	Total Minus EIR Savings		**$152.8**

X. GAS CONVERSIONS

Including Naughton Unit 3 and Jim Bridger Units 1 and 2, PacifiCorp's 2023 IRP forecasts converting seven coal units to gas, which amounts to hundreds of megawatts. The Company appears to be attempting to maintain the interconnection hosting capacity that is currently used by its coal assets. However, if PacifiCorp intends to operate each of these units on gas, the Company does not appear to have considered how it will obtain sufficient fuel supply.

With significant gas conversions assumed, PacifiCorp would need to significantly increase its reliance on firm gas pipeline capacity to ensure adequate fuel supply, an investment that may necessitate the construction of additional large, interstate pipelines. Yet, when Sierra Club asked PacifiCorp about the amount of fuel capacity needed to provide firm service, the assumed and modeled cost of both firm and non-firm gas transportation service, the assumed fuel source for each gas conversion (*e.g.*, Opal Market Hub), and the current remaining amount of available firm pipeline capacity for each identified fuel source (*e.g.*, in Dth/D), the Company was

not able to provide a full response.[51] While PacifiCorp did provide confidential workpapers including the assumptions used, the Company noted that it does not know what pipeline capacity is currently available. Instead, the Company is only aware of the capacity that it *needs* for the planned gas conversions.[52]

Overall, the assumptions used by the Company [redacted].[53] This suggests that the Company is assuming that existing pipeline infrastructure will provide sufficient gas transport capacity to support the conversion of approximately seven separate units to utilize natural gas as their primary fuel. However, there is little justification for whether all of these seven units would be able to rely upon a single market delivery point without significant and costly pipeline expansion. The fact that the Company has not included consideration of the pipeline capacity available in its 2023 IRP indicates that PacifiCorp has not performed and presented sufficiently robust analysis to properly assess and incorporate the costs and risks associated with a gas conversion strategy. For these reasons, Sierra Club recommends that the Commission to apply caution when evaluating PacifiCorp's methodology to determine the feasibility of achieving all of the gas conversions included in the Preferred Portfolio. Given recent experience with winter storms across the U.S., during which there were significant levels of disruption to gas supply, this strategy may be understating the associated costs and risks.

XI. SURPLUS INTERCONNECTION

As noted in the introduction of these comments, in the 2023 IRP, the Company has included modeling of surplus interconnections. Surplus interconnections add more generation to

[51] *See* PacifiCorp Response to Sierra Club Data Request 33, included in Attachment 3.
[52] PacifiCorp. Response to Sierra Club Data Request 33, included in Attachment 3.
[53] CONF_Scenario Master_BaseCase 2023 IRP Base (Inputs Gas Conversion) R.xlsx", tab "15 – Refuel Capex".

an existing interconnection without requiring additional transmission lines while ensuring that the installed nameplate capacity is increased at a site without exceeding the original interconnection capacity.[54] PacifiCorp moved to include modeling of surplus interconnections given the proliferation of variable resources which do not always occupy the entirety of a given transmission line during all hours. As such, the 2023 IRP added surplus resource capability to its capacity expansion modeling options. Notably, when surplus interconnection is used, added generation can be of the same or a different type. While the former results in increased generation capability, the latter results in the creation of a hybrid resource (*e.g.*, a hybrid resource combination of solar, wind and storage).

Sierra Club commends the inclusion of surplus interconnection to the capacity expansion modeling options. This modification shows PacifiCorp's understanding of emerging opportunities and new resource configurations. While this inclusion is laudable, improvements can be made, particularly with regards to the deployment of incremental storage resources. According to the Company's confidential attachment provided in response to Sierra Club Data Request 30, approximately [redacted] megawatts of incremental capacity were selected as surplus interconnections.[55] Notably, some of those megawatts were added in the year of the existing coal retirement and were not initially deemed as surplus interconnection.[56] Of these [redacted] megawatts, [redacted] megawatts ([redacted] percent) correspond to battery storage assets.[57] Given the timing of battery storage additions, it appears that the PLEXOS model did not select storage resources at the same site as current fossil assets.[58] Because coal units are projected to have declining capacity factors

[54] PacifiCorp 2023 Amended IRP at 222.
[55] PacifiCorp Response to Sierra Club Data Request 30, included in Attachment 3.
[56] *Id.*
[57] *Id.*
[58] *Id. See also* PacifiCorp Response to Sierra Club Data Request 44, included in Attachment 3.

well before their retirement dates and batteries can provide ancillary service benefits to the grid, especially around frequency support, it is surprising that the model did not see value in pairing storage with existing fossil assets, which has proven successful in some utility pilot programs.[59]

Sierra Club recommends that PacifiCorp explore hybridizing a thermal asset with an energy storage resource, which would increase the flexibility of the asset and provide lower emission reliability services, such as spinning reserve. It would also reduce operating costs as the storage asset could operate more responsively. Moreover, it would provide a glide path for existing fossil-fueled plants to be phased out while bolstering system flexibility and reliability. In sum, while Sierra Club is very supportive of the inclusion of surplus interconnections, it would seem like the opportunity for them has not been fully realized in the 2023 IRP and improvements related to it are warranted for future cycles.

XII. INCREASE MEDIUM CO_2 PRICE TO ACCOUNT FOR ENVIRONMENTAL REGULATION

PacifiCorp uses four price policy scenarios for CO_2 pricing: zero, medium, high, and a price forecast that aligns with the social cost of greenhouse gases. PacifiCorp has suggested s that the proxy CO_2 pricing is intended to address the ongoing trajectory of environmental policy, but not a specific carbon tax. The medium and high scenarios apply a CO_2 price as a tax beginning in 2025. As expressed in previous comments, PacifiCorp's CO_2 price trajectory is not aligned with the significant movement in recent years toward increasing environmental legislative and regulatory risk. Since the last IRP cycle, significant federal legislation such as the EPA standards for fossil fuel-fired power plants, the Good Neighbor Plan, and the Coal

[59] For example, Portland General Electric ("PGE") has paired a 5 MW storage system at its Port Westward II gas plant, finding that the pairing allows PGE to meet reliability requirements for reserve power more efficiently, while reducing fuel use and emissions. PGE, *Energy Storage, available at* https://portlandgeneral.com/about/who-we-are/innovative-energy/energy-storage.

Combustion Rule have been proposed, updated, or finalized. However, the medium CO_2 price closely tracks the medium CO_2 price from the 2021 IRP and, starting in 2033, is lower than assumed in the 2021 IRP.

While PacifiCorp has pointed to the high price and social cost greenhouse gases scenarios to address increased risk, only the medium CO_2 price was used for portfolios evaluated for the Preferred Portfolio. In the face of increasing federal policy addressing fossil-fueled generation, it seems implausible that a price proxy lower than that of the 2021 IRP is appropriate to use for the 2023 IRP. Sierra Club continues to recommend that the Company increase the medium CO_2 price from its current price point for this cycle to reflect recent federal regulations and at the very least incorporate these developments into the 2023 IRP update.

XIII. NATRIUM AND PROXY NUCLEAR RESOURCES

As in the 2021 IRP, Sierra Club continues to have significant concerns with PacifiCorp's planning assumptions regarding the Natrium nuclear plant in Wyoming and additional proxy nuclear resources to be sited in Utah. PacifiCorp's expectation that it will receive power from novel nuclear technology by 2030 introduces substantial cost and execution risks and it is notable that 1,000 MW of proxy nuclear resources were manually added into the portfolio to address reliability shortfalls—not economically selected by the model. As Sierra Club demonstrated, it is not a foregone conclusion that reliability shortfalls *must* be met with nuclear energy; there are other combinations of resources that can equally meet reliability needs. While the total amount of proposed nuclear resources is relatively small compared to the entire portfolio, PacifiCorp has described nuclear as "critical to the planned transition of our coal resources . . .".[60] Indeed,

[60] PacifiCorp 2023 Amended IRP at 35.

PacifiCorp's 2023 IRP envisions relying on SNCR at several coal units (likely in violation of federal law) until those units can be replaced with nuclear.

Comments from the 2021 IRP, from multiple parties,[61] pointed out the varied and significant risks of relying on unproven nuclear technology, from regulatory uncertainty to cost overruns to environmental harm and lack of a permanent waste solution. *The same uncertainties persist in the 2023 IRP*. To Sierra Club's knowledge, neither permitting from the Nuclear Regulatory Commission, nor any other required permitting, has been secured;[62] financial assumptions remain murky;[63] any contractual agreements with TerraPower have not been publicly disclosed; and there is no permanent waste solution;[64] among other issues.[65] Despite

[61] *See, e.g.,* Utah Pub. Serv. Comm'n, Docket 21-035-09, Opening Comments of Div. of Pub. Utils. at 4 (Mar. 4, 2022) (recommending that Natrium not be included in the preferred portfolio due to cost uncertainty); Utah Pub. Serv. Comm'n, Docket 21-035-09, Opening Comments of Off. of Consumer Servs. at 4 (Mar. 4, 2022) (describing Natrium as "fraught with uncertainties and tremendous risk"); Utah Pub. Serv. Comm'n, Docket 21-035-09, Opening Comments of Utah Clean Energy at 6-8 (Mar. 4, 2022) (noting numerous uncertainties surrounding Natrium, including that the project has never been built and faces regulatory risk); *See also,* Or. Pub. Util. Comm'n, Docket LC 77, Redacted Opening Comments of the Or. Citizens' Util. Bd. at 3-9 (Dec. 3, 2021) (identifying fuel supply risks, regulatory risks, project management risks, financing/cost share risks, technology and safety risks, and contractual uncertainties); Or. Pub. Util. Comm'n, Docket LC 77, Opening Comments of Nw. Energy Coalition at 7-8 (Dec. 3, 2021) (noting that the Natrium project is unlicensed, the developer has no experience in construction and commissioning of its design, there are no alternative suppliers for the specific type of nuclear reactor being projected, there is insufficient fuel supply, there is no waste storage plan, and there is no discussion of project delay or cost overrun, among other issues); Or. Pub. Util. Comm'n, Docket LC 77, Initial Comments of Renewable Nw. at 12-13 (Dec. 3, 2021) (noting that PacifiCorp forced the PLEXOS model to select Natrium even though "PacifiCorp's territory is more suited towards evaluating the costs and benefits of deploying technologies like offshore wind.").

[62] *See* PacifiCorp Response to Sierra Club Data Request 18, included in Attachment 3 (stating that TerraPower is responsible for all regulatory approvals and not providing any requested update on the status of any permitting processes).

[63] In response to Sierra Club's data request requesting estimated capital and operating costs of the Natrium demonstration project, PacifiCorp pointed Sierra Club to its confidential workpapers supporting the 2023 IRP, specifically confidential folder "Chapters, Shortfalls - Part 1\Model Reports\ST\Preferred Portfolio", confidential file "CONF_ST Cost Summary -23I.ST.Reliable.20.PA1_.EP.MM.PP-D3 29.13338 (LT. 13338 - 19562) v120.0.xlsb", tab "Generator" and resource "NUC.PX.UTN._.___.Sm Adv Naughton." *See* PacifiCorp Response to Sierra Club Data Request 14, included in Attachment 3; *see also* PacifiCorp Response to Or. Pub. Util. Comm'n Data Request 198, included in Attachment 3. Referring to this confidential workpaper, it appears that PacifiCorp assumes [redacted] fuel costs for Natrium and [redacted] generation costs.

[64] *See* PacifiCorp Response to Sierra Club Data Request 16, included in Attachment 3 (noting interim solutions "until the United States (U.S.) government has approved a final repository").

[65] For instance, the fuel source for Natrium or any other proxy resource remains uncertain. TerraPower originally planned to secure fuel from Russian sources but has since shifted its focus to U.S. based supplies. While PacifiCorp is aware of two facilities in Ohio and New Mexico moving towards the ability to produce the required "high-assay

these enormous uncertainties, PacifiCorp continues to assume that nuclear reactors are the best path forward for its ratepayers, manually selecting an additional 1,000 MW of proxy nuclear resources in order to create "reliable" final portfolios, as discussed above. As these comments point out, reliability can be met without reliance on unproven nuclear reactors, and Sierra Club urges PacifiCorp to evaluate future resource mixes that rely on proven and clean technologies.

Indeed, even putting aside the serious challenges with nuclear technology including its inherent safety risks as well as the mining impacts on surrounding communities for the necessary fuel, the history of nuclear technology in the United States strongly suggests that nuclear projects have not been in the best interest of ratepayers.

XIV. CONCLUSION

Sierra Club appreciates the opportunity to provide comments and recommendations to the Commission regarding PacifiCorp's 2023 IRP. Sierra Club looks forward to collaborating with the Commission, PacifiCorp, and all other parties to this proceeding.

Respectfully submitted,

/s/ *Rose Monahan*

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low-enriched uranium" ("HALEU"), it is far from clear that these facilities would be able to supply the quantities needed in the timeframe envisioned. *See* PacifiCorp Response to Sierra Club Data Request 15, included in Attachment 3.

DOCKET NO.: 23-035-10

SIERRA CLUB'S OPENING COMMENTS ON PACIFICORP'S 2023 INTEGRATED RESOURCE PLAN

ATTACHMENT 1
SIERRA CLUB DECEMBER 2022 STAKEHOLDER FEEDBACK FORM

PacifiCorp - Stakeholder Feedback Form

2023 Integrated Resource Plan

PacifiCorp (the Company) requests that stakeholders provide feedback to the Company upon the conclusion of each public input meeting and/or stakeholder conference calls, as scheduled. PacifiCorp values the input of its active and engaged stakeholder group, and stakeholder feedback is critical to the IRP public input process. PacifiCorp requests that stakeholders provide comments using this form, which will allow the Company to more easily review and summarize comments by topic and to readily identify specific recommendations, if any, being provided. Information collected will be used to better inform issues included in the 2023 IRP, including, but not limited to the process, assumptions, and analysis. In order to maintain open communication and provide the broader Stakeholder community with useful information, the Company will generally post all appropriate feedback on the IRP website unless you request otherwise, below.

Date of Submittal December 20, 2022

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*Organization: Sierra Club

Address: 2101 Webster Street, Suite 1300

City: Oakland State: California Zip: 94612

Public Meeting Date comments address: **12/1/2022** X☐ Check here if not related to specific meeting

List additional organization attendees at cited meeting: Lindsay Beebe, Ed Burgess

*__IRP Topic(s) and/or Agenda Items:__ List the specific topics that are being addressed in your comments.

- Inflation Reduction Act
- Transmission Assumptions
- Reliability Adjustments

☐ Check here if you do **not** want your Stakeholder feedback and accompanying materials posted to the IRP website.

*__Respondent Comment:__ Please provide your feedback for each IRP topic listed above.

1. **Inflation Reduction Act**

    a. **Inflation Reduction Act and Conservation Potential Assessment (CPA)**

During the December 1, 2022 Stakeholder Meeting, PacifiCorp described its approach to adjusting its assumptions for demand-side resources (especially energy efficiency measures) in response to new rebates and tax incentives included in the Inflation Reduction Act ("IRA"). PacifiCorp explained that it is "accelerating

ramp rates from those used in the 2021 CPA." This has the effect of increasing the technical potential of PacifiCorp's CPA portfolio by approximately 21 percent. During the meeting PacifiCorp also clarified that it is not making any adjustments to the cost of those energy efficiency measures.

Sierra Club is concerned that this approach is insufficient to capture the significant effects that the IRA will have on the adoption of efficiency measures. Among some of the more significant provisions of the IRA affecting energy efficiency, the IRA:

1. Introduces a 30% tax credit (25C) for home and business energy efficiency improvements, and increases the cap from $500 lifetime to $1,200 per year.

2. Introduces the home energy performance-based, whole house rebates (HOME Rebates) program which will provide $4.3 billion in rebates to homeowners for efficiency measures such as insulation, air sealing, appliance installation, and HVAC replacements. Rebates will range from $2,000-$4,000 per home, or up to $400,000 for multifamily buildings, and can be doubled for low- and moderate-income homes.

3. Introduces the high-efficiency electric home rebate program which will provide $4.5 billion in rebates to homeowners for measures such as heat pumps, heat pump water heaters, electric stoves, clothes dryers, and insulation/air sealing measures. Rebates will be capped at $14,000 per household and will include point of sale rebates administered by states.

Notably, these rebates and tax credits are not mutually exclusive and can stack upon each other.

For items 2 and 3 listed above, a total of $1.1 billion has been allocated to states with PacifiCorp customers.[1]

State/ Territory	Home Energy Performance-Based, Whole-House Rebate Allocations	High Efficiency Electric Home Rebate Allocations	Total Allocations Amount
California	$291,951,040	$290,252,580	$582,203,620
Idaho	$40,604,320	$40,367,910	$80,972,230
Oregon	$57,046,250	$56,714,440	$113,760,690

[1] https://www.energy.gov/articles/biden-harris-administration-announces-state-and-tribe-allocations-home-energy-rebate

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Utah	$50,698,180	$50,403,030	$101,101,210
Washington	$83,266,580	$82,782,050	$166,048,630
Wyoming	$34,686,390	$34,484,390	$69,170,780
Total			$1,113,257,160
Total (excl. CA)			$531,053,540

Sierra Club has two primary concerns with PacifiCorp's proposed approach to incorporating the IRA into its CPA:

1. First, the financial impacts of these new rebates and tax credits are likely to have a material impact on the "market baseline" uptake of a wide variety of energy efficiency measures. However, PacifiCorp's proposed approach will not adjust the market baseline in its load forecast. Instead, PacifiCorp appears to plan on a much more limited approach by making adjustments to its load forecast for private generation and electric vehicles. However, this would fail to account for the much broader range of demand-side impacts that the IRA will have.

2. Second, the availability of rebates will have a direct impact on the cost of implementing efficiency measures in most cases. However, PacifiCorp clarified during the December 1 meeting that it does not plan to make any adjustments to measure costs as depicted on slide 14. While implementation details are still being worked out for these programs, the statute is very clear that there will be direct and immediate financial incentives that will buy down the cost of implementing these measures. This reduced cost will not need to wait for utility-administered programs to ramp up.

Given these concerns, Sierra Club recommends that PacifiCorp adjust its input assumptions in one or both of the following ways:

1. Adjust the load forecast used in the 2023 IRP to incorporate a new "market baseline" that accounts for the new efficiency rebates and tax incentives. Sierra Club recommends that PacifiCorp's load forecast should be approximately 1 percent/year, annual growth rate, which is in-line with the EIA's Annual Energy Outlook 2022 Reference Case.[2]
2. Reduce the measure costs for CPA measure portfolio to account for the new rebates and tax incentives. This is especially critical since PacifiCorp's IRP model selects a resource portfolio based significantly

[2] https://www.eia.gov/outlooks/aeo/narrative/electricity/sub-topic-01.php

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on costs. If these major cost reductions are not accounted for, the resulting portfolio will include fewer efficiency measures than is optimal. Sierra Club recommends that PacifiCorp consider a 30 percent reduction in the LCOE for certain measures, such as HVAC replacement.[3]

Without these adjustments (or some approximation thereof) the 2023 IRP will already be out of date the day it is filed.

b. Inflation Reduction Act Benefit - Greenhouse Gas Reduction Fund

A lesser known program created by the IRA is the Greenhouse Gas Reduction Fund. This program provides $27 billion in grants by 2024 for the following projects:[4]

1. $7 billion for competitive grants to enable low-income and disadvantaged communities to deploy or benefit from zero-emission technologies, including distributed technologies on residential rooftops;
2. Nearly $12 billion for competitive grants to eligible entities to provide financial and technical assistance to projects that reduce or avoid greenhouse gas emissions; and
3. $8 billion for competitive grants to eligible entities to provide financial and technical assistance to projects that reduce or avoid greenhouse gas emissions in low-income and disadvantaged communities.

At a minimum, it would be expected that communities in PacifiCorp's service area would acquire grants at a rate equal to the overall percentage of electric residential retail sales in the US, or 1.1%. As a high-end estimate, we can consider the existing low-to-moderate income clean energy programs (4 of 42 total exist in Oregon and Washington[5]). Assuming some expansion of programs in other states, a reasonable high-end estimate is 4.9%.

Considering the average cost of PV in the PacifiCorp region of $2.60/watt,[6]' we expect to see a significant increase in the total installed private solar compared to PacifiCorp's 2021 IRP.

Scenario	% of GHG Fund Grants	Total Grant $	Total Additional Private PV
Low-End Estimate	1.1%	$299 million	115 MW
High-End Estimate	4.9%	$1,311 million	504 MW

[3] As a very simple example, replacing an old HVAC unit in many cases may lead to energy savings on the order of the 20 percent necessary to qualify for the $2,000 rebate (the low end of total possible rebates). Assuming a typical HVAC replacement cost of $7,000, this would lead to an approximately 30 percent reduction in the total cost of the measure.
[4] https://www.epa.gov/inflation-reduction-act/greenhouse-gas-reduction-fund
[5] https://www.cesa.org/resource-library/resource/directory-of-state-low-and-moderate-clean-energy-programs/
[6] https://www.consumeraffairs.com/solar-energy/how-much-do-solar-panels-cost.html

* Required fields

Sierra Club recommends that PacifiCorp adjust their private generation forecasts to account for these readily available grant funds.

c. Inflation Reduction Act Benefit - Investment Tax Credit Bonuses

The Inflation Reduction Act included pivotal extensions of the federal Investment Tax Credit (ITC) and Production Tax Credit (PTC). For example, many projects will be eligible for the full 30% ITC (assuming prevailing wage and domestic content requirements are met). However, in addition to these base credits there are several bonus categories that may be layered on top. Additional guidance is expected to further clarify where and when these bonuses will apply, however the statutory language is clear enough that Sierra Club expects many new renewables procured by PacifiCorp will be eligible to receive one or more bonuses. In particular, there is a 10% bonus for projects that are sited in designated Energy Communities, which include those whose economies have historically relied upon fossil fuel production. Based on the information provided to date, Sierra Club is concerned that PacifiCorp's 2023 IRP analysis is not fully accounting for bonus categories in its characterization of proxy resource costs. **Below is a table that summarizes Sierra Club's recommendations for the bonus credits that should be applied for a selection of PacifiCorp's proxy resources, and a brief rationale**. This is not intended to be exhaustive, but is illustrative of the IRA provisions that will be applicable starting in 2023 and should therefore be modeled accordingly in PacifiCorp's IRP.

Resource	**Base Credit (30%)**	**Energy Community Bonus (10%)**	**Total ITC**
Rock Springs, WY Solar 20 MW	Yes	Bridger Underground Coal Mine closed in 2021	40%
Lakeview, OR Solar 20 MW	Yes	≥0.17% fossil fuel employment + higher than average unemployment	40%
Arlington, OR Wind 20 MW	Yes	Boardman Coal plant retired in 2020	40%
Monticello, UT Wind 20 MW	Yes	New Horizon Coal Mine closed in 2017	40%

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Medicine Bow, WY Wind 20 MW	Yes	Seminoe II mine closed in 2015	40%
Goldendale, WA Wind 20 MW	Yes	≥0.17% fossil fuel employment + higher than average unemployment	40%

2. Transmission Assumptions

Sierra Club appreciates PacifiCorp's efforts to provide more information on transmission network upgrade costs in advance, including the Cluster Study 2 information presented at the December 1 stakeholder meeting.

However, Sierra Club is concerned that the costs presented may not reflect relevant provisions of the IRA that could significantly reduce the costs of transmission upgrades. If the true costs (including certain IRA provisions) are not accurately reflected, it may bias the model's resource selection – particularly in areas where higher network upgrade costs have been identified such as in Clusters 1-4.

In particular, some of these upgrade costs are likely to be eligible for the Energy Infrastructure Reinvestment ("EIR") program, which would provide a low interest financing option through the Department of Energy. Sierra Club estimates that this could lead to approximately a 30 percent reduction in the NPV of the transmission project costs relative to traditional utility financing at PacifiCorp's WACC. Below is a simple comparison of a hypothetical $500M network upgrade based on Sierra Club's preliminary analysis of these two options:

	Rate of Return	Term	NPV
Utility-financed	7% (WACC)	40 years	$768.7 M
EIR Program	4% (DOE loan)	30 years	$545.0 M

While the EIR option must meet certain criteria, Sierra Club is reasonably confident that many of PacifiCorp's identified transmission upgrades could meet these criteria since they would be facilitating investment in new renewable energy projects, and replacement of fossil assets.

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Sierra Club recommends that PacifiCorp examine a scenario in which the cost of all the identified network upgrades are reduced by 30 percent. We believe this is a reasonable approximation for modeling the EIR financing option.

In addition to the EIR program, the Bipartisan Infrastructure Law passed in 2021 included over $10 billion in federal funding for the Grid Resilience and Innovation Partnerships program. One especially noteworthy aspect of this is that $5 billion has been allocated to the Grid Innovation Program, which specifies that the funds may be used for "investments that accelerate interconnection of clean energy generation."[7] **Sierra Club strongly recommends that PacifiCorp partner with eligible entities in its service territory (which includes states, tribes and territories, local governments, and public utility commissions) to secure some of this funding**. An initial concept paper is due to the Department of Energy on January 13th.

3. **Reliability Adjustments**

During the December 1, 2022 Stakeholder Meeting, PacifiCorp described a pair of studies it intends to perform to evaluate risk and reliability.[8] Based on PacifiCorp's presentation, Sierra Club's understanding is that PacifiCorp intends to apply dollar-per-kilowatt ($/kW) adjustments to specific resources based on an identified reliability contribution. PacifiCorp explained that these adjustments are necessary because the LT model may not recognize certain resource benefits that only become relevant during extreme conditions. In the 2021 IRP, PacifiCorp described this process as a granularity adjustment. Sierra Club's understanding is that the purpose of the granularity adjustment is to shift the LT model resource selection towards specific resources.

As Sierra Club noted in its comments on PacifiCorp's 2021 IRP, this approach may be necessary for the model to ensure the full value of resources, such as battery storage, are appropriately captured. However, as in the 2021 IRP, Sierra Club has concerns with the transparency regarding these adjustments. Without specific details, these adjustments may simply amount to a tool for PacifiCorp to "put its thumb on the scale" and steer resource selection towards its predetermined, preferred outcome.

In order to ensure that any granularity adjustments made do not unreasonably bias the PLEXOS model towards a predetermined outcome, Sierra Club recommends that PacifiCorp complete a reliability assessment through the LT model without making any cost adjustments to specific resources, which will only distort economic resource selection. Instead, PacifiCorp should allow the model to select the necessary combination of resources to meet reliability requirements based on each resources' actual costs. If PacifiCorp determines (through proper documentation) that the resulting portfolio is deficient in terms of meeting a specific reliability metric (e.g., LOLE), then cost adjustments and a subsequent model run may be appropriate. However, whatever adjustment is made should be reasonable and transparent. **At a minimum, Sierra Club recommends that PacifiCorp should provide to stakeholders the results of the initial model run and the model run resulting from any manual adjustments to resource costs. The following specific datasets should be made available as soon as possible to stakeholders:**

[7] https://www.energy.gov/gdo/grid-innovation-program
[8] December 1, 2022 Stakeholder Meeting Slides at 51-52.
* Required fields

1. Hourly load changes from iteration with "normal" conditions to iterations with stochastic analysis (please indicate which stochastic iteration, or combination thereof, was used for the reliability analysis)
2. Stochastic Risk Adjustment credit in $/kW for each resource
    a. An explanation of how these credits were determined
    b. Identification of which resources were provided with a credit, and, if applicable, an explanation for why certain resources, including solar + storage, geothermal, and offshore wind, were not provided with a credit.
3. The initial LT model results without the Stochastic Risk Adjustment Credit

For the 2021 IRP analysis, in addition to adjustments made to cost inputs during the initial resource selection process, it is Sierra Club's understanding that PacifiCorp also made other adjustments to the final resource portfolio by adding specific resources to account for remaining reliability shortfalls.

Sierra Club strongly recommends that PacifiCorp consider expanding the set of resources PacifiCorp relied upon both during initial selection and afterwards to account for any remaining reliability shortfalls. During the 2021 IRP, it became apparent that the primary set of resources PacifiCorp used to make these final reliability additions included: 1) Solar + storage, 2) Storage, 3) Non-emitting peakers, and 4) New nuclear (SMR). PacifiCorp explained that the ability for solar + storage to resolve reliability concerns was limited by its generation profile relative to the times of reliability need as well as interconnection limits. However, Sierra Club is concerned that this limitation is partly due to the limited set of solar + storage configurations that PacifiCorp is evaluating. For example, a solar + storage facility with oversized DC components (higher inverter loading ratio or "ILR") may be able to achieve a higher capacity factor and greater output during times of reliability need. A 2020 report from Bloomberg New Energy Finance describes how such a hybrid resource configuration can achieve performance and cost comparable to new thermal generators (e.g., natural gas).

Sierra Club has performed some preliminary analysis on how increasing the ILR for the proxy solar plus storage resource could enhance its reliability contribution on PacifiCorp's system. Using hourly model data from PacifiCorp's 2021 IRP, and simulated output from a high-ILR solar plus storage resource, Sierra Club was able to reduce the initial portfolio's unserved energy by 94%. Not only does this configuration provide a greater reliability benefit but it also can help to alleviate or avoid some of the challenges PacifiCorp has described regarding limited interconnection space. The remaining 6% of unserved energy could probably be further reduced if combined with other resources that PacifiCorp had not considered, such as off-shore wind, advanced geothermal, long-duration storage, increased energy efficiency programs, and EV load management. This would reduce or eliminate the need to resort to unproven technologies such as advanced nuclear or non-emitting peakers. Sierra Club strongly recommends that PacifiCorp's 2023 IRP analysis include a more robust set of reliability resources.

Data Support: If applicable, provide any documents, hyper-links, etc. in support of comments. (i.e. gas forecast is too high - this forecast from EIA is more appropriate). If electronic attachments are provided with your comments, please list those attachment names here.

Please see footnotes above.

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Recommendations: Provide any additional recommendations if not included above - specificity is greatly appreciated.

Please submit your completed Stakeholder Feedback Form via email to IRP@Pacificorp.com

Thank you for participating.

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DOCKET NO.: 23-035-10

SIERRA CLUB'S OPENING COMMENTS ON PACIFICORP'S 2023 INTEGRATED RESOURCE PLAN

ATTACHMENT 2
SIERRA CLUB JANUARY 2023 STAKEHOLDER FEEDBACK FORM

PacifiCorp - Stakeholder Feedback Form

2023 Integrated Resource Plan

PacifiCorp (the Company) requests that stakeholders provide feedback to the Company upon the conclusion of each public input meeting and/or stakeholder conference calls, as scheduled. PacifiCorp values the input of its active and engaged stakeholder group, and stakeholder feedback is critical to the IRP public input process. PacifiCorp requests that stakeholders provide comments using this form, which will allow the Company to more easily review and summarize comments by topic and to readily identify specific recommendations, if any, being provided. Information collected will be used to better inform issues included in the 2023 IRP, including, but not limited to the process, assumptions, and analysis. In order to maintain open communication and provide the broader Stakeholder community with useful information, the Company will generally post all appropriate feedback on the IRP website unless you request otherwise, below.

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Public Meeting Date comments address: January 13, 2023 & PacifiCorp/Sierra Club January 6, 2023 meeting ☐ Check here if not related to specific meeting

List additional organization attendees at cited meeting:

*__IRP Topic(s) and/or Agenda Items:__ List the specific topics that are being addressed in your comments.

- Reliability Modeling – disclosures and recommended portfolio
- Inflation Reduction Act
- Transmission

☐ Check here if you do **not** want your Stakeholder feedback and accompanying materials posted to the IRP website.

*__Respondent Comment:__ Please provide your feedback for each IRP topic listed above.

Sierra Club submits the following stakeholder feedback form in order to provide specific and concrete recommendations in time for adjustments to be made to the 2023 IRP. Sierra Club's hope is that by providing this feedback prior to formal commenting after submission of the IRP, PacifiCorp may be able to more effectively take into consideration Sierra Club's recommendations, make adjustments where appropriate, and ultimately produce a stronger IRP. These recommendations and additional information build upon the January 6, 2023 discussion between Sierra Club and PacifiCorp as well as PacifiCorp's most recent stakeholder input meeting:

1. PacifiCorp should disclose reliability adjustments made to LT and ST model runs (specifics detailed below) either concurrent with, or ideally prior to, the 2023 IRP filing;
2. PacifiCorp should consider a "Commercial + Clean + Reliable Portfolio" that fills reliability gaps identified between the LT and ST models with clean, commercialized resources in order to reduce reliance on non-commercialized resources that inherently increase the risk of the final portfolio. At a minimum, a "Commercial + Clean + Reliable" portfolio would provide useful information on the cost

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deviation between a portfolio that relies on clean and commercialized resources to meet reliability versus a portfolio that includes non-commercialized resources, such as small modular reactor ("SMR") nuclear projects and proxy non-emitting peakers;

3. Sierra Club's analysis applying the ITC and PTC 10% bonus tax credit for Energy Communities to the 2021 IRP lead to a reduction in PVRR exceeding $1 billion, suggesting that applying the bonus tax credit to the 2023 IRP would make a meaningful and significant difference. Sierra Club continues to urge PacifiCorp to incorporate the ITC and PTC 10% bonus tax credit into the 2023 IRP;
4. Rather than applying a blanket 30% transmission cost reduction to account for financing made available through the Inflation Reduction Act ("IRA") as Sierra Club initially recommended, PacifiCorp should, at a minimum, apply a 30% transmission cost reduction specifically to Cluster Areas ("CAs") 1, 2, 4, 12, and 14. In parallel, PacifiCorp should seek to secure low-cost financing for these network upgrades through the DOE's Energy Infrastructure Reinvestment ("EIR") program.
5. PacifiCorp should factor in fossil plant retirements in its CAs when identifying transmission costs by (a) inputting $0 associated network upgrade costs (other than facility interconnection) if new clean resources coincide with a plant retirement; and (b) reduce the cost of generation resources being added in conjunction with (or shortly after) a fossil plant retirement corresponding to the EIR financing option available under the IRA.
6. PacifiCorp should provide stakeholders with a complete list of the maximum selectable resources at each location available for LT model resource selection as soon as possible;
7. PacifiCorp should not limit future resource additions at specific locations based on what is currently reflected in the interconnection queue. Instead, PacifiCorp should include more expansive limits for potential resources at each location. Specifically, Sierra Club recommends that PacifiCorp consider increasing the limits on potential resources at specific locations to twice the current queue levels, with a minimum of 1000 MW per location.

Justification for and explanation of these recommendations is expanded upon below.

1. Reliability - Recommended Information Disclosure Concurrent With, or Prior To, 2023 IRP Filing

Based on discussions at the January 6 meeting between Sierra Club and PacifiCorp, it is Sierra Club's understanding that PacifiCorp intends to apply a reliability-based resource cost adjustment as part of its LT model (i.e., capacity expansion) input assumptions. Sierra Club understands that this reliability-based cost adjustment is intended to minimize any reliability gaps in the resource portfolio selected by the LT model. The magnitude of this reliability-based cost adjustment for each resource will be determined by the results of an initial ST model run conducted after the initial LT model run. Resources that are able to generate during periods of a reliability shortfall (according to the initial ST model run) will be given a greater cost reduction and will therefore be more likely to be selected in subsequent LT model runs.

The rationale provided by PacifiCorp during this meeting helped to clarify the Company's approach, and gave Sierra Club some greater confidence in it. However, Sierra Club remains concerned about potential distortions to the resource portfolio that could arise from this approach. For example, the magnitude of the cost adjustments applied to each resource could be influenced by a variety of factors in the initial LT and initial ST model runs, some of which may not be applicable in subsequent model runs.

As such, Sierra Club believes it is imperative that PacifiCorp provide adequate transparency about how the resource-specific reliability-based cost adjustments are determined, and how they ultimately affect resource selection. To this end, Sierra Club has several concrete recommendations on information that PacifiCorp should provide concurrent with (or ideally prior to) its 2023 IRP filing:

a. Detailed results of the initial LT model runs, prior to any reliability-based cost adjustments. At a minimum, these results should include the resource portfolio (i.e., annual load and resource tables), as well as the estimated PVRR.

b. Detailed results of the initial ST model runs, absent any reliability-based cost adjustments. At a minimum, these results should include the 8760 hourly data that indicates when there is unserved energy.
c. Specific reliability-based cost adjustment values (e.g., in $/kW) for each resource type. PacifiCorp should also provide a detailed narrative description of how these values were determined using the data from the initial ST model run.
d. A list of resources selected during the initial LT run and the resources selected in the LT run with the granularity adjustments clearly indicating which resources were incremental and which resources did not get selected in the second run (compared to the first).
e. Detailed results of the ST model run after the granularity adjustments, absent any reliability-based cost adjustments. At a minimum, these results should include the 8760 hourly data that indicates when there is unserved energy.
f. A list of any resources that were added as part of any final LT or ST run to address any remaining unserved energy and that were forced into the model. For each resource selected for reliability purposes, a detailed justification including the hours that prompted its selection should be provided.

2. Reliability: Recommended "Commercial + Clean + Reliable" Portfolio to Reduce Overall Risk

One additional aspect of Sierra Club's concerns is that the reliability-based cost adjustments, described above, may unduly bias the LT model's resource selection towards resources that have not been commercialized and are currently more speculative in nature. For example, in the 2021 IRP, PacifiCorp relied heavily upon SMR nuclear units and non-emitting peakers as reliability resources, despite the fact that these resources have not been commercialized to date. In contrast, PacifiCorp did not consider resources that have had more commercial success to date (globally speaking) such as offshore wind, demand response, enhanced geothermal,[1] and high-capacity factor solar plus storage, among other resources. Sierra Club believes that relying too heavily upon non-commercial resources to meet critical reliability needs would be a risky strategy. In fact, in the Oregon PUC's acknowledgement of the 2021 IRP, the Commission specifically called for the Natrium SMR project addition in 2028 to be removed from the preferred portfolio in part due to concerns about its commercial readiness.

As such, Sierra Club recommends that PacifiCorp adequately explore low-risk portfolios that rely more heavily upon commercialized clean energy resources to address any reliability concerns. While such a portfolio may deviate from a true "least cost" portfolio, it will be informative to understand the magnitude of this deviation and may ultimately be justified in order to manage risk. Sierra Club believes this "Commercial + Clean + Reliable" portfolio can be accomplished through one of the following methods:

- Method 1: Remove the reliability-based cost adjustment from the LT model runs. Solve for any reliability shortfalls identified in the ST model through the "manual" addition of a subset of clean energy resources that excludes non-commercial resources such as SMRs and non-emitting peakers, and non-clean resources such as natural gas conversions.
- Method 2: Apply the reliability-based cost adjustment only to commercialized resources and exclude cost reductions for non-commercial and non-clean resources.

[1] While technically no enhanced geothermal project is currently in operation, some PPAs have recently been executed with expected online dates as soon as 2026:

- https://www.businesswire.com/news/home/20221110005162/en/Fervo-Announces-20-MW-Power-Purchase-Agreement-to-Provide-247-Carbon-Free-Geothermal-Electricity-to-Southern-California
- https://www.businesswire.com/news/home/20221011005274/en/Fervo-Energy-to-Provide-247-Carbon-Free-Geothermal-Electricity-to-Clean-Power-Alliance%E2%80%99s-Three-Million-Southern-California-Customers
- https://www.prnewswire.com/news-releases/east-bay-community-energy-adds-fervo-geothermal-energy-to-portfolio-opening-doors-to-247-zero-emission-electricity-301553282.html

* Required fields

- Method 3: Perform PacifiCorp's standard reliability-based cost adjustment, but exclude non-commercial resources from the candidate resource list.

3. ITC and PTC 10% Bonus Tax Credits

In its December feedback form, Sierra Club strongly recommended that PacifiCorp's 2023 IRP analysis include the 10% ITC and PTC Bonus Tax Credits for Energy Communities, which was a provision adopted in the Inflation Reduction Act ("IRA"). As Sierra Club pointed out, a large amount of PacifiCorp's service territory appears to overlap with areas that could be designated Energy Communities, and therefore it would be safe to assume that most new wind, solar, and battery storage projects being added from now through 2033 could qualify. During the meeting on January 2, 2023, PacifiCorp acknowledged that these bonus credits could potentially play a role going forward, but did not believe they would be significant enough that they should be explicitly modeled in the 2023 IRP analysis. Sierra Club has since performed its own analysis to quantify the potential magnitude of the Energy Communities bonus tax credits.

The table below summarizes the potential value of these bonus tax credits if applied to all wind, solar, and storage resource additions identified in the 2021 IRP Preferred Portfolio. Notably, if the bonus ITC/PTC tax credits for Energy Communities were applied to these potentially eligible resources, it would lead to a reduction in PVRR that exceeds $1 billion. To put this in perspective, this is a greater difference in PVRR than was identified for all but one of the eight Variant Portfolios that PacifiCorp studied in its 2021 IRP. The first table below illustrates Sierra Club's analysis of the annual tax credit bonus value. The second table below provides a summary of the PVRR change in the 2021 Variant Portfolios compared to the potential PVRR change related to the Energy Communities bonus credit.

Added Capacity (MW)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Wind	194	1641	547	0	255	202	301	0	0	0	0	0	0	156	450	0	268
Solar	345	805	600	0	83	160	477	626	1100	0	0	0	0	702	0	0	0
Storage	288	352	800	0	42	660	477	626	1100	0	0	0	0	702	0	0	0
Tax Credit Bonus	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
PTC (in millions of $)	$4.0	$23.8	$32.6	$32.6	$35.4	$38.3	$44.1	$48.1	$55.3	$55.3	$55.3	$55.3	$55.3	$55.23	$55.3	$55.3	$55.3
ITC (in millions of $)	$10.5	$23.3	$52.4	$52.4	$53.9	$67.5	$72.0	$65.7	$105.7	$104.2	$57.4	$40.0	$40.0	$0.00	$0.00	$0.00	$0.00

Variant Portfolio from 2021 IRP	**PVRR ($M) Change from P02-MM-MM**
P02a-JB 1-2 No GC	$477
P02b-No B2H	$388
P02c-No GWS	$128
P02d-No RFP GWS	$1,036
P02e-No Nuc	$133
P02f-No Nau	$54

* Required fields

P02g-CCUS	$271
P02h-JB3-4 Retire	$95
Energy Communities 10% Bonus ITC/PTC (this analysis)	($1,005)

Given these results, Sierra Club reiterates its recommendation that PacifiCorp attempt to model the Energy Communities bonus credit in its IRP. Sierra Club recognizes that it may not be appropriate to apply the bonus credit to 100% of clean energy projects in PacifiCorp's portfolio since not all of them will necessarily be located in an Energy Community location. However, the statutory language is broadly worded such that Sierra Club believes a large majority of projects (i.e., in the 60-80% range) could qualify. As such, PacifiCorp should seek to approximate this level of bonus credit.

4. Transmission

a. Reduction in Transmission Costs via the EIR Program

During the meeting between PacifiCorp and Sierra Club on January 6, 2023, PacifiCorp expressed interest in further specificity on how provisions of the IRA might be applied towards transmission network upgrades being considered as part of its 2023 IRP resource portfolio selection, which are informed by the Cluster 2 study results published in November 2022.

PacifiCorp expressed some concern that certain funding made available through the IRA might be used up by other entities before PacifiCorp had an opportunity. Indeed, one of the programs Sierra Club mentioned – the Grid Innovation Program – is limited to $5 billion and may soon be utilized if PacifiCorp did not already begin pursuing this option. However, Sierra Club does not believe this concern is applicable in the case of the Energy Infrastructure Reinvestment (EIR) program since the total cap on program loans is $250 billion.

On December 20, 2022, Sierra Club provided a feedback form to PacifiCorp identifying the EIR program as a potential opportunity to secure low interest financing for grid infrastructure, such as network upgrades, to support clean energy additions that partially or fully replace fossil generation resources. Sierra Club's preliminary analysis suggested that this program could reduce transmission infrastructure costs on the order of ~30% relative to normal utility financing. Accordingly, Sierra Club recommended that PacifiCorp's 2023 IRP study a scenario that reduced identified network upgrade costs by 30%.

If PacifiCorp were able to successfully participate in this program and use it to reduce the cost of investments in clean energy-enabling infrastructure (including transmission), it could significantly improve the economics of certain clean energy projects being considered in the 2023 IRP analysis and could lead to a different portfolio selection in PacifiCorp's modeling (as well as different decisions made by RFP respondents who may be responsible for contributing to transmission upgrade costs).

PacifiCorp disputed Sierra Club's suggestion that a blanket 30% cost reduction for these network upgrades was warranted, but suggested that a more targeted approach might be worth exploring. This response attempts to provide this more detailed request. After some further evaluation, Sierra Club is particularly interested in the network upgrade costs PacifiCorp identified for specific cluster areas in their Cluster Study 2. For example, some of the most costly network upgrades appear to occur in Clusters Areas 1, 2 and 4 which roughly correspond to the Wyoming region. This is particularly noteworthy since Cluster Areas 1, 2, and 4 include over 9000 MW of generation resources, including almost 4,000 MW of wind. Similarly, there are significant costs associated with the network upgrades in Cluster Areas 12, and 14 in Utah, which includes over 3000 MW of solar generation resources. The table below provides a summary of the resources being considered for these clusters and the identified network upgrade costs.

Cluster Area	Battery Storage (MW)	Pump Storage (MW)	Solar (MW)	Solar & Battery Storage (MW)	Wind (MW)	Total (MW)	Network Upgrade Full Cost ($ M)
CA01 - NE WY		1,000	199	375	392	1,966	$2,047
CA02 -SE WY	200			419	1,197	1,816	$3,969
CA04 - Bridger	200	2,300		900	2,200	5,600	$9,509
CA12 - SE UT	800	1,300	544	1,072		3,716	$1,763
CA14 - SW UT				1,561	456	2,017	$1,604
Total	**1,199**	**4,600**	**743**	**4,327**	**4,245**	**15,114**	**$18,892**

Sierra Club is concerned that assigning these extraordinarily high transmission costs to clean energy resources in these cluster areas may cause these resources to not be selected, and may in turn limit the amount of cost-effective coal retirements that might otherwise be selected by the Plexos model.

For instance, these five Cluster Areas also roughly coincide with certain fossil generation resources that are candidates for retirement such as the Jim Bridger, Dave Johnston, Naughton, and Wyodak coal plants in Wyoming, and the Hunter and Huntington plants in Utah. This would make the replacement resources, and enabling transmission investments, potentially eligible for the EIR program.

There are two dimensions to the ability for these new resources to displace the generation from coal plants. First, the addition of renewable resources like wind and solar in proximity to these fossil plants is likely to reduce the dispatch of those fossil plants even if the coal plants are not retired. Second, the addition of these resources may accelerate economic retirement of these fossil resources (assuming reliability needs are still met). In either case, transmission upgrades and/or generation project costs in the vicinity of the coal plant locations are very likely eligible for the EIR program financing.

The potential cost savings to PacifiCorp ratepayers would be significant. For example, Sierra Club estimates that if EIR financing can be used for these transmission network upgrades alone (CA's 1, 2, 4, 12, and 14), it could result in cost savings to PacifiCorp customers on the order of $8.5 billion (NPV). Given the magnitude of these savings, Sierra Club believes there is a strong possibility they could alter the outcome of PacifiCorp's IRP portfolio analysis. As explained above, absent any cost reductions from the EIR, the high transmission costs identified could cause resources in the identified locations to be cost-prohibitive and not selected as part of PacifiCorp's analysis. However, if the cost reductions from the EIR were achieved, it could lead to an outcome where the preferred portfolio included more of the resources located in CA's 1, 2, 4, 12, and 14.

Additionally, based on Sierra Club's understanding of the EIR program, the final date for the transmission upgrades and clean energy projects to be placed in service could potentially extend beyond the 2026 timeframe identified in statute from the IRA. As long as sufficient agreements are in place, and development activity has commenced prior to 2026, Sierra Club believes it will be possible to secure the

* Required fields

necessary financing. This could provide a significant and material benefit to PacifiCorp ratepayers, not only by unlocking more cost-effective generation resources, but by reducing the costs of the supporting transmission investments.

Given these findings, Sierra Club recommends that PacifiCorp's 2023 IRP include an evaluation of a scenario in which the network upgrade costs for the Cluster Areas identified above (i.e., CA01, CA02, CA04, CA12, and CA14) is reduced by approximately 30%. In parallel, PacifiCorp should pursue all available options to secure newly available financing options through the IRA, including the EIR program. Should PacifiCorp continue to dispute the validity of a 30% cost reduction, Sierra Club strongly recommends that PacifiCorp identify an acceptable cost reduction to take into account financing available under the EIR.

b. Reduction in Transmission Costs via Generator Replacement

As described above, PacifiCorp has identified significant transmission network upgrade costs in certain cluster areas that are both rich in renewable resources (e.g. southern Utah for solar, Wyoming for wind) and contain large fossil generation plants that may be subject to retirement in the near future.

Sierra Club is concerned that these transmission costs may prove to be cost prohibitive for certain viable resource additions in those cluster areas. For this reason, Sierra Club strongly recommends that PacifiCorp explore all options available to *reduce* those transmission costs, such as through the EIR program as described in section 4a above. In addition, there may also be opportunities for PacifiCorp to *avoid* some of these transmission costs altogether when adding these resources. This could occur if PacifiCorp is able to retire existing generation resources and utilize its existing transmission capability for the new resources. This is underscored by the fact that FERC recently approved revisions to PacifiCorp's OATT on January 10, 2023 which includes a new generator replacement process that could facilitate such replacement.

For example, if the Jim Bridger plant were to retire prior to 2030 (of which PacifiCorp's share equates to ~1,400 MW), then the Company's transmission system would be able to support a large share of the 2,200 MW of wind currently seeking interconnection in Cluster Area 4, without the need to invest over $9 billion in network upgrades. This represents a vast improvement in the project economics that would make both the early retirement and wind additions more likely to be selected by the LT model. Moreover, the project economics of the wind resource additions could be *even further* improved if those wind projects themselves qualified for financing under the EIR program described above.

As such, Sierra Club strongly recommends that PacifiCorp include resource options in each Cluster Area with a potential fossil plant retirement such that:

1. Some amount of clean resource additions have $0 in associated network upgrade costs (other than facility interconnection) if coinciding with a plant retirement (i.e., up to the retiring plant's nameplate value).
2. The cost of generation resources being added in conjunction with (or shortly after) a fossil plant retirement should be reduced corresponding to the EIR financing option.

5. Transmission and Portfolio Selection Options: Maximum Resource Limits

During the January 13, 2023 stakeholder meeting, PacifiCorp indicated that the LT model resource selection process would include location-specific candidate resources that are linked to the current set of resources in the interconnection queue and cluster study. Additionally, PacifiCorp confirmed that for each location, the amount of resources identified represents an upper limit for what the model can select (with some possible exceptions).

Sierra Club recommends that PacifiCorp provide stakeholders with a complete list of the maximum selectable resource at each location as soon as possible. This will assist in determining whether these limits on allowable resource selection are reasonable.

* Required fields

Additionally, Sierra Club is concerned that it may not be appropriate to limit future resource additions based on what is presently reflected in the interconnection queue. It is possible that more resources will seek to join the interconnection queue even prior to the next IRP cycle or IRP update. Furthermore, in many ways the IRP provides a signal to project developers about where the most valuable locations are on PacifiCorp's system and where they should seek to develop projects. If PacifiCorp prematurely limits available resources at certain locations in its model, then the results may suggest to developers that PacifiCorp has little or no interest in those locations simply because no developers had entered the queue at that time. Instead, Sierra Club recommends that PacifiCorp include more expansive limits on potential resources at each location. Not only will this help reveal a more optimal portfolio, but it could also help inform the market where they should prioritize future project development activities based on PacifiCorp's system needs. Specifically, Sierra Club recommends that PacifICorp consider increasing the limits on potential resources at specific locations to twice the current queue levels, with a minimum of 1000 MW per location.

Thank you for your consideration of this feedback.

Data Support: If applicable, provide any documents, hyper-links, etc. in support of comments. (i.e. gas forecast is too high - this forecast from EIA is more appropriate). If electronic attachments are provided with your comments, please list those attachment names here.

Recommendations: Provide any additional recommendations if not included above - specificity is greatly appreciated.

Please submit your completed Stakeholder Feedback Form via email to IRP@Pacificorp.com

Thank you for participating.

* Required fields

DOCKET NO.: 23-035-10

SIERRA CLUB'S OPENING COMMENTS ON PACIFICORP'S 2023 INTEGRATED RESOURCE PLAN

ATTACHMENT 3
PUBLIC DATA REQUEST RESPONSES

Sierra Club Data Request 03

Please provide all cost assumptions (VOM, FOM, capex, and any other cost input) for new resources under all examined scenarios (including files pre- and post- granularity/reliability adjustments) as extracted from the PLEXOS model. Please explain any and all differences between the PLEXOS inputs for all scenarios (including LT and ST runs) and table 7.1.

Response to Sierra Club Data Request 03

Please refer to the confidential work papers supporting PacifiCorp's 2023 Integrated Resource Plan (IRP), specifically confidential folder "Chapters, Shortfalls - Part 1\Input Assumptions\ Supply Side Table", confidential file "CONF_SSR Database Summary Tab.xlsx" which contains the supply side proxy resource costs including variable operations and maintenance (VOM), fixed operations and maintenance (FOM), capital expenditures (CAPEX) and other costs. As provided is Confidential file, "CONF_IRP 2023 Develop Escalation (NREL hard coded) Update 2020ASRFP.xlsx" on the resource escalations.

Please refer to confidential folder "Chapters, Shortfalls - Part 1\Input Assumptions\Other Assumptions", confidential file "CONF_2023 Master Assumption Gas Transport" which reports the gas transportation costs. Please refer to the Company's response to Sierra Club Data Request 10 for the tax credits for proxy resources.

Please refer to the public / non-confidential work papers supporting PacifiCorp's IRP, specifically folder "Chapters & Inputs\DSM" which provides the PLEXOS model inputs for energy efficiency (EE) and demand response (DR).

Please refer to Confidential Attachment Sierra Club 03 which provides the granularity adjustment.

Differences between the long-term (LT) and short-term (ST) model are related to model setup changes. Cost inputs are generally the same between the LT and ST model. For example, fuel prices in LT are the same in the ST model. This is true for proxy resource costs except as noted below:

- The granularity adjustment is included in the LT model for proxy resource selection but is not included in the ST model as the proxy resources are passed from the LT model for ST dispatch.

- There are setups in the model where the inputs may change but is the same between LT and ST models, for example:

  - the Carbon capture, utilization and storage (CCUS) Bridger fuel price was extended where it required for Powder River Basin (PRB) coal after mine closes.

  - extending natural gas proxy resource lives to 40 years.

  - turning off proxy nuclear for model selection.

- There are scenarios in PLEXOS that turn on or turn off model resources, but the underlying proxy cost inputs do not change between LT and ST models.

Please refer to the confidential work papers supporting PacifiCorp's 2023 IRP, specifically confidential folder "Chapters, Shortfalls - Part 1\Model Reports\ST\ Preferred Portfolio" and confidential files, for example, "CONF_ST Cost Summary -23I.ST.Reliable.20.PA1_.EP.MM.PP-D3 29.13338 (LT. 13338 - 19562) v120.0.xlsb", tab "Generator", "Battery", "LT Generator" Annualized Build Cost ($000), and "LT Battery" Annualized Build Cost ($000) for the cost of proxy resources in the ST studies.

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Sierra Club Data Request 09

Please provide a list of the coal prices (modeled as variable with the units' generation) for all units in the LT and ST runs under all scenarios.

Response to Sierra Club Data Request 09

Please refer to Confidential Attachment SC 09 which provides the coal prices input into the PLEXOS model.

Please refer to the confidential work papers supporting PacifiCorp's 2023 Integrated Resource Plan (IRP), specifically confidential folder "Chapters, Shortfalls - Part 1\Model Reports\ST\Preferred Portfolio" and, for example, confidential file "CONF_ST Cost Summary - 23I.ST.Reliable.20.PA1_.EP.MM.PP-D3 29.13338 (LT. 13338 - 19562) v120.0.xlsb", tab "Generator" and column F "Generation (GWh)" for the unit generation.

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Sierra Club Data Request 11

Please refer to file "CONF Table 7.1 – 7.2 – Total Resource Cost for Supply-Side Resource Options 23 IRP 031523.xlsx."
(\2023 IRP May 31 Data Disk (Confidential) - Chapters, Shortfalls - Part 1.zip\Chapters, Shortfalls - Part 1\CH7 – Resource Options)

(a) Refer to cells AX44:AX96. Please explain why tax credits are not included for the storage and standalone solar resources in the "PTC Tax Credits / ITC (Solar Only) / 45Q CCUS Only" column.

(b) Please explain why listed "PTC Tax Credits / ITC (Solar Only) / 45Q CCUS Only" values for Natural Gas resources with hydrogen cite values for Photovoltaic (Utility) 30% ITC from the "LCF" tab.

(c) Please explain where energy community bonuses for tax credits are included in the modeling and work papers.

Response to Sierra Club Data Request 11

(a) Not including tax credits for storage and standalone solar resources was an oversight as storage would receive investment tax credit (ITC) benefits and standalone solar would receive production tax credit (PTC) benefits. Although the confidential file supporting PacifiCorp's 2023 Integrated Resource Plan (IRP), Volume I, Chapter 7 (Resource Options), Table 7.1 (2023 Supply-Side Resource Table (2022$)) and Table 7.2 (Total Resource Cost for Supply-Side Resource Options) – "CONF Table 7.1 – 7.2 – Total Resource Cost for Supply-Side Resource Options 23 IRP 031523.xlsx", cells AX44:AX96, were not filled out, these tax credits were included in the PLEXOS model for these proxy resources, where tax credits were allowed through 2037.

(b) ITCs were applied to 100 percent hydrogen proxy peakers as they are expected to generate at a low capacity factor. Due to an oversight, ITCs were missing for the 100 percent hydrogen peakers in the Company's provided work papers. The photovoltaic (PV) (Utility) 30 percent ITC capital recovery factor of 5.056 percent was applied instead of the 5.176 percent for hydrogen peakers.

(c) Please refer to PacifiCorp's 2023 IRP, Volume I, Chapter 3 (Planning Environment) which states "In the 2023 IRP, resources in Utah South and all of Wyoming are assumed to receive the 10% Energy Community bonus, resulting in a 110% PTC (wind, solar, other energy resources) or 40% ITC (energy storage and peaking resources)".

Sierra Club Data Request 14

Please provide the estimated costs (capital and operating) associated with the Natrium demonstration project.

Response to Sierra Club Data Request 14

Please refer to the Company's response to OPUC Data Request 198.

Sierra Club Data Request 15

Please provide a narrative explanation of the fuel that the Natrium plant will use and the status of supply sources of this fuel.

Response to Sierra Club Data Request 15

The fuel that will be initially used in the Natrium reactor is a metallic uranium alloyed with 10 percent by weight Zirconium (U-10Zr). The fuel is contained within long tubes and made into hexagonal fuel bundles. The fuel is enriched up to 19.75 percent. The fuel assemblies will be made in Wilmington, North Carolina by Global Nuclear Fuels (GNF). TerraPower's original intent was to procure high-assay low-enriched uranium (HALEU) from Rosatom for the first core, while the United States (U.S.) government supports development of domestic supply. Since the invasion of Ukraine, TerraPower no longer supports obtaining HALEU from Russia, and therefore is reliant on domestic sources. The U.S. Department of Energy (DOE) has issued draft request for proposals (RFP) for both HALEU enrichment and deconversion (converting the enriched uranium to oxide or metallic form). Final RFPs for both processes are expected later this year (2023). Centrus in Piketon, Ohio has developed a pilot plant that is beginning to make HALEU, and Urenco in Eunice, New Mexico also has the capability to do so. Both companies are actively moving forward on HALEU capability.

Sierra Club Data Request 16

Please provide an update on the construction or availability of federally licensed storage facilities for nuclear wastes that would be generated from the Natrium plant.

Response to Sierra Club Data Request 16

Most nuclear spent fuel is safely stored at the sites that used the fuel in dry or wet storage. The Natrium demonstration plant has the ability to store up to 10 years of spent fuel in an underground storage pool adjacent to the reactor. The fuel will then be transferred to dry storage vaults at the Kemmerer site, until the United States (U.S.) government has approved a final repository. This is very similar to what is being done for the light water reactors currently in commercial operation in the U.S. There are two efforts to build interim dry storage facilities away from reactors in the U.S., one in Andrews, Texas and the other in Eunice, New Mexico. The storage facility in Eunice, New Mexico has been licensed through the U.S. Nuclear Regulatory Commission (NRC). Low-level radioactive material is shipped to either U.S. Ecology in Richland, Washington or to Energy Solutions in Clive, Utah.

Sierra Club Data Request 18

Please identify all anticipated federal, state, and local permit approvals, including required waivers or exceptions to federal, state, and/or local law, that will be required for the proposed Natrium plant.

(a) For each permit requirement identified, indicate the current status of the permitting process (e.g., yet to apply, pending, permit received, etc.).

(b) For each permit requirement identified, please indicate the anticipated timeframe for obtaining said permit.

Response to Sierra Club Data Request 18

The Natrium demonstration plant will be licensed under 10 Code of Federal Regulations (CFR) Part 50 and TerraPower will obtain a construction permit and an operating license from the United States (U.S.) Nuclear Regulatory Commission (NRC). TerraPower is not taking any exceptions to federal, state, or local law. TerraPower is responsible for identifying and obtaining all necessary permits; as such, PacifiCorp is unable to provide the details requested.

For information, 10 CFR Part 50 can be accessed by utilizing the following Federal Government website link:

eCFR :: Title 10 of the CFR -- Energy

Sierra Club Data Request 20

Has PacifiCorp quantified the anticipated NOx emission reductions that can be achieved at the Hunter and Huntington plants with the installation of selective non-catalytic reduction (SNCR) control technology?

(a) If yes, please provide this quantification and any supporting work papers.

Response to Sierra Club Data Request 20

Please refer to Confidential Attachment Sierra Club 20 which provides the expected nitrogen oxide (NOx) emissions rates in the 2023 Integrated Resource Plan (IRP) for the Hunter and Huntington units, before and after selective non-catalytic reduction (SNCR) installation.

For details on total NOx emissions, please refer to the confidential work papers supporting PacifiCorp's 2023 IRP, specifically confidential folder "Chapters, Shortfalls - Part 1\Model Reports\ST\Preferred Portfolio", confidential file "CONF_ST Cost Summary -23I.ST.Reliable.20.PA1_.EP.MM.PP-D3 29.13338 (LT. 13338 - 19562) v120.0.xlsb", tab "Emissions by Gen", column "parent Name" and sort by "NOx" to report Hunter and Huntington emissions, by unit.

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Sierra Club Data Request 22

Has PacifiCorp quantified NOx emission reductions that could be achieved at the Hunter and Huntington plants with the installation of selective catalytic reduction (SCR) control technology?

(a) If so, please provide this quantification and any supporting work papers.

Response to Sierra Club Data Request 22

Please refer to Confidential Attachment Sierra Club 22 which provides the expected nitrogen oxide (NOx) emissions rates in the 2023 Integrated Resource Plan (IRP) for the Hunter and Huntington units, before and after selective catalytic reduction (SCR) installation.

The 2023 IRP variant study P03-Hunter3-SCR run in PLEXOS reported an increase of $149 million present value of revenue requirement differential (PVRR(d)) for installing SCR instead of selective non-catalytic reduction (SNCR). Given the increase in PVRR(d) costs from installing SCR on Hunter Unit 3, SCR was not analyzed for the other Hunter and Huntington units. Instead, the Hunter Unit 3 results were considered representative for the other units. Based on the foregoing clarification, the Company responds as follows:

For details on total NOx emissions, please refer to the confidential work papers supporting PacifiCorp's 2023 IRP, specifically confidential folder "Chapters, Shortfalls - Part 1\Model Reports", confidential file "CONF_ST Cost Summary - 23I.ST.Reliable.20.PA1_.EP.MM.PP-V3 Hunter 3 SCR.8385 (LT. 8385 - 20171) v120.0.xlsb", tab "Emissions by Gen", column "parent Name" and sort by "NOx" to report Hunter Unit 3 with SCR).

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Sierra Club Data Request 25

Initial versus Reliable Portfolios - Please refer to the "LT" folder found in the 2023 IRP Data Disc (Public) "Model Reports" folder.

(a) Please explain why the Initial LT and Reliable LT folders within the Model Reports folder contain a different number of files. Should there be files missing, please provide ALL Initial and Reliable LT files for each portfolio studied.

(b) Please confirm that the Initial and Reliable LT runs for the Preferred Portfolio are:

Initial LT: LT_6530_23I.LT.IR.20.PA0_.EP.MM.Base
Reliable LT: LT_7359_23I.LT.RP.20.PA1_.EP.MM.PP-D3 29

i. If these are not the correct runs for the Preferred Portfolio, please identify the correct ones.

ii. Please confirm and justify the reliability adjustments made between the Initial and Reliable LT runs of the Preferred Portfolio, as compared in the attached table.

Response to Sierra Club Data Request 25

(a) Some of the 2023 Integrated Resource Plan (IRP) sensitivities were based off the base initial run. As an example, the P18 and P19 analysis merely studied the cost impact of adding one additional cluster study resource on the East side of the system (P18) and one additional cluster study resources on the West side of the system (P19). The purpose of these studies was not to re-optimize the entirety of the capacity expansion portfolio selection, but to explore if additional transmission capacity, exogenously added, plus enabled renewable resources, was cost effective. As such, there was not a requirement for an initial study for this variant, and therefore the implied files were never created nor provided.

(b) Please refer to the Company's responses to subparts i. and ii. below:

i. The initial run which led to the preferred portfolio was "LT_6529_23I.LT.Initial Run.20.PA0_.EP.MM.Base Limited". The supporting work paper is provided with the work papers supporting PacifiCorp's 2023 IRP, specifically folder "Model Reports\LT\LT Initial Run".

The preferred portfolio reliable long-term (LT) is "LT_13338_23I.LT.RP.20.PA1_.EP.MM.PP-D3 29". The supporting work paper is provided on the 2023 IRP supporting work papers, specifically folder "Model Reports\LT\LT Reliable Portfolio\Preferred Portfolio".

ii. Any and all adjustments between the initial portfolio and reliable portfolio are informed directly by the shortfalls which are reported out of the short-term (ST) phase of the model using the initial portfolio, as well as the economics of all resources including proxy reported out of the ST phase of the model. When reviewing the shortfalls present in the initial run of the LT capacity expansion model index # 6529, shortfalls were found to extend up to 16 hours in length. As such, merely using battery or other renewable (wind/solar) resources would not have led to a reliable system. Resource options which met both long duration capacity and clean energy requirements which the company must comply, were long duration battery, non-emitting peaker and nuclear resources. The most economic versions of these proxy resources were added for reliability based on the ST cost summary performance characteristics of the available options.

Sierra Club Data Request 27

Initial versus Reliable Portfolios - Please provide a detailed explanation of PacifiCorp's methodology for selecting resource additions and subtractions when updating the initial Preferred Portfolio to the reliable Preferred Portfolio. In this explanation please include the following:

(a) An overview of the process for identifying hourly shortfall patterns and identifying the appropriate resources to alleviate that specific shortfall.

(b) A rationale for why certain resources were reduced rather than increased (e.g. winter FOT, wind).

(c) A rationale for why Wyodak was changed from a gas conversion in 2027 to SCNR through 2039, and how this contributes to reliability.

(d) A rationale for why 500 MW of nuclear units were added in both 2032 and 2033.

Response to Sierra Club Data Request 27

(a) Annual reports of all hourly shortfalls are provided in the confidential work papers supporting PacifiCorp's 2023 Integrated Resource Plan (IRP), specifically confidential folder "Chapters\Input Assumptions\Reliability\Shortfalls", confidential file "PA0 MM Limited March 3". When evaluating shortfalls, three factors are considered.

1. The maximum size of the shortfall during the shortfall window (i.e. if the shortfall is 100 megawatts (MW), 150 MW, 400 MW, 250 MW and 300 MW in consecutive hours, the need is to solve the 400 MW shortage).

2. The duration and timing of the shortage – is the shortage during the middle of the day when there is solar radiance, or at night…is the duration two hours long that can be met with a four-hour battery or is it 12 hours long so it cannot be met with a shorter duration resource, such as solar or four-hour battery?

3. The locations of the shortage – is the shortage on the east side or west side of the system, is there transmission available such that a proxy resource can be located in an advantageous location and still meet the shortage?

These factors combine to determine what proxy resource types are eligible for selection to meet the shortages. Long durations of shortfall (more than eight hours) or very large size maximum shortfalls (greater than 400 MW) lead to a

need for larger or longer duration assets to meet the shortage. In cases where the shortage is smaller in duration (under four hours) storage solutions tend to be the most cost-effective option. Any considerations of resources to meet reliability needs to balance the duration of the shortages, economics of available proxy resource options, locations where the shortfall occurs and resources are eligible to be placed, and the size of the largest hourly shortfall in the duration.

(b) Front office transactions (FOT) are not managed for reliability in the long-term (LT) run, therefore changes to reported FOT in the LT are due to the level of granularity the model sees and should not be considered as changes for reliability. In the case of the wind resources, the 138 MW reduction in wind from the initial run to the final, reliable portfolio, came from the assessments noted in the Company's response to subpart (a) above. The shortfalls were such that 138 MW of wind was selected to be switched with solar plus storage. The storage component of the solar resources would mitigate shortfalls more effectively than the wind during hours of need.

(c) The Company assumes that the reference to "SCNR" is intended to be a reference to selective non-catalytic reduction (SNCR). Based on the foregoing assumption, the Company responds as follows:

The initial LT study referenced in the Company's response to Sierra Club Data Request 25 selected Wyodak SNCR and this selection was not changed in the reliability portfolio.

(d) The initial LT run referenced in the Company's response to Sierra Club Data Request 25 selected two 500 MW of nuclear resources. The initial selections were in 2030 and 2031, however, having three total advanced nuclear plants to come online in 2030 and 2031 was deemed unlikely, therefore an assumption of a delay in the second and third plant was deemed more realistic for the additional nuclear capacity to be achievable.

Sierra Club Data Request 29

CONFIDENTIAL REQUEST - Granularity Adjustment - Please refer to "Granularity Adj-MM-Generators CONF" provided as an attachment to PacifiCorp's response to Sierra Club data request 03, which provides the Granularity Adjustment values. Please also refer to page 223 of the IRP, which states: "the granularity adjustment reflects the difference in economic value between an hourly 8760 cost calculation in ST modeling, and the seven-block per month representation used in the LT model."

(a) Please confirm that the values provided in "Granularity Adj-MM-Generators CONF" where originally calculated during the 2021 IRP process and were not recalculated for the 2023 IRP analysis.

(b) Please confirm that the adjustment values in "Granularity Adj-MM-Generators CONF" are expressed in $/kW-yr. If not, please provide the units.

(c) Please confirm that the values in "Granularity Adj-MM-Generators CONF" reflect the difference in net revenues (i.e., marginal revenue minus marginal cost) between the ST model and the LT model and are limited to +/- [redacted] /kw-yr.

(d) Please provide the original work papers used to calculate the adjustment values, including the 8760 hourly costs and revenues derived from the ST model and the seven-block per month representation of costs and revenues used in the LT model.

(e) For the coal units, please explain whether the net revenue calculation was based on total/average costs (including take or pay) or incremental/marginal costs (i.e., "dispatch tier").

(f) Please explain why there is such a discrepancy between the granularity adjustment of certain coal units and comparable proxy gas units. An illustrative example is provided below, but please provide a response that explains the discrepancies more broadly:

[redacted]

YEAR	[redacted]
2023	
2024	
2025	
2026	
2027	

YEAR	[redacted]
2028	
2029	
2030	
2031	

[redacted]

Response to Sierra Club Data Request 29

(a) While there was an initial granularity adjustment from PacifiCorp's 2021 Integrated Resource Plan (IRP) which was used in very preliminary runs, the granularity adjustment used in PacifiCorp's 2023 IRP was re-calculated once all modeling inputs were updated, reviewed and verified.

(b) Confirmed.

(c) Confirmed.

(d) The requested information is considered commercially sensitive and highly confidential. The Company requests special handling in accordance with Order No 23-213 and has uploaded the requested highly confidential information to Huddle.

(e) In the PLEXOS model, no coal units in the 2023 IRP were setup with take-or-pay coal costs incorporated into their operation. As such, all calculations related to coal units are based on fuel costs which are incremental/marginal.

(f) The units are not comparable from the view of the granularity adjustment. Fuel costs, fixed operations and maintenance (FOM), variable operations and maintenance (VOM), capacity and operating characteristics are all different between the two resource types. Additionally, existing plants are no longer capitalizing initial build costs whereas proxy resources do capitalize these items over the study horizon impacting net figures. The differences in years 2023 through 2026 are related to the availability date for proxy resources. Later year differences are related to the very different operating and dispatch characteristics of different resource types.

Sierra Club Data Request 30

Surplus Interconnection - Please refer to page 224 of 2023 IRP - Volume I Amended Final, which states: "all majority-owned and operated coal plant sites are considered candidates for surplus interconnection, such that other technologies can be added prior to the coal plant's retirement"

(a) Please identify the year, location, MW and generation type of all resource additions in the Preferred Portfolio that were added as surplus interconnections prior to a coal plant retirement. Please include a breakdown by plant location.

(b) Were any additional surplus interconnection additions limited by must run constraints or minimum burn constraints?

(c) Please provide the hourly generation of both the coal plants and the surplus additions in each year until the plant's retirement.

Response to Sierra Club Data Request 30

(a) Please refer to Confidential Attachment Sierra Club 30. In some instances, proxy resources were added in the year of the existing coal retirement and were not deemed as surplus interconnection. An example is Jim Bridger proxy resources added in 2037; 540 megawatts (MW) of wind addition and 400 MW of battery. The addition of the Natrium nuclear project is an early replacement for Naughton Unit 1 and Naughton Unit 2.

(b) No. Surplus interconnection additions are not limited by must run constraints or minimum burn constraints.

(c) The Company has not prepared the PLEXOS hourly generation data for coal plants and surplus additions in the 2023 Integrated Resource Plan (IRP). Instead, please refer to the short-term (ST) cost summary for the annual generation, specifically the confidential work papers provided with the Company's 2023 IRP, confidential folder "Chapters, Shortfalls - Part 1\Model Reports\ST\Preferred Portfolio", and for example, confidential file "CONF_ST Cost Summary -23I.ST.Reliable.20.PA1_.EP.MM.PP-D3 29.13338 (LT. 13338 - 19562) v120.0.xlsb", tab "Generator" (and if battery, "Battery").

Confidential information is designated as Protected Information under Order No. 23-132 and may only be disclosed to qualified persons as defined in that order.

Sierra Club Data Request 31

Cluster Resources - Please provide the amounts (in MW) of Cluster 1 and Cluster 2 resources that were included in the Preferred Portfolio, and the Cluster 1 and 2 resources that were not included. Please include a breakdown of the included and excluded resources by cluster location and resource type.

Response to Sierra Club Data Request 31

Approximately 5,928 megawatts (MW) of generators and 4,760 MW of battery storage were selected out of the serial cluster, cluster study 1 and cluster study 2 items in the 2023 Integrated Resource Plan (IRP) preferred portfolio. Note: these totals include some battery storage sited at the same location as a solar generator, therefore MW capacities are not fully additive.

A total of 13,489 MW of cluster study generators and 11,505 MW of cluster study battery storage was eligible for selection in the 2023 IRP. Please refer to the "Generators" and "Batteries" information provided in the tables below. Note: some of the battery storage was treated as part of a request for proposals (RFP) process for solar plus storage resources, therefore the MW capacities are not fully additive.

Generators:

Row Labels	Sum of Selected	Sum of Possible
BOR	1100	1100
CLV	300	4454.1
COR	200	1758.86
GOE	200	546
SOR	0	499
UTN	0	619
UTS	769	849
UWY	952	1256
WMV	483	483
WWA	583	583
WYE	890.8	890.8
YAK	449.99	449.99
Grand Total	**5927.79**	**13488.75**

Batteries:

Row Labels	Sum of Selected	Sum of Possible
BOR	1099.9	1099.9
BPA	160	160
CLV	300	2473
COR	200	2313.46
GOE	549	549
SOR	0	500
UTN	0	1959
UTS	158	158
UWY	272	272
WMV	628	628
WWA	628	628
WYE	314.9	314.9
YAK	449.99	449.99
Grand Total	**4759.79**	**11505.25**

Bubble Abbreviation:

Abbreviation	Bubble Name
BPA	BPA
COR	Central OR
UTN	UT North
WMV	Willamette Valley
WWA	Walla Walla
BOR	Borah
CLV	Clover
GOE	Goshen
SOR	Southern OR
UTS	UT South
UWY	Utah/Wyoming
WYE	Wyoming East
YAK	Yakima

The location of the Open Access Same-Time Information System (OASIS) Cluster Study 1 and Cluster Study 2 information is publicly available and can be accessed by using the following website links:

oasis.oati.com/woa/docs/PPW/PPWdocs/pacificorpcliaq1.htm
oasis.oati.com/woa/docs/PPW/PPWdocs/pacificorpcliaq2.htm

Sierra Club Data Request 33

Gas Conversions - Please refer to Table 8.1, which lists gas conversion options for the following units: Naughton 1 & 2, Bridger 1, 2, 3, & 4, Dave Johnston 4, and Wyodak.

(a) For each gas conversion option, please identify the amount of fuel capacity needed to provide firm service (e.g., in Dth/D).

(b) For each gas conversion option, please provide the assumed cost of both firm and non-firm gas transportation service. Please indicate which cost (if any) was included in PacifiCorp's modeling assumptions, and what the basis for the assumption was.

(c) For each gas conversion unit, please identify what the assumed fuel source would be (e.g., Opal Market Hub).

(d) For each fuel source provided in response to subpart (c), please provide the current remaining amount of available firm pipeline capacity (e.g., in Dth/D).

Response to Sierra Club Data Request 33

(a) Please refer to the confidential work papers supporting PacifiCorp's 2023 Integrated Resource Plan (IRP), specifically confidential folder "Chapters, Shortfalls - Part 1\Input Assumptions\Master Assumptions\Gas Conversion", confidential file "CONF_Scenario Master_BaseCase 2023 IRP Base (Inputs Gas Conversion) R.xlsx", and tab "15 – Refuel Capex", column K.

(b) Please refer to the confidential work papers supporting PacifiCorp's 2023 IRP, specifically confidential folder "Chapters, Shortfalls - Part 1\Input Assumptions\Master Assumptions\Gas Conversion", confidential file "CONF_Scenario Master_BaseCase 2023 IRP Base (Inputs Gas Conversion) R.xlsx", tab "15 – Refuel Capex", column J.

(c) Please refer to the confidential work papers supporting PacifiCorp's 2023 IRP, specifically confidential folder "Chapters, Shortfalls - Part 1\Input Assumptions\Master Assumptions\Gas Conversion", confidential file "CONF_Scenario Master_BaseCase 2023 IRP Base (Inputs Gas Conversion) R.xlsx", tab "15 – Refuel Capex", column U.

(d) PacifiCorp objects to request on the basis that it requests information not in the Company's possession or control. Without waiving the foregoing objection, PacifiCorp responds as follows:

Pipeline capacity information is only available per inquiry of respective gas pipeline companies. PacifiCorp does not have full view of what capacity is available; only capacity that it needs for respective plant gas conversion that is disclosed in the Company's responses to subparts (a) through (c) above.

Sierra Club Data Request 35

HIGHLY CONFIDENTIAL REQUEST - Coal Fuel Costs - Please refer to CONF_Scenario Master_BaseCase 2023 IRP Base (Inputs)-1-11-23-Colstrip-Update.xlsx, tab "10 – Coal Cost Incremtl by Vol"

(a) Please confirm that this input file was used for modeling coal fuel costs of the Preferred Portfolio under the base case. If another input file was used, please refer to that file.

(b) Please confirm that the fuel cost for the Jim Bridger plant includes a Take-Or-Pay minimum volume in each year through 2028. For each year with a minimum volume, please identify the approximate date prior to that year when the minimum volume becomes binding or fixed.

(c) If a take-or-pay minimum volume is applied to the fuel cost for the Jim Bridger plant, please explain how this minimum volume is used in the modeling. E.g., is the minimum volume costs incurred even after modeled years in which Jim Bridger has retired.

(d) Please explain the discrepancies between the inputs provided here and those in the Highly Confidential Jim Bridger Long-Term Fuel Supply Plan. For example, Appendix 12 of the LTFSP indicates that coal consumed in 2025 is projected to cost [redacted] whereas the input file shows costs ranging from [redacted]

Response to Sierra Club Data Request 35

(a) Not confirmed. Please refer to the Company's response to Sierra Club Data Request 9. Yes, confidential file "CONF_Scenario Master_BaseCase 2023 IRP Base (Inputs)-1-11-23-Colstrip-Update.xlsx", tab "10 – Coal Cost Incremtl by Vol" was used for coal prices in the PLEXOS model with certain exceptions for Hunter, Huntington, and Jim Bridger, which incorporated recent information.

(b) PLEXOS does not model a take-or-pay provision for the Jim Bridger plant in PacifiCorp's 2023 Integrated Resource Plan (IRP) and does not enforce minimum coal purchases.

(c) Please refer to the Company's response to subpart (b) above. Fixed and variable coal fuel costs do not continue after the plant retires.

(d) The differences in values are primarily due to the fact that the IRP values referenced above are incremental costs for different sources that are available at different volume levels and were used as inputs in the IRP PLEXOS model. The referenced inputs were used for dispatch, however, the reported cost of Jim Bridger coal in the 2023 IRP is calculated outside of the model.

Please refer to tab "JB Fuel Adjustment" in the confidential ST cost summary results for each study, for example within the preferred portfolio results in confidential file "CONF_ST Cost Summary - 23I.ST.Reliable.20.PA1_.EP.MM.PP-D3 29.13338 (LT. 13338 - 19562) v120.0.xlsb".

These results reflect generalized assumptions consistent with the endogenous retirement and conversion options for Jim Bridger. By contrast, the Jim Bridger Long-Term Fuel Supply Plan (LTFSP) value referenced above is an overall average cost of all sources consumed at the volume which was the solution or output of the PLEXOS model and is specific to the cessation of coal-fired operation identified in the 2023 IRP preferred portfolio. In addition, the inputs for the two files referenced above were prepared at different points in time. Thus, when the LTFSP modeling was prepared it included updates to the assumptions used.

Sierra Club Data Request 37

SNCR - Please identify any and all actions taken to date, as well as planned actions in the next 12 months, to install selective non-catalytic reduction (SNCR) control technology at Wyodak, Hunter, or Huntington.

LT Initial vs Reliable (Preffered Portfolio)

Installed Capacity (MW)

Resource	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	Total
Gas - CCCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas - Peaking	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NonEmitting Peaker	0	0	0	0	0	0	0	606	0	0	0	0	0	345	289	0	0	0	0	0	1240
DSM - Energy Efficiency	0	0	0	(1)	(3)	(2)	(4)	3	28	7	24	15	0	(11)	8	(13)	(15)	(6)	(4)	(3)	23
DSM - Demand Response	0	0	0	0	14	(9)	(2)	3	(13)	0	0	0	5	0	(1)	5	(2)	0	0	0	0
Renewable - Wind	0	0	220	0	100	300	1849	0	0	(3190)	(1152)	0	0	0	540	0	0	0	0	0	(1333)
Renewable - Utility Solar	0	0	0	1019	483	(253)	(566)	(120)	(405)	728	0	300	0	0	0	0	0	0	0	0	1186
Renewable - Geothermal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewable - Battery	0	0	200	1424	628	535	34	0	0	0	150	0	0	0	(769)	0	(4)	0	0	0	2198
Renewable - Battery (Long Duration)	0	0	(482)	0	0	0	0	0	0	0	150	0	482	0	200	0	0	0	0	0	350
Storage - CAES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage - Pumped Hydro	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	(8)	0	0	0	0	0
Nuclear	0	0	0	0	0	0	0	0	0	500	500	0	0	0	0	0	0	0	0	0	1000
Front Office - Selected Markets	(13)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(13)
Front Office Transactions - Winter	0	(1)	16	(34)	(160)	(67)	(532)	(575)	(579)	(56)	41	39	21	18	20	(18)	(62)	(90)	(101)	(64)	(2184)
Front Office Transactions - Summer	0	0	222	(202)	(308)	86	59	47	99	53	64	34	48	52	12	0	(58)	(108)	(100)	(157)	(157)
Coal Plant End-of-life Retirements	0	0	0	799	0	0	0	930	687	351	0	0	0	0	0	0	0	(330)	0	0	2437
Coal Early Retirements	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coal - CCUS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coal - SCR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coal - SNCR	0	0	0	0	0	0	0	0	0	(418)	(1649)	0	0	0	0	0	0	(268)	0	0	(2335)
Coal - Duel Fuel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coal - Gas Conversions	0	0	0	0	(268)	0	0	1058	354	83	77	0	0	0	(160)	(1413)	0	268	0	0	0
Coal Plant ceases running as Coal	0	(0)	0	0	268	0	0	(699)	0	0	0	0	0	0	0	0	0	330	0	0	(102)
Gas Plant End-of-life Retirements	0	0	0	0	0	0	0	0	0	119	0	(119)	0	0	0	0	0	0	57	1	58
Retire - Non-Thermal	(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(0)
Expire - Wind PPA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expire - Solar PPA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expire - QF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expire - Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Response to Sierra Club Data Request 37

Due to the federal court stay of the United States (U.S.) Environmental Protection Agency's (EPA) disapproval of Utah's State Implementation Plan (SIP), Utah is not currently subject to the federal ozone interstate rule. The EPA has also proposed approval of Wyoming's ozone transport SIP. As such, selective non-catalytic reduction (SNCR) installation at Hunter, Huntington and Wyodak is being re-evaluated.

Sierra Club Data Request 41

Granularity Adjustments

(a) Please provide an intuitive explanation for why some coal units had larger granularity adjustments than gas units at the same location.

(b) Please explain if capital costs were factored into the granularity adjustment calculation, and, if so, why.

Response to Sierra Club Data Request 41

The Company objects to this request as vague and ambiguous as to the term "intuitive explanation". Without waiving the foregoing objection, the Company responds as follows:

(a) Generically, coal and gas units have different costs and operating characteristics leading to different resource values in the PLEXOS model. These costs and operational differences lead to differences in the economics of plant dispatch and annualized costs and revenues (which the granularity adjustment measures). Because the plants operate differently there is an inherent difference in the granularity adjustment of these different types of resources.

(b) No. Capital costs are not considered or factored into the granularity adjustments as this data is not relevant to the measure. Granularity adjustments provide the differential between the annual value of resource operation in the long-term (LT) run and in the short-term (ST) run due to the difference in granularity of the two models. Variable operating costs, revenues and performance are used to evaluate granularity differences.

Sierra Club Data Request 43

Please explain why PacifiCorp did not reoptimize all variant portfolios, including P18 and P19, and whether PacifiCorp anticipates that not re-optimizing the portfolios resulted in excessive resources being included in the variant portfolios.

Response to Sierra Club Data Request 43

Portfolios P01, P02, P03, P04, P05, P07, P08, P10, P11, P12, P14, P15, P16 and P24 began with a distinct fully endogenous initial long-term (LT) portfolio.

A set of additional variant portfolios were evaluated upon distinct endogenous initial LT modeling but shared their initial LT portfolio with another variant run. For example, P20 - JB 3-4 CCUS was built on case P02 - JB 34 EOL, such that the impact of carbon capture, utilization and storage (CCUS) could be evaluated over the life of these units. The following variants fall into this category:

- P06 – No Forward Tech (used initial portfolio P05 – No NUC)
- P20 – JB 3-4 CCUS (used initial portfolio P02)
- P23 – RET Coal 30/33 (used initial portfolio P24; case P23 was added during the extended comment period)

Portfolios P09, P13, P17, P18, P19, P21 and P22 were evaluated based on the P-MM reliable portfolio, as a fully optimized initial portfolio would have been counter to the measure being sought:

- Variant portfolio P09 evaluated the impact on P-MM assumptions if the Wyoming Ozone Transport Rule (OTR), which was effective at the time of the study, was not enforced.

- Variant portfolio P13 specifically sought to evaluate how the P-MM portfolio would perform if all demand-side management (DSM) was selected.

- Variant P17 evaluated whether or not Colstrip should be extended from 2025 to 2029 as selected in case P-MM. This case was only run in the short-term (ST) model to determine if a new optimization was indicated. If shortfalls had appeared, additional modeling would have followed.

- Variant portfolios P18 and P19 sought to evaluate only the economic impact of adding the next best cluster resource (east and west) to the P-MM portfolio. The next best cluster resources were determined by the P-MM ST resource evaluation.

- Variant P21 and P22 evaluates the impact of installing CCUS technology for Dave Johnston Unit 2 and Dave Johnston Unit 4 in the P-MM portfolio.

Three of the above studies (P13, P18 and P19) were conducted with the understanding that additional resources would likely result in a higher cost present value of revenue requirements (PVRR) outcome. The value of these studies is to assess the magnitude of that PVRR impact for determining possible least-regret paths to consider for the preferred portfolio. Outside of the intent of these cases, there is no expectation that portfolios would be considered "excessive".

Sierra Club Data Request 44

In PacifiCorp's modeling of surplus interconnections, please explain why storage resources were not paired with current fossil assets.

Response to Sierra Club Data Request 44

PacifiCorp's 2023 Integrated Resource Plan (IRP) did allow for storage resources to be selected at the same site as current fossil assets, however due to economics and accounting for key factors such as reserves and emissions, these resources tended not to be selected until renewables were also placed at those sites.

The reliability benefit of storage resources is less when paired with existing dispatchable thermal resources. The potential reduction of emission costs when storage is coupled with emitting resources is not sufficient to overcome the relative benefit of storing variable non-emitting energy.

In a critical hour, a surplus interconnection would limit the total output of the storage resource and the existing dispatchable resource to the existing interconnection limit. As a result, no additional energy would be able to flow into transmission beyond what would already have been available from the existing resource. Storage resources located with new or existing renewable resources provide greater reliability benefits due to the variable generation from renewable resources that can be stored.

OPUC Data Request 198

Natrium - Please provide the cost inputs used for the Natrium nuclear resource in PLEXOS.

Response to OPUC Data Request 198

The Natrium nuclear resource cost inputs for PacifiCorp's 2023 Integrated Resource Plan (IRP) are an initial proposal and do not reflect a signed contract. The costs are the same as the 2021 IRP except the Inflation Reduction Act (IRA) provided production tax credits (PTC) over 10-years for non-emitting resources, including Natrium. In PacifiCorp's 2023 IRP, Natrium is assumed to begin commercial operations in 2030; two years later than assumed in the 2021 IRP.

For cost inputs, please refer to the confidential work papers supporting PacifiCorp's 2023 IRP, specifically confidential folder "Chapters, Shortfalls - Part 1\Model Reports\ST\Preferred Portfolio", confidential file "CONF_ST Cost Summary -23I.ST.Reliable.20.PA1_.EP.MM.PP-D3 29.13338 (LT. 13338 - 19562) v120.0.xlsb", tab "Generator" and resource "NUC.PX.UTN._.___.Sm Adv Naughton". Please also refer to tab "LT Generator", column K, "Build Cost ($000)".

DOCKET NO.: 23-035-10

SIERRA CLUB'S OPENING COMMENTS ON PACIFICORP'S 2023 INTEGRATED RESOURCE PLAN

ATTACHMENT 4
CONFIDENTIAL DATA REQUEST RESPONSES

THIS EXHIBIT IS CONFIDENTIAL PURSUANT TO UTAH PUBLIC SERVICE COMMISSION RULES R746-1-602 AND 603

THIS ATTACHMENT IS CONFIDENTIAL IN ITS ENTIRETY AND IS SEPARATELY PROVIDED TO THE COMMISSION AND ELIGIBLE PARTIES

DOCKET NO.: 23-035-10

SIERRA CLUB'S OPENING COMMENTS ON
PACIFICORP'S 2023 INTEGRATED RESOURCE PLAN

ATTACHMENT 5
TABLE OF GRANULARITY ADJUSTMENTS

THIS EXHIBIT IS CONFIDENTIAL PURSUANT TO UTAH PUBLIC SERVICE COMMISSION RULES R746-1-602 AND 603

THIS ATTACHMENT IS CONFIDENTIAL IN ITS ENTIRETY AND IS SEPARATELY PROVIDED TO THE COMMISSION AND ELIGIBLE PARTIES

BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

In the Matter of PacifiCorp's 2023 Integrated Resource Plan	Docket No. 23-035-10

CERTIFICATE OF SERVICE

I CERTIFY that on December 12, 2023, a true and correct copy of the foregoing Sierra Club's Opening Comments on PacifiCorp's 2023 Integrated Resource Plan was served upon the following as indicated below:

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