

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 2022-08-23

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City: _____ State: _____ Zip: _____

Public Meeting Date comments address: 02-25-2022 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.

Supply-side resource table

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.

Fervo commends PacifiCorp for the steps it is taking to reduce the greenhouse gas emissions of its portfolio over time, especially through the inclusion of increased renewable energy capacity in its integrated resource planning. While the 2021 IRP took aggressive steps to increase clean energy generation, storage, and transmission in Utah, by excluding geothermal energy, PacifiCorp's IRP missed a meaningful opportunity to fulfill PacifiCorp's customer-centered vision of delivering affordable, reliable, clean power. While PacifiCorp endeavored appropriately to include geothermal generation in its supply-side analysis, it did so using outdated information on the cost and resource potential of geothermal energy development in Utah. In its February 25, 2022, IRP Public Input Meeting, PacifiCorp (PacifiCorp or the Company) presented slides covering updates to the Supply Slide table, without mentioning updates to its modeling assumptions regarding geothermal. Fervo encourages PacifiCorp to more closely and accurately examine geothermal alternatives in its 2023 IRP. PacifiCorp should undertake an updated assessment of the geothermal resource in Utah, including an up-to-date review of the costs to produce electricity from geothermal resources. With massive resources at reasonable depths across the state, well-established supply chains, and a plethora of oil and gas workers well-suited to work on geothermal development with limited reskilling, there is no better place for geothermal energy to play a meaningful role than in Utah. In the following comments, Fervo provides details on updated cost and resource potential estimates for geothermal energy in Utah. With this information, PacifiCorp can more accurately model geothermal energy in its 2023 IRP. GREENFIELD CAPITAL EXPENDITURES. The 2021 IRP analysis utilized capital costs for both dual flash and greenfield binary geothermal plants derived from a 2011 study examining the feasibility of expanding production at the Blundell geothermal plant. While these capital costs may have appropriately characterized the cost to develop geothermal energy in 2011, there have

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been significant technological advances in the 10+ years since that study, substantially lowering these costs. Despite deploying different approaches to geothermal energy development, companies across the industry generally agree on the accuracy of financial advisory and asset management firm Lazard's levelized cost of energy (LCOE) estimates published in 2021. Lazard estimates the capital cost of geothermal facilities at between \$4,325/kW and \$5,575/kW. The capital expenditure numbers cited in PacifiCorp's Supply-Side Resource Table are significantly higher than Lazard's estimates, with facility cost ranging between \$5,708/kW and \$5,973/kW. In the most glaring scenario, the current capital required for a greenfield binary geothermal plant could be nearly 40% lower than modeled in the 2021 IRP (See Table 1 of Fervo's 2021 IRP comments, dated March 4, 2022). Capital costs for geothermal facilities are decreasing for a multitude of reasons, including, but not limited to, massive increases in drilling productivity caused by the shale boom and increased federal policy support for geothermal energy. GEOTHERMAL PPA PRICING. PacifiCorp's Generic Geothermal PPA price of \$77.34/MWh is also higher than an average of recently signed PPAs. Table 2 in Fervo's 2021 IRP comments, dated March 4, 2022, compiles geothermal PPAs with public pricing signed since 2019, with an average price of \$68.63. In its 2023 IRP, PacifiCorp should use pricing more reflective of current market conditions in order to compare geothermal's potential to other technologies on a consistent and comparable basis, in accordance with guidance from the Commission. RESOURCE POTENTIAL. In future modeling scenarios, PacifiCorp should consider the vast potential of geothermal energy in Utah to extend beyond producing hydrothermal resources like Roosevelt Hot Springs, currently powering the Blundell plant. Utah already has three generating geothermal plants in three separate basins and generates the third most geothermal power in the nation, according to the U.S. Energy Information (EIA). While Roosevelt Hot Springs has long been considered Utah's leading geothermal resource, new technologies and drilling techniques have unlocked the development of a far wider range of resources. Experimentation undertaken at the U.S. Department of Energy's Frontier Observatory for Research in Geothermal (FORGE) facility has taken meaningful steps to prove the feasibility of extracting heat and producing power from reservoirs with lower natural permeability than traditional hydrothermal reservoirs. This approach to extracting geothermal energy from unconventional resources is unlocking massive resource potential across Western Utah. Based on the new data points derived by FORGE and the robust contracting for geothermal resources in the West, PacifiCorp should consider recent advances in geothermal technology and evaluate its potential when compared to other resources on a consistent and comparable basis, in accordance with guidance from the Commission. Additionally, the Utah Geological Survey (UGS) has documented the presence of "hot sedimentary aquifer" style resources in Utah, the largest of which is the Great Basin Thermal Regime. The UGS has noted these resources are ripe for horizontal drilling and other enhanced permeability techniques. There is also lower drilling risk in these reservoirs compared to traditional hydrothermal reservoirs as a result of their homogeneous geology. Conservative estimates suggest the power potential in this basin is on the order of hundreds of MW. Overall, the U.S. Geological Survey (USGS) has estimated, with a 95% level of confidence, that Utah's undiscovered hydrothermal geothermal resource is 334 MWe, and its enhanced geothermal systems potential is 32,600 MWe. CONCLUSION. The cost of geothermal energy is declining, and new technology is unlocking greater geothermal potential than ever before. In addition to its ability to provide 24/7 clean power to Utah, there are clear economic and job creation benefits to geothermal energy development. A vast majority of quality geothermal resources in Utah exist on state and federal lands, and lease and royalty payments would provide financial benefit to the government. Also, geothermal energy development requires the drilling and completion of a substantial number of wells, so the construction workforce needed by the geothermal industry has a nearly identical skillset to that of oil and gas. The geothermal resource potential exists. New innovation and technology are driving unprecedented cost reductions across the industry. Private investment is flocking to companies across the geothermal energy value chain as commercial and industrial customers increasingly demand clean energy solutions that more closely align production and consumption of procured clean energy. Thank you for your consideration of these comments. We would be happy to discuss further at any point.

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.

<https://www.lazard.com/media/451905/lazards-levelized-cost-of-energy-version-150-vf.pdf> ;
<https://pubs.usgs.gov/fs/2008/3082/> ; <https://www.eia.gov/energyexplained/geothermal/use-of-geothermal-energy.php>

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.

PacifiCorp Response (8/31/22)

Thank you for your considerations of PacifiCorp's resource planning strategy. In line with established regulatory precedent, the Company is committed to pursuing least cost, least risk preferred portfolio outcomes including geothermal when economically competitive. Further, the capital costs being presented for the 2023 IRP supply-side resources table are aligned with Fervo's comments above. The recently passed Inflation Reduction Act of 2022 will provide PTC (production tax credits) for geothermal projects which the company is examining, as it is open to analyzing geothermal projects that arise in the course of business. As the Company procures additional renewable capacity, it will do so by examining the full suite of resource options to ensure fair, just and reasonable rates on behalf of our customers across our multi-state service territory.

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