DOCKETED	
Docket Number:	21-SIT-01
Project Title:	21-SIT-01, SB100 Implementation Planning for SB100 Resource Build
TN #:	250973
Document Title:	Laura Singer Fervo Energy Comments - RE Resource Portfolio Assumptions for the next CAISO 20-Year Transmission Outlook
Description:	N/A
Filer:	System
Organization:	Laura Singer / Fervo Energy
Submitter Role:	Intervenor
Submission Date:	7/7/2023 3:07:52 PM
Docketed Date:	7/7/2023

Comment Received From: Laura Singer / Fervo Energy
Submitted On: 7/7/2023
Docket Number: 21-SIT-01

RE Resource Portfolio Assumptions for the next CAISO 20-Year Transmission Outlook

Additional submitted attachment is included below.

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July 5, 2023

California Energy Commission
Docket #21-SIT-01
715 P Street
Sacramento, CA 95814

RE: Resource Portfolio Assumptions for the next CAISO 20-Year Transmission Outlook

Fervo Energy Company (Fervo) is pleased to submit comments regarding the California Energy Commission's (CEC's) Resource Portfolio Assumptions for the next CAISO 20-Year Transmission Outlook, as presented at the Joint Agency Staff Workshop on June 23, 2023.

Fervo is a utility-scale developer of geothermal power projects with lease interests across the west and projects under construction in Utah and Nevada. Fervo's next-generation geothermal projects will deliver 24x7 carbon-free energy to the California grid. Fervo has executed power purchase agreements (PPAs) with several California LSEs in response to California Public Utility Commission (CPUC) procurement orders, including D.21-05-035.

Fervo Energy is at the forefront of integrating cutting-edge technologies into the geothermal energy sector and our demonstrated results are revolutionizing the geothermal industry's ability to serve reliable power to residents. The industry is evolving rapidly; capturing the true pace of this innovation is critical to the 20-year Transmission Outlook producing an accurate and realistic foundation for future resource procurement and transmission planning.

EGS is ready to scale.

Particularly, we are eager to share how EGS technology has progressed far beyond prior assessments of technology readiness and place geothermal resources at the cusp of large scale deployment. It was noted in the workshop – in regards to the portfolio's inclusion of 5GW of generic clean, firm energy or long-duration energy storage (LDES) – that enhanced geothermal systems are speculative technology that has not proven its ability to scale. Recent commercial demonstrations by public and private projects show this not the case[1].

The proposed 2045 SB 100 Scenario for the 20-Year Outlook, as presented in the workshop, rightly assumes that a massive increase in renewable energy resources will be required to meet

[1] https://www.deseret.com/utah/2023/7/6/23778406/utah-forge-geothermal-university-of-utah-beaver-county-u-s-department-of-energy-renewable

California's renewable energy goals. The scenario increases natural gas plant retirements by 15GW, a welcome change that will have significant climate and public health benefits.

To offset increased retirement of natural gas, the scenario relies heavily on offshore wind, battery storage, and solar, and to a much lesser degree, geothermal, pumped hydro, and LDES. Geothermal, in particular, contributes approximately 2,332 MW in the 2045 scenario. However, geothermal's contribution remained unchanged from the 2021 20-year Outlook's 2040 projection or the SB 100 Starting Point Scenario for 2040. The technology and market demand for geothermal energy is taking off and CAISO's transmission planning must keep pace.

In 2021, the CPUC called for 1,000 MW of clean firm generating capacity to come online before the end of the decade. Geothermal project developers like Fervo are working hard to deliver on this order, but face constraints on the transmission system. The current transmission system does not adequately support the current level of geothermal development, a problem that will only be exacerbated as new technologies like Enhanced Geothermal Systems (EGS) decline in cost through increased deployments. Updated projections from NREL's 2023 ATB show steep declines in cost across technologies, further fueling capacity additions. CAISO's transmission planning must anticipate and help facilitate the development of these already-planned and rapidly expanding geothermal resources.

Given the incredible amount of geothermal resources that exist within or extremely close to California, and the demonstrated demand for high capacity-factor clean generation, geothermal should play a larger role in these future portfolios.

Geothermal's technology readiness exceeds other nascent technologies.
As noted above, assumptions about enhanced geothermal technology, as presented in the June 23 workshop, reflect an outdated understanding of the modern geothermal industry. Based on Fervo's drilling progress at our 5MW commercial project at Blue Mountain in Nevada, EGS has reached a TRL of 8 (first of a kind commercial). Successful completion of our 37-day crossflow production test has qualified and demonstrated the actual system in a commercial operational environment. This project will achieve commercial operation with its commissioning in Q3 2023, bringing it to a TRL of 9 (commercial operation in relevant environment) during the coming months.

Out of state geothermal resources are left mostly untapped in the 2045 scenario.
The additional 295MW added to the 2045 Scenario from the 2023-2024 TPP were mapped solely to the Imperial Valley area. While Imperial Valley can certainly contribute to geothermal energy buildout, it is far from the only location which can do so. Fervo publicly announced offtake agreements, for example, will be delivered entirely from Utah projects. Nevada is also the location for significant amounts of electricity generation produced from geothermal resources, from both existing and future projects. EGS resource estimates for Utah and Nevada are reproduced below (Table 1), indicating the vast potential of out-of-state geothermal

resources. Fervo encourages the consideration of these resources' ability to serve California demand.

Table 1. EGS resource estimates [2]

	Enhanced Geothermal Systems (MWe)			
State	**F95**	**F50**	**Mean**	**F5**
Nevada	71,800	101,300	102,800	139,500
Utah	32,600	46,500	47,200	64,300
California	32,300	47,100	48,100	67,600

Fervo appreciates the opportunity to participate in this effort and the consideration of these comments.

Sincerely,
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[2] https://pubs.usgs.gov/fs/2008/3082/