



# GEOTHERMAL RISING POLICY

## POWERING OUR RENEWABLE FUTURE.

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November 14, 2023

California Energy Commission  
Docket Unit, MS-4  
Docket No. 23-SB-100  
715 P Street  
Sacramento, California 95814  
*Electronic Submission*

### Re: SB 100 Joint Agency Report – Public Comment

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Dear Commissioner/Staffer:

*Geothermal Rising* is the world's oldest geothermal association, serving as the main professional and educational organization for the geothermal community and the public. Our members harness the heat beneath Earth's surface for direct use and to generate 24/7 carbon-free electricity, critical to achieving reliable, affordable, fully decarbonized industries and power grids. *Geothermal Rising* membership includes project developers, service and equipment providers, and research groups etc.

The analytical framework for evaluating decarbonization pathways for SB 100 is a critical opportunity to consider and recognize the potential for geothermal energy to play a key role in California's future grid. Geothermal energy is an "always on" renewable resource, and California happens to be sitting atop some of North America's highest-quality geothermal reservoirs. There are also emerging opportunities in Enhanced Geothermal Systems (EGS) to harness thermal energy from hot rock.

California state energy agencies, particularly the California Public Utilities Commission (CPUC), have taken a lead role in recent years in the revitalization of the western U.S. geothermal sector, which, along with many other factors, has catalyzed innovation and momentum in technology and policy all around the west. We look eagerly to the next phase of SB 100 to clarify the further potential for geothermal, and ask that it builds on the planning forecasts already issued by the CPUC, as discussed below.

We believe that despite its significant progress, California is not on track to achieve either SB100's goals for zero-carbon electric sales by 2045 or E.O. B-55-18's goal of a carbon-neutral economy by 2045. This is because the state has not yet sufficiently diversified its clean energy mix. California needs to buy enough clean energy to meet our existing electricity needs and to be able to electrify buildings and transportation – as called for under E.O. N-79-20. Geothermal can provide a major contribution to these needs. Ideally, at least 5 GW of geothermal should be planned for, regardless of how aggressively natural gas is phased out.

*Geothermal Rising* respectfully submits the following comments to the *California Energy Commission* (CEC) regarding the public consultation on SB 100.

#### **A Balanced Solution**

We note that in the most recent workshop regarding the opportunity of the 2025 SB 100 Report, the emphasis was on offshore wind, LDES, hydrogen, and CCUS. Although these all have a role to play in a balanced solution, we must stress the opportunity and potential that geothermal energy can provide California. Why are we not planning for increased geothermal in addition to increased wind, LDES, hydrogen, and CCUS? Although these all have a role to play in a balanced and practical portfolio of energy sources, several of these technologies are very early-stage and do not have proven commercial successes. Geothermal energy can contribute to SB 100's goals to a significantly greater degree than what is currently planned. Given that hydrothermal and EGS both have commercial success, and that geothermal technologies are rapidly being refined, geothermal energy can provide immediate support to California's energy mix among other viable technologies.



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For example, concerning long-duration storage, it is clear that the SB 100 strategy framework continues to have a level of uncertainty. Geothermal mitigates the need for energy storage given that geothermal is firm and “always on.” Geothermal energy can also fuel-switch industrial processes away from the burning of fossil fuels, thus mitigating the need for an overemphasis on CCUS.

California should not miss a chance to expand its supply of sustainable, firm and flexible geothermal power when substantial resources can be developed immediately to serve the CAISO grid. Geothermal has played an important role on the California grid for decades, and powerful new innovation is currently taking place across the industry. Achieving 100% carbon-free energy that is reliable and affordable will require clean, firm, weather-independent generating capacity and California should embrace a future of growing geothermal resources. Frankly, overlooking geothermal results in an over-reliance on intermittent resources today that cannot be sustained in the future without also building out renewable and clean baseload.

### Increasing Value of Geothermal

The geothermal sector is always very interested in decarbonization modeling, and stands ready to support the current effort both with any needed inputs and with a critical perspective which reflects the commercial realities of the sector and the state of geothermal technology.

In the 2021 Report Summary, geothermal is one of the few resources not projected to significantly scale up its share on the grid by 2040. The 2021 projections are not aligned with commercial realities. For example, the development of projects in the Salton Sea in addition to out-of-state clean-firm imports prove that geothermal is not a stagnant resource. On the surface, it appears nonsensical to not plan for rapid scale up of geothermal energy on the grid, yet we do understand that there are permitting challenges with respect to geothermal in California and that there may be ongoing concerns in relation to perceived cost. Additionally, we acknowledge that EGS has only recently had proven commercial pilot successes and thus has not had time to make its way into modeling.

If California is to achieve SB100 goals, geothermal energy must be a key contributor as one of the only economical baseload renewable resources available. Cost is important to consider, but the return and long-term, stable value that geothermal energy would provide must also be considered. For example, EGS is on a cost curve that is likely to decrease substantially over time in line with growth it is seeing now. We would warmly welcome a discussion to help us understand any concerns that the CEC and its sister agencies may have regarding the development of geothermal energy.

As noted in the 2021 Report, page 92,

*“The 2020 ATB update, which was released after modeling for this report was underway, however, included a 30 percent reduction in geothermal cost projects, based on the Department of Energy Geovision Report.*

*“This cost-reduction projection places the geothermal LCOE below the LCOE of the generic zero-carbon firm resources modeled in these scenarios. As significant generic zero-carbon firm capacity was selected in the study scenario, it is likely that geothermal would be selected to a much greater extent should the updated cost data be used.*

*“...Coproduct of lithium from geothermal brine may also provide additional revenue streams, effectively lowering the cost of geothermal power, and will be evaluated by the Blue-Ribbon Commission on Lithium Extraction in California.”*

This analysis was done in 2020, and since then, technology has continued to progress, and costs continue to go down, making geothermal an even more feasible solution to meet our 2045 goals.



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Price reductions as geothermal scales will make capital and operational costs of geothermal development more economical. A 2016 study by the Center for Energy Efficiency and Renewable Technologies (CEERT), in collaboration with the National Renewable Energy Laboratory (NREL), quantified the value of additional geothermal energy in helping California comply with the Renewable Portfolio Standard (RPS).<sup>1</sup> The study concluded that developing an additional 1,250 MW of geothermal resources at the Salton Sea alone is cost-effective as part of a diverse renewable portfolio, and yet, geothermal has not been explicitly mentioned in the diversification scenario.

### **Load Flexibility, Reliability, and Affordability**

Geothermal energy meets the call for flexible, reliable, and affordable power baked into the SB100 goals. Given its growth in recent years, California should adequately incorporate geothermal energy into its planning, improving renewable energy management and fossil fuel retirements. Furthermore, to avoid potential curtailment of load capacity, it is logical to prioritize the development of baseload renewable energy.

The state must recognize that a diverse, balanced portfolio of clean and renewable sources will likely include geothermal energy. Storage and flexible demand-side technologies can work hand in hand with geothermal to accelerate this transition while enhancing reliability.

### **Land Use and Geothermal Potential**

In California, geothermal developers are specifically excluded from resources in protected areas. Although the current land use screens modeling portrays a relatively insignificant reduction in potential geothermal output, this modeling is based on an outdated 2008 USGS report that only considered conventional hydrothermal resource potential. As we are entering the era of next-generation geothermal, it is critical that California re-consider total geothermal resource potential in the state (and those resources which can be readily delivered into CAISO) and how land use restrictions inhibit the rapid development of both conventional and next-generation baseload, virtually inexhaustible, subsurface energy.

### **Accelerating SB 100 Implementation**

The 2021 Report notes,

*“the accelerated timelines resulted in additional economic gas retirements, increased selection of geothermal resources, and decreased selection of solar and battery storage. These results suggest accelerated implementation could affect the overall 2045 resource portfolio.*

*Each accelerated timeline scenario results in increased annual costs compared to the SB 100 Core scenario... Total cumulative cost differences between these scenarios have not been evaluated.”*

An accelerated implementation is necessary, given the current and progressing climate situation. Furthermore, geothermal projected costs have gone down since the 2021 Report modeling as fundamental breakthroughs in EGS and scaling have put it on a declining cost curve. Thus, we highlight the call for continued assessment as discussed in the Report,

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<sup>1</sup> Caldwell, J., and L. Anthony, The Value of Salton Sea Geothermal Development in California’s Carbon Constrained Future, CEERT, March 2016



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*"Modeling inputs and assumptions should be updated in future analyses to reflect market changes in existing and emerging technologies, including changes in price, the commercialization of new technologies, and updates to total resource potential."*

### Conclusion

We recommend that state agencies establish an industry-led task force to examine a practical path to develop a minimum of 5 GW of geothermal power in the state of California over the next ten years. To achieve this, the state will need to streamline geothermal permitting, develop transmission lines and connection infrastructure, and deploy geothermal-targeted investments into R&D, which would all be catalyzed by an enhanced role for geothermal in the 2025 SB 100 Report.

*Geothermal Rising* asks the joint agencies to include geothermal assumptions as a discrete assumption in the sensitivity analysis for SB 100 pathways—on a level playing field with other clean, firm and long-duration storage resources. In line with developments in other clean firm power such as offshore wind, hydrogen, and LDES, geothermal energy assumptions should be evaluated on par with the current industry's aggressive growth in the proposed "Resource Diversification" and "Combustion Retirement" pathways.

We urge strong leadership on procurement, transmission, and market design to lead a renaissance in the development of California's abundant 24/7 geothermal resources. A 100% clean energy future, with an affordable, resilient system, is entirely achievable in California. The world is watching California for how it designs its future power mix in the energy revolution. Now is the opportunity to show the world how a robust power system and fuel mix can be developed with geothermal energy to substantially contribute to sustainable, clean, and renewable energy goals. That's the Earth's power source right below our feet.

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All of which is respectfully submitted.

Sincerely,

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