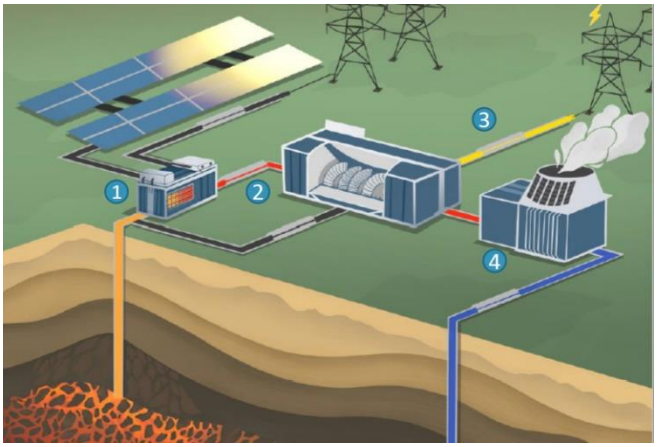
GeoZone Long-Duration Thermal Energy Storage Demonstration Project

Overview

Cyrq Energy (Cyrq) has developed a novel application of thermal storage technology to increase the flexibility, climate impact, and value of geothermal generation at the Geysers.

Existing generation at the Geysers uses saturated steam produced from deep geothermal wells to spin turbines that provide a steady around-the-clock output of electricity. To augment the beneficial capabilities of the Geysers, Cyrq has proposed installing thermal storage upstream of turbines to superheat the steam during high-need hours for the grid.



Cyrq's thermal storage (1) will be installed upstream of turbines (2) at the Geysers to superheat the steam and increase output to the grid (3) during high-need hours with limited impact to cooling (4) and reinjection.

Super-heating the steam enables the existing turbines to operate much more efficiently—as much as doubling their power output. Increasing the output of the Geysers during high-need hours allows geothermal resources to maximize their climate impact by displacing the least efficient gas peaker plants that otherwise provide power at that time. The thermal storage system is then reheated from grid electricity during solar hours when renewable generation is plentiful and emissions are negligeable.

Geothermal Opportunity Zone (GeoZone)

Cyrq's proposal was selected as a finalist in Sonoma Clean Power (SCP)'s Geothermal Opportunity Zone (GeoZone) solicitation. SCP is the default public power provider for Sonoma and Mendocino counties. In 2021, SCP started the GeoZone initiative to reinvigorate development of local geothermal resources—with a goal of adding 500 MW of new capacity. The Counties of Sonoma and Mendocino both passed resolutions to join SCP in forming the GeoZone. SCP released a solicitation for proposals from the geothermal industry to expand local geothermal capacity through new technology and development. Proposals to SCP's GeoZone solicitation were judged by a team including technical experts on the Geysers, a local permitting official, and a consultant to the Department of Energy's Geothermal Technology Office.

GeoZone finalists like Cyrq that develop new technologies and projects in the GeoZone that are compatible with community values, cost-effective, and scalable are offered a commitment from SCP to contract for power. SCP will also assist private partners with community engagement and policy advocacy. SCP expects to bring a cooperation agreement it has negotiated with Cyrq to its board for approval at its meeting on March 2nd, 2023.

Community Impact of Cyrq's Thermal Energy Storage System

Cyrq's proposed system increases the capabilities of the Geysers with minimal impact to the environment. The thermal storage system has a negligeable surface footprint, includes no hazardous materials and no emissions, requires no drilling, and does not significantly impact the water requirements at the Geysers for cooling or reservoir recharge.

Unlike lithium-ion battery storage, Cyrq's storage system is completely comprised of equipment and materials that can be procured domestically. Installation and maintenance of Cyrq's system will be a significant creator of jobs. Most of the subcomponents will be assembled on-site and require skilled labor. Cyrq's GeoZone cooperation agreement includes a commitment to hire locally and focus on building local workforce capacity.

Enhancing the capability of the Geysers also has long-term financial and reliability benefits to the community. Enabling the Geysers to increase revenues by outputting at hours with higher wholesale prices improves their economic viability—allowing them to extend their operational life, improve the business case for new expansion, and continue providing valuable tax revenue to the community. Increased flexibility also increases the ability to use local power sources to maintain electric service to local customers when the grid is stressed.

Demonstration Project

To validate the scalability and feasibility of its thermal storage system, Cyrq has proposed installing a 5 to 10 MW demonstration project at a Geysers power plant in Sonoma County. The project will be capable of storing as much as 20 hours of energy. Cyrq has assembled a multidiscipline team including SCP, the National Renewable Energy Laboratory, Calpine (the existing operator of the power plant), Babcock & Wilcox (a power technology company), and EthosEnergy (a turbine technology company) to design and deploy the demonstration project.

The demonstration project will be more costly than deployment at-scale due to upfront engineering, cost uncertainty, and technology risks. To minimize the impact of funding the demonstration project to the SCP ratepayers that will contract for off-take from the system, Cyrq is pursuing grant funding. The Department of Energy's Office of Clean Energy Demonstrations is accepting applications for non-lithium long-duration storage for which Cyrq's technology is a great fit. SCP and Cyrq are also hoping to pursue anticipated grants from the California Energy Commission.

If successful, Cyrq's thermal storage system could be cost-effectively deployed at-scale at most Geysers units—potentially doubling the 750 MW of current capacity. Through the GeoZone initiative, SCP will be a primary customer of these commercial deployments.