

## Super Hot Rock Deep Geothermal Recommendations

Geothermal energy technology is operating today, mining heat from natural hydrothermal systems, which produce steam from circulating ground water in regions where the crust is hot, such as near volcanoes, hot springs, or thin crust. Engineered geothermal systems (EGS), still in the research and development stages, will emulate hydrothermal systems by injecting water into engineered reservoirs in dry rock and producing steam. Super hot rock (SHR) geothermal is a deeper, hotter version of EGS, taking advantage of very energy-dense geothermal resources at depths where temperatures exceed 400°C and where water, either natural or injected, is in a supercritical state with more energy content and much greater fluidity. By accessing these deeper, hotter resources, SHR geothermal could produce 10 times the energy per well compared to conventional geothermal or EGS. The potential of SHR is vast, scalable, and builds on existing industries for drilling and power production. Additionally, SHR geothermal is not geographically restricted, unlike today’s commercial geothermal power. Additional benefits of SHR geothermal include a small footprint, the potential for siting at existing and/or shuttered fossil fuel plants, and the ability to contribute to the production of zero-carbon hydrogen.

FY22 (Authorized Funding Levels and Programs)	FY22 (Recommended Funding Levels for Current and New Program Authorizations)	FY22-25 (Cumulative Recommended Funding Levels for Current and New Program Authorizations)
\$30,000,000	\$100,000,000 <i>(~\$70,000,000)*</i>	\$400,000,000 <i>(~\$350,000,000)*</i>

*\*bracketed numbers represent funding levels that do not have corresponding authorizations*

Super hot rock geothermal is in the early stages of research, development, and demonstration, but, given the small ecosystem for this technology, the learning curve could be rapid. As a result, research and development funding as well as demonstration funding should be provided in the next few years. Deployment incentives and regulations should be developed to support this technology as it moves toward commercialization.

### Research & Development

- Establish—through coordination between ARPA-E and the Geothermal Technologies Office of the Office of Energy Efficiency and Renewable Energy at the Department of Energy (DOE)—a dedicated program and laboratory focus on SHR geothermal innovation and provide at least \$30 million per fiscal year for 5 years to support it.

- Establish an initiative tasked with researching and developing super deep energy drilling and conducting field-based pilots to support and to inform commercial-scale SHR geothermal demonstrations.

## Demonstration

- Provide \$70 million per fiscal year, at a minimum, to support one or multiple demonstrations.
- Establish and fund a program for first-of-a-kind (FOAK) and next-of-a-kind (NOAK) SHR geothermal demonstration projects involving “shallow SHR” resources near existing hydrothermal and magmatic resources using rotary drilling technology.
- Establish and fund a program for FOAK and NOAK demonstration projects involving innovative drilling methods, such as energy drilling, to depths of 10 kilometers or more.
- Establish and fund a project to develop the capabilities of converting fossil-based electric generating units (EGUs) to utilize steam from the SHR geothermal process.
- Accelerate the development of demonstration projects with aggressive federal cost-share, potentially at an 80/20 split, and encourage public-private collaboration and partnerships, particularly with the oil and gas industry.

## Deployment

- Establish a production or investment tax credit for SHR geothermal like those offered to wind and solar, with authorization through 2035 and options for monetization.
- Establish risk reduction tax incentives, such as tax write-offs for well failures, to help advance SHR geothermal drilling through more projects.
- Establish incentives for the production of steam from SHR projects.
- Establish tax credits or loan guarantees to the oil and gas drilling industry to utilize drilling expertise to solve engineering issues, utilize drilling equipment to drill wells, and engage in the SHR geothermal market.
- Establish incentives for the development and use of energy drilling.

## Regulatory Clarity

- Direct the Environmental Protection Agency to conduct a review and/or develop federal regulations for SHR geothermal projects in anticipation of future projects.
- Direct federal agencies, including the Bureau of Land Management and the U.S. Forest Service, to assess how SHR project permitting on federal lands could be conducted.
- Provide federal funding for states to develop geoscience expertise and oversight capabilities for a possible new Underground Injection Control (UIC) well class.

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## About the Carbon-Free Technology Initiative

The Carbon-Free Technology Initiative (CFTI) is focused on implementation of federal policies that can help ensure the commercial availability of affordable carbon-free, 24/7 power technology options by the early 2030s to help the electric power industry meet net-zero carbon reduction commitments. Participants in the CFTI include the Edison Electric Institute (EEI) and its member companies, Clean Air Task Force, Bipartisan Policy Center, Center for Climate and Energy Solutions, ClearPath, Great Plains Institute, Information Technology & Innovation Foundation, Nuclear Energy Institute, and Third Way.

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