MAZAMA ENERGY
NEWBERRY SUPERHOT ROCK DEMONSTRATION PROJECT
FREQUENTLY ASKED QUESTIONS

Who is Mazama Energy?

Mazama Energy is a geothermal operator and development company dedicated to advancing technologies and methods for extracting heat from superhot rocks to generate utility-scale carbon-free, baseload energy. The company's capabilities are derived from its founders AltaRock Energy and Blade Energy Partners.

What is the Newberry Superhot Rock Demonstration Project?

Mazama Energy is currently piloting the Superhot Rock (SHR) Enhanced Geothermal System (EGS) Demonstration, the first demonstration of its kind, located on the western flank of Newberry Volcano in Central Oregon. This project will demonstrate the feasibility of creating a commercially viable geothermal reservoir in superhot rocks. If successful, the demonstration will prove the ability to economically extract heat from the earth in locations where geothermal energy could not be harnessed before, significantly expanding the use of geothermal as a renewable energy source.

Why is this project important?

The Superhot Rock (SHR) Enhanced Geothermal System (EGS) Demonstration project tackles rising energy demands by advancing sustainable solutions and paving the way for a reliable clean energy future.

As the demand for energy in the U.S. increases, the ability to meet that demand with clean energy sources is critical. The U.S. Department of Energy Geothermal Technologies Office's (GTO) GeoVision analysis found that geothermal electricity generation has the potential to increase at least 26-fold by 2050. Another estimate shows that geothermal could generate more than 2,000 times the annual energy usage of the U.S. if just 2% of the thermal energy located at depths of 2 to 6 miles could be captured. With EGS, the world could potentially generate more energy than oil, gas, solar, and wind combined, creating an affordable, renewable, and carbon-free source of energy for all.

What are Enhanced Geothermal Systems (EGS)?

Enhanced Geothermal Systems (EGS) utilize underground hot rocks, natural permeability, and fluid to create geothermal energy. Fluid flows through small pathways in the hot rocks, transferring heat to the surface via wells. This heat powers turbines to generate electricity, effectively harnessing geothermal energy in select regions of the country.

Most natural geothermal systems require ideal conditions, but often the rocks are hot without sufficient permeability or water. Enhanced Geothermal Systems (EGS) address this by injecting fluid into the hot rocks to open pathways, increasing the size and connectivity of fluid pathways. Once established, an EGS operates like a natural geothermal system: cool water is pumped down one well, heated by the rocks as it travels, and then brought back up through a second well to power a plant. This technique is known as Enhanced - or Engineered - Geothermal Systems (EGS).

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What is Superhot Rock (SHR) Enhanced Geothermal System (EGS)?

Superhot Rock (SHR) EGS harnesses the potential of subsurface formations with temperatures exceeding 705°F (374°C). At these temperatures, injected water extracts much more heat from the rocks, significantly increasing energy output. As a result, electricity production per well can be 6 to 8 times higher than that of conventional geothermal wells, making SHR EGS a highly efficient and promising method for tapping into renewable geothermal energy.

How will the project work?

To create permeability in the superhot rock formations, the project will use hydraulic stimulation, a technique that combines hydraulic fracturing and shearing methods. Hydraulic fracturing involves injecting water mixed with non-hazardous materials to create a reservoir within the impermeable rock. The fractures that form the reservoir, which are only millimeters in size, are kept open with proppants—small particles of quartz or ceramics. Following this initial stimulation, the fracture network will be expanded through hydro shearing. This combined approach sets Mazama's strategy apart from previous tests at Newberry, providing a more effective way to tap into geothermal energy.

How much water will the demonstration project use, and where does it come from?

The entire project is expected to use approximately 47 million gallons (180,000 m^3) of water. To put this in perspective, this is about 0.0006% of the estimated annual recharge to the Deschutes Basin that is generated from the western flank of Newberry Volcano, where the project is located. It's roughly the same amount of water that the city of Bend uses on a typical summer day.

Will this project impact the local groundwater?

The water is sourced from two existing shallow water wells, both permitted by the Oregon Water Resources Department. No water will be taken from the lakes in the caldera, Paulina Creek, or local domestic supplies. An independent hydrology study confirms that there will be no significant impact on groundwater levels beyond the immediate project area, which is several miles away from the nearest well used by local residents.

The water that is injected into the earth will not connect to local groundwater resources. The existing demonstration well is cased and cemented into the ground for the first 6,500 feet (1,981 m) below the surface with multiple layers of steel and cement as required to meet groundwater protection standards. The planned EGS reservoir will be created 6,500 to 11,000 feet (1,981 m to 3,353 m) below the ground surface in a thick section of impermeable rock, placing it more than a vertical mile below the shallow groundwater aquifer.

All water that flows back out of the well will be contained in double-lined retention ponds. Depending on water quality standards, the water will either be re-injected into the deep EGS reservoir or, if applicable, evaporated using sprinklers.

This project only uses a minimal amount of non-hazardous tracers and diverter materials, both of which have been thoroughly reviewed and approved by regulators.

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Will the project increase the risk of earthquakes?

The US Department of Energy (DOE) has proactively addressed potential seismic concerns related to EGS by developing best practices, protocols, and guidelines to help both the industry and regulators assess and manage any risks of induced seismicity. All DOE-funded EGS projects, including the Newberry SHR EGS project, are required to adhere to these established practices and protocols.

As part of the feasibility study required for regulatory approval, a panel of independent engineers and scientists concluded that the likelihood of the project causing tremors noticeable to humans is very low, with an even smaller chance of triggering a damaging earthquake. This is because the project is not close to any seismically active faults and more than ten miles away from the nearest populated area.

Throughout the project, a network of seismometers, devices that measure and record ground vibrations, or seismic waves, caused by earthquakes and other processes, will map microseismic activity in the region. Proactive measures are in place to ensure that microseismicity does not escalate into larger earthquakes. Any increase in seismic activity will be closely monitored by Mazama Energy in close partnership with Lawrence Berkeley National Laboratory (LBNL) and in permanent communication with the U.S. Geological Survey Cascades Volcano Observatory (CVO) and the Pacific Northwest Seismic Network (PNSN).

Will the project increase the risk of volcanic activity?

No, the project will not affect Newberry Volcano, which has been dormant for over 1,300 years. The volume of heat and rock involved in the project is minuscule compared to the vast total volume of hot rock in the area. Additionally, the project is located far from the volcano's magma chamber and plumbing system, ensuring no interaction.

Are you building a power plant or utility to generate electricity?

No, this demonstration project is solely focused on testing the feasibility of extracting heat in a way that is cost-competitive with traditional energy sources. Electricity will not be generated from the demonstration project.

If the SHR EGS demonstration proves successful, additional studies, environmental analyses, and financial planning would be necessary before considering the construction of a power plant for electricity generation.

Who is funding this project?

The SHR EGS project is funded by Mazama Energy and a grant from the U.S. Department of Energy (DOE). It has been developed in collaboration with three DOE national laboratories - Lawrence Berkeley National Laboratory, Pacific Northwest National Laboratory, and National Renewable Energy Laboratory - and two universities: the University of Oklahoma and Oregon State University.

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What is different from this project than from previous work at Newberry Volcano?

This project takes a new approach to SHR EGS by using a combination of hydraulic fracturing and hydro shearing, unlike the previous project, which relied solely on hydro shearing - a method that proved unsuccessful. Both techniques involve injecting water underground but serve different purposes - hydraulic fracturing creates new pathways in the rock, while hydro shearing enhances the system by opening existing small (micrometers to millimeter-sized) cracks. This combined approach significantly increases the surface area for heat exchange between the superhot rock and the circulating water, boosting efficiency.

This integrated method is what sets Mazama Energy's strategy apart from anything previously tested at Newberry, offering a more promising pathway for EGS development.

What is the timeline for completing the project?

The project began in October 2024 and is expected to take approximately three years to complete. This timeline includes all phases: initial planning, drilling, and testing phases, and the implementation of enhanced geothermal systems (EGS) technologies.

How will the project benefit the local community and economy?

Mazama Energy's partnerships with over 40 businesses and contractors, many based in south Deschutes County, will create jobs, stimulate economic growth, and support the local economy. These partnerships ensure that the community shares in the project's impact by providing employment opportunities, fostering local expertise, and strengthening economic ties within the region. Additionally, Mazama Energy's collaboration with Oregon State University-Cascades in developing a robust Community Benefits Plan focused on Diversity, Equity, Inclusion, and Access (DEIA), Energy Equity, and Workforce Development further enhances the project's positive impact on the local community.

How do I learn more about the project?

For more information about the project, you can visit the official website at mazamaenergy.com. The website provides detailed information about the project's goals, methods, and progress, as well as additional resources and contact information for further inquiries.

For more information about geothermal energy, you can visit the following pages of the U.S. DOE Geothermal Office website:

Geothermal Basics

Geothermal Glossary

https://www.energy.gov/eere/geothermal/geothermal-basics

https://www.energy.gov/eere/geothermal/geothermal-faqs

https://www.energy.gov/eere/geothermal/geothermal-glossary