

Air Force Office of Energy Assurance exploring use of geothermal technology

By The Air Force Office of Energy Assurance

In pursuit of energy resilience solutions to meet Department of Air Force (DAF) mission requirements and congressional mandates, DAF issued a Request for Information (RFI) on March 10, 2022, seeking industry input on cutting-edge, geothermal technologies. The deadline for interested parties to submit their ideas was April 21, 2022 and the team is currently in the process of reviewing submissions.

Geothermal power, by its nature, avoids fuel security and supply chain threats and, with the generation technology being located on base, the energy supply is more secure. Ground-source geothermal technology harnesses the power of the relatively constant temperatures of the earth resulting in baseload resilient energy for the installations.

"Greater resilience creates a more lethal and ready DAF today and puts the Enterprise in a better position to meet the challenges of the future, regardless of their nature or duration," said Kirk Phillips, Director, Air Force Office of Energy Assurance (OEA). Phillips' Office evaluates the energy resilience needs of DAF installations and develops innovative solutions, including pilot projects, to meet those needs and support the mission.

OEA is interested in using geothermal energy because it can provide installations with resilient, baseload, clean power that does not rely on a water source as opposed to hydropower or other geothermal technologies such as pond/lake closed-loop and open-loop systems. "Geothermal energy is true resilient, clean energy because it is fueled by natural heat within the earth's crust," Phillips explained. "It is a power source that's available 24 hours a day, 365 days a year and we need to take advantage of it."

Geothermal systems can be more expensive than comparable air-source systems of the same heating and cooling capacity. However, the additional costs may be returned in energy savings in five to 10 years and the resilience and climate attributes of a geothermal system support the additional investment.

"Geothermal power plants can meet the most stringent clean air standards, including the White House Sustainability Executive Order on carbon pollution-free energy and net-zero emissions sustainability goals," Phillips said. "They emit little carbon dioxide, very low amounts of sulfur dioxide and no nitrogen oxides. The small quantities of gases emitted from geothermal power plants are natural, minor constituents of all geothermal reservoirs, not the result of the power production process."

Geothermal energy is a potentially vast source of clean baseload electricity in the U.S. and cutting-edge, emerging energy technologies could make it more accessible. Emerging geothermal technologies that the Air Force is exploring include:

- Enhanced or Engineered Geothermal Systems (EGS) – Creates hydraulic linkages between two or more boreholes to allow fluid circulation which allows heat stranded in low-permeability rocks to be utilized for geothermal energy production.
- Closed-Loop Geothermal (CLG) – Uses sealed wells to circulate a heat transport fluid through the subsurface, which eliminates the need for geothermal fluid flow from permeable rock formations. It may also be able to produce heat and power within a wide range of temperature and rock conditions, including low-temperature sedimentary zones and high-temperature dry rock formations.
- Millimeter-Wave Technology Demonstration for Geothermal Direct Energy Drilling (ARPA-E) – AltaRock Energy will overcome technical limitations to deep geothermal drilling by replacing mechanical methods with a Millimeter Wave (MMW) directed energy technology to melt and vaporize rocks for removal. This approach could increase drilling speed by 10 times or more, reducing costs while reaching higher temperatures and greater depths than those achievable with the best current and proposed mechanical technologies.

OEA is proposing the development of two ground-source, CLG pilot projects at Mountain Home Air Force Base, Idaho, and Joint Base San Antonio, Texas. OEA envisions breaking ground on these pilot projects in three to five years. Through the pilot projects, OEA wants to bring together and foster relationship building between installations, local utilities and technology providers.