



Precise Geothermal Drilling

Technology Overview

Geothermal heating and cooling takes advantage of stable ground temperatures to store and transfer heat, using the earth's crust as a thermal battery. Closed-loop geothermal heating and cooling systems include a ground loop heat exchanger (GLHE) and an electrically powered ground source heat pump. Conventional GLHE design requires large areas of land, which limits their application, especially in densely populated cities.

Precise geothermal drilling optimizes GLHE design to reduce space requirements and uses smaller than standard drill rigs, requiring only a 10 ft vertical clearance. The rigs can easily access and drill in tight, enclosed areas. Specialized drill equipment pushes with water rather than air, making borehole drilling more precise and capable of achieving 15° angles. Conventionally drilled boreholes require 20 ft spacing, while inclined boreholes require only 5 ft.

A hydraulic power pack powers the drill rig from outside the building, avoiding the risk of filling interior space with exhaust gasses, such as carbon monoxide, while also minimizing noise.

Why is GSA Interested?

Geothermal systems save energy and support GSA's goals to electrify the federal real estate portfolio by 2045. Many of GSA's 1,500 buildings are located in urban areas inaccessible to geothermal systems. Reduced borefield footprints save valuable land space and expand opportunities for geothermal. A vendor case study of a historic building in New York City showed a 41% reduction of greenhouse gas emissions, 60% reduction in energy consumption for heating, and 18% reduction for cooling by implementing geothermal. New drilling techniques minimize dust, noise, and vibration to reduce disruption in occupied spaces.

Being substantially underground, there are minimal maintenance requirements and the systems have longer useful lifetimes compared to other types of HVAC systems.

Deployment Potential

Dense cities with aging building stock are ideal places to use precise geothermal drilling. Angled and water-pushed drilling methods convert spaces like basements, parking garages, and building perimeters into suitable places for geothermal systems.

Green Proving Ground (GPG), in collaboration with the U.S. Department of Energy, is evaluating the real-world performance of precise geothermal drilling in federally owned buildings within GSA's inventory. The technology will be provided by Brightcore Energy and coordinated with other ongoing evaluations of this technology.