



## PRODUCT INNOVATION GRANTS

### THAR GEOTHERMAL LLC: Next-Generation CO<sub>2</sub> Geothermal Heat Pump Systems

***Impact:*** In heat pump applications, the ground either cools or heats a working fluid, allowing the system to work as an air conditioner in the summer and a heater in the winter. Geothermal heat pumps (GHP) are an established commercial technology that has been deployed throughout the United States, Europe, and Asia. Most geothermal systems are based on chemical refrigerants; Thar Geothermal's system employs carbon dioxide (CO<sub>2</sub>) as the working fluid. To date over 1 million GHP systems have been installed in the U.S. alone, with even more in operation internationally. Recent studies commissioned by the DOE have identified GHP's as a critical technology to enable the U.S. to achieve its ambitious energy efficiency and demand reduction goals for residential and commercial buildings. Thar projects that the technology developed under this grant could reduce HVAC cooling and heating energy requirements by 50% and 20%, respectively; associated fossil fuel use (and its resulting air pollution) will be reduced proportionally.

***Project Overview:*** Thar Geothermal LLC will fabricate a new, unique oil-free compressor to be used in a commercial-scale ground source geothermal heat pump system. The system will employ carbon dioxide (CO<sub>2</sub>) as a natural refrigerant. This project builds off the previous success of a GBA Product Innovation Grant received by Thar Process in December 2008.

Thar's geothermal system will be deployed in their building in the RIDC business park in O'Hara Township, Pennsylvania. Carnegie Mellon University will provide independent measurement and verification of system performance and assist Thar with building integration and optimization. Upon completion of the project, Thar intends to aggressively commercialize the technology, which will spur advances in Pennsylvanian manufacturing and machining sectors, as well as in commercial and residential projects across the country.



***GBA Product Innovation Grant Amount:*** \$100,000

***Leadership Team:*** Thar Geothermal LLC is a spinoff company of Thar Processes, a global leader in supercritical fluid technology and equipment. The Thar Geothermal project team is led by Lalit Chordia, *President*, along with Marc Portnoff, *Manager of New Technology* and Eric Mellors, *Senior Engineer*. Thar's Carnegie Mellon University research partners from the *Center for Building Performance and Diagnostics* are Volker Hartkopf, *Professor and Director*, and Nina Baird, *Adjunct Instructor and PhD Candidate*.

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