

### Energy Efficient Geothermal Air Conditioning

***Impact:*** Commercial and residential air conditioning accounts for one-sixth of all coal burned for electricity. Using the air conditioning improvements expected from this project, HVAC energy requirements will be cut in half and will reduce fossil fuel use (and its resulting air pollution) proportionally.

Ground loop heat pumps represent an established commercial technology that enjoys an especially strong following in Europe. In heat-pump applications, depending on the season, the ground either cools the working fluid or adds heat to it, thus acting as an air conditioner in the summer and a heater in the winter. Most such systems are based on Freon or water fluids and employ polyethylene piping. The proposed Thar system would require smaller diameters of pressurized metal pipe, thus reducing resource use and operational requirements.



Thar CO<sub>2</sub> Pumping System

***Project Overview:*** Thar Process will develop an energy efficient geothermal air conditioning system that will consume substantially less electricity than conventional systems. The system will employ a natural refrigerant with no global warming or ozone depletion impacts, as well as replace the traditional air-blown heat rejecter with an underground geothermal loop. The Thar approach will create a large residential and light commercial air conditioning system of up to 5 tons, though larger installations and retrofitting will also be possible. Thar Process, Inc., already has nearly three decades of experience with applications for high-pressure carbon dioxide.

University students will assist in designing and monitoring of the system. Quick commercialization and job creation are expected for excavation and machining contractors, as these companies will be able to gain useful know-how that will foster the development of Pennsylvania-based industry catering to in-ground air conditioning systems. If this new technology were applied to just 1% of the market, CO<sub>2</sub> emissions would fall by 6 million tons and household and business electricity costs could be reduced by up to \$350 million.

***GBA Product Innovation Grant Amount:*** \$80,000

***Leadership Team:*** Thar Process is a global leader in supercritical fluid technology and equipment. The Thar Process project team is led by Lalit Chordia, President, and John Davis, Development Manager. The University partner is Dr. David Archer, Adjunct Professor of Architecture at Carnegie Mellon University.

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