

# Commercial Ground-Source Heat Pump

## What is this Technology?

Ground source heat pumps (GSHP) rely on the fact that the Earth (beneath the surface) remains at a relatively constant temperature throughout the year. GSHP buries a series of pipes, commonly called a “loop,” in the ground near the building to be conditioned. The GSHP circulates a fluid that absorbs heat from, or relinquishes heat to, the surrounding soil, depending on whether the ambient air is colder or warmer than the soil. Good GSHP designs also integrate a dedicated outdoor air system (DOAS) for ventilation control, where the direct-expansion (DX) coil can be very effective at humidity control.

## Why is GSA Interested?



**ENERGY EFFICIENCY** GSHP uses 25%–50% less electricity than conventional heating or cooling systems.



**COST EFFECTIVENESS** GSHP involves multiple contractors and is an emerging technology in commercial application. Case study data shows an initial capital cost approximately twice that of comparable conventional HVAC systems. The primary increase in cost is associated with the ground loop. Test Bed projects will incorporate improvements in the configuration, sizing, and installation of the ground loop all toward the objective of improving performance while reducing the installation cost.



**SPACE SAVINGS** The use of GSHP typically reduces interior mechanical room space by 50-80%.



**OPERATIONS & MAINTENANCE** GSHP systems have relatively few moving parts. There are no outdoor components to maintain. The refrigerant loop within the unitary equipment is factory sealed and is maintenance-free for its installed life.



**APPLICABILITY** GSHPs are applicable to most commercial office type facilities. While GSHPs can be cost-effective as existing HVAC equipment is replaced at end of life, typically commercial GSHPs are installed in new and major renovation applications where there is sufficient area to properly dissipate heat in the summer and absorb sufficient heat in the winter. In addition, the facility and ground-loop needs to be sufficiently contained so that the pumping requirement for the ground loop does not become excessive.

## Measurement & Verification

The Green Proving Ground program has commissioned the Oak Ridge National Laboratory to perform measurement and verification (M&V) on Commercial Ground Source Heat Pump technology at the Mary Switzer Federal Building in Washington, D.C. Findings from that investigation will be available in December 2012.