

RENEWABLE ENERGY SOLUTIONS

# Tapping into geothermal energy



## RENEWABLE ENERGY SOLUTIONS

Located just feet below the Earth's surface, is a renewable and consistent source of energy known as geothermal energy. At a depth of approximately six feet, for example, soil and groundwater temperature in most of the world's regions is stable between 45 – 58 degrees Fahrenheit. And, in some places, geothermal energy is available in the form of steam and hot water trapped in the Earth's crust.

Johnson Controls offers geothermal energy solutions that allow you to tap into this natural energy source for use in heating and cooling systems. We'll take responsibility for everything from design and engineering to operations and maintenance of the system, saving you money and reducing your facility's impact on the environment.

### How does a geothermal system work

With geothermal systems, there is often no need to create mechanical heating or cooling. Instead, ground-source heat pumps use the earth or groundwater as a heat source in the winter and a heat sink in the summer. Unlike conventional heat pumps, it is much easier for the geothermal heat pump system to capture heat from soil or water of a moderate temperature than from the frigid air outside. Conversely, in summer, the relatively cool ground or water absorbs waste heat more readily than warm outdoor air.

Geothermal systems often involve a series of pipes, called loops, which are installed below ground or submersed in a pond or lake. In a closed-loop system, fluid is pumped into the building, where it is compressed in the heat exchanger and released at a higher temperature. In summer this process is reversed, removing heat from the building to cool the facility. In an open loop system, groundwater is piped directly from an aquifer to the building where it transfers its heat to a heat pump. After it leaves the building, the water is pumped back into the same aquifer via a discharge well located a suitable distance from the first.

Geothermal wells may be used instead of a loop. Temperate water from the bottom of the well is withdrawn, circulated through the heat pump's heat exchanger and returned to the top of the water column in the same well. Typical wells are six inches in diameter and may be as deep as 1,500 feet.

Geothermal systems offer more flexibility through indoor or outdoor equipment installations. Loops are available in a variety of configurations and can be installed under parking lots, walkways and greens spaces with minimal disturbance to the environment. Whatever your application requires, Johnson Controls can design and size a system to meet your needs.

### Why Johnson Controls

Johnson Controls is a \$32 billion leader in energy and environmental solutions. Our contracts often include a performance guarantee, reducing your risk. Our global experience in energy supply- and demand-side businesses, along with 120 years of building expertise, make us well suited for these applications. With 500 offices around the world, we can deliver solutions anywhere you need them.



Schlitz Audubon Nature Center, Milwaukee, Wisconsin uses geothermal wells for heating and cooling

### GEOTHERMAL FACTS:

**Geothermal energy has been identified as the most energy-efficient and cost-effective space conditioning available today by the Environmental Protection Agency.**

Cost saving benefits:

- Competitive installation costs
- Lower energy costs by 25-40%
- Utility incentives/rebates
- Domestic hot water available at low or no cost in summer.
- Lower maintenance costs

Environmental benefits:

- No emissions (no fuel burned)
- Requires less electricity
- No danger of groundwater contamination
- Reduced use of refrigerants

Occupant comfort benefits:

- Ranks among highest of all HVAC systems
- Individual room or zone temperature control
- More consistent heating/cooling level
- Ideal humidity
- No odors or fumes
- Quiet operation

### WHERE WE'RE WORKING:

#### Utah Department of Corrections

This heating plant project includes an onsite geothermal well that provides building heat for prison cellblocks, a furniture manufacturing shop, and a dormitory. It also heats water for use in showers and the kitchen and laundry systems.