U.S. DEPARTMENT of ENERGY | Office of Energy Efficiency and Renewable Energy
Geothermal Technologies Office

GEOTHERMAL HEAT PUMP CASE STUDY:

The Century Center

Reliable Comfort, Whether 40° Below or Triple Digits

Name: The Century Center

Location: Bismarck, North Dakota

Site Type: Offices

Size:

- Heats and cools 112,617 square feet of floor space
- Has 224 individual heat pumps
- Consists of 286 wells
- Occupies an area of about 2 acres

Unique Features:

- A separate heat pump system thaws sidewalk ice

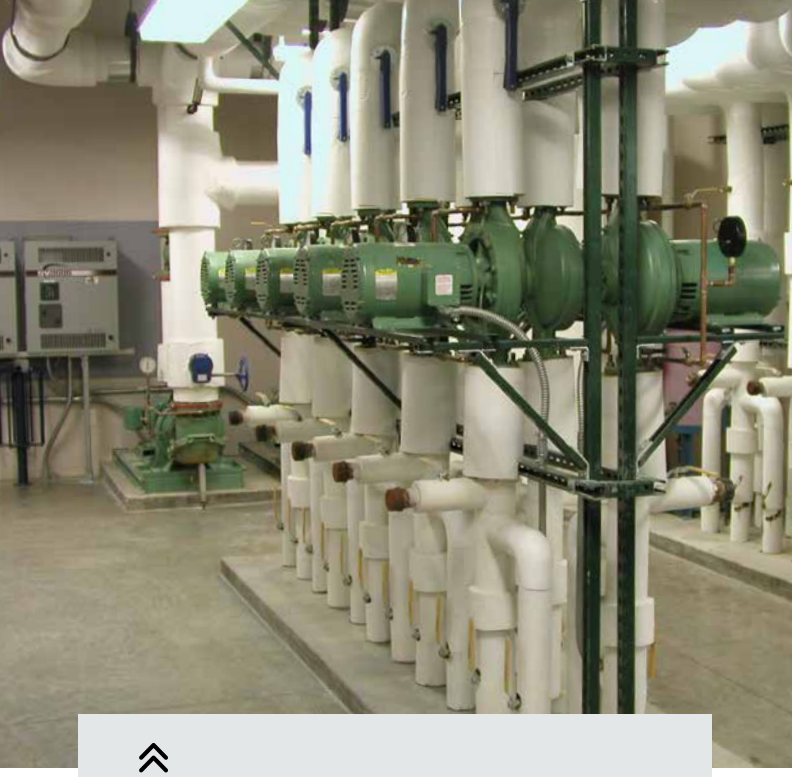
Energy Use: 781,000 kWh per year

Funding Sources: State of North Dakota

Moderating the Extreme. Bismarck, North Dakota, gets seasonally frigid, but the city government continues operating during such harsh temperatures, supported by the geothermal heat pumps that circulate milder subterranean temperatures from beneath the Century Center. *Photo from the Century Center*

Drilling Another Type of Well in North Dakota

Beneath North Dakota there is a rich energy reserve sufficient to heat and cool buildings across the state. With just boreholes, pipes, and heat pumps, this dormant energy source is easy to tap into. We're not talking about the oil North Dakota is known for; geothermal is another energy option, even closer to the Earth's surface. In 2003, the state tapped into geothermal energy for the Century Center in its capital city of Bismarck.



Heat pumps in the Century Center in Bismarck, North Dakota, keep state employees comfortable in the offices above as air circulates reliably, silently, and out of sight in pipes below. *Photo from the Century Center*

Although not the first North Dakota state government building to use geothermal heat pumps (GHPs), the Century Center is the largest, providing enough space for about 400 employees who work in a variety of state agencies. The upfront cost of the geothermal installation was high, but the system saved enough energy to offset initial costs and be paid off within 2.5 years. More than 20 years later, the savings hum on.

Consistent and Quiet

Within the offices, perhaps employees might notice a gentle click when a pump turns on or off, but the geothermal system is otherwise imperceptible. It is also invisible: The pipes loop beneath the north parking lot and enter the building's envelope from below. There are no unsightly boxes outside, and no droning machines inside.

Maintenance and operation have also been a breeze. Even as the building's heat pumps meet their nominal lifetime of 20 years, the Century Center has only needed a couple dozen replaced out of 224 pumps. And in the deepest prairie freezes, the system has not needed repairs.

Comfort in Brutal Weather

The Century Center's fully windowed façade takes in southern light year-round, such that the front often requires cool air in the winter, while the back requires heating. In the coldest weather, which sometimes reaches -40°F, the whole building needs heating, as does the sidewalk, which sits above an auxiliary heat pump system that deices during typical winter temperatures.

Summers are also not always mild, but the geothermal system cools the building up to temperatures of 110°F. Through these extremes, the system is not stressed; it continues to operate and keep state employees comfortable—a testament to the suitability of geothermal for Bismarck and beyond.

> Overall it's a great system. It works well in extreme temperatures but is most efficient between 25 and 50 degrees (Fahrenheit) when parts of the building are heating, and others are cooling.
>
> Mike Schumacher, Facilities Manager at the Century Center

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Visit the Case Studies page to see more examples of geothermal heat pumps in action.

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For more information, visit:
www.energy.gov/eere/geothermal/geothermal-heat-pumps

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