

# Make it Electric



Energy information to help you manage your operation • Volume 21, Number 2 May 2008



## Down to earth

### Geothermal systems draw savings to the surface

The most efficient heating and cooling on earth is right under our feet, where ground temperature is relatively stable year-round. Comfort is there for the taking or, in the case of geothermal systems, for the pumping.

While most of us are walking over significant savings every day, some businesses and organizations, such as St. James Basilica and Oakes Community Hospital, both of North Dakota, are tapping into it. These organizations are gaining more than 300 percent efficiency in their heating and cooling systems while positively impacting the environment.

#### This is deep

Geothermal technology is both highly advanced and as obvious as a hole in the ground.

Its advantages flow from the earth's ability to store immense amounts of heat. Rather than burning a fossil fuel to create energy, geothermal systems simply move what already exists out of the ground and into your buildings. What's great is that the heat is coming from an energy source that renews naturally and continuously.

Ground temperatures vary widely, depending on latitude, but generally remain fairly consistent throughout the year. Even when the air temperature is 10 degrees below zero in our region, the ground temperature stays around 45 to 50 degrees beginning around five feet below the surface,

which means the ground contains heat that's ready to be used.

According to the U.S. Department of Energy, geothermal systems—also known as ground-source heat pump systems—are the cleanest, safest, most economical, and environmentally friendly systems available. And because they deliver more than three units of heat for each unit of energy used, they reduce costs by up to 70 percent.

Geothermal heat pumps are cool too. During the summer the process is reversed to take heat out of buildings and pump it back into the ground.

#### How it all works

Closed-loop systems are most common. These systems use tubing that's buried in the ground—either vertically or horizontally—and connected to the heat pump inside your building. The sealed tubing is filled with a liquid that circulates through the system.

In the winter the liquid in the loop is warmed by the earth and routed to the heat pump. There the low-grade heat is extracted in the heat exchanger and transformed to a higher temperature that can be used to heat your business.

#### A look inside:

Cost-of-energy adjustment explained

In the summer you can reverse the process by selecting the cooling mode on your thermostat. The system then extracts heat from inside your business and discharges it through the ground loop.

Open-loop systems operate on the same principle, but they don't require a system of closed piping. In these systems, well water is pumped to the heat pump and then is discharged. In the process the heat pump transfers heat into your home or business in the wintertime, out in the summertime.

### For comfort, apply heat or cold

For the Oakes Community Hospital, the short payback on a geothermal system was just what the doctor ordered.



The 85-year-old organization serves approximately 14,000 people in four southeastern North Dakota counties. Last year the hospital moved from an aging downtown building into a brand-new \$10.4 million facility on the north edge of town. Although Catholic Health Initiatives (CHI) owns the hospital, the community raised about \$1.5 million for its construction.

The architects had experience with geothermal systems and presented the heating-cooling option during planning for the Oakes facility. When the board of directors and CHI leaders saw the projected five-year recoup on initial investment, the decision to go geothermal was simple.

"The board took one look at that estimate and increased our budget immediately," said Don Kapfer, CHI executive vice president and administrator of the 20-bed critical-access facility.

The system consists of a loop field of 130 wells and 10 heat pumps, each with 15-ton capacities. A computerized system allows the facility's environmental engineers to monitor and control conditions room by room throughout the 35,500-square-foot building.

Kapfer says that the system not only provides energy savings but produces a more constant heat. "That's an obvious difference," he said. "The air that comes out of the blowers is only about 110 degrees compared with much hotter air from other systems. When you turn up the thermostat you don't get that initial blast of high heat, and that really adds to the comfort level."

One more sure indication the system is working well is what Kapfer is not hearing—complaints from staff or patients. "It's been great," he said. "The employees are just ecstatic about being in this facility."

### Staying grounded for the long haul

For the leader of St. James Basilica in Jamestown, replacing a worn-out boiler system with a geothermal system was less about short-term recoup than it was about long-term savings and stability.

"It was about gaining efficiency in our system," said Father Al Bitz. "Geothermal is like insulation in the 1960s, when people wondered whether installing insulation would pay. Today people are wondering whether they should go with geothermal, but 20 years from now everybody will be doing it."

Bitz knows what he's talking about. Prior to joining St. James he authorized the installation of a geothermal system in a Casselton parish. Bob Sitzmann, Otter Tail Power Company energy management representative and contact for both the Oakes and Jamestown projects, calls him Father Green. "He's always striving for savings through energy efficiency," Sitzmann said.

Bitz took a big step with the geothermal system, which features 52 wells and 5 ten-ton heat pumps. Other upgrades, such as replacing drafty doors and installing compact fluorescent lightbulbs, are making a difference in the Basilica as well.

The term Basilica is assigned to churches with historical significance and unique architectural features. Because

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*Father Al Bitz  
St. James Basilica, Jamestown, North Dakota*

of that, Bitz said, St. James's internal and external aesthetics need to be preserved. Nearly all of the new system is hidden outside, in a mechanical room, and in the recessed basement ceiling. A ten-foot section of pipe in a basement stairwell is the only visible alteration.

The parishioners, Bitz said, don't notice a thing in the winter, but the geothermal system has made all the difference in hotter months. In the 94-year history of St. James, the Basilica has never had air-conditioning. Now, finally, summer worship is cool.

"Geothermal was a significant investment," Bitz said. "But this church has been here for nearly 100 years, and we hope to be here for another 100. This system will more than prove itself."



## Cost-of-energy adjustment explained

At the beginning of the year customers saw a change in the Resource Adjustment (Minnesota) or Energy Adjustment (North Dakota and South Dakota) line item on their bills. This increase was the result of typical energy purchases for this winter, coupled with the cost to purchase replacement energy for a planned maintenance outage at one of our largest generating plants.

### Term defined

The cost-of-energy adjustment is the portion of that Resource Adjustment or Energy Adjustment that reflects changes in the cost for fuel we use to generate electricity, transportation costs for that fuel, and costs we incur to buy energy to supplement our own power plants, minus the base fuel and purchased-power amount included in the per-kilowatt-hour rate you pay.

### What it means to you

If Otter Tail Power Company's fuel and purchased-power costs are less than the amount included in our base rate, we pass on the savings to you in the form of a credit on your bill. In fact, most customers received a credit on their bills for more than 20 years, or until around 2002.

If the cost is more than what's included in our base rate, the difference is passed on to you—without any markup—through the Resource Adjustment or Energy Adjustment. Fuel and purchased-power costs have increased dramatically since 2005, and Otter Tail Power Company currently recovers only about 90 percent of those costs from customers.

### Why purchase power?

Energy from our power plants, renewable energy, and energy conservation all work together to provide the electricity necessary to meet growing customer needs. It's when those resources aren't enough to meet customer demand that we have to buy supplemental electricity from the wholesale energy market, which is heavily influenced by increases in natural gas and other fossil fuel prices.

### Conserve to save

Energy-efficiency programs can reduce your energy costs now and into the future. Visit [www.otpc.com](http://www.otpc.com) and click on *Products/services* and *Business services* to learn more.

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