

Lower Costs, Less Impact City, University Benefit From Unique Heat Source

By St. Joe Valley Metronet

On a biting cold winter morning, brutal winds and subzero temperatures batter the exterior of the Desert Dome at Potawatomi Park in South Bend, transforming the world outside into a wasteland of snow and ice.

But safe inside the glass and steel structure, the city's collection of exotic desert plants basks in a flow of steady heat generated by a bank of high-performance computer servers located nearby. Connected by a high-speed network of dark fiber known as the St. Joe Valley Metronet (SJVM), the servers provide computational power and data for computers some five miles across town on the Notre Dame campus.

The innovative solution, implemented by the city of South Bend in partnership with the University of Notre Dame, saves energy expenses at both sites. The university cuts cooling costs it would normally have to spend to keep sensitive computer equipment from overheating. By using recycled waste heat to keep fragile plants warm, the parks department substantially lowers its annual \$70,000 heating bill.

The solution also lessens the carbon footprint at both sites by reducing gases that would otherwise be generated for heating and cooling.

According to Notre Dame scientist Paul R. Brenner, the university worked with the city to develop a grid heating system to provide direct thermal heat to the Botanical Conservatories and Greenhouse, built in the 1970s.

Municipal funds were not available for capital upgrades, and rising annual natural gas heating costs had grown to more than \$115,000 in 2006. The city was facing the difficult decision of having to close the greenhouse.

"At the greenhouse, primary heat is provided via natural gas boilers, which provides steam heat to the majority of the building," Brenner wrote in a white paper. But during one

recent winter, the boilers went down and pipes froze. Many plants were lost or damaged.

"Our goal was to provide baseline grid heating in place of fossil fuel heat, using the existing boilers on a limited basis during peak winter weather," Brenner reported.

Bigger and better

A traditional computer rack, connected to the Notre Dame campus through connectivity with a local service provider, was located within the dome structure containing the city's desert collection.

The first phase proved so successful that planners moved quickly to expand the project. Phase II, a data center with several racks of computers in a hardened shipping container behind the conservatory, will be functioning before the upcoming winter. It is expected to transform the data center's \$35,000 electrical bill into 150,000 BTUs per hour of useable heat.

Phase II work also includes a connection using the St. Joe Valley Metronet fiber-optic network. More than 50 miles long and growing, Metronet is a high-speed data transfer infrastructure with virtually unlimited bandwidth. Metronet is an initiative of Project Future, the economic development organization for St. Joseph County.

The Metronet was "an enabler" in the project, according to Mary Jan Hedman, SJVM's executive director.

"It would be very difficult if not impossible to have such a successful project without the presence of the Metronet," Hedman notes. "Because of the size of the computers, the amount of data that's being exchanged and the distance between the campus and the greenhouse, you need an extremely high-capacity network in order to make this work."

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Paul R. Brenner, of the Center for Research Computing at the University of Notre Dame, stands in the Desert Dome at the Potawatomi Park greenhouse in South Bend. He says the public wants to know, "How are you pushing heat over the Internet?"

(Photos courtesy of University of Notre Dame/Matt Cashore).

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Future expansions

A new phase of the grid-heating project has been proposed that will use data centers to provide heat for the South Bend Wastewater Treatment Plant. The plan would use heat generated from high-performance research computers to maintain anaerobic process reactors at a steady 95 degrees Fahrenheit, the ideal temperature for breaking down biodegradable solids in sewage.

Currently in the development stage, the project will involve a more robust data center environment and could potentially serve as a model for other municipalities searching for cost-effective, green solutions to their energy needs.

"We're looking for innovative, creative projects," explains Gary Gilot, director of public works for the city of South Bend. "South Bend is well-positioned to be a model green, cool city and to demonstrate new approaches that could be replicated around the country."

As planners look to the future, they see a variety of other applications offering similar benefits of lowered energy costs, a

reliable source of efficient heat and a reduced carbon footprint.

"Nationally, data centers use about \$5 billion a year in energy," Gilot reports. "(Given its current trajectory), that will likely exceed \$10 billion in the next 10 years."

Cities that can retrofit existing data centers to use something like the Metronet to recycle waste heat can do a lot for energy conservation.

"There are a lot of university communities where there's research going on," Gilot concludes. "They have pretty big data centers. That's a heat source that's there forever, 24/7, and it's not subject to economic ups and downs."

INFORMATION LINK

Author: St. Joe Valley Metronet, based in South Bend, encourages technology-based economic development by providing state-of-the-art telecommunications infrastructure at cost-effective prices. Learn more at (574) 234-6590 or www.stjovalleymetronet.org

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