Superconductivity Project Addresses Urban Power Challenges

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Twenty thousand households in suburban Columbus, Ohio, are about to receive electricity through a high temperature superconducting cable developed at the Department of Energy's Oak Ridge National Laboratory.

A new technology that holds promise to transform the global transmission and distribution of electric power was formally energized today near Columbus, Ohio. The $9 million project uses a second-generation High Temperature Superconducting (HTS) cable system to efficiently deliver electric power to approximately 8,600 homes and businesses in suburban Columbus.

The Columbus project is the first demonstration of the new Triax HTS cable design, which dramatically reduces the cost of superconducting systems and brings the technology one step closer to commercial viability. The system was developed by Southwire Company and its partners, American Electric Power, Praxair, American Superconductor and the U.S. Department of Energy's Oak Ridge National Laboratory.

Approximately 200 meters (660 feet) of Triax HTS cable from Southwire are part of the system distributing electric power to residential, commercial and industrial customers through AEP's Bixby substation in Groveport, Ohio. The installation phase of the two-year demonstration project came in on time and on budget.

Superconducting cables, operating at extremely low temperatures,

eliminate virtually all resistance to the flow of electric current. One Triax HTS cable can carry as much current as 18 large copper cables, with much less energy loss.

"This project demonstrates the potential role for superconductivity in modernizing our electricity system," said Secretary of Energy Samuel W. Bodman. "This new development allows power lines to increase capacity in congested urban areas while using less space. I'm pleased to be part of this excellent and innovative team."

Superconducting cables are one solution to the challenging task of providing sufficient electric power to densely populated areas. In an increasing number of cities, there is little room underground to bury cable. The cost of building new tunnels or ducts, including the cost of acquiring the rights-of-way, to lay additional cable is prohibitive - representing up to 75 percent of a cable project. With their higher capacity, superconducting cables have the potential to multiply the supply of electricity to an area using the existing infrastructure footprint.

Despite these advantages, high temperature superconducting cable systems are still expensive. The U.S. Department of Energy provided partial funding through its Superconductivity Partnership with Industry program to help make the Columbus project possible.

"AEP has a long history of supporting innovation in power generation, transmission and distribution. The demonstration of the Triax cable at our Bixby Station is another example of how we seek to advance technologies to help increase the capacity of and ensure the reliability of our power delivery network," said Michael G. Morris, AEP's chairman, president and chief executive officer. "Over the next two years, this project will provide an invaluable, real-world test of state-of-the-art superconducting cable technology on an operating power distribution system."

Rapid advances in HTS cable design are continuing to lower the cost of superconducting systems, with the goal of making superconductivity feasible for commercial applications over the next few years. The Columbus project unveils an important advance toward this goal: the Triax HTS cable. Designed in a joint venture of Southwire and nkt cables, a European cable manufacturer, this second-generation cable design can carry up to 3,000 amps of power, approximately three times more current than other superconducting projects now energized or under construction.

"Superconducting cables have the potential to increase efficiencies in the delivery of electric power in the same way that an expressway can handle more traffic than a typical city street," said Stuart Thorn, president and chief executive officer of Southwire. "The Triax cable design is a major step forward, and we are excited to demonstrate its potential for delivering more power to more people."

The Triax cable places the three necessary phase conductors concentrically around a common central core, surrounded by a copper shield. Earlier designs required a separate cable for each phase. The more compact Triax design reduces by half the quantity of HTS wire needed. It also reduces the cold surface area, and with it the critical cooling requirements. Both of these innovations lower the cost of HTS systems.

"The Columbus project drew on our expertise in the practical application of cryogenic refrigeration solutions," said Steven Lerner, senior vice president and chief technology officer at Praxair. "The proprietary system has a unique level of redundancy to assure uninterrupted, lower-loss electric power transmission."

Because HTS cables can carry more current at a lower voltage over short or long distances, large power transformers can be located farther away

from urban centers, allowing urban planners to free up valuable real estate for development or green space. HTS technology also enables greater interconnectivity between electrical substations, creating redundancies that increase the reliability of the electrical grid.

"2006 will undoubtedly go down in history as the year in which high temperature superconductor technology started to deliver on its long held promise," said Greg Yurek, CEO of American Superconductor. "We are witnessing the birth of a new era for the world's utility grids and taking one of the first steps in meeting our growing appetite for electric power."

For more information on the new HTS cable design and the Bixby substation demonstration project, visit www.supercables.com

Source: Southwire Company