

DOE touts energy-saving possibilities of three superconductor demonstration projects

Three teams of utilities and their development partners are designing high-temperature superconductors (HTS) that, if they prove successful, could dramatically increase the amount of electricity carried over transmission lines.

The Department of Energy, which is providing half the \$68.4 million budgeted for HTS research and development over four years, showcased the three projects at an open house at the U.S. Senate on June 2.

Superconductivity is the largest R&D program supported by DOE's Office of Electric Transmission and Distribution, said Jimmy Glotfelty, the office's director.

Two U.S. senators commended the effort. Sen. Pete Domenici, R-N.M., chairman of the Senate Energy and Natural Resources Committee, noted that \$47 million was allocated for research into superconductivity in the 2004 budget.

"We must come up with innovation in the electric delivery system in the United States," Domenici said.

Sen. Chuck Schumer, D-N.Y., said, "You can have both growth and be environmental. The only way to do that is through technology."

According to DOE, superconductivity works by using liquid nitrogen to cool certain materials to as much as 320° F below zero, at which level they can carry electricity without resistance. This can allow HTS wires to carry a greater volume of electricity, and lose less electricity during transit. DOE estimates that, currently, about 10% of electricity generated is lost before it arrives to end-use customers.

The Long Island Power Authority is working with American Superconductor (the supplier of HTS wire and the project lead), Nexans (manufacturer of the cable) and Air Liquide (developer of the refrigeration system) on a 2,000-foot

segment of line that, at 138 kV, would be the first superconducting line with applications at the transmission level.

"We have to do things much smarter and much more environmentally sensitive," said Bruce Germano, LIPA's vice president for retail services, because land on Long Island is so expensive.

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— **Bruce Germano,**
vice president,
retail services, LIPA

LIPA is also facing increasing pressures to expand its supply options. In the utility's 10-year forecast prepared in 1998, it predicting a peak demand of 5,400 MW in 2013, but it hit that level last summer, a full decade early. The HTS cable, to begin at the East Garden City substation and terminate at a 138/69-kV transformer, would enable the utility to move larger amounts of power over the same corridors.

At just over \$30 million, the LIPA project is the most expensive of the three demonstration projects. Installation is expected to be complete by the end of 2005.

Upstate New York utility Niagara Mohawk, a unit of National Grid, is solely focused on power transmission and distribution.

"We believe that technological improvements will be critical in providing service to our customers," said Michael Hynes, the company's vice president for business services.

NiMo's partners are SuperPower (project lead and developer of second generation HTS wire), BOC (developer of a cryogenic cooling system) and Sumimoto Electric (producer of the cable). The project

consists of a 350-meter cable that would run underneath Interstate 90 in Albany, N.Y., to connect two substations. As time passes, a 30-meter segment of cable will be removed and "second generation" cable will be spliced in.

This project has an estimated cost of \$25.71 million and is due to be in service in 2005. The New York State Energy Research and Development Authority provided additional funding.

American Electric Power and its partners are currently testing a 15-foot segment of tri-axial cable, which AEP's senior vice president for distribution, Glenn Files, called a "revolutionary" move in HTS technology.

AEP is working with Ultera (the team leader, a joint venture between Southwire and German firm nkt cables), DOE's Oak Ridge National Laboratory (for supporting technology and research) and Integrations Concepts Enterprises (providing power controls).

The utility plans to install a 200-meter segment of cable designed to operate at 13.2 kV that will serve residential and commercial customers in Columbus, Ohio, beginning in early 2006. Half of the cable will run aboveground and the rest will be buried.

Southwire and DOE previously built and installed three 100-foot HTS cables that since early 2000 have delivered electricity to three Southwire manufacturing facilities in Georgia, according to DOE.

The tri-axial design, according to DOE, can be less expensive than other HTS designs and retain more power because it consists of three electrically insulated layers of superconductor built around the same axis. Other HTS designs are based on three independent cables.

AEP's project has an estimated cost of \$8.65 million. ML