High Temperature Superconductors Come To Manhattan

Project Overview

Project: Manhattan HTS Triax Project

Location: N. Manhattan/Yonkers, New York

Project Owner: Con Edison

Product Used: HTS Triax Superconducting Cable

In-service Date: Expected May 2013

Grappling with growing power demands in densely populated Manhattan, Consolidated Edison Company of New York (Con Edison) wanted to link an existing substation with a new substation being built. They were looking for an effective way to stage development to match revenue flow and to defer expensive transformer costs.

The solution is a 300-meter (984-foot), high-temperature superconductor (HTS) cable from Southwire. The HTS Triax cable will carry up to 4,000 A per phase at 13.8 kV from the existing substation to the new site. As additional transformers come to the new site, the HTS Triax cable

will serve as a bus link between the two substations, increasing grid flexibility and system security. An added innovation of this HTS Triax installation is a fault-current limiting function that will further enhance distribution reliability.

This HTS Triax substation bus-tie application lets Con Edison leverage transformer assets with a small equipment footprint, smaller right-of-way and avoidance of costly new transformers.

Project Hydra brings HTS Triax technology to densely populated

Manhattan.

Urban Density Requires High Distribution Capacity The Manhattan installation, known as Project Hydra, will use Southwire’s HTS Triax® Superconducting Cable to relieve distribution congestion and reduce power delivery costs. The high-capacity HTS Triax cable lets the two

Project Hydra substations share excess capacity during peak loads or emergencies. The project is expected to be in-service by May 2013.

HTS Triax systems operate at -320˚F (-196˚C) for ultralow loss with high current. At 4,000 A per phase, this is the highest capacity HTS cable built to date. The high capacity is needed to meet expected power demands. Manhattan HTS Triax links substations, limits fault currents

When multiple substations are linked in a network, there must be fault current protection between stations. Project Hydra’s HTS Triax installation includes a built-in fault-current limiting function. “The distribution grid in Manhattan is so dense that protection from fault currents

is a significant engineering problem,” says David Lindsay, Director, Distribution Engineering for Southwire. The HTS Triax fault-protection function enhances the action of standard protection devices.

Costs dropping for established Technology

HTS is now commercial technology in the cost-reduction stage. Current HTS Triax systems use pulse-tube cryogenic cooling technology with fewer parts, lower cost, smaller footprint, and more energy-efficiency than older systems. The combined operational time of Southwire and joint venture partner NKT Cables longest-running commercial HTS projects is over 11 years. HTS projects in-power, or soon to be, include:

• Columbus, Ohio

• Carrollton, Georgia

• Copenhagen, Denmark

Southwire HTS Triax delivers cost effective

Distribution

Southwire has been pioneering HTS projects since the late 1990s. HTS Triax cable systems rely on Southwire’s compact second-generation design, which puts all phase conductors in one cable. These high-capacity, ultra-low loss cables can be retrofitted into existing infrastructure

to relieve distribution bottlenecks in congested urban grids.

Lindsay says, “This HTS Triax substation bus-tie application lets Con Edison leverage transformer assets with a small equipment footprint, smaller right-of-way and avoidance of

costly new transformers.”

Partners Developed Manhattan New York HTS Triax Project

The Manhattan New York HTS Triax installation is being developed by Southwire Company and its partners American Superconductor, Con Edison of New York, U.S. Department of Energy Oak Ridge National Laboratory and the U.S. Department of Homeland Security. The HTS

Triax cable was designed in the Ultera joint venture of Southwire and NKT Cables, a European cable manufacturer. “High-temperature” is Relative “High-temperature” superconductivity (HTS) is relative:

HTS conductors run in liquid nitrogen at -320˚F (-196˚C). Operating with almost no resistance, HTS puts high density, low-loss capacity in existing duct banks. That’s a key to cost-effectiveness in urban settings.