



SuperPower, Inc. Fault Current Limiting Superconducting Transformer

Project Description

SuperPower and its partners will design, develop, manufacture, install, and demonstrate a Smart Grid compatible Fault Current Limiting (FCL) Superconducting transformer on a live grid utility host site. The 28 MVA three-phase FCL Medium-Power Utility transformer (69 kV/12.47 kV class) will be placed within Southern California Edison's (SCE) MacArthur Substation in Irvine, California. The integrated fault current limiting capability will enable much improved fault current handling. The project will construct the first transformer to use significant amounts of the new second-generation yttrium barium copper oxide superconducting tape. This project is divided into several phases including: conceptual design and development; fabrication and testing of a single-phase device; fabrication and testing of a fully functional prototype three-phase device; and installing, integrating and commissioning the prototype unit with Smart Grid communication and control technology live on the SCE grid. The prototype is planned to operate on the SCE grid with various operational data being collected. Results from this project on cryogenic techniques, high voltage dielectric materials, bushings, and ac losses in high temperature superconductors (HTS) will also be useful to cable and other fault current limiter projects. SuperPower with SPX Transformer Solutions are committed to enable the commercial manufacturing and selling of FCL transformers to the global utility industry through the design and capabilities to be demonstrated by this project.

Goals/Objectives

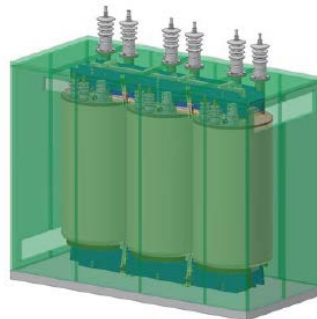
- Design an HTS transformer that can operate for 24 hours or more at twice its rated capacity with only increased cooling requirements and no loss of useful life
- Quantify the benefits of superconducting transformers on lowering electricity costs and transmission and distribution costs through increased efficiency
- Quantify the potential total ownership cost savings to the utility industry through longer life transformers, less frequent replacement of circuit breakers and downstream equipment through integrating the FCL functionality, the ability to reconfigure substation layout to take advantage of enhanced overcurrent capability, and smaller physical device enabling the utility to accommodate more substation power demand without adding real estate

Key Milestones

- Dummy Unit Assembly and Testing (January 2014)
- Single Phase Unit Assembly and Testing (May 2014)
- Three Phase Unit Assembly and Testing (January 2015)
- Installation on Southern California Edison Grid (February 2015)

Benefits

- Jobs created and retained through advanced technology applications
- Electricity distribution costs reduced
- Power quality improved
- Annual U.S. carbon dioxide emissions reduced due to improved grid efficiency
- U.S. energy sector competitiveness strengthened



CONTACTS

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PARTNERS

SPX Transformer Solutions
Texas Center for Superconductivity at
the University of Houston
Southern California Edison

PROJECT DURATION

2/1/2010–9/30/2016

BUDGET

Total Project Value
\$14,544,557

DOE/Non-DOE Share

\$7,272,278 / \$7,272,279

EQUIPMENT

Fault Current Limiting Transformer

DEMONSTRATION STATES

California

CID: OE0000244

*Managed by the National Energy Technology
Laboratory for the Office of Electricity Delivery
and Energy Reliability*