

Superconductivity for Electric Systems 2006 Project Summary

YOUR ORGANIZATION:	SuperPower, National Grid, Sumitomo Electric Industries, The BOC Group
PROJECT TITLE:	Status Update for the Albany HTS Cable Project
PRESENTERS:	Chuck Weber (SP), Ron Lee (BOC), Takato Masuda (SEI)
FY 2005 FUNDING:	\$4,350K (DOE to SuperPower)
FY 2006 FUNDING:	\$3,147K (DOE to SuperPower)
START/COMPLETION DATES:	Initial Award – July 2003, Commissioning of Phase I – July 2006

Overall Project Purpose and FY 2006 Objectives:

Project Purpose: The project objective is to develop a flexible, cold-dielectric, three phase in one cryostat HTS cable for operation in the power grid at 34.5kV, 800A_{rms} continuous current. The cable system will be designed and tested to handle second contingency fault currents conditions (23kA_{rms}, 38 cycles). A field installed joint will be included to allow the replacement of a 30m section of the BSCCO based cable (Phase 1) with a 30m section of YBCO cable (Phase 2). The purpose of this project is to develop a commercially viable cable system that meets or exceeds commercial reliability standards.

FY2006 Objectives: The primary FY2006 objectives were to complete installation of the HTS cable system (cable, return pipe, joint & terminations); ; complete implementation of the cable monitoring and control system; complete the initial cool down and off-grid performance testing; commence on-grid operation of the HTS cable system; complete the cable design for the YBCO cable; fabricate YBCO conductor for the 30-m Phase 2 cable; and complete fabrication and factory testing of the 30m YBCO cable

FY 2006 Results and Accomplishments:

A summary of FY2006 accomplishments include:

Installation of the BSCCO cable system completed – The BSCCO based cable system installation was completed in March. The two cable sections (320m & 30m) and the return pipe (350m) were pulled into the underground conduits in October. Fabrication of the underground cable-to-cable joint commenced in November. In January the cable ends were prepared for connection to the terminations and the terminations were set in place. After all connections were completed the inner cryostat wall was installed at each termination and joint and the system was checked for leaks. The outer cryostat of the termination and joint walls were then assembled and evacuation of the vacuum spaces was carried out.

Cable monitoring and control system – The overall monitoring and control system for the cable system was implemented and interfaced to the BOC Remote Operations Center in Bethlehem, PA. Critical Alarm Logic has been implemented that interfaces between the monitoring equipment and the National Grid Eastern Regional Control Center.

Initial cool-down and off-grid performance testing - The initial cool down of the cable system was completed in June. All parameters (flow rates, temperatures, vacuum levels, contraction forces) of the cool down process were within expected ranges. Off grid testing began immediately after the cool down was completed. Testing included over pressurization of the cable system, phase & meggar checks on the cable, capacitance and dielectric loss tangent measurements during cool down, heat in-leak measurements, failure mode operation, alarm setpoint verification, critical current measurement and DC withstand testing.

Commence on-grid operation – On grid operation of the cable is expected to begin in July. We will report on the status of this item at the Peer Review meeting.

YBCO conductor fabrication – Significant progress has been achieved toward manufacturing the YBCO conductor required for Phase II of the program. Details on the progress made to date will be presented during the Peer Review meeting.

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FY 2007 Plans and Expectations:

FY 2007 Plans:

1. Monitor and operate the cable system continuously from the BOC Remote Operations Center.
2. Complete the cable design for the YBCO cable
3. Complete fabrication of YBCO conductor for the 30-m Phase 2 cable
4. Complete fabrication and factory testing of the 30m YBCO cable
5. Commence installation of the 30-m YBCO cable

Research Integration:

Each partner in the project team brings expertise to the program in their respective areas of responsibilities. The team members and their roles are listed below.

1. **SuperPower, Inc** - Schenectady, NY: Project manager; site infrastructure; manufacture 2nd generation HTS conductor
2. **National Grid Company** - Albany, NY: Host utility, conventional cable & system protection, system impact studies
3. **Sumitomo Electric Industries** - Osaka, Japan: Design, build, install, and test the HTS cable, terminations, & joint
4. **The BOC Group** - Murray Hill, NJ: Design, build, install, and test the cryogenic refrigeration system (CRS); remotely monitor and control the cable system

In order for the entire cable system to function safely and properly all parties need to work very closely together. Integration of each party's efforts with the rest of the team to ensure the system functions as designed. The feedback received from the various DOE Readiness Review meetings, last year's Peer Review, and the ability to manage to budget and schedule are all positive indicators of the effectiveness of the team working closely together.