Project Title:	**Development and In-Grid Demonstration of a Transmission Voltage SuperLimiter™ Fault Current Limiter**
Organization:	American Superconductor Corporation, Southern California Edison, Siemens AG, Nexans GmbH & Co. KG
Presenters:	Bruce Gamble, Syed Ahmed, Wolfgang Schmidt, Nicolas Lallouet
FY 2010 Funding:	$2.35 M

Overall Project Purpose and Objectives:

The overall objective of this project is to develop and demonstrate in-grid testing of a commercially viable three phase transmission voltage level Fault Current Limiter (FCL) as a basis for addressing key utility needs. FCL's permit tighter grid interconnections without the concomitant increase in fault currents. This in turn improves electric system reliability. Specific objectives of this program include:

- Establish optimum 2G HTS wire performance characteristics and manufacturing capability for specifications and financial constraints of a commercially viable SuperLimite FCL
- Develop HTS switching elements that will perform consistently and reliably under in-grid operating conditions
- Design and fabricate transmission-voltage level system components including terminations, internal cryogenic buswork, overall high voltage system design and control strategy
- Select a cryogenic system with high reliability and low operation and maintenance cost
- Perform an accredited laboratory and utility supervised test of a single phase high voltage SuperLimiter FCL demonstrator
- Perform grid analysis, identify the site for in-grid SuperLimiter FCL demonstration, and qualify the value of the solution with our utility partner

The project is a milestone-driven effort encompassing core technology development and single-phase (1-phase) high voltage SuperLimiter FCL testing. The program addressed design and technology development and is now addressing constructing and testing of a single phase of the limiter system.

2010 Approach and Results:

The effort in 2010 is aimed at initiation of component procurement and fabrication of the single phase module assembly for testing next year. Work has included fabrication of components, procurement of the refrigerator and cryostat, and construction of a short dummy module to validate assembly procedures for the FCL.

The work in 2010 has included completion of items identified during the design FMEA and Readiness Review Meetings. These included:

- Thermal cycling to validate contact resistance does not degrade
- HV Measurement validated that the support leg design is acceptable
- HV measurements on support legs conducted at Oak Ridge at 20 kV AC and ± 700 kV Optimization of key module components including the support structure based on design reviews.
- Coil testing to find the maximum number of switching events a coil can withstand without degradation.

The major goals for this period are summarized in the following table:

WS4	Prototype (non-HTS) modules for single phase test	No longer applicable- plan to perform reliability tests with left-over coils per Readiness Review recommendation after all coils are built
WS5	Delivery of wire for single phase module	In progress will complete early June 2010

The task "High Voltage Test of Dummy Module" has been cancelled due the delayed completion of the dummy module. But, according to the successful high voltage tests performed before with components of the module, we consider this task no longer as necessary. Instead we are planning an electrical field calculation using the final module design, to make sure the maximum electrical field under high voltage test conditions does not exceed the design value.

2011 Plans and Expectations:

The plans for the next year are summarized in the following table. The principal objective is the construction of and full voltage and power testing of a single phase of the fault current limiter at Power Tech. The modules, cryostat, refrigerator and terminations will be assembled on site and tested.

WS6	Delivery of switching module for single phase test	Sept/Oct 2010- coil manufacture underway, validating insulation/lamina selection
HVD5	BIL and Full Current Test of single phase FCL	February 2011- based on coil schedule and availability of test facility- first assured window is Feb 15, 2011
HVD6	Phase 1 Report	Mar-11

Technology Transfer, Collaboration, Partnerships:

Work under this program in prior years has included AC loss measurement by the LosAlamos National Laboratory and wire characterization by Texas Center for Superconductivity at the University of Houston. Effort under this program addressing wider insert and lamination has benefited our ATP program addressing HTS wind generators. In the past year HV testing of support elements was conducted at Oak Ridge National Laboratory.