

**2010 Advanced Cables and Conductors Peer Review  
Project Summary**

---

<b>Project Title:</b>	<b>Advanced Cable Research</b>
<b>Organization:</b>	Los Alamos National Laboratory
<b>Presenters:</b>	Steve Ashworth and Dave Reagor
<b>FY 2010 Funding:</b>	\$300 K

---

**Overall Project Purpose and Objectives:**

The overall purpose of this project is to develop and demonstrate new technologies for HTS power cables. Our major objective in support of this has been to demonstrate a novel cooling system in a suspended overhead cable. Two new technologies introduced in FY2009 and further developed in FY2010

**2010 Approach and Accomplishments**

Our approach in FY2010 has been to take the ‘laboratory’ proof-of-principle experiments reported last year for Distributed Cooling (DC) and the Overhead Cable and engineer both concepts to the point at which a cooled overhead cable can operate in an ‘open’ environment.

Paradoxically, whilst our primary aim was to demonstrate the cable operation most of the effort was directed towards the terminations. As previous cable projects have come to understand, you cannot demonstrate a cable unless the terminations work without problem. Our laboratory type experiments showed that, whilst DC can cool the cable, local heat loads in the terminations have a higher coolant demand. We re-designed and re-built the terminations, arranged for enhanced cooling and better access (to facilitate instrumentation and installation on elevated poles) and enhanced the data collection by installing a thermometer array within the cable.

With these enhancements at the terminations we felt able to install HTS 1G conductor to a total of 520A in the cable at the ‘test’ site. The new termination designs are now appropriate for transfer to the ‘open’ site and 2G conductor to 1kA was specified and ordered for this site. The ac loss modeling capability of another project was utilized to design the conductor for this cable and orders placed with delivery due mid-June 2010. It is anticipated that the ‘open’ site cable will be demonstrated before the end of FY2010.

The test site cable has been thermally cycled > 20 times in the past year without problem with cool down times of < 2hrs. It is outdoors and has been subjected to adverse weather and significant snowfall without ice burden problems.

We have also examined the possibility of Distributed Cooling in liquid filled HTS cables and other equipment.

**2011 Plans and Expectations:**

We expect the high current suspended cable to be installed at the ‘open’ site before the end of FY2010. During FY2011 this cable will be operated as a demonstration and as a technology transfer tool. The cable will be operated during all weather seasons and over a sustained period to assess for example the effect of wind loading (vibration, fatigue of cryostat or HTS) and the potential for ice loading. Towards the end of FY2011 we will examine the effects of overcurrents on such a system.

We also plan to continue to develop Distributed Cooling for liquid filled cables and terminations and to investigate it’s potential in for example FCL coils, or other magnets.

**Technology Transfer, Collaboration, Partnerships:**

**2010 Advanced Cables and Conductors Peer Review  
Project Summary**

The structure of this program has been to bring the cable to an operating, well engineered state at a test site and then transfer to an open site for demonstration. The technology transfer element of this program is due to begin in the fourth quarter FY 2010 when the cable is operated off LANL property. At this point the technologies will be suitable for further development in partnership. We have submitted a paper on Distributed Cooling of underground cables.