OAK RIDGE NATIONAL LABORATORY

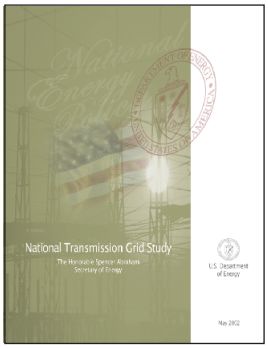
FACT SHEET

MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

NTTRC

National Transmission Technology Research Center Will Address Nation's Electricity Transmission Issues

ORNL is developing the National Transmission Technology Research Center (NTTRC) as a unique facility to support the nation's need to address electricity transmission reliability and security issues. While the demand for power in the U. S. is expected to rise 25% in the next 10 years, the current transmission capacity relative to growth has declined. In addition environmental and aesthetic concerns continue to delay construction of more towers. These problems are highlighted in the *Report of the President's National Energy Policy Development Study* (http://www.whitehouse.gov/energy/) and the *National Transmission* Grid Study (http://tis.eh.doe.gov/ntgs/reports.html).



The NTTRC is a collaborative effort among government and industry partners to respond to the nation's urgent electricity transmission issues. The key partners are:

- Oak Ridge National Laboratory (ORNL) through research sponsored by the Department of Energy (DOE);
- 3M Corporation and partners, including Alcoa, PLP, Nexxans, Wire Rope Industries, Netrak, and the Western Area Power Administration (WAPA);
- Tennessee Valley Authority (TVA); and
- EPRI-PEAC (Power Electronics Applications Center) Corporation.

The NTTRC will test and evaluate critical transmission systems. The technologies to be characterized include advanced conductors, existing conductors, advanced sensors and controls, and transmission power electronics through four unique facilities:

Outdoor PCAT

- **Outdoor Powerline Conductor Accelerated Testing (PCAT)** facility developed in FY 2002 and located within a mile of the main ORNL complex is currently testing 3M's new composite-core conductor. The new conductor design, using 3M Nextel 650 ceramic fibers embedded in an aluminum matrix with zirconium added, is capable of increasing the current-carrying capacity of transmission lines using existing rights of way. The PCAT will first test small-diameter conductor cable and then test medium and large cables in the future. The tests will evaluate the overall performance of the conductors to verify predictions of computer models by looking at sag and tension data, such as stress/strain curve and breaking point, and by testing various conductor accessories that attach the conductor to the towers. The PCAT facility is a closed loop of about 1200 feet of composite core cable. A direct current power supply fed by a transformer provides current to the site. TVA helped design the line and install it and other accessories at the test site. EPRI-PEAC Corporation, a locally based research and development company, contributed the equipment to test the power supply.

- **Indoor PCAT facility** is planned for development on the Oak Ridge Reservation at DOE's East Tennessee Technology Park site in the K-33 Building (56-foot ceiling and 1400-foot length). This facility offers the unique opportunity to test four full transmission spans (two down and two back) indoors. Testing on conductors and sensors and controls will be enhanced through the controlled atmospheric conditions (no wind, no rain, no lightning, and stable temperature)

Indoor PCAT location: Building K-33, East Tennessee Technology Park

- **Powerline Conductor Operational Testing Facility (PCOT)** will place overhead conductors and perhaps superconducting cables into operational transmission lines, in a controlled environment where they can be heavily instrumented and inaccessible to the public. Furthermore, the unique switching arrangement available at this location will allow the test conductor to be loaded at the transmission system operator's discretion. Loading can be adjusted at the Kingston, Tennessee, steam plant. In addition to conductors, advanced sensors and communications successfully developed using the indoor and outdoor PCAT facilities will provide the environment for more realistic testing.

- **Transmission Power Electronics Test (TPET)** bed will provide the necessary infrastructure and protocols for evaluating performance of medium voltage power electronics devices and systems. The facility will provide a controlled environment with sufficient voltage and current to support testing. This includes the capability of testing 161-kV class superconducting cables, transformers, and current limiters.

The NTTRC facilities will be located on the DOE Oak Ridge Reservation and the TVA right of way.

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