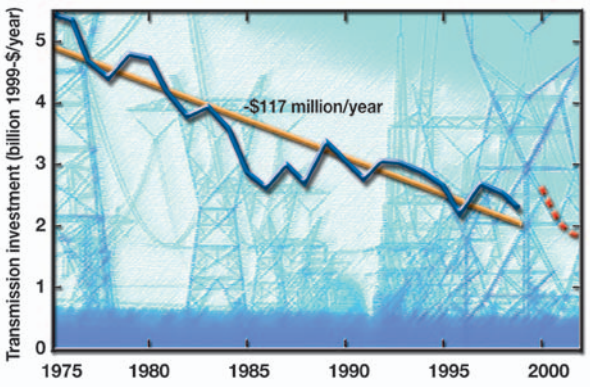
Transmission Study Highlights Congested Power Superhighway

The National Energy Policy directs the Secretary of Energy to examine the benefits of establishing a national electrical grid and to identify major transmission bottlenecks and ways to remove them. In response, DOE conducted a National Transmission Grid Study (NTGS) to examine issues resulting from transmission constraints and reduced power system reliability and to provide solutions.

Brendan Kirby of ORNL was one of a panel of experts that helped DOE conduct the NTGS. Public input to the NTGS was obtained through meetings in Detroit, Atlanta, and Phoenix. A group of researchers and industry experts then were asked to write six supporting reports for the NTGS. (Kirby is lead author on one of the reports and a co-author on a second.) The cover report, which integrates the six issue papers and provides final recommendations, was published in May 2002 (see www.energy.gov).



Investment in the transmission grid has declined for over 20 years. The blue line shows actual investment; the gold line indicates the projected investment trend; the red line indicates projected investment through 2002.

Interest in a national transmission grid has arisen because competition in the wholesale electricity market has changed the way U.S. electric grids are used. Transmission systems designed to move power within small service areas are now frequently stressed to their limits by the regional movement of large blocks of power. These new patterns, growing demand for electricity, and reduced investment in transmission facilities have caused transmission congestion across the country. Removal of transmission bottlenecks will support a wholesale market that allows electricity to flow freely to multiple load centers, reducing costs and inviting investment in transmission systems.

The NTGS recommends regulatory and market-based approaches to stimulate investment in a national "transmission superhighway" and identifies research areas that would benefit from federal support.

ORNL is in the process of developing a National Transmission Test Facility to aid in evaluating advanced overhead conductors and developing advanced transmission line instrumentation. As planned, the facility will be built and operated in collaboration with the Tennessee Valley Authority.

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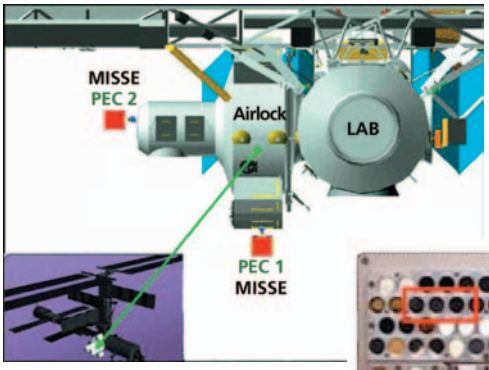
Sponsor: DOE/EERE Distributed Energy and Electricity Reliability

ORNL's Graphite Foam Boards the International Space Station

Samples of graphite foam developed by James Klett of ORNL recently traveled on the space shuttle *Discovery* to a destination aboard the International Space Station. The Materials International Space Station Experiment, or MISSE, consists of two suitcase-like containers, each holding hundreds of samples of advanced materials. Shuttle crew members attached the suitcases to the outside of the space station and opened them to the harsh environment of space. The materials will remain in space for 1 year. Then they will be returned to earth, where scientists will examine the materials and study the effects of the exposure.



Left: *Approximate location of the advanced materials samples on the International Space Station.* Below: *Red outline indicates graphite foam samples in the collection of materials.*

Graphite foam is a patented open-cell material with ultra-high thermal conductivity. Researchers foresee many potential uses of the foam in the thermal management of power electronics and other equipment in satellites, space stations, and shuttles.

Its high conductivity and very high surface area make graphite foam ideal for use in heat sinks for cooling high-power electronics. The foam exhibits thermal conductivity as high as that of aluminum but at only 20% of its weight. This characteristic has lead to development work in the area of cooling systems for power electronics that can dissipate significantly more heat than conventional heat sinks. In addition, prototype automobile radiators made of graphite foam have been demonstrated that are two-thirds the size of conventional cooling systems. One of these was tested in a vehicle in races leading up to the 2002 NASCAR Daytona 500. It is anticipated that numerous other types of systems that must dissipate heat will benefit from the unique properties of the graphite foam.

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Sponsor: DOE/EERE FreedomCAR and Vehicle Technologies Program