Superconductor Maker In Political Crosshairs

Congressional inquiry could jeopardize bold New York City grid project

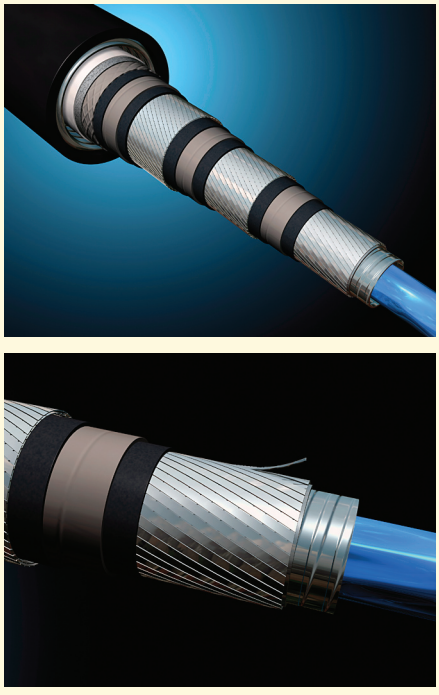
NEWS Since the discovery 20 years ago of high-temperature superconductors (HTSs)—materials that could conduct without resistance at temperatures attainable with liquid nitrogen—the most exciting and far-reaching applications have been expected in electricity. And for many years, the most hard-charging, technically smart company developing HTSs for power has been American Superconductor Corp. (AMSC) of Westborough, Mass. So there's been a stir over the disclosure that AMSC is under investigation by the office of Representative John Dingell, a Democratic congressman from Michigan, one of the most influential U.S. legislators, and an aggressive inquisitor.

The incident that aroused Dingell's suspicions was the award in 2006 by the U.S. Department of Homeland Security of a multimillion-dollar no-bid contract to AMSC to develop and test what it's calling Secure Super Grids in New York City. Working with the local utility Consolidated Edison Co., AMSC plans to develop and install superconducting cables that would connect substations in a much tighter mesh, so that if stations or feeder cables fail, power can be instantly rerouted. Feeder cable failures were implicated in the 1999 and 2006 New York City neighborhood blackouts.

The AMSC–Con Ed plan squarely addresses that problem. But it makes use of technology that's on the verge of commercialization by other companies, not only in the United States but also in Europe and Japan. So it's easy to see why Dingell's investigators might have wondered not only why AMSC got this particular contract on a noncompetitive basis but also why it has received so many other government development contracts on similar terms.

A big part of the funding for the AMSC–Con Ed plan is not for the substation connections but for a second, research and development, component. These funds are to be doled out only as certain technical milestones are met. The second phase involves developing and testing an innovative HTS fault-current limiter system—a device designed to dampen huge current surges from grid-scale short circuits. These generally have been imagined as stand-alone devices, but AMSC proposes to incorporate the current-limiting function in the cables themselves, exploiting a special property of superconductors—they lose their superconducting property and become normally resistive if currents rise too high. So, if properly tuned, they have the innate ability to limit excessive currents.

Both the substation connections and the fault limiters are of critical interest to New York City. Its power system is unusual among the world's megacities in that adjacent electrical zones are rather isolated from each other, observes James Baumstark, Con Ed's vice president for central engineering. As a result, if trouble develops in one of the zones, power can't be easily transferred from neighbors to make up for the shortfall. Con Ed would like to fix that by installing more feeder cables—the trunk cables that carry power into each zone—to connect substations to each other. Superconducting cables are an enticing choice, because they can carry up to 10 times as much current as a regular cable in an equivalent volume without dissipating heat that could damage nearby equipment. What's more, because the number of potential fault currents increases with the number of substation-to-substation connections added, superconducting cable's innate current-limiting ability is all the more appealing.



UNDER SCRUTINY: A congressman is investigating the maker of the superconducting tape used in these cables, scheduled for installation in New York City.

Despite that seemingly natural application, all efforts to design a commercially viable superconducting fault current limiter have come to grief so far, says Alexis P. Malozomoff, AMSC's chief technical officer. First-generation HTS wire embedded a bismuth-strontium-calcium-cuprate superconductor in a multifilamentary structure containing a lot of silver. As a result, even when the critical current threshold was exceeded and the HTS became resistive, the silver would still carry enough current to vitiate the desired fault-limiting effect.

In the past year, however, AMSC has introduced a second-generation conductor in which the HTS is deposited on a textured substrate, using techniques derived from the semiconductor industry and developed mainly at Oak Ridge National Laboratory, in Tennessee. Wire and cable made from the new yttrium-barium-cuprate tape, which contains much less silver, become much more resistive at critical thresholds.

With Siemens, AMSC has already tested a stand-alone fault-current limiter using the second-generation HTS wire. And Hyundai Heavy Industries Co., in Ulsan, South Korea, used the new wire in a limiter that set performance records. Building on such work, AMSC proposes to develop a cable system that is intrinsically current limiting. Specifications call for the superconducting cable to carry 4000 amperes continuously and no more than 40 000 A of fault current. With tweaks to the number of superconducting wires running in parallel, the cable can be set to become resistive at anticipated fault-current levels.

The important thing to understand—and this may have escaped Dingell's staff—is that the fault-current-limiter part of the project is an experiment. AMSC and Con Ed could get as much as US $25 million from Homeland Security over a period of years, but only if fault-current limitation is demonstrated in a series of lab and field exercises, starting this year. The program can be terminated at any time if the team fails to make progress.

IN THE 1980s, huge companies quaked when scrutinized by Dingell's investigators, including defense contractor General Dynamics Corp., in Falls Church, Va., which was revealed to be charging its lobbying expenses to the government under cost-plus contracts. A small company such as AMSC, which owes its viability and success almost entirely to government contracts, might be quaking, too. But to judge from the tone of conversations with its staff, it doesn't seem to be, and its collaborators in the New York City supergrid project are holding firm, too.

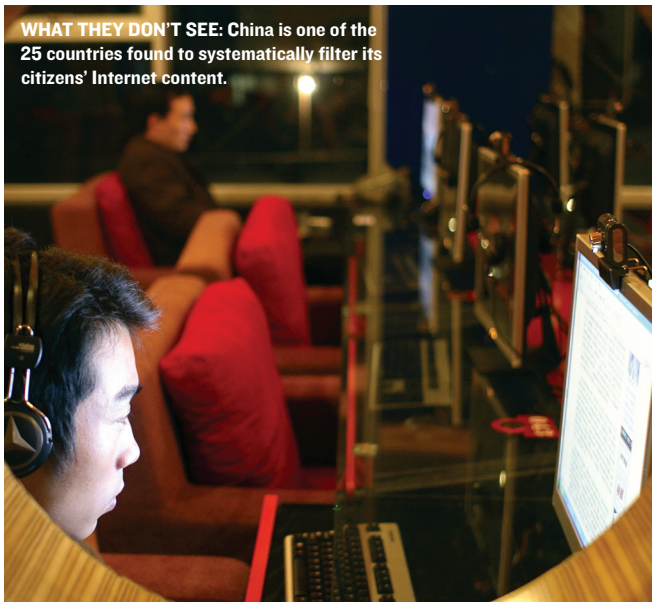
AMERICAN SUPERCONDUCTOR CORP. (2)

NEWS

Even if the contract had been awarded on a competitive basis, it's likely AMSC would have easily won it. The company owns the first commercial second-generation HTS factory, which is the technical and practical foundation for its current-limiting concept. And Southwire, its partner in Secure Super Grids, has set the record—2700 A—for an HTS cable in a working transmission grid using a cable it designed with AMSC's first-generation wire. Southwire, in Carrollton, Ga., conducted that test with American Electric Power in Ohio. As for fault-limiting cables, Malozomoff says "we're the only company out there that has come up with this"—a claim nobody disputes.

AMSC expects to survive the Dingell probe with its reputation essentially intact. But the investigation may be a shot across its bow. With superconductors on the eve of commercialization and set to become a big business, AMSC's claims will be subjected to ever closer scrutiny. Its days as a no-bid government contractor may be coming to an end, and increasingly it may have to cope with normal competitive pressures.

—WILLIAM SWEET



WHAT THEY DON'T SEE: China is one of the 25 countries found to systematically filter its citizens' Internet content.

RYAN PYLE/CORBIS

Internet Censorship: As Bad As You Thought It Was

Maybe a bit worse, actually

"In the dot-com heyday of the '90s and early 2000s... there was a myth that the Internet can't be controlled," says Ronald Deibert, a researcher at the University of Toronto's Citizen Lab. "There was some mysterious, magical property associated with it that will route around censorship." The most exhaustive study yet of Internet censorship—*Access Denied: The Practice and Policy of Global Internet Filtering*, published this month by the MIT Press—pretty much disproves that notion.

The report's authors, the OpenNet Initiative—a multidisciplinary team at the University of Toronto, and Cambridge, Harvard, and Oxford universities—