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What's New in the World of Superconductivity (September, 2009)

Akihiko Tsutai, Director
International Affairs Division, ISTEC

Power

American Superconductor Corporation (September 9, 2009)

American Superconductor Corporation (AMSC) has formed a new overseas office, AMSC India, to provide AMSC's power electronics and superconductor-based solutions to India's rapidly growing wind energy and power grid markets. AMSC India will comprise a regional head office in Delhi and a service office in Pune. Greg Yurek, founder and chief executive officer of AMSC, commented, "India is beginning to tap into its renewable energy resources and is making significant investments to vastly improve the throughput and reliability of its power grid. Our advanced power electronics and superconductor solutions are well positioned to address these needs both in the near and long term. AMSC India has been formed to provide high-quality local technical support for our new wind power customers and build a strong foundation for future sales into India's broader renewable energy and power grid markets." The Indian government recently established a new "Power for All by 2012" plan to stabilize India's power supply and to increase the number of residences with electricity; this plan will require the installed generation capacity to grow from 140,000 MW to nearly 225,000 MW and will require billions of dollars of investment in the power transmission and distribution infrastructure. At present, AMSC has two wind turbine manufacturing customers in India, Ghodawat Energy Limited and Inox Wind Limited, from which it has received orders for five and three wind turbine electrical systems, respectively.

Source:
"AMSC India Formed to Address India's Rapidly Growing Wind Energy and Power Grid Markets"
American Superconductor Corporation press release (September 9, 2009)
http://phx.corporate-ir.net/phoenix.zhtml?c=86422&p=irol-newsArticle_Print&ID=1329462&highlight

Zenergy Power GmbH (September 10, 2009)

Zenergy Power has announced that its wholly owned subsidiary, Zenergy Power Pty Ltd., has been awarded a three-year R&D grant from the Australian Research Council. The grant, valued at A$800,000 (approximately US$725,000), will be used to support the ongoing development of a high-voltage fault current limiter; specifically, the funds will be used for research on novel magnetic materials and unique core and coil arrangements with the aim of developing smaller, lighter, and cheaper fault current limiters.

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Source:
"Australian Grant for FCL Development"
Zenergy Power GmbH press release (September 10, 2009)
http://www.zenergypower.com/images/press_releases/2009/2009-09-10-Australian-Grant-for-FCL-Development.pdf

Zenergy Power GmbH (September 16, 2009)

The German Federal Foundation for the Environment has awarded Zenergy Power GmbH and Bültmann GmbH with the 2009 German Environmental Award. The prize was awarded for the application of superconductor technology to industrial machinery. Together, the two companies developed and launched the world's first superconductor-based magnetic heater for metals processing. The application has clearly demonstrated the economic and environmental advantages of superconductors in commercial manufacturing and has attracted much interest in the semi-finished metals industry. Such systems have enabled an increase in productivity by 25 % while simultaneously allowing energy consumption to be reduced by 50 %, compared with conventional heating systems. The environmental advantage of this technology becomes apparent when one considers that industrial metals heating accounts for 3 % of the global power consumption.
Source:
"Prestigious Environmental Award for Success of Superconductors"
Zenergy Power GmbH press release (September 16, 2009)
http://www.zenergypower.com/images/press_releases/2009/2009-09-16-European-Environmental-Prize.pdf

American Superconductor Corporation (September 23, 2009)

American Superconductor Corporation (AMSC) has formed another overseas office, AMSC Korea, to provide AMSC's power electronics and superconductor-based solutions to South Korea's rapidly growing wind energy and power grid markets. The headquarters for AMSC Korea will be located in Busan, where it will serve AMSC's numerous Korean customers including LS Cable, the Korea Electric Power Company (KEPCO), the Korea Electric Power Research Institute (KEPRI), the Korea Electrotechnology Research Institute (KERI), Doosan Heavy Industries, and Hyundai Heavy Industries. Dan McGahn, senior vice president and general manager of AMSC Superconductors, commented, "Korea has long been a key area for AMSC given its focus on energy technology innovation and manufacturing excellence. The country is investing billions of dollars to bolster its power grid and become a leading exporter of clean energy technologies such as wind turbines. With the formation of AMSC Korea, we can accelerate the adoption of our power electronics and superconductor solutions in the region while providing our local customers additional value-added support." As part of a new national renewable energy plan (worth about US$85.8 billion, one-third of which will come from the government), the Korean government has allocated about US$76.9 billion for the promotion of renewable energy and US$8.8 billion for the development of green technologies. Korea is also expected to become a major exporter of renewable energy technologies, including wind turbines.
Source:

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“AMSC Korea Formed to Capitalize on Substantial Wind Energy and Power Grid Opportunities”
American Superconductor Corporation press release (September 23, 2009)
http://phx.corporate-ir.net/phoenix.zhtml?c=86422&p=irol-newsArticle_Print&ID=1334700&highlight

American Superconductor Corporation (September 23, 2009)

American Superconductor Corporation (AMSC) has formed a strategic alliance with LS Cable Ltd. (Korea) to advance the commercial sales of superconductor cables. Together, the two companies will collaborate to deploy at least 10 km of superconductor power cables in commercial power grids over the next five years. The superconductor cable systems to be produced by LS Cable will utilize AMSC’s proprietary ‘344 superconductors’, with the alliance ensuring an ongoing supply of high-quality HTS wire from AMSC. Joon Hyung Cho, Executive Vice President and Chief Technology Officer of LS Cable, commented, “LS Cable is committed to advancing the broad adoption of superconductor cable systems to address the power demands and grid reliability challenges faced by electric utilities today. With several superconductor demonstrations already complete, Korea's power grid is set to undergo continued upgrades in the years to come. We formed this strategic alliance with AMSC to advance the commercial production of superconductor cable systems to support Korea's grid of the future. We are delighted to expand our relationship with AMSC and secure the best-in-class superconductor wire needed to manufacture our commercial superconductor cable systems.”

In conjunction with this announcement, AMSC also announced that LS Cable is presently working with the Korea Electrotechnology Research Institute (KERI) to develop a 100-meter, 154-kV superconductor cable system to be installed in the Gochang power grid in 2011. The system will utilize approximately 13 km of ‘344 superconductor’ and will represent the first superconductor power cable demonstration in Korea to operate at a transmission-voltage level.

Source:
“American Superconductor and Korea’s LS Cable Form Strategic Business Alliance”
American Superconductor Corporation press release (September 23, 2009)
http://phx.corporate-ir.net/phoenix.zhtml?c=86422&p=irol-newsArticle_Print&ID=1334704&highlight

Zenergy Power GmbH (September 23, 2009)

Zenergy Power GmbH has announced a collaborative agreement with American Electric Power (AEP) for the installation and operation of a transmission-voltage fault current limiter (FCL). The installation will be the first transmission-level FCL to be installed in the U.S. electricity grid. The FCL will likely be installed at the 138-kV Tidd substation near Steubenville, Ohio, in late 2011. The agreement follows a thorough evaluation conducted by AEP of the FCL business case with respect to the utility’s grid requirements. The construction and installation of the high-voltage FCL will be partially funded by the U.S. Department of Energy as part of Zenergy’s ongoing US$11 million project, previously announced in June 2007. Michael Heyeck, Senior Vice President of Transmission at AEP, commented, “As we expand and rebuild the transmission grid of the future to enable renewables and other forms of new generation, superconducting FCLs can provide a smart means to avoid capital investment as we integrate newer grid elements into the existing

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grid. An economical and reliable application of FCL would be useful in addressing these challenges."
Source:
"American Electric Power FCL Agreement"
Zenergy Power GmbH press release (September 23, 2009)
http://www.zenergypower.com/images/press_releases/2009/2009-09-23-AEP-FCL-Agreement.pdf

American Superconductor Corporation (September 29, 2009)

American Superconductor Corporation (AMSC) has signed a new contract with Sinovel Wind Corporation Limited (Beijing, China) for the supply of core electrical components to be utilized in Sinovel's 3-MW wind turbines. The contract is worth more than $100 million. AMSC plans to begin shipping the components in March 2010 and to complete all shipments by the end of calendar year 2011. Sinovel is presently China's largest wind turbine manufacturer. In addition to having produced thousands of 1.5-MW wind turbines, Sinovel has also already installed several 3-MW wind turbines off the coast of Shanghai in China's first offshore wind farm.
Source:
"AMSC and Sinovel Sign $100 Million Follow-On Electrical Components Contract for 3 Megawatt Wind Turbines"
American Superconductor Corporation press release (September 29, 2009)
http://phx.corporate-ir.net/phoenix.zhtml?c=86422&p=irol-newsArticle_Print&ID=1336479&highlight

Quantum Computer

University of California – Santa Barbara (September 23, 2009)

Researchers at the University of California – Santa Barbara have used a superconducting electrical circuit to make an important advance in the field of quantum mechanics. The researchers used a superconducting electrical circuit to detect quantum correlations in measurements of entangled quantum bits. The observed correlations were stronger than those obtained using classical physics, illustrating that the rules of quantum mechanics can also extend to macroscopic systems. Measurements of "entangled states" (i.e., a pair of particles with opposite spins) should enable stringent tests of the predicted discrepancies between quantum and classical physics, otherwise known as "Bell inequalities." Such measurements are known as a "Bell violation". Using two entangled superconducting qubits, the researchers successfully measured and reported a clear violation of Bell inequality, demonstrating that the macroscopic electrical circuit is indeed a quantum system. John Martinis, one of the principal investigators, commented, "This experiment has met this challenge [measuring a Bell violation in a superconducting circuit], achieved by performing a very demanding measurement on a pair of Josephson qubits, a measurement that requires excellent control over qubit state preparation, qubit entanglement, and very high fidelity single-shot state measurements of the entangled qubits. It directly proves that quantum mechanics is the only possible description for the behavior of a

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macroscopic electrical circuit." The group's results were reported in Nature.
Source:
"Physicists at UC Santa Barbara make discovery in quantum mechanics"
University of California – Santa Barbara press release (September 23, 2009)
http://www.ia.ucsb.edu/pa/display.aspx?pkey=2094

Accelerator

Bruker Energy & Supercon Technologies, Inc. (September 8, 2009)

Bruker Energy & Supercon Technologies, Inc. (BEST) has announced that its subsidiary, Bruker ASC GmbH (Germany), has been awarded contracts for synchrotron instrumentation from several research institutions worldwide, including the U.S. Department of Energy's SLAC National Accelerator Laboratory at Stanford University, the Pohang Accelerator Laboratory in Korea, and the University of Lund in Sweden. The total value of the contracts is approximately $3.7 million. Wolfgang Diete, Director of Bruker's Synchrotron, Beamline & X-Ray Optics business, commented, "These contracts are important milestones for our plans to further grow the synchrotron instrumentation business after our recent acquisition by Bruker. Based on our technological experience, we look forward to bringing these critical instruments into operation to support our international customers in achieving their scientific goals and perhaps even new breakthroughs."
Source:
"Bruker Energy & Supercon Technologies Awarded Multiple Contracts for State-of-the-Art Accelerator and Synchrotron Instrumentation"
Bruker Energy & Supercon Technologies, Inc. press release (September 8, 2009)
http://www.bruker-est.com/pr090908.html

Thomas Jefferson National Accelerator Facility (September 17, 2009)

The U.S. Department of Energy's Thomas Jefferson National Accelerator Facility (Jefferson Lab) has successfully tested the first U.S.-built superconducting radiofrequency (SRF) niobium cavity for the proposed International Linear Collider (ILC). The cavity was built as part of a DOE-funded R&D effort to develop the technologies required to build the ILC, a next-generation electron-positron collider for exploring matter at higher energy levels. SRF accelerator cavities would be a crucial component of this accelerator; if built, the ILC will require about 16,000 niobium cavities. Venders around the world have been competing to produce cavities that meet the stringent performance requirements of the ILC. The cavity that was tested at Jefferson Lab was manufactured by Advanced Energy Systems, Inc. (New York).
Source:
"American-made SRF cavity makes the grade"
Thomas Jefferson National Accelerator Facility press release (September 17, 2009)
http://www.jlab.org/news/releases/2009/SRF-Cavity.html

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Basic

Rice University (September 23, 2009)

A team of seven U.S. universities led by Rice University has won a contract worth US$5 million from the Department of Defense to build a simulator for examining high-temperature superconductivity. The simulator will examine complex materials, such as high-temperature superconductors, using ultracold atoms in an optical lattice created with lasers; the lattice will simulate the crystal structure, while the atoms will act as proxies for the electrons. The contract will build on the results of an earlier phase of funding for the Optical Lattice Emulator (OLE) program, which confirmed that ultracold atoms and lasers could be used to build the types of structures needed to simulate high-temperature superconductors. Randy Hulet, the team's principal investigator, commented, "It's difficult to study superconductivity in real materials, partly because even minor defects in the crystal structure can throw off the experimental results. But with the optical lattice, we can know, with absolute certainty, that there are no defects. We can really probe the essence of the [Hubbard] model."

Source:

"Rice awarded $5M for light-based crystal simulator"

Rice University press release (September 23, 2009)

http://www.media.rice.edu/media/NewsBot.asp?MODE=VIEW&ID=13089&SnID=1920094913

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