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What's New in the World of Superconductivity (June, 2010)

Akihiko Tsutai, Director
International Affairs Division, ISTEC

Power

Tres Amigas, LLC (June 2, 2010)

Tres Amigas, LLC, has announced that Viridity Energy, Inc. will design, build, and operate the power trading platform that will be used for the Tres Amigas SuperStation. Viridity Energy will provide the network and commercial operations required for the sale and delivery of Tres Amigas' transmission services, associated electric energy transfers, and other ancillary products and services. Phil Harris, President and Chief Executive Officer of Tres Amigas, commented, "The commercial operation of the SuperStation requires experience in transmission system network operations and services across multiple regions as well as knowledge of wholesale power markets. Viridity Energy brings the development and operating expertise required to ensure that Tres Amigas meets the energy and reliability requirements of each region we will be serving." At present, Viridity Energy provides advanced network operating services to micro-grid systems in the Eastern and Western regional power markets. The Tres Amigas SuperStation will enable the transfer of thousands of megawatts of electricity among the presently asynchronous Eastern Interconnection, Western Interconnection, and Texas Interconnection, serving as a renewable energy market hub and balancing authority.
Source:
"Tres Amigas and Viridity Energy Announce Commercial Operations Agreement"
Tres Amigas, LLC press release (June 2, 2010)
http://www.tresamigasllc.com/docs/Tres-Amigas-Press-Release20100602.pdf

Zenergy Power GmbH (June 2, 2010)

Zenergy Power GmbH and its industrial partner Bültmann GmbH have been awarded the 2010 European Business Award for the Environment in the "Process" category for the development of their magnetic billet heater (MBH), which increases the efficiency and productivity of industrial metal production. The MBH enables the energy consumption required for the heating of metals during extrusion to be reduced by 50 % while simultaneously allowing productivity to be increased by 25 % as a result of the excellent temperature homogeneity. The European Commission selects the winners of the European Business Awards, which are awarded every two years; this year, the awards were selected from 141 entries from 24 EU and candidate countries.
Source:
"Zenergy Power Selected by European Commission for Environmental Award"
Zenergy Power GmbH press release (June 2, 2010)
http://www.zenergypower.com/images/Presse/PM/2010-06-02-pm-ebae.pdf

American Superconductor Corporation (June 9, 2010)

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American Superconductor Corporation (AMSC) and Hyundai Heavy Industries, Co., Ltd. (HHI, South Korea) have announced an expansion of their strategic alliance to include the joint development of a 5-MW full conversion wind turbine intended for offshore wind applications. HHI and AMSC Windtec™, a wholly owned subsidiary of AMSC, will jointly develop the design for this turbine. HHI hopes to begin volume production of the 4-MW wind turbines by the end of 2011; at that time, HHI will purchase the power electronic components for the turbines from AMSC according to the terms of the strategic alliance. The present alliance expands upon an existing alliance between the two companies involving the licensing of AMSC Windtec's designs for 1.65-MW and 2-MW doubly fed induction wind turbines to HHI. To date, HHI has ordered nearly 80 sets of electrical control systems and power electronic components for its 1.65-MW wind turbines and an initial 10 electrical control systems for its 2-MW wind turbines.
Source:
"AMSC and Hyundai Heavy Industries Expand Wind Power Strategic Alliance"
American Superconductor Corporation press release (June 9, 2010)
http://phx.corporate-ir.net/phoenix.zhtml?c=86422&p=irol-newsArticle_Print&ID=1436158&highlight

Zenergy Power GmbH (June 14, 2010)

Zenergy Power GmbH has entered into collaboration with Applied Superconductor Limited (ASL, United Kingdom) for the sale and marketing of inductive fault current limiters. ASL became Zenergy Power's first FCL customer in January 2010, at which time they purchased an 11-kV unit to be integrated into an electrical distribution grid operated by CE Electric UK. The success of this ongoing project has led to the present partnership and the formal expansion of Zenergy Power's market presence within the United Kingdom. Herbert Piereder, CEO of ASL, commented, "It is with pleasure that ASL extends its working relationship with Zenergy Power in this way. Our long standing work with distribution network operators has given us a good understanding of the electrical fault handling requirements of UK grid operators and we are confident that Zenergy Power's inductive FCL product can play a significant role in addressing the growing challenge of maintaining and expanding the UK electrical grid system."
Source:
"Zenergy Power enters into UK Marketing Collaboration for FCL's"
Zenergy Power GmbH press release (June 14, 2010)

American Superconductor Corporation (June 15, 2010)

American Superconductor Corporation (AMSC) has announced the achievement of a significant milestone: the company's proprietary power electronic solutions are now supporting the production of more than 15,000 MW of wind power worldwide, representing nearly 10 % of the installed wind power capacity as of the end of 2009. Greg Yurek, AMSC's founder and Chief Executive Officer, commented, "The fast-growing global wind industry continues to be the primary business driver for AMSC. We are providing proprietary wind turbine designs and production support services to more than a dozen customers in seven countries around the world, including 10 customers in the Asia Pacific region. Each wind turbine produced by these companies utilizes AMSC's core electrical components and control systems, which serve as the brains of these power generation machines. In addition, AMSC's D-VAR grid interconnection technology, including our D-VAR RT low voltage ride through solution, is being utilized by more than 70 wind farms in seven countries worldwide to meet local grid interconnection requirements. With nations around the world seeking to derive a greater percentage of their energy needs from renewable energy sources, we believe we have only begun to scratch the surface of the renewable energy grid interconnection market's potential."

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Recent industry reports have forecasted further acceleration in wind turbine installations in Asia over the next decade.
Source:
"Nearly 10 Percent of World's Wind-Generated Electricity 'Powered by AMSC®'"
American Superconductor Corporation press release (June 15, 2010)
http://phx.corporate-ir.net/phoenix.zhtml?c=86422&p=irol-newsArticle_Print&ID=1438087&highlight

Bruker Energy & Supercon Technologies, Inc. (June 28, 2010)

Bruker Energy & Supercon Technologies, Inc. (BEST) has reported its in-field high magnetic field test results for its second-generation (2G) HTS tape, confirming an enhanced performance arising from improvements to its proprietary manufacturing technology. The YBCO material produced by BEST recently achieved a new record critical current of 1,925 A in a 4-mm-wide tape tested at a temperature of 4.2 K in an 18-T magnetic field directed parallel to the tape surface. This current corresponds to a 4,810 A per cm-width and a superconductor current density of 27 MA/cm^2. With a perpendicular field orientation, a critical current of 1,000 A in a 7-T magnetic field and a critical current of 732 A in a 10-T magnetic field were achieved. These critical current test results were verified in collaboration with the high magnetic field test laboratory at the Karlsruhe Institute of Technology in Germany. Dr. Alexander Usoskin, an R&D Manager at BEST, commented, "We believe these new critical current test values are more than twice the highest critical currents previously observed in 4 mm wide HTS coated conductors in such magnetic fields. The results were obtained from 5 to 10 meter long tapes that we consider to be representative samples of our large scale YBCO manufacturing process. With our new proprietary deposition technique based on multi-beam pulsed laser deposition, the manufacturing of such 'high-field' HTS tapes is now feasible, and we also expect these processes to be more robust for increasing processing yields." Dr. Klaus Schlenga, Chief Technology Officer at BEST, added, "These in-field critical current test results are especially impressive since the high current capacity is accompanied by high intrinsic mechanical tape strength, without the need for any additional reinforcement, for example with steel tapes. Significantly improved in-field performance should positively influence high magnetic field applications that are tightly linked to the technical critical current density of the YBCO superconductor, such as superconducting dipole magnets, Nuclear Magnetic Resonance (NMR) ultra-high field superconducting magnets, and other new superconducting magnet designs in energy research."
Source:
"BEST Reports Improved In-Field Critical Current Performance of its Second Generation High-Temperature Superconductor YBCO Tapes"
Bruker Energy & Supercon Technologies, Inc., press release (June 28, 2009)
http://phx.corporate-ir.net/phoenix.zhtml?c=121496&p=irol-newsArticle&ID=1442039&highlight

Medical

Elekta (June 7, 2010)

Elekta (Stockholm, Sweden) presented its next-generation magnetoencephalography (MEG) system at the Organization of Human Brain Mapping's 16th Annual Meeting in Barcelona, Spain. The Elekta Neuromag® TRIUX platform meets the key requirements critical for monitoring normal and abnormal brain activity while being designed to operate in virtually any clinical environment. The system features a three-times larger dynamic range compared with previous devices and built-in shielding in addition to

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several features that will simplify use and improve patient experience. The system will be available as either a turnkey system or as a hardware/software upgrade for some Elekta Neuromag models.
Source:
"Elekta Introduces Next Generation MEG System for Monitoring the Brain in Action"
Elekta press release (June 7, 2010)
http://www.elekta.com/corporate_international_press_releases_400610.php?url=aHR0cDovL2ZlZWQubmUuY2lzaW9uLmNvbS9jbGllbnQvd2F5bWFrZXIxL1dPTFJlbGVhc2VGaWxlLmFzcHg/aWQ9MTYyNzY2NiZmbj1yZWxlYXNlLmh0bWw
Disclaimer: *Elekta Neuromag® TRIUX is a works in progress. Specifications and product details subject to change without notice.*

Bruker (June 17, 2010)

Bruker has received an order for an ultra-high field MRI CryoProbe™ from the F.M. Kirby Research Center for Functional Brain Imaging at the Kennedy Krieger Institute in Baltimore, MD. The 500-MHz MRI CryoProbe will be the first of its kind to be installed in North America and is part of a preclinical MRI BioSpec® system that includes an 11.7-T UltraShield Refrigerated (USR™) superconducting magnet and AVANCE™ electronics. The Bruker MRI CryoProbe is based on very low temperature, closed-cycle cooled RF-coils and preamplifiers that enable a signal-to-noise ratio (SNR) that is 2.5 times higher than equivalent room temperature RF-coils in routine MRI applications. The new system will enable a leap in sensitivity, providing even higher resolution images of microscopic structures in vivo, and will be used to explore neurodegenerative diseases in small animals.
Source:
"Bruker Announces Order by Kennedy Krieger Institute for Ultra-High Field 11.7 Tesla Pre-Clinical MRI System with First 500 MHz CryoProbe™"
Bruker BioSpin press release (June 17, 2009)
www.bruker.com/mricryoprobe

Quantum Electronics

Raytheon Company (June 22, 2010)

Raytheon BBN Technologies, a wholly owned subsidiary of Raytheon Company, has announced a major advance in quantum information technology regarding the coupling of light and superconductors. Under normal conditions, superconducting atoms absorb photons at a particular frequency. A research group at Raytheon, in collaboration with the National Institute of Standards and Technology, has found that by applying a second field at a different frequency, this absorption can be prevented—making the superconducting atom effectively transparent. This discovery suggests the possibility of the efficient coupling of superconducting quantum bits, also known as qubits. Will Kelly, associate scientist at Raytheon BBN Technologies, commented, "Superconducting artificial atoms offer fast and reliable processing, and light offers fast and reliable transmission over long distances. Combining light and superconducting artificial atoms offers the best of both and is a promising development for building a large-scale quantum computer." The company's achievements have been reported in *Physical Review Letters*.
Source:
"Raytheon BBN Technologies Achieves Quantum Information Breakthrough"
Raytheon Company press release (June 22, 2010)

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http://raytheon.mediaroom.com/index.php?s=43&item=1583&pagetemplate=release

Basic

Brookhaven National Laboratory (June 14, 2009)

Researchers at Bar-Ilan University (Israel) and Brookhaven National Laboratory have successfully fabricated thin films patterned using large arrays of superconducting nanowires and loops. The production of superconducting nanowires has been difficult, if not impossible, using conventional superconductors because the minimum size required for these samples to become superconducting is relatively large. In layered copper-oxide superconductors, however, the coherence length is much smaller; in addition, these materials operate at warmer temperatures, making them more attractive for real-world applications. In the presently reported study, the Brookhaven team used a precision technique (molecular beam epitaxy) to make superconducting thin films one atomic layer at a time. The Bar-Ilan team then used electron-beam lithography to “etch” a pattern of thousands of loops into the material’s surface. The resulting “nanowires” were only 25 nanometers in diameter and were 150 – 500-nm long. Measurements of electrical resistance confirmed that these nanowires were superconducting at temperatures below about 30 K. Furthermore, the researchers observed that the electrical resistance of these materials could be altered in an unexpected manner by placing them in an external magnetic field. Instead of the loop resistance continuing to increase when placed within an increasing external magnetic field applied perpendicular to the wires, the loop resistance oscillated up and down. Ivan Bozovic, a physicist at Brookhaven, commented, "These oscillations in resistance have a large amplitude, and their frequency corresponds to discrete units (quanta) of magnetic flux—the measure of the strength of the magnetic field piercing the loops. A material with such a discrete, switchable form of magneto-resistance—especially from the superconducting to the non-superconducting state—could be extremely useful for engineering new devices." The group’s work was published in the online version of *Nature Nanotechnology* (June 13, 2010).
Source:
“Scientists create nano-patterned superconducting thin films”
Brookhaven National Laboratory press release (June 14, 2009)
http://www.bnl.gov/bnlweb/pubaf/pr/PR_display.asp?prID=1148

University of Florida (June 27, 2010)

Researchers at the University of Florida have described precisely how the atomic-level structural elements of high-temperature superconductors impede electrical current; specifically, they developed a mathematical model that explains how grain boundaries separating rows of atoms within superconductors impede current. The group abstracted a very theoretical model for a single boundary in a manner such that the model can be applied to all such boundaries in a high-temperature superconducting wire. While the new model does not suggest a way to break down these barriers to electrical current, it should provide researchers with a better tool for interpreting the results of past and future experiments. The group’s research was published in the online edition of *Nature Physics*.
Source:
“Physicists explain why superconductors fail to produce super currents”
University of Florida press release (June 27, 2010)
http://news.ufl.edu/2010/06/27/superconductor/

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