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SuperPower offers variations of 2G high temperature superconductor wire to meet unique requirements for clean, green and smart grid devices

Unique wire architectures

- Unique wire architectures and superconductor formulations benefit specific device
- Two new devices under development to further enhance the electric power grid
- Quick-Ship program offers customers small wire quantities for fast shipment

SuperPower Inc. continues its annual tradition of participating in the Hannover Messe SuperConductingCity Stand with an exhibition focused on its state-of-the-art second-generation high temperature superconductor (2G HTS) wire, which is the enabling component for many energy-efficient and power dense devices, each of which can benefit from unique wire specifications.

“SuperPower is now offering three unique varieties of 2G HTS wire, each for a distinct device type,” said Traute F. Lehner, senior director for marketing and government affairs at SuperPower, who will be in attendance at the Hannover Messe. “These application-specific conductor types include Cable Formulation (CF) wire for cable and similar applications; Advanced Pinning (AP) wire for in-magnetic-field applications such as motors, generators and other high-field magnetics; and Fault Current Limiter (FCL) wire that utilizes a highly resistive substrate suitable for these grid protection devices.

“The unique manufacturing techniques adopted by SuperPower allow for a number of ways to customize our wire for applications that benefit from differing chemistries and architectures,” Mrs. Lehner continued. “We are able to vary the chemical formulation of our superconductor material, as well as its thickness in order to impact the wire performance. The thickness of both our silver and copper stabilizers can be varied as well, depending on the needs of the end application.”

Variations in wire architectures offered by SuperPower include:

- Four wire widths: SuperPower 2G HTS wire is produced in a base 12 mm width that can, after the basic processing is completed, be slit into widths of 3 mm, 4 mm, and 6 mm.
- Two substrate thicknesses: the 50 micron substrate thickness is suited for most applications and contributes to the high current



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density that allows for devices that are considerably smaller and lighter than conventional devices. The 100 micron substrate is ideal for use in the fault current limiter due to the added mass of the highly resistive substrate material.

- Three distinct varieties of 2G HTS wire:
 - Cable Formulation (CF) wire with enhanced performance at around 77K and in very low field for cable and other similar applications
 - Advanced Pinning (AP) wire with superior performance at a range of temperatures from 77K to as low as 4K and in various magnetic fields
 - Fault Current Limiter (FCL) wire based on a thicker (100 micron), highly resistive Hastelloy® substrate, with the option to vary the thickness of the silver cap layer.
- Additional options: Wire insulation with polyimide wrapping available in both 0.025 and 0.050 mm thicknesses (including adhesive), as well as joining of wire segments to produce very long lengths of wire with low resistance and high quality joints and splices.

The superior current carrying capacity of HTS wire is clearly of interest to a wide range of technologies, including, in particular, the generation, transmission, distribution, transformation, and storage of energy. SuperPower, along with notable industry leaders, is currently working on two new development programs which have the potential to revolutionize the electric power grid:

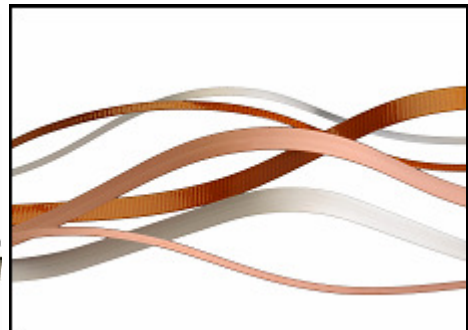
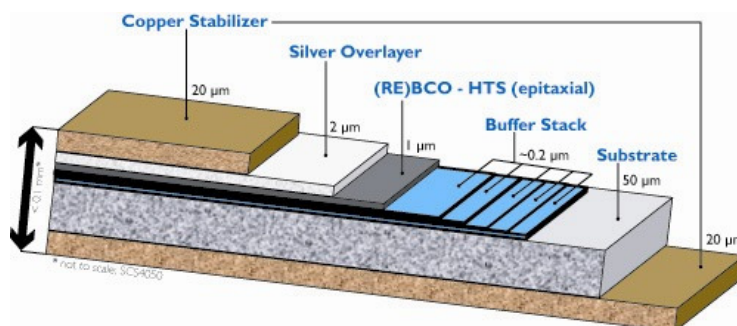
- SuperPower, in partnership with Waukesha Electric Systems, and Oak Ridge National Laboratory, and the Texas Center for Superconductivity at the University of Houston, is developing a superconducting fault current limiting transformer that will be smaller, lighter, quieter and safer than conventional transformers, with lower ac losses and a longer lifetime due to a reduction in the thermal aging process. It will be compatible with Smart Grid requirements by incorporating the FCL feature into the transformer to rapidly detect and limit surges at high power levels that can be handled by downstream equipment.
- SuperPower, with ABB, Brookhaven National Laboratory, and the Texas Center for Superconductivity at the University of Houston, is developing an advanced superconducting magnetic energy storage (SMES) device that can, within the magnetic field of an HTS coil, store and almost instantaneously discharge large quantities of power to and from the grid with a round trip efficiency of greater than 85 percent. Application of SMES into

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the grid will provide load levelling between renewable energy sources and the transmission and distribution network.

SuperPower is also pleased to announce its new "Quick Ship" program that offers a variety of 2G HTS wire types in short piece lengths (up to 40 meters) for delivery within one to two business days when purchased 'as is.' Quick-Ship is ideal for customers who would like to obtain small quantities of 2G HTS wire for evaluation, testing or practice work. A list of available inventory is provided to potential customers at the beginning of each month with the wire provided on a 'first-come, first-served' basis.

SuperPower Inc. of Schenectady, New York, was formed in 2000 to develop and commercialize 2G HTS wire for energy technology devices. In 2002 SuperPower produced its first one-meter length of 2G HTS wire, proving the manufacturing process that includes electropolishing of a metal substrate, deposition of a series of buffer layers, addition of a thin layer of rare earth-based superconductor material, and addition of silver and (optional) copper stabilizers. Since that time, SuperPower has scaled up its manufacturing process so that today production is completed in greater than kilometre-length "tape" segments with steadily increasing critical current.



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