HTS Roadmap for the Electric Power Sector 2015-2030

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***Abstract* – In a relatively short period of time, HTS wire has progressed from being produced in short lengths for lab study to being used in large scale electric grid application projects. In fact, superconducting cables installed around the world have more than 20 years of combined operational experience. The need for superconducting fault current limiters is being driven by rising system fault current levels as energy demand increases and more distributed generation and clean energy sources, such as wind and solar, are added to an already overburdened system. Other applications such as transformers, superconducting magnetic energy storage and wind turbine generators all hold promise for helping modernize the electric grid. However, challenges remain for these devices to be more widely adopted by electric utilities and other end users.**

A 2015-2030 roadmap document for HTS in the electric power sector was developed to paint a picture of where the industry is at present and what steps it should take to promote widespread adoption of superconducting based devices. It outlines research & development challenges and needs in the short, mid and long term that can be tracked using metrics. Several of these challenges include:

Economics. The cost associated with manufacturing HTS wire has to be further reduced by improving yields and increasing throughput of the manufacturing processes in order to make it only a few times more expensive than copper wire. However, it is not fair/reasonable to simply compare the cost of an HTS based device to a conventional one. Because of the unique attributes of HTS devices, a system cost analysis should be conducted.
Process control. There is a general lack of manufacturing knowledge in producing HTS wires with nanometer-sized precipitates or phases uniformly distributed over kilometer lengths.

Long term reliability. End users are generally unfamiliar with the materials used in HTS devices and cryogenic systems. Data are not available that proves undiminished product-performance HTS components life time over 30 to 40 years.

The document describes the present status and future perspectives for HTS technology including wire, and cryogenic systems, and advanced electric power applications. The document was developed by collecting information from a diverse group of stakeholders in

the superconductivity community from around the world. This information was collected through surveys, phone interviews and in-person meetings.

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***Keywords (Index Terms)* – High temperature superconductor, large scale electric grid application, economics, reliability, wire, cable, fault current limiter, transformer, energy storage, generator.**

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