Communique

International Superconductivity Industry Summit (ISIS)-20

Gonjiam Resort, Korea

October 2011

The 20th International Superconductivity Industrial Summit (ISIS-20) which had approximately 50 attendees from its member organizations from CCAS, CONECTUS, ISTEC, NZHTSIA, and KICS, focused discussions on how to establish renewable energy networks utilizing superconductivity technology in order to benefit the global economy. Technological advances made possible by superconductors will help to solve the critical energy-related problems such as the need for safe, clean and sustainable energy sources.

Devices utilizing superconductors will contribute to the world economy and global environment of the future, and are important green technologies which are needed for sustainable societal growth. Many countries share the growing need for sustained R&D and investment in this field, and recognize the importance of cooperation between governments, universities, research institutes and private companies for the integration of superconductor technology with electric power systems, magnet technology and high energy physics.

A great deal of effort to develop practical applications of superconductor technology has been expended and core technologies needed for the application of the superconducting electric devices in the grid are coming to fruition. These efforts have resulted in the continued support of the governments, *e.g.* USA, Japan, Korea, Germany and New Zealand, for the "Program for Grid Applications". All ISIS 20 attendees share the idea that sustained support and effort are needed to realize full commercialization worldwide.

The improvement in the performance of superconducting materials with various shapes and structures has hastened the development of superconducting power devices which can be utilized in the fields of energy, electronics, medicine, transportation and telecommunications. Successful development reports which show the possibilities of new emerging markets were reported at ISIS 20.

The participants shared the recognition that superconductivity technology can play critical roles in the field of renewable energy, e.g. wind power systems, and the possibilities of industrialization are ever increasing through the compaction of equipment with much higher efficiency. They also shared the idea that the introduction of superconducting power devices will help solve problems associated with increasing instability resulting from the increase of distributed power generation systems.

Advancement in the manufacturing technology of thin-film type high-temperature superconducting wire has been such that mass production is within sight. Many research prototypes have been developed, but work continues to solve technical problems related to high field application and the lowering of manufacturing cost, which will lead to a broader range of industrial applications and widespread industry acceptance of superconducting power devices.

The ISIS 20 summit provided reports and discussions on the status of government-sponsored superconductivity-related programs in the USA, Japan, Europe, New Zealand, Korea and Russia; the possible and detailed roles of superconducting power devices for renewable energy; future application plans in the smart grid; the status of superconducting wires and their application in electronic devices and high magnetic field; offshore wind power superconducting generators; case studies of applications in the grid and future road-map; the persistent current mode high-temperature superconductivity technology, etc.

Large-scale projects for the grid application of superconducting power devices are being carried out in Korea. It was reported that superconducting fault current limiters and cables were installed and activated successfully at the real grid in the *Icheon* substation, and superconducting cables will be tested in the transmission network on *Jeju Island*. Summit attendees visited the substation and heard presentations from Icheon officials.

In the United States of America, government funding for HTS wire R&D in the US Department of Energy (DOE), Office of Electricity (OE), has been discontinued for 2012. This has led to the elimination of HTS R&D programs at the Oak Ridge and Los Alamos National Laboratories. Product and applications development utilizing HTS wire however continues in other departments, e.g. the Department of Homeland Security and the

Department of Defense. Substantial work in electronics, using both LTS and HTS materials, is ongoing and a major program targeting very high speed digital computing has been initiated. The focus of superconductor development is moving from research to applications and product demonstration.

In Japan, M-PACC Project (Materials & Power Application of Coated Conductors Project) is energetically proceeding. The purpose of this project is to assess the prospects for practical applications of superconducting power equipments. In this project, technologies have been developed for three different equipments using yttrium-based superconducting coated conductors, including SMES, power cables, and power transformer. Higher performance coated conductors have been also developed in this project in order to improve the superconductive characteristics as well as to enhance the cost effectiveness for respective power equipments.

As for electronic devices, various kinds of SQUID applications are now being widely developed by ISTEC in collaboration with many universities and companies. They are developing, for example, mineral exploration system, various non-destructive evaluation systems, immunoassay system, and ultra-low-field NMR/MRI. These developments have become possible by using reliable HTS SQUID fabricated by ISTEC. LTS electronic device is also being developed in the NEDO project as well as in the JST project. In these projects, high-speed digital systems have been developed, such as a real time oscilloscope for high-speed measurement of optical communication signals and a reconfigurable data-path microprocessor for future high speed computers.

In Europe, a recent overview on activites and achievements was presented by the EUCAS (European Conference on Applied Superconductivity). This year as a centennial trifold conference . In Research there is considerable effort in the improvement of coated conductor technology, partly funded by the EU. The emphasis is on developing cost effective processes for these coated conductors for power applications and magnets.

In addition there are some projects concerning large scale applications like superconducting magnetic levitation, fault current limiters for medium voltage, Super-SMES, Power

Transmission Lines, enabling technologies for large rotating machinery (generators) and HTS applications for accelerators.

Over the last year New Zealand has continued to make significant progress in commercial activity based on high temperature superconductors, and in the development of the key technologies required by the international industry. HTS-110 Ltd has bought to the market a 200MHz (5T) cryogen free NMR system. It has continued to deliver increasingly high performance HTS magnets to scientific and industrial customers. It has also introduced to market a robust industrialised cryocooler, initially targeted at gas liquefaction market, but also designed to meet the needs of HTS power systems equipment. In a further milestone HTS-110 attracted investment from New Zealand listed Scott Technology Ltd that gives Scott majority ownership.
General Cable Superconductors Ltd continues to commercially manufacturer and supply HTS Roebel cable to developers for use in generators, transformers and magnets. This cable meets the industry's need for a cable that can conveniently carry very high currents (>1000 amps) and manage AC losses. Among other customers this year cable has been supplied to an Industrial Research Ltd led 1MVA transformer project. The transformer will be online in a substation in 2013.

In Russia, intensive R&D was conducted on LTS materials, beginning in the 1960s, as it was recognized that superconductivity could be the key to meet future energy needs and a major contribution to high energy physics. This initial R&D led to established large scale manufacturing capability for LTS wire. With the more recent focus on HTS, Russian government supported programs are developing HTS wire for energy applications in cable and other grid related equipment while recognizing the opportunity for such materials in medical equipment, transportation, communications, and electronics. The Government has established several projects and organizations to effectively focus these HTS programs.

The location for ISIS-21 will be Portland, Oregon, USA, preceding the 2012 Applied Superconductivity Conference.

It is difficult for this short communique to include details of all the reports and discussions of ISIS-20. For more information, please contact the respective organizations.

CCAS
Coalition for the Commercial Application of Superconductors
http://www.ccas-web.org/

Conectus
Consortium of European Companies determined to use superconductivity
http://www.conectus.org

ISTEC
International Superconductivity Technology Center
http://www.istec.or.jp/index-E.html

NZHTSIA
New Zealand High Temperature Superconductor Industry Association
http://www.hts.org.nz

KICS
Korea Industries Confederation for commercialization of Superconductivity
http://www.super-kics.or.kr