

# HIGH TEMPERATURE SUPERCONDUCTIVITY NEWS

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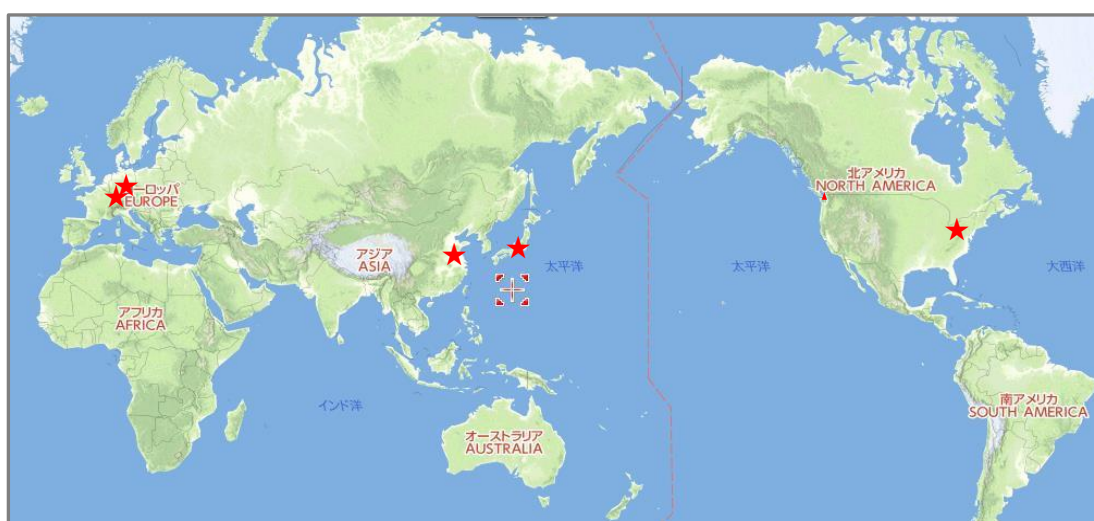
### THE INTERNATIONAL ENERGY AGENCY'S (IEA)

#### TECHNOLOGY COLLABORATIVE PROGRAM (TCP) ON HTS<sup>1</sup>

**FALL 2017**

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<sup>1</sup> Developed by Yutaka Yamada and Brian Marchionini, Operating Agents for the IEA HTS TCP

## IEA-HTS Executive Committee Meeting at Kawasaki, Japan

The first IEA-HTS Executive Committee (ExCo) meeting of fiscal year 2017 was held in Kawasaki, Japan from 4–5 July 2017. Attendees, including ExCo representatives from Italy, Switzerland, the United States, and Japan and several Japanese superconductivity companies and institutes, joined the meeting and presented on HTS wire to applications activities.

The meeting began with updates on HTS activity from representatives from China, Germany, Italy, Japan, Korea, Switzerland, and the United States. Several groups in Japan then introduced their recent work, including a Japanese national HTS project by the New Energy and Industrial Technology Development Organization (NEDO), an HTS MRI using YBCO wire by Mitsubishi electric company, a railway HTS cable system by Railway Technical Research Institute (RTRI), an HTS power cable by Tokyo Electric Power Company (TEPCO) and Sumitomo Electric Co., Ltd. (SEI), and refrigerators for a cable system by Taiyo Nissan and Mayekawa Corporations.



Figure1. Exco Meeting at Kawasaki, Presentation of HTS cable by Jean-Maxime Saugrain (Nexans)

The meeting also included a discussion on HTS cable systems, “What do we need for HTS cable commercialization?” Attendees, including Jean-Maxime Saugrain from Nexans (Fig. 1) discussed and exchanged opinions about the future issues to advance HTS to industrialization. Members from the Tokyo embassy joined the session, indicating concern about the main goal of HTS applications, high technology for future energy.

On the last day, the delegates visited the RIKEN NMR facility in Yokohama. This facility is developing an HTS

NMR magnet over 1 GHz while operating a normal NMR systems for the study of biological chemistry, physiology and medicine.

## European Conference on Applied Superconductivity 2017

The European Conference on Applied Superconductivity (EUCAS) 2017 was held 17-24 September 2017 at the International Conference Centre of Geneva (CICG), hosted by CERN in collaboration with the University of Geneva and EPFL-SPC. More than 1130 participants from around the world attended the meeting, including 17 plenary talk presenters and special guests, 177 oral presentations, and more than 800 poster presentations.

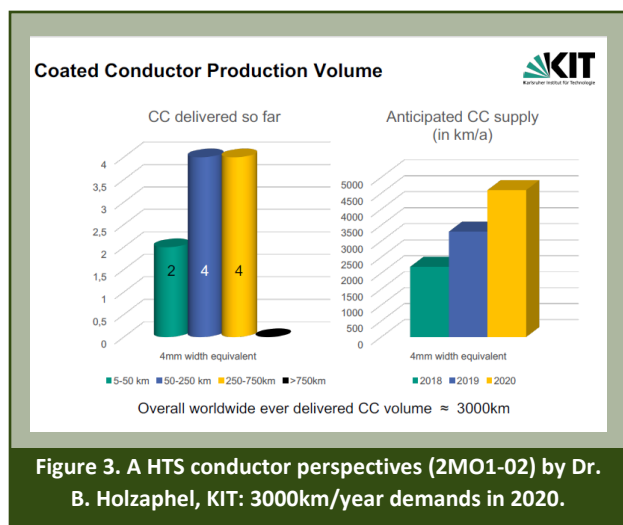


Figure 2. Speakers at the opening ceremony at EUCAS 2017 thanked industry sponsors.

The following sessions were of interest from the IEA-HTS TCP perspective:

1. Progress in HTS Conductor Industry (Sept. 19 Tue, 13:30-15:30)
2. Industry Session (Sept 19 Tue 15:50-18:00)
3. Lessons learned (Sept. 18 Mon 15:50-18:00)

In the “Progress in HTS Conductor Industry” session, HTS wire companies presented an update of their products. As demonstrated in the session, many companies are now constantly producing a large amount of HTS conductors, including YBCO wire and other conductor. This is a key for HTS applications such as electric power devices, NMR, MRI, high energy physics accelerators, and fusion devices. According to Bernhard Holzapfel, coated conductor supply will soon reach 3000km/year soon (Fig. 3).



**Figure 3. A HTS conductor perspectives (2MO1-02) by Dr. B. Holzaphel, KIT: 3000km/year demands in 2020.**

In the “Industry Session”, some of the superconducting company CEOs introduced the effort to industrialize the superconducting technologies such as NMR. Leaders of major projects presented on R&D accidents and how to recover from them during the “Lessons Learned” session. Throughout the conference, researchers presented on HTS applications and demonstrations, and the lessons presented in this session were meant to provide guidance to these researchers in managing R&D projects.

### IEA-HTS Executive Committee Meeting in Geneva

The second IEA-HTS Executive Committee (ExCo) meeting of the fiscal year 2017 was held alongside EUCAS in Geneva on 20 September 2017. Participants from Germany, Italy, Japan, Switzerland, and the United States attended the meeting, and were joined by observers from CERN, France, and Switzerland. The TCP’s desk officer from the IEA, Luis Munuera, also joined the meeting to present on key findings from IEA’s recent publications and answered questions from TCP members. Representatives provided updates on technical meetings attended in the previous year and discussed current and proposed ExCo activities and member engagement.

## European Cryogenics Day 2017 and the Second International Workshop on Cooling Systems for High-temperature Superconductor Applications

The European Cryogenics Day 2017 and the Second International Workshop on Cooling Systems for High-temperature Superconductor Applications took place in Karlsruhe Germany on September 13-15 on the KIT campus. The events were attended by 132 participants from organizations in 19 countries.

The European Cryogenics Day featured topics on Cryogenics in Astrophysics, Cryogenics in Particle Physics and Computing, and Cryogenics in Transportation, Air Separation and Power Applications. Two presentations by two IEA HTS Executive Committee members were delivered: Hiroyuki Ohsaki (University of Tokyo, Japan) presented a review and update on MAGLEV and Mathias Noe (KIT, Germany) presented on cooling requirements for superconducting power cables.

The International Conference on Cooling Systems for HTS applications covered topics such as power applications, novel machinery, and small scale applications. The conference also has a poster session covering novel activities in cryogenics. KIT also coordinated a technical excursion to the Karlsruhe Tritium Neutrino Experiment - KATRIN. More information about the poster session conference can be found at <https://www.ecd-iwchts2017.kit.edu/56.php>.

## Chinese Applied Superconductivity Conference at Tianjin University



Figure 4. Participants at the 2017 Chinese Applied Superconductivity Conference at Tianjin University.

The Chinese superconductivity conference was held in Tianjin University, Tianjin, China from 20-24 August 2017. This conference is held biennially and covers HTS wires to electric applications, similar to ASC and EUCAS. There were 620 attendees (Fig. 4) with 12 plenary talk presentations, 144 oral presentations, and 212 poster presentations. There were 14 companies in the technology exhibition including the Futong Group, Western Superconducting Technologies Co. Ltd., Sumitomo Electric Industries Ltd., and Shanghai Superconductor Technology Co. Ltd.

China has invested around USD100 million in HTS over a 5-year period. The following items were highlighted at this conference:

1. HTS wire, especially YBCO: There are now 3 companies working in this area in Shanghai district.
2. Superconducting Fault Current Limiters: There are several projects in high voltage FCL using YBCO and Bi wire.
3. Cables: Futong Group, which mainly works in optical fiber, is now testing HTS power cable (100m, 33kV-1kA) in their Tianjin factory branch.

A small meeting for HTS cable was held during the conference, attended by participants from wire, refrigerator companies, and an electric power company.

## STI-DOE Project focused on Next Generation Electric Machine

Superconductor Technologies Inc. (STI) is developing a project on next generation electric machines using HTS wire on at EUCAS on 19 September 2017.<sup>2</sup> The project received \$4 million in funding from U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) on behalf of the Advanced Manufacturing Office (AMO) in June 2017.

***“These technology R&D projects aim to significantly improve industrial motors for manufacturing, helping companies who use these motors in manufacturing save energy and money over the long run.”***

***-- Mark Johnson, director of the EERE Advanced Manufacturing Office***

The main purpose of the “Next Generation Electric Machines (NGEM)” program is to improve the superconductive wire manufacturing process at high enough temperatures to improve performance and yield while simultaneously reducing cost. Specifically, the objective is to develop wire with 1440A/cm-width at 65K in 1.5T magnetic field, and improved cost performance. MIT's Plasma Science and Fusion Center Assistant Director Joseph V. Minervini stated, “STI's goal of high performance at low cost can be a game changer for a wide range of applications, not only at temperatures near liquid nitrogen, but also at lower temperatures.”<sup>2</sup>

<sup>2</sup> “DOE Awards \$4.5 Million to Superconductor Technology Inc. and Partners to Improve HTS Wire for Next Generation Machines” AUSTIN, Texas, Nov. 29, 2016 (GLOBE NEWSWIRE) <https://globenewswire.com/news-release/2016/11/29/893610/0/en/DOE-Awards-4-5-Million-to-Superconductor-Technology-Inc-and-Partners-to-Improve-HTS-Wire-for-Next-Generation-Machines.html>