**IEA Technology Collaboration Program on High Temperature Superconductivity**

**(HTS TCP)**

***Draft* Minutes from the**

**Executive Committee Meeting held on 25-27 May, 2016**

**Munich (Aying) Germany**

**ExCo Participants:**

Germany: Tabea Arndt

Mathias Noe

Italy: Luciano Martini

Japan: Susumu Kinoshita

Hiroyuki Ohsaki

Yutaka Yamada (Operating Agent)

Korea: Sidole Hwang

Seong-Woo Yim

Switzerland: Bertrand Dutoit

United States: Brian Marchionini (Operating Agent)

**Topic 1: Opening remarks**

* Tabea Arndt welcomed the group to Aying, Germany and gave an overview of the meeting’s main events.

**Topic 2: Welcome and Apologies for Absence, Agenda approval**

* Luciano welcomed the participants to the meeting and expressed regrets from Klaus Schlenga, Debbie Haught, Guy Deutscher, and Giuliano Angeli
* The agenda was approved.

**Topic 3: Approval of the last ExCo meeting minutes**

* The meeting minutes were approved.

**Topic 4:** **Update from ExCo members about HTS projects/activities**

Germany Updates, Mathias Noe

* Bruker
  + Two production lines in Alzenau
    - Pilot-line for 4mm wide HTS tapes with the capability to process a single piece tape length of 600m – in operation
    - Pilot-line for 12mm wide HTS tapes with the capability to process a single piece tape length of 100m – ramp up in progress
  + Successful relocation of the BHTS operation in Q3 2015
* Deutsche Nanoschicht
  + Expanded pilot line is capable of >200km of HTS wire
* AmpaCity
  + Agreement for extension of field test in Essen for several years
* Flywheel, Babcock Noell
  + Application is for the power quality market; the need is steadily increasing at customer side
  + A small modular device is set to be commissioned in 2016
  + 5-10kWh; 15,000 rpms
  + There is not much HTS material in the flywheel
* 3S HTS line
  + Development of a single phase HTS‐line for a 20 kA DC and a length of 25m
  + Not an “HTS Cable”
* Electric Aircraft Project, Siemens and Airbus
  + High power transmission cable – up to 10MW; voltage level >1kV
* Transformer, KIT and ABB
  + 1 MVA, 20 kV Fault Current Limiting Transformer ready to test in June 2016
* FCL, Siemens and KIT
  + To develop and test a single phase 10 kV, 600 A current limiting coil
  + Project Duration: July 2014-June 2017
* SupraPower
  + Aims to develop a new concept of innovative, lightweight, robust and reliable wind turbine for offshore applications using superconducting technologies
* EcoSwing
  + Retrofitting an existing wind turbine generator with a full scale HTS generator
  + Consortium of 9 institutions
  + 2015-2019 period of performance; 14M Euro project

Siemens Updates, Tabea Arndt

* DIAMANT
  + Cost effective Magnesium diboride conductor for wind turbine generator applications
* ASSiST
  + Stadtwerke Augsburg could have installed a second branch to the facility, but instead installed a SFCL
  + Energized Mid-March 2016 and field test goes through 2017
  + Cryostat is closed; cold head on top
* NeToVe
  + Project is analyzing existing grids to optimize for next generation grids
  + Looking at more efficient use of grid using advanced devices such as FCLs
* Magnet Technology (internal project)
  + 2G HTS, cryogen free, conduction cooled
  + 1.4 T; HTS more homogeneous magnet field than LTS
  + Will allow strong magnetic fields using traditional electrical plug. Could be used in MRIs; airport security
* E-Aircraft
  + Airbus and Siemens signed agreement in the field of hybrid electric propulsion systems (See Mathias’ update above)

Korea Updates, Sidole Hwang

* 22.9 kV cable, 50 MVA, 410 meters, Ichon Substation
  + At second stage of this project with LS cable; 6/2014- 5/2017
  + $4M budget
  + Open loop system need 3 tons/day; now trying to see if they can manage in closed cycle
* 80 kV DC cable
  + Project complete
* 154 kV, 2.25 kA, 600 MVA; 1km YBCO cable
  + 1 former in 1 cryostat
  + 2 splices in the cable
  + 12 kW total system loss for length of cable
* “Commercial” project
  + 22.9kv; Southwest of Seoul; 1km cable
  + Connect two substations (154 kV/22.9 kV)
  + Bidding is in process for the cooling system
  + LS cable deciding the wire supplier
  + Planned installation in 2017
  + CEO decided strategically to install a new technology

Japan Updates, Part 1, Yutaka Yamada

* ISTEC is closing and AIST will take over management functions
  + AIST National Institute of Advanced Industrial Science and Technology (Tsukuba). AIST is a national institute under METI.
  + AIST announced a new consortium for superconductivity named ASCOT <http://www.aist.go.jp/aist_j/news/pr20160526.html> (in Japanese, but you can see member companies and institutes)
* ISS
  + Date: Dec. 13 to 15, 2016 (held by AIST).
  + Site: Tokyo International Forum (Center of Tokyo, 1min near JR Yuraku-cho Station).
  + Will continue to have an international focus; may not be able to host the “young generation” award this year.
  + <http://www.istec.or.jp/index-E.html>

Japanese Updates, Part 2, Susumu Kinoshita

* New NEDO project
  + 2016 – 2020; $68M EURO; $12.5M in year 1
  + Two main parts to the project
    - 1) Power transmission cable for a cable and railway
      * NEDO supporting HTS cable with 50%
      * Cable project is 10% of overall $68M budget (rest of projects are 30%)
    - 2) High Magnetic field system development

Werner Prusseit, Theva

* Two German companies on verge of commercialization of coated conductors
  + Theva and Deutsche Nanoschicht
* Theva achieved average 800 A/mm2 (@77K sf) (from 600-1200); 200x copper
* Raw materials are inexpensive <5EU/kAm; no rare materials; main cost is in production
* Scaling up phase is still needed (still in pilot phase)
* RABiTS drawback is that you cannot use all alloys/materials
* IBAD – orientation in first layer on top of substrate
* Focus is reducing cost; not increasing performance
* D-Nano planned capacity = 200km/year
* Achieved yield goal of 70%; bad wire goes to trash or used as samples
* The thicker you grow, the less you gain
* Supplying conductor and EcoSwing generator coils
  + First big coils have been made and undergoing testing
  + By end of year Theva will deliver all coils
* Key issues for development
  + - Process stability and reproducibility
    - Scalability, volume, speed
    - Procurement, alternative suppliers
  + Anticipates there will be a large drop in cost over the short term because of several new suppliers on the market
  + Medium voltage cable planned by RWE to retrofit cable in Essen, 2.5 km, 2017-2020

United States, Brian Marchionini

* Army Research Laboratory
  + Working with University of Houston on 24 and 48 filament coated conductors
  + New QA tool being established for multifilamentary REBCO tapes
  + Army is the transition partner of ARPA-E SMES program and currently working on trouble shooting and necessary repairing of the related hardware.
* IEEE Guide for FCL Testing of FCLs Rated above 1000 V AC
  + Recently published
  + More info: Frank Lambert, frank.lambert@neetrac.gatech.edu
* Resilient Electric Grid
  + Eversource and PEPCO have publically announced that they have/are investigating REG systems on their grid
  + New information will be released publically at the IEEE PES general meeting in July in Boston, Massachusetts
  + EPRI is carrying out an independent and impartial assessment of HTS cables for the US Department of Homeland Security, including a commercialization and marketing assessment.
* Advanced Superconductor Manufacturing Institute
  + Building a detailed roadmap to address manufacturing challenges to commercialize products developed by original equipment manufacturers
  + Extensive public private network engaged in the institute
  + http://superasmi.com

Switzerland, Bertrand Dutiot

* A 60 kA HTS cable was designed and manufactured at the Swiss Plasma Center
* University of Geneva is working on the fundamental understanding and control of the electronic properties of new materials
* EPF Lausanne – is investigating distributed sensing techniques based on fiber optic technology and their applicability to ITER for leak localization
* Summer School is June 20-24 – http://appliedsc.epfl.ch/school

Italy, Luciano Martini

* FCL project
  + Successfully installed 3.4 MVA device, but it was removed from the site. Will be replaced with 15.6 MVA device protecting 5 feeders (old device was protecting 1 feeder)
  + Previously focused on 1G device. You need 600m of 1G wire and only 100m of 2G wire; however, 2G is not as stabilized as 1G; soldering more challenging—particularly with FCL
  + Tested each phase of the new device
* SMES
  + Recently granted 2.7M Euros for a 3 year project; still negotiating contract, should start beginning of September
  + Planning to use MgB2, but the amount is not very much; focus of the project is on making the device reliable
  + 50 kW used on customer side for power quality
  + 20 K cryocooler

**Topic 5: Summary of recent OA Activities**

* **Roadmap** is completed and posted on the website
* **Annual Report** was drafted and just need signature from Luciano
* A revised **Website** was drafted with several wireframes; additional text has been developed and will be sent out for review. ExCo members will have two weeks to review so that the site can be completed by the end of June
* **World Projects at a Glance** was updated a new interactive map feature was demonstrated using Google Fusion Tables. The new map will initially be used only for ExCo members
* AmpaCity **“Casebook”** was completed in cooperation with ISGAN Annex 6 on the Ampacity project. Will be available at [www.iea-isgan.org](http://www.iea-isgan.org) with a link on the HTS TCP site.
* **ASC Special session** was discussed**.** We want to limit the presentation time to have more for interactive discussion.

**Topic 6: OA Contract**

* OA contract for Energetics was approved and signed
* Contract for Yamada was approved and will be signed later

**Topic 7: Strategy Session**

* A strategy session was held to cover four main discussion points. 1) Feedback from IEA during our request for extension presentation, 2) Discussion of the value brought to ExCo members, 3) Discussion of how the ExCo is unique and 4) New member engagement strategy. A summary of each is below.
* **Feedback from IEA during September 2015 meeting in Paris**
  + Discussion covered several topics that were brought up by Carrie Pottinger and other IEA staff during our request for extension presentation. To be responsive to IEA we discussed the following four main points listed in quotes below. Our discussion is summarized immediately afterwards.
    1. “Consider expanding the scope of the [TCP] to include technologies beyond the electric power sector”
       - We can expand to large scale energy applications. Should broaden to include Transportation; electric vehicles in particular
         * Nordic region is having issues charging cars (HTS could help)
       - Magnetic separation (linked to generation, high efficiency)
       - The application areas we cover should still be covered in the IEA mission (medical applications may not fall into scope)
       - We should monitor what is going on in neighboring fields
    2. “Engage other [TCPs]”
       - Our ExCo is already coordinating with ISGAN
       - Luciano will contact Luis Munuera and ask for advice on reaching out to other TCPs. He will cc OAs. TCPs identified include:
         * Energy Storage
         * DSM
         * Hybrid and Electric Vehicle
         * Wind
         * 4E (conducts work on motors)
    3. “Consider shortening or modifying our [TCP] name to more accurately reflect what it does”
       - HTS TCP name is ok
    4. “There should be more emphasis on cost and expand on the barriers to technology deployment”
       - Cost information is a difficult exercise
       - Roadmap is giving information on the wire
       - Application cost is more tricky
       - Cannot be compared 1:1 to conventional technologies. Because there is a value add. Not easy to say how much cable is per meter
* **What is the value that the TCP brings to its members?**
* Luciano
  + Added value is coming to a meeting to get important information on projects
  + Funding agency will ask for a document to justify HTS. HTS TCP reports are from an unbiased source and help to justify R&D and which technology are important for Italy to invest in.
* Yamada
  + Senior level company staff are busy and don’t have time to research everything; our ExCo can help synthesize information and explain what other institutions are doing
* Kinoshita
  + Keep up to date of important technical projects
* Sidole
  + Info gathered from this meeting is helpful to help direct future research decisions
  + If you know what the worldwide trends are then you can plan for the future with less risk
* Bertrand
  + Especially helpful for staying up to date on projects around the world
* Ohsaki
  + Get information on HTS and strategy and background on projects; to consider new projects
* Mathias
  + Being part of international groups and staying up to date with projects is helpful to management
* Tabea
  + Very open atmosphere; more so than a conference/event
  + Is helpful to be able to articulate to others about value of technology
* **How are we unique?**
* We share information more than other groups; promote additional sharing
* Co-operated work (roadmap)
* The type of information that you get is value added
* Part of IEA! Official mandate to do this. Top down order. Others may be bottom up.
* Italy has a meeting of all the TCPs; have a coordinated way of working; broader collaboration
* **New member Engagement Strategy**

|  |  |  |  |
| --- | --- | --- | --- |
| Potential Member | Country/ Organization | ExCo Member to follow-up | Notes |
| Pascal Tixador | France | Luciano/Mathias |  |
| Jean Maxime | Nexans | Luciano |  |
| Vitalo Visotsky | Russia | Luciano | Russian organization verbally declined in past |
| Amalia Ballarino/ Lucio Rossi | CERN | Luciano/Bertrand will invite to next ExCo |  |
| Knut Samdal | Norway | Luciano | Luciano has relationship with SINTEF; Norway is former ExCo |
| David Cartwell | UK | Mathias |  |
| Richard Taylor | Australia | Mathias | Will contact at next ASC mtg |
| Bob Buckley? | New Zealand | Tabea? | May be difficult to join now |
| Ali Gencer | Turkey | Luciano | University representative |
| Alexander Polasek | Brazil | Luciano and Mathias | a utility is active in superconductivity |
| Dag Willen | Denmark/nkt cables | Mathias |  |
| Xavier Obradors | Spain | Luciano | has connection to SupraPower |
| Xiao; | China/ Innopower | Luciano | not OECD country |
|  | ENTSO-E | Luciano |  |
| Rob Ross | Netherlands | Mathias | Tennet project |
| Michael Becker | Deutsch-Nano | Mathias |  |
|  |  | Each member from their country will ID | Cryogenic organizations |
| ? | Utilities/end users |  |  |

**Topic 8: OA Activities**

|  |  |  |
| --- | --- | --- |
| **Potential 2016/2017 Activities** | **Due Date** | **Priority** |
| Website update (maintenance; inc. link to IEA site) | June ‘16 | 1 |
| Host/co-host workshops to gain visibility and share info\*   * TCPs, CIGRE, ISIS, CONECTUS, cryogen society | Spring ’17 | 2 |
| ASC Special Session coordination | June ‘16 | 1 |
| ExCo meeting organization/coordination | Nov/Dec ‘16 | 2 |
| Collect info for roadmap update/release in Q3 | ‘16/ late ‘17 | 2 |
| White papers directed at utilities - Input to framework (potential topics)/draft document | Aug ’16/end of ’16 | 1.5 |
| 1-2 page policy document for IEA   * HTS role in low carbon society | July ’16 | 1 |
| Analysis of HTS vs conventional equipment (cable 1st) -TOC/final report | June/end of ’16 | 1.5 |
| HTS News posted 4x/year on website | ‘16/’17 | 1 |
| New member outreach – first contact material | June ‘16 | 1 |
| Annual Report | Jan ‘17 | 2 |
| Status of US/Japan HTS activities | Jan ‘17 ExCo | 2 |

**Topic 9: Financial Report**

* Luciano delivered the financial report
* NEDO will pay the same amount at Germany and the US
* A membership task force will be established to review the fee structure and discuss again at ASC. We need to have a clear structure for approaching new members.

**Topic 10: Action items**

|  |  |  |
| --- | --- | --- |
| **Action** | **Due Date** | **Responsible Party** |
| Determine if we can disseminate HTS TCP materials for the ASC special session (i.e. Roadmap, Annual Report) | 4 June, 2016 | Brian will contact Sue Butler |
| Provide additional guidance to presenters at ASC special session | 10 June | Brian |
| Summary from ASC special session | 2 weeks after ASC | OAs/ExCo review |
| Recommendations/open challenges by region (IEA wants advise on potential funding opportunities) | ASC | ExCo members provide wish list for Govt funding |
| Finalize Annual report (minor changes from Yamada + need Luciano signature) | Today! | Brian |
| Update HTS TCP links on IEA Website. Inquire about making TCP links easier to find (Brian will contact Diana/Luis) | 4 June, 2016 | Brian |
| Send draft website material for ExCo review (give 2 weeks for ExCo review) | 10 June, 2016 | ExCo |
| Draft website | 30 June | Brian |
| Inquire about ExCo next meeting (Paris or Milano); coordinate meeting/workshop with TCPs | 30 Jan - 1 Feb | Luciano |
| Modify world projects at a glance spreadsheet (map/data only available to ExCo members; Static map on website to show it’s available) | 30 June | OAs |
| (Also see list of OA duties for 2016) |  |  |
| Disseminate ExCo meeting notes | 3 June 2016 | Brian |
| Initial contact with potential new members and sponsors (email from ExCo member to targeted person; Brian will compile info for the email) | 17 June 2016 | ExCo |
| Convene task force to evaluate member fees |  | Luciano, Debbie, Ohsaki, Sidole, OAs |
| Get photo of ExCo | Today! |  |
| Plan for meeting at ASC (Wednesday afternoon) |  | Brian contact ASC conference services |

**Topic 11: Next ExCo meeting**

* During ASC in September we will have a short meeting on Wednesday, 7 September from 4-6pm. An informal dinner will follow. This is contingent on finding meeting space during this time.
* The following ExCo meeting will be Jan 30 – Feb 1 in Milan or Paris.
* Could invite other TCPs to come to our ExCo meetings to present on a topic that has a potential superconductivity application

**Topic 12: Technical visit to Augsburg FCL**

* Pictures will be posted on the members only section of the website

**Topic 13: End of ExCo Meeting**

* Meeting was adjourned