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Umwelt, Verkehr, Energie und Kommunikation UVEK

Bundesamt für Energie BFE

Jahresbericht 15.11.2014

IEA Implementing Agreement: “Assessing the Impact of High Temperature Superconductivity in the Electric Power Sector” (ExCo Member)

Auftraggeber:

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Forschungsprogramm Elektrizitätstechnologien & -anwendungen
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BFE-Vertragsnummer: SI/500193-01

Projektziele

Die Projektziele beinhalten eine umfassende Information über die neuesten Fortschritte und Anwendungen auf dem Gebiet der Hoch-T_c-Supraleitung (HTSL) im Energiebereich. Dazu zählen vor allem supraleitende Strombegrenzer, Kabel, Motoren und Schwungräder, weiter Generatoren und Transformatoren, sowie magnetische Energiespeicher (SMES). Der Zugang zu dieser Dokumentation wird durch die Teilnahme der Schweiz an einem Programm sichergestellt, das unter der Leitung der International Energy Agency (IEA) steht: "Implementing Agreement for a Cooperative Programme for Assessing the Impact of High Temperature Superconductivity on the Electric Power Sector". Die Projektziele umfassen den Informationsaustausch über die bisher erreichten Fortschritte, über den gegenwärtigen technischen Stand und den zukünftig vorgesehenen Projekten.

Das IEA-Implementing Agreement „HTS-Supraleiter“ umfasst 11 Partner, mit 3 industriellen Partnern. Ein besonderer Schwerpunkt dieser umfassenden Orientierung im IEA-Agreement ist das periodische Erscheinen von detaillierten, technisch hochstehenden Berichten, die ausser der Durchführbarkeit von neuen supraleitenden Lösungen auch Aspekte wie Umwelt und Sicherheit, aber auch die Durchdringung des Marktes durch HTSL-Produkte untersucht. Zusätzlich wird die Anwendbarkeit der hier entwickelten Konzepte auf den Schweizer Markt untersucht.

Zusammenfassung

Das Hauptinteresse dieses Projektes ist auf die Entwicklungen auf dem Energiesektor gerichtet, besonders der Einsatz von Hoch-T_c-Supraleitern im Hinblick auf industriellen Anwendungen; Strombegrenzer, Hochstrom-Kabel, Schwungräder und Windkraftgeneratoren, unter Berücksichtigung der anfallenden Kühlprobleme. Die industrielle Entwicklung von Supraleitermaterialien (High-T_c und MgB_2) mit hohen Stromdichten und niedrigen Wechselstromverlusten wird besonders aufmerksam verfolgt.

Nachdem unser Operating Agent, Dr. Alan Wolsky, sein Pensionsalter erreicht hat, wurden 2014 die Nachfolge bestimmt: ein Duo, bestehend aus Brian Marchionini (USA) und (ISTC, Japan) wurde als ideale Kombination gewählt, um besseren Einblick in die Tätigkeiten dieser zwei für die Supraleitung wichtigsten Länder zu gewinnen.

Die Stromdichten für industrielle Längen von Bändern haben im 2013 bei allen Herstellern die 500 A für eine Standardbreite von 10 mm erreicht oder überschritten. Das Ziel bleibt nach wie vor die 1000 A/cm - Marke für Längen > 1 km, um die Porduktionskosten deutlich zu senken. Der Zusatz von $BaZrO_3$ im Nanometer-Massstab hat zu einer deutlichen Steigerung von J_c geführt. Verschiedene Band-Architekturen wurden für diverse Anwendungen entwickelt.

Eine weitere Absenkung des Herstellungspreises wurde 2014 erzielt. Der Herstellungspreis liegt aber immer noch deutlich über demjenigen von Bi-2223-Bändern, die beim Bau des 1 km-Kabels in Essen (D) verwendet wurden. Dieses Kabel wurde erfolgreich getestet und befindet sich nun im industriellen Einsatz. Als Highlight für supraleitende Anwendungen kann der 154 kV Strombegrenzer in Korea gelten. Grössere Projekte für Studien im Hinblick auf 10 MW Windkraftgeneratoren wurden in den USA bewilligt.

Trotz der niedrigeren Operationstemperatur findet der Einsatz von MgB_2-Drähten ein steigendes Interesse, wegen der um den Faktor 10 niedrigeren Herstellungskosten. Neue Herstellungsmethoden haben zu wesentlich höheren Stromdichten geführt, die neue Möglichkeiten erschliessen. Das 20 kA-Kabel für das „LINK“– Projekt am CERN (über 1‘000 km Draht) wurde erfolgreich getestet: Die Ergebnisse bei 24K eröffnen die Möglichkeit, MgB_2-Kabel mittels flüssigem Wasserstoff bei einer Betriebstemperatur von 20K zu kühlen. Der Einsatz von MgB_2 - Drähten bei Windgeneratoren wird gegenwärtig erwogen; Konzeptstudien in Europa und den USA zeigen die Notwendigkeit auf, die AC-Verluste in MgB_2 - Drähten weiter zu senken.

Durchgeführte Arbeiten und erreichte Ergebnisse

ExCo meetings in 2014

Dieses Jahr fanden 3 ExCo - Meetings statt:

1: 20 February 2014: IEA ExCo - Treffen; Energetics Offices, Washington, D.C.
2: 18-20 June, 2014: IEA ExCo - Treffen; RSE, 20134 Milano (Italy)
3: 3-5 December 2014: IEA ExCo - Treffen; Jeju (Korea)

Dazu findet am 26.11. während der ISS in Tokyo eine besondere Sitzung statt, mit einem Wettbewerb für junge Wissenschaftler, mit dem Ziel, sie für die angewandte Supraleitung zu motivieren.

Erstes IEA ExCo - Treffen; 20 February 2014

Energetics Inc. Offices, Washington, D.C.
Extraordinary ExCo meeting (choice of the new Operating Agent)

Dieses Meeting diente dazu, für die nächsten 2 Jahre (bis Ende 2015) die Nachfolge des aus Altersgründen zurückgetretenen Operating Agent, Alan Wolsky, zu regeln.
Es hatten sich 2 Kandidaten gemeldet, Dr. Brian Marchionini aus den USA und Tsutomu Watanabe aus Japan. Beide Kandidaten hatten ein Dossier eingeschickt, das schon vor der Sitzung an alle ExCo - Mitglieder verteilt wurde, die vorgängig dazu befragt wurden. Insgesamt 9 Mitgleder haben an der Wahl teilgenommen: 5 Anwesende (USA, Deutschland, Italien, Japan und die Schweiz). 4 Mitglieder (Finnland, Korea, Israel und Kanada) haben schriftlich abgestimmt.

Das wichtigste Ergebnis dieses Treffens war die Wahl der beiden Kandidaten als neue Operating Agents: **Brian Marchionini** aus den USA und **Tsutomu Watanabe** aus Japan. Entscheiden waren nicht nur die Fähigkeiten der beiden Kandidaten, sondern auch deren Zugehörigkeit zu Energetics (USA) und ISTEC (Japan). Die Wahlprozedur ist im Annex I detailliert beschrieben.
Das ExCo verspricht sich von dieser Wahl einen direkteren Zugang zu aktuellen Informationen und eine erhöhte Präsenz des IA “HTS superconductors“. Ein weiteres wichtiges Thema war die Reorganisation des Implementing Agreements. Alle Probleme wurden erörtert, von der Aufgabenstellung für die Operating Agents bis zur finanziellen Situation.

Eine neue Initiative betrifft das Interesse von jungen Forschern an der angewandten Supraleitung. Dazu wurde ein Wettbewerb organisiert: Ein bestehendes Projekt soll von jungen Mitarbeitern vorgestellt und erläutert werden. Dies wird als Neuerung an der International Superconducting Science Conference (ISS2014) in Tokyo in einer besonderen Sitzung stattfinden: am 26.11.2014 von 09h00 bis 11h00. 7 Projekte werden vorgestellt und anschliessend werden die besten 3 prämiiert. Die Details sowie die Abstracts zu den einzelnen Projekten sind im Annex II beschrieben.

Zweites IEA ExCo meeting,

RSE, Via Rubattino 54, 20134 Milano
18-20 June, 2014

Program:

1. Opening remarks (*Romano Ambrogi*, Head of Development and Planning, RSE)
2. Welcome, apologies for absence and Agenda approval (*Luciano Martini*)
3. Approval of the minutes of the last ExCo meeting in Washington d.c.

4. Operating Agents (OAs) Introduction:
   - Short presentation by *Brian Marchionini* (Energetics Inc., USA)
   - Short presentation by *Tsutomu Watanabe* (ISTEC, Japan)
5. Operating Agents (OAs) duties Update: main activities for FY2014 (FY2015), ongoing work, responsibility sharing, formal contract, website,
6. ExCo members' discussion on IA-HTS strategy, main priorities, approach and duties, interaction with IEA headquarter and other IAs
7. World Scientific Series on Applications of Superconductivity (Guy Deutscher)
8. ExCo members' oral contributions:
   - "Latest status of R&D efforts on HTS technologies in …
   - "Field testing results of the first Italian SFCL project" (Italy)
   - "Report on CIGRE WG D1.38 activity" (Germany)
9. Financial report: HTS-IA account status and collected fees (Mario Fanelli, RSE)
10. AOB (e.g., agreed Actions List, next steps)
11. Date and place of next ExCo meeting(s)
12. End of ExCo Meeting

Experimentelle Resultate und Fortschritte

a) HTS: Kabel und Strombegrenzer: Ampacity, Essen (D)
1 km lang, Bi-2223 (Prof. B. Holzapfel, KIT)

Kabel

Bilder zu diesem Kabel wurden schon im Jahresbericht 2013 gezeigt. Unterdessen wurde dieses Kabel erfolgreich getestet und ist im industriellen Betrieb.
Technische Daten: 10kV, 40 MVA
Projektbeginn: September 2011
Installation beendet: Ende 2013
Erste Tests: Januar – März 2014
Projektdauer: 4.5 Jahre

Ziele:

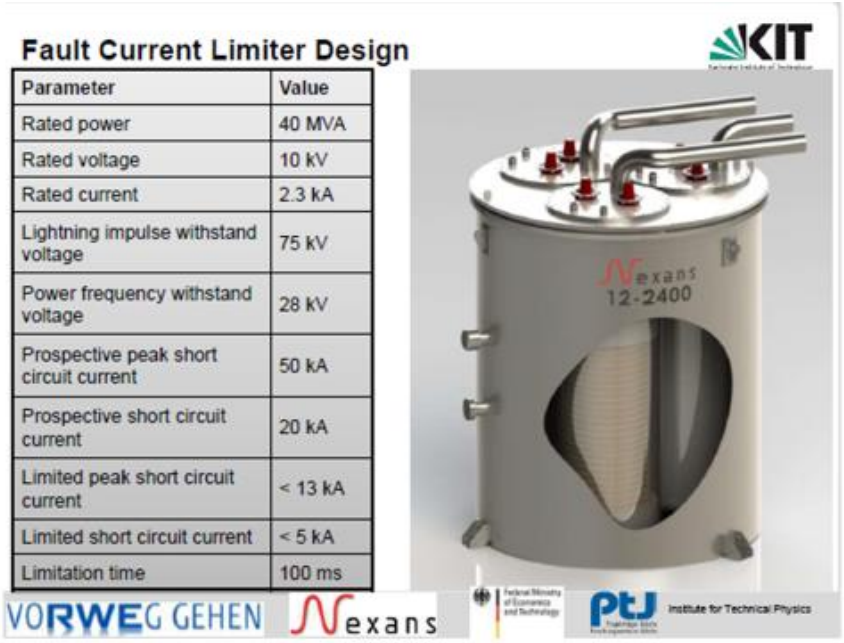
Technische Machbarkeit von HTS in elektrischen Netzen
Evaluierung von 10 kV HTA - Kabeln als Alternative zu konventionellen 110 kV – Systemen
Auswertung der Betriebsdaten während der Demonstrationsperiode

RWE:	Spezifikation des HTS – Systems
	Test des HTS- Systems zwischen 2 Substationen
Nexans:	Herstellung des HTS - Kabels + Kabeltest
	Herstellung des Strombegrenzers
KIT:	HTS Tests und Charakterisierung
	Messung der AC - Verluste, Modellisierung (FEM, 2D und 3D)

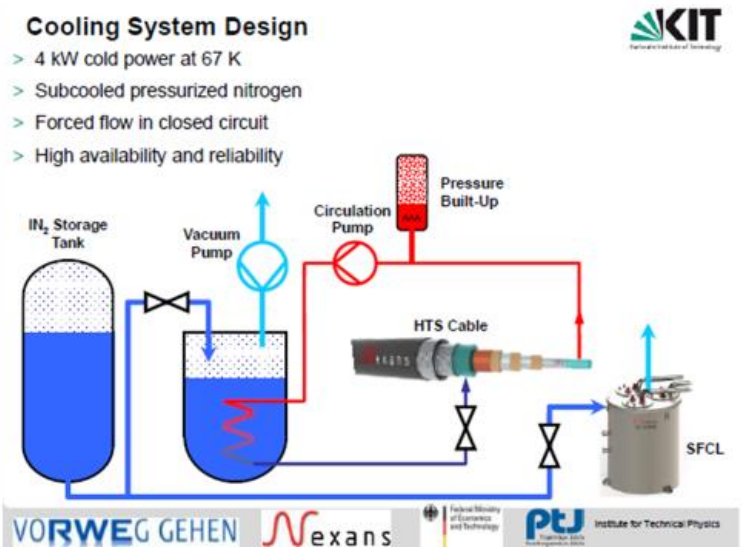
Alle Komponenten wurden fristerecht geliefert
Alle Tests sind erfolgreich verlaufen
Dauer der ganzen Kabel – Installation: 3 Monate
Regelmässige Tests werden seither durchgeführt.

Strombegrenzer: 10 kV, 40 MVA, 2.3 kA

Das Projekt umfasst sowohl ein Kabel wie einen Strombegrenzer.
Die Parameter des Strombegrenzers sind in der folgenden Figur angegeben.
Die Kühlleistung beträgt 4 kW



Das Kühlsystem



b) *Aktuelle HTS–Aktivitäten in den USA*

Debbie Haught, (Office of Electrical Delivery and Energy Reliability)

1) Fortschritte in den Eigenschaften von Coated Conductors
   AMSC (American Superconductors)
   Superpower (now Furukawa)
   STI (Superconductor Technologies Inc., Austin, Texas)
2) Anwendung in Strombegrenzern

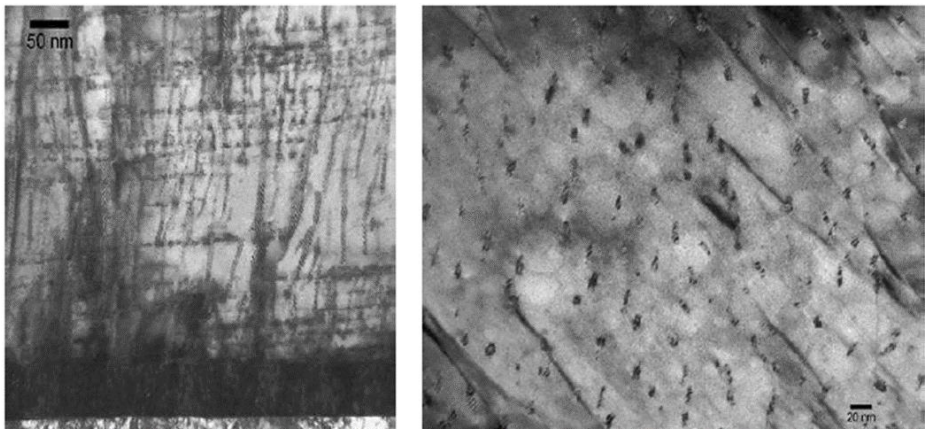
3) 10 MW Windgeneratoren
4) Energiespeicher
5) Entwicklungen in Bi-2212 – Drähten
   Oxford Instruments (OST)
6) Neue MgB_2 – Drähte
   Hypertech

1) Fortschritte in den Eigenschaften von Coated Conductors

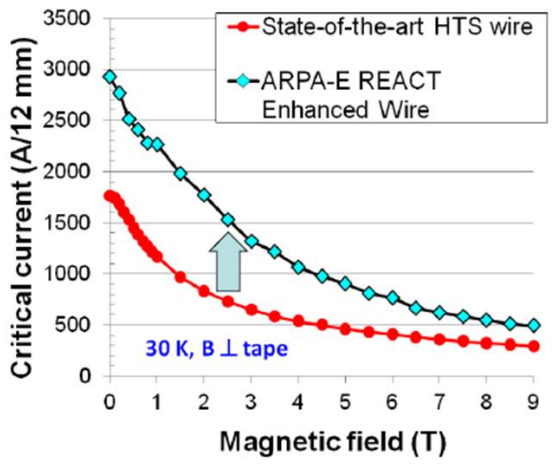
Die Coated Conductors von AMSC werden in verschiedenen Konfigurationen hergestellt. Dabei wird unterschieden zwischen Bändern für verschiedene Anwendungen:

* Resistive Strombegrenzer: 250 - 500 A
* Kabel: I_c > 160 A;
  Niedrige AC-Verluste, nichtmagnetische Substrate
  Verhalten bei Wicklung des Kabels
* Spulen: 1.2 μm, Optimierung für Betrieb bei 30K/1 – 2 T
  Verhalten bei c-axis stress bis zu 40 Mpa – keine Delamination

Erhöhung von Jc mittels Doping mit 7.5 % Zr.
$BaZO_3$ Nanopartikel: 5 nm Durchmesser, > 100 nm lang, 35 nm Abstand



Letzte Entwicklungen bei SuperPower/University of Houston: 15% Zr – Zusatz,
68% Erhöhung von I_c. Bei 30K/2T: 1‘500 A
Bedingungen für den Einsatz in Windgeneratoren erfüllt.
Industrielle Produktion Ende 2014 geplant.



- 15% Zr-added wire at 30 K, 2.5 T, B||c: I_c > 1500 A, J_c = 13.6 MA/cm^2, Pinning force = 340 GN/m^3
- Lift factor at 30K, 3 T, B||c improved by >100% to ~ 4.4

Entwicklungen von dünneren Bändern:
25 μm Hastelloy, 40 μm Cu: total 70 μm Dicke,
entspricht einer **Erhöhung von I_e um 36%!**
Sehr homogene Eigenschaften über mehrere hundert Meter Bandlänge
Kostenentwicklung
Verglichen mit 1998 (PLD Technik), sind die Preise 2014 um einen Faktor 3 - 5 gesunken, als Folge der Verbesserung des Prozesses.
RCE-CDR - Technik (Reactive coevaporation/cyclic deposition and reaction):
In situ – Prozess, Herstellung von grossen Flächen.
Ausbeute 99.5%.
2014: Project funding für eine Kapazität von 750 km/Jahr.

2) Strombegrenzer

- **OE Smart Grid Programm:**

Edison's Smart Grid site in Südkalifornien
Partner: SuperPower, SPX Waukesha, Univ. Houston, Southern California Edison

Strombegrenzer: 28 MVA, 3 - phasig;
Transformer: 69 kV/12.47 kV
2 Jahre Betrieb sind geplant; totale Kosten: **21.5 Mio. $**
Inbetriebnahme: Februar 2015

- **Resilient Electric Grid ConEd system (sponsored by Homeland Security)**

System zur Erhöhung der Resiliency im urbanen Betrieb
13.8 kV, 95 MVA, 4000 A
Dieses System wird 2 Substations verbinden (Hydra Cable)

- **Applied Materials Strombegrenzer bei Central Hudson (N.Y.)**

115kV/14.4 kV Substation
Frequenz: 10 Strombegrenzer-Zyklen pro Jahr.

3) Windgeneratoren

ARPA-E **REACT :** Projekt für > 10 MW in den USA
DOE Project: 4 Mio. $
REACT: Entwicklung von supraleitenden Alternativen, um in Motoren und Generatoren den Anteil an Seltenen Erden zu reduzieren
- Universität Houston (Venkat Selvamanickam)
- SuperPower
- TECO-Westinghouse
- Tai-Yang Research

Die angestrebten Ziele sind in der folgenden Tabelle dargestellt:

Metric	Now	End of project
Critical current at 30 K, 2.5 T (A/12 mm) (device operating condition)	750	~3,000
Wire price at device operating condition ($/kA-m)	144	36
Estimated HTS wire required for a 10 MW generator (m)	65,000	16,250
Estimated HTS wire cost for a 10 MW generator $ (,000)	7,020	1,755

Kriterium für den Einsatz von HTS – Bändern in Windgeneratoren: **3000 A bei 30K, 2.5T**
Dieses Kriterium ist im Moment etwa zu 50% erfüllt.

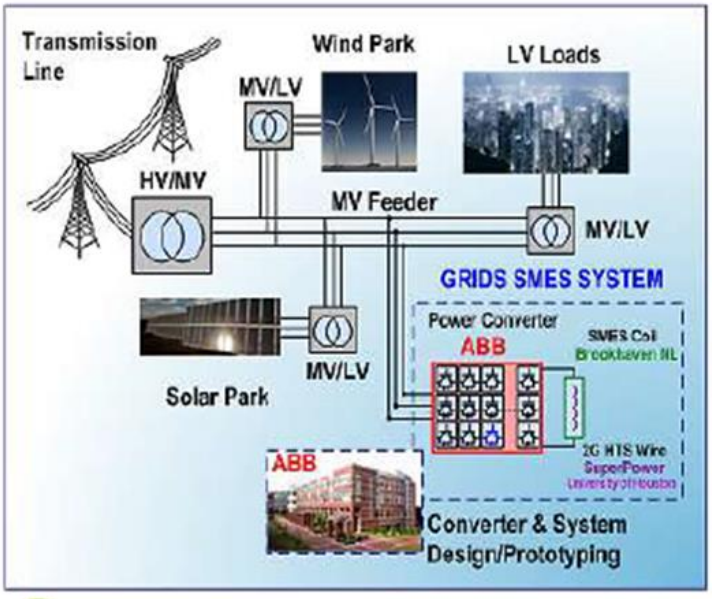
4) Energiespeicher (S.C. Magnetic Energy Storage, SMES)

Mehrere Projekte laufen in den USA, z.T. mit beträchtlichen finanziellen Mitteln.

ARPA-E Open
2.7 Mio $
Tai-Yang Research (Chris Rey)
North Carolina University
University of Houston

Vorteile: Hohe Leistung: <1 – 100 MW
100‘000 Ladung/Entladungszyklen
Volle Reversiblität
Keine beweglichenTeile
Dynamische Response
Nachteile: Niedrige Energiedichte: 30 – 100 WStd./kg

ARPA-E GRIDS
4.6 Mio. $
ABB (V. Ramanan)
Brookhaven Natl. Lab.
SuperPower
Univ. Houston



Ziel: 1.7 MWh SMES, direkt verbunden mit Leistungselektronik auf Si - Basis.
9.2 km HTS-Band von 12 mm Breite.
Bemerkung: hohes Magnetfeld (12 T)

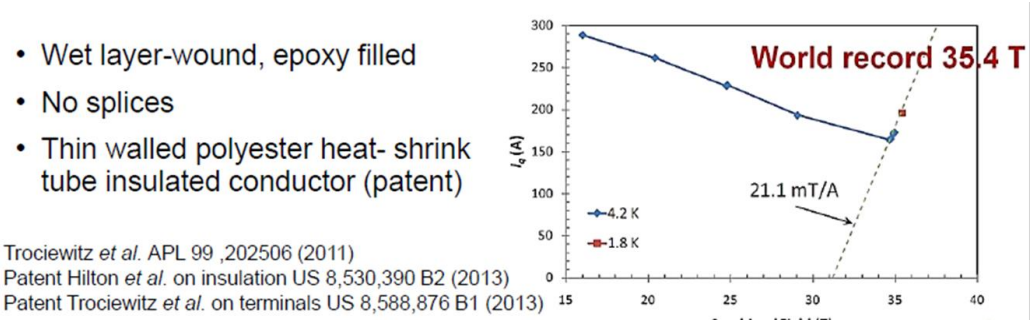
SMES Target Design	I_{op} (kA)	B_{0p} (T)	E_{stored} (MJ)	$V_{discharge}$ (kV)	HTS cable type
	10-25	10-12	60/100/250	1-5	Al stabilized

Industry	Energy (MJ)	Power (MW)	Weight (kg)	Volume (m^3)	Foot Print [Dia. x L] (m x m)	B-field (T)	Cost/kW-hr ($/kW-hr)	Cost/kW ($/kW)
	60	5	1,000	9.42	2 x 3	> 12	3,000	1,000

Ein starkes Interesse von Seiten der Air Force wurde festgestellt.

5) Hochfeldmagnete

Ein neuer **Rekord** für Supraleitende Magnete wurde in Tallahassee aufgestellt: 35.4 T



Ein **Labormagnet für 32 T :** wird gegenwärtig in Tallahassee entwickelt.

Bohrung:	32 mm
Homogenität, 1 cm	5 x 10^{-4}.
Inductance	254 H
Gespeicherte Energie	8.6 MJ
Rampe bis 32 T	1 Std.
Zyklen	50‘000

90% der 12.3 km HTS – Band sind schon ausgeliefert.
Inbetriebnahme: Ende 2015.

6) „Emergent Superconductors“, mit höheren T_c - Werten

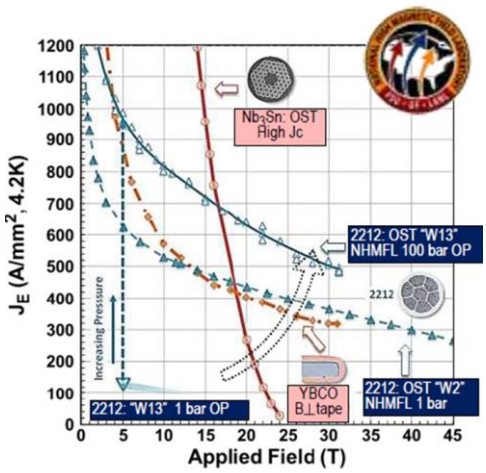
Ein ganz besonderes Ziel ist die Suche nach neuen Supraleitern mit noch höheren T_c - Werten. Dieses Projekt wird vom Center for Emergent Superconductivity in Brookhaven bearbeitet.

Funding: **DOE EFRC**
August 2009 – August 2014
22.5 Mio. $
Brookhaven (J.C. Seamus Davis)
Argonne Natl. Lab.
University of Illinois

Reines Grundlagenprojekt. Bisher erzielte Resultate:
Grand Unified Theory of Exotic Superconductivity
Hidden magnetic Waves in HTS
Key advance in understanding “Pseudogap” phase in HTS

7) Bi-2212 – Drähte

Im Hinblick auf Dipole und Quadrupole in Beschleuniger - Magneten mit Magnetfeldern von 15 – 20 T ist ersichtlich, dass eine Alternativ zu Nb3Sn gefunden werden muss. Der Einsatz von Y-123 Coated Conductors ist möglich, steht aber aus Kostengründen nicht zur Diskussion
Zur Information: CERN plant bis 2035 den Bau eines neuen Beschleunigers, von 100 km Umfang mit B > 15 T
→ **Bi-2212** drängt sich auf, als einzige



Möglichkeit. Bi-2212 kann in Drahtform hergestellt werden.
Grosse Fortschritte wurden in den letzten 2 Jahren erzielt.
Allerdings sind die Kosten von BI-2212 noch recht hoch (nächste Tabelle).

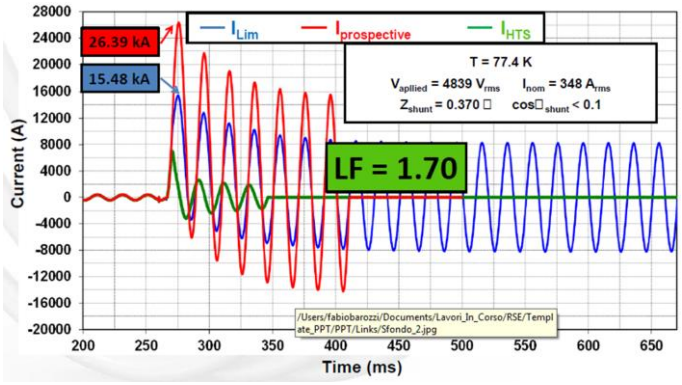
Conductor Property	Delivered value today	In 2 years	In 5 years
Current density J_E @ 4,2K, 20T	~ 500 A/mm^2	~ 700 A/mm^2	~ 700 A/mm^2
Length	200 – 1,000 m	400 – 1,000 m	> 3,000 m
Strength	110 MPa	150 - 200 MPa	> 200 MPa
Selling price range $/kA.m @ 4.2K, 20T	330 - 550	200 - 400	100 - 150

C. Tests mit dem ersten italienischen Strombegrenzer

Luciano Martini, RSE, Milano

Nach 2 Jahren erfolgreichem Testbetrieb wurde der erste italienische Strombegrenzer vorgestellt.
Charakterisierung:

Supraleiter:	Bi-2223
Totale Länge:	1.88 km
Querschnitt der Bi-2223- Bänder:	4.6 x 0.35 mm
Spannung	9 kV_{rms}
Strom	220 A_{rms}
Kurzschluss-Strom	30kA_{rms}
Kühlung	LN2 (77K)



In einer zweiten Phase wurden die Bi-2223 – Bänder durch Y-123 – Bänder ersetzt. In beiden Fällen war der Betrieb erfolgreich.

Upgrade zu 9kV/15.6 MVA ist in Vorbereitung
Dieses wird installiert als Transformer – Schutz in derselben Substation.
Der Vorgang wird extensiv numerisch erfasst, auch für spätere Systeme.
Ein weiteres Upgrade von 1-Phase zu 3-Phasen ist in Vorbereitung.

D. Status Updates of HTS Technology in Japan

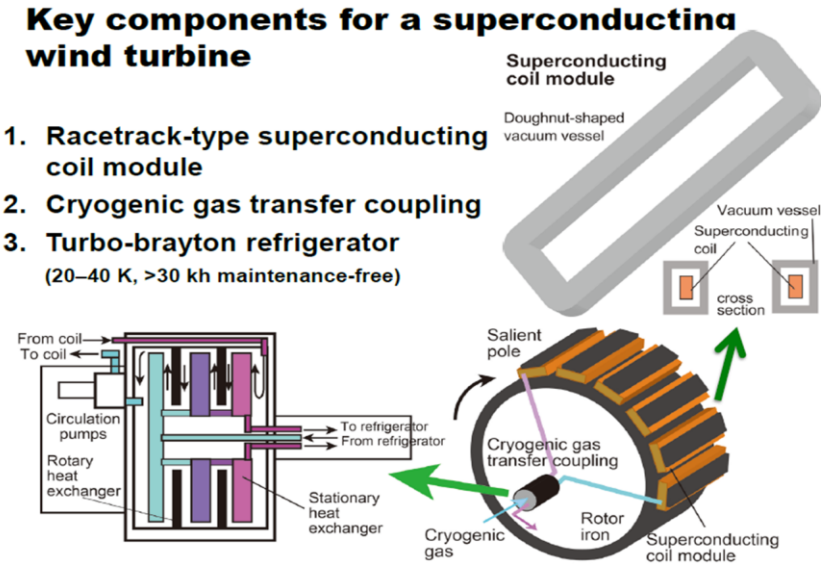
H. Ohsaki (University Tokyo) / N. Kusunose (NEDO)

1) Kabelprojekte

Für die nächsten 3 Jahre : 1‘200 Mio Yen = 10 Mio. Fr.
Yokohama Project: 66 kV/ 2 kA (Bi-2223)
275 kV/3 kA (Y-123)
Kühlung: Turbo-Brayton (Wartungsintervall: 30‘000 → 40‘000 Std.)
Firmen: Sumitomo, Furukawa, Fujikura, Maekawa, TEPCO.

2) 10 MW Windgeneratoren

Beteiligte Firmen: AIST, Furukawa, Mayekawa, Niigata, Sophia University, Tokyo University



3) Schwungräder zur Energiespeicherung

Direkt finanziert von NEDO

Leistung	300 kW
Energiespeicher:	100 kWh (360 MJ)
Drehgeschwindigkeit:	3’000 – 6’000 min^{-1}
Rotordurchmesser	2‘000 mm
Magnetlager:	Bulk Y-123

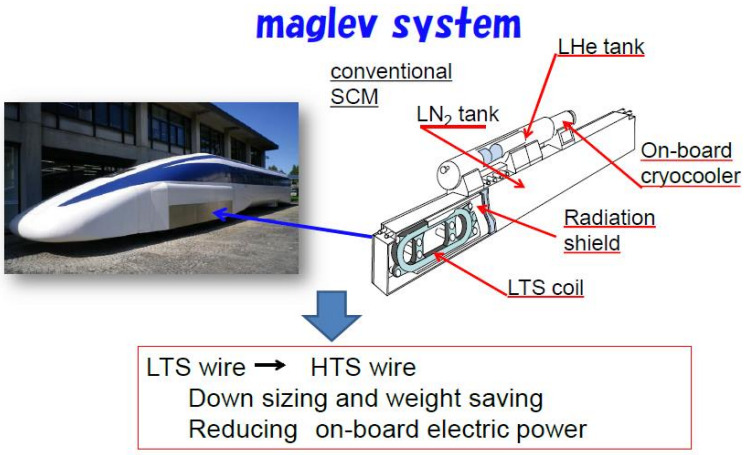
4) Magnetische Separation

Separation von Fe-O – Partikel aus dem Boilerwasser in Thermischen Kraftwerken (H. Nishijima, University of Tokyo)

In thermischen Kraftwerken führt die Reduktion von Fe O – Partikeln zu Druckabfall und zu einer Erniedrigung der Effizienz des Wärmeaustausches → Leistungsabnahme.
1% Erhöhung des Wärmeaustauschs → Reduktion der CO2 – Emission in Japan um 4.5 Mio. Tonnen jährlich.
70% der Elektrizität weltweit kommt aus Thermischen Kraftwerken → weltweit würde dies zu einer spürbaren Erniedrigung des CO2 – Ausstosses führen.

5) Transport: **Superconducting Maglev**, Tokyo-Osaka-Nagoya

Test section 18.4km
Tokyo-Nagoya (286 km, 40 min.)
Tokyo-Osaka (438 km, 67 min.)
2011 Running test ended at the Yamanashi test line in September.
The total running distance was about 874'000 km.
1997 Yamanashi Test Line opened
2005 **Bi2223 magnet tested** (550 km/h).
JR Central responsible for all expenses.
2013 Extension of Yamanashi Test Line completed (42.8 km). In der jetzigen Phase noch mit NbTi – Supraleitern. Die Möglichkeit von HTS (oder MgB2) wird untersucht.
2014 Environment Impact Statement in April.
Zukunftspläne:
2027 Commercial operation between Tokyo and Nagoya.
2045 Commercial operation between Tokyo and Osaka.
(*MLIT: Ministry of Land, Infrastructure, Transport and Tourism*)

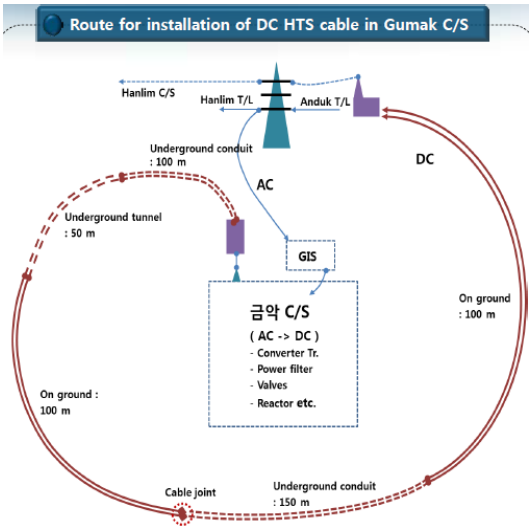


E. Progress in HTS cable projects: KEPCO grid Korea

Seong-Woo Yim (Korea Electric Power Corporation)

A) KEPCO verfolgt 3 Kabelprojekte:

1. 22.9 kV / 50 MVA HTS cable: System ist nun im Langzeitbetrieb und –test, bis 2017
   AC, 410 m (19.7 Mio. $)
2. 80 kV / 500 MW HTS cable: Wird dieses Jahr 6 Monate betrieben
   DC, 500 m Inbetriebnahme: 2015.



3. 154 kV / 600 MVA HTS cable: Wird gegenwärtig auf Jeju installiert;
AC, 1 km Inbetriebnahme: 2015.

B) Kühlsysteme

a) Stirling Refrigerator

3.2 kW @ 69K
0.5 kg/sec
1 – 10 bar
55 kW

b) Brayton Refrigerator

1.8 kW @ 69K
Neon: 0.3 kg/sec
48 kW

C) HTS Kabelsystem mit Netzanschluss

Aufgrund der Erfahrungen mit dem 154kV/600 MVA Kabel in Jeju wird ein komplettes Kabelsystem mit Netzanschluss geplant:
154 kV/1 GVA,
3 – phasig
3 km HTS Kabellänge
Angepasst in 175 mm Conduit - Durchmesser

F. Current Status of SFCL Development at KEPCO

Sidole Hwang (Korea Electric Power Corporation)

Rated voltage (rms)	22.9 kV
Rated current (rms)	630 A
Rated power frequency	60 Hz
Rated power Freq. withstand v. (rms)	70 kV
Rated impulse withstand voltage	150 kV. BIL
Rated short circuit current (rms)	12.5 kA
Reactor impedance (Ω)	0.4
Recovery time (sec)	< 0.3
Maximum Cooling Power (W)	220 at 80K
Operation temperature (K)	75~77K

Nationale Zusammenarbeit

Nach dem Ende des nationalen MANEP – Programms wurde der Zusammenhalt zwischen den einzelnen Partnern gewahrt: das Programm läuft, wenn auch in kleinerem Rahmen, weiter. Ausser des zielbewusst betriebenen Informations-Austauschs wurden auch neue Zusammenarbeits-Projekte gefördert. Daran nahm die Angewandte Supraleitung einen beachtlichen Anteil. Dieses Projekt ist nun beendet, sodass die weitere Forschung in der Angewandten Supraleitung nun durch eigene Projekte erfolgt.

Die Gruppe von Dr. Dutoit and der EPFL in Lausanne führt Berechnungen und Messungen von A.C. - Verlusten an Kabeln durch. Diese Gruppe nimmt auch an einem europäischen Projekt zur Entwicklung eines Strombegrenzers teil. Am PSI werden HTS – Leiter für verschiedene Magnete und Hochstromdurchführungen sowie eine neue Testeinrichtung für 100kA entwickelt. Die Universität Genf hat momentan keine eigenen Projekte, ist aber stark eingebunden in den Arbeiten an supraleitenden Spulen, einerseits mit der Firma Bruker, Fällanden (ZH) (HTS – Magnete), anderseits mit dem CERN. Wichtigste aktuelle Punkte sind dabei die Tests an Bi-2212 – Drähten, die an der Uni Genf reagiert wurden, und an Y-123 – Bändern. Dabei sind nicht nur die Stromdichten wichtig, sondern auch das Verhalten unter mechanischer Beanspruchung.

Internationale Zusammenarbeit

Wie in den vergangenen Jahren besteht die Internationale Zusammenarbeit aus dem regen Austausch von Informationen und der Teilnahme in gemeinsamen Projekten.
Wie schon erwähnt, ist die Gruppe von Dr. Betrand Dutoit an der EPFL in Lausanne Partner eines europäischen Projekts (im Rahmen des 7. Frame programs), das die Entwicklung eines Fault Current Limiters zum Ziele hat. Dabei bringt diese Gruppe ihr Know How auf dem Gebiete der Berechnung der ablaufenden Prozesse ein. Die Gruppe von Dr. Pierluigi Bruzzone am PSI ist fest in internationale Projekte eingebunden, vor allem im Zusammenhang mit dem ITER Projekt. Die Arbeiten an HTS – Kabeln im Hinblick auf mögliche Fusionsmagnete wurden intensiviert.

Bewertung 2014 und Ausblick 2015

Alle bekannten Projekte auf der Basis von HTSL - Supraleitern haben sich dieses Jahr - wie schon in den Jahren vorher - erfolgreich und ohne nennenswerte Probleme entwickelt. Dies ist auch ein Beweis für den Fortschritt, der in den letzten Jahren auf dem Gebiet der Betriebssicherheit von supraleitenden Geräten und Anlagen erzielt wurde.

Unter der grossen Anzahl von neuen Magneten und Anlagen verdienen folgende Fortschritte eine besondere Erwähnung:

- Neue Bestrahlungsmessungen haben gezeigt, dass die Gd–Atome, die zur Erhöhung von J_c in Y-123 – Bändern eingeführt wurden, bei Neutronenbestrahlung zerfallen. Die dabei entstehenden Ionen verursachen im Supraleiter Bragg-Peaks, die lokal zu einer Erniedrigung der supraleitenden Eigenschaften führen. Somit ist klar, dass Gd – Zusätze vermieden werden müssen.
- Das Bi-2223 – Kabel im Kabelprojekt Ampacity in Essen ist nun nach bestandenen Tests erfolgreich ans Netz angeschlossen worden.
- HTS-Hochspannungskabel in Japan und in Korea: verschiedene Kabelkonzepte wurden in Japan und in Korea erfolgreich getestet. Bemerkenswert ist das neueste koreanische Projekt, mit 80 kV und 500 MW.

- bei den Coated Conductor-Bändern bestehen die Fortschritte vor allem in den grösseren Längen und in den höheren Stromdichten (≥ 500 A/cm), die von den meisten Herstellern erzielt wurden.
- Bei den MgB_2 - Drähten wurden durch die neue IMD - Technik die Dichten der einzelnen Filamente deutlich erhöht, was vor allem einen deutlichen Fortschritt bei höheren Feldern bewirkte. Neue Herstellungsschritte werden gegenwärtig eingeführt, um industrielle Längen von Drähten mit diesen neuen Eigenschaften herzustellen. Von grosser Bedeutung ist die zu erwartende Erniedrigung der Kosten für MgB_2 – Drähte: in 3 Jahren wird dabei die Grenze von 3 $/kAm für den Einsatz bei 20K und 2 T unterschritten werden.
- Am CERN wurde ein MgB_2–Kabel entwickelt, der bei 24K einen Strom von 20‘000 A trägt. Damit sind die Bedingungen für einen Einsatz im neuen Beschleuniger (LHC – Upgrade) erfüllt. Die notwendige Länge von etwa 1‘000 km MgB2 – Draht werden für diesen Zweck gebraucht.
- Dieses Resultat öffnet den Weg für zukünftige Anwendungen mit Wasserstoffkühlung. Diese werden immer wichtiger, wegen der zu erwartenden zunehmenden Knappheit von flüssigem He als Kühlmittel. Hier könnte MgB2 wegen seiner um eine Grössenordnung niedrigeren Kosten vermehrt zum Einsatz kommen. Verschiedene mögliche Lösungen können in Betracht gezogen werden. Gegenwärtig ist eine Studie im Gang (ISS Potsdam und CERN), die die Möglichkeit untersucht, den in der Nordsee durch Windgeneratoren produzierten Strom mittels eines supraleitenden Kabels nach Süddeutschland zu transportieren. Dabei wird aus Kostengründen die Variante von MgB2 – Drähten bei 20K genauer untersucht.

Anhang I

Draft Minutes from the IEA Executive Committee Meeting at Energetics Incorporated Offices, Washington, D.C.

Participants:

Germany:	Bernhard Holzapfel
Italy:	Dr. Luciano Martini (Chairman)
Japan:	Dr. Nobuhiko Kusunose
Switzerland:	Prof. René Flükiger (Vice-Chairman)
	Prof. Bertrand Dutoit
United States:	Debbie Haught
U.S. Operating Agent Candidate:	Brian Marchionini
Japan Operating Agent Candidate:	Tsutomu Watanabe
Note taker:	Tenley Dalstrom

A: Welcome by the Host, Debbie Haught, US DOE

The meeting started on Thursday the 20th with opening remarks from Debbie Haught. She thanked the attendees for travelling to Washington, D.C. for the meeting. She briefly mentioned that the U.S. Superconductivity Program has become much more spread out, and that the program is presently in flux, yet she hopes to maintain participation with the IEA Superconductivity IA Executive Committee.

B: Welcome and apologies for absence, Luciano Martini, Chairman

Luciano Martini stressed the importance of the meeting, and that the selection of an operating agent will be a challenging task, as the two candidates are very qualified for the position. He expressed apologies from non-attendees which included members from Germany, Canada, Israel, Korea and the two sponsor organizations and noted that absent members have been provided the opportunity to vote based on the presentations that were sent out, and he has received some feedback.

C: ExCo Closed Session – Agenda Approval and Meeting Introduction

Luciano Martini briefly reviewed the agenda and it was approved by the group.
During the ExCo discussion of the voting process it was agreed that the first round should be a 2/3 majority, the second round should be a 2/3 majority, and the third round should be 50% plus one majority. There will be 9 votes in total. 5 countries are represented in the room. Finland, Korea, Israel, and Canada have provided their votes. Two thirds is 6 votes, 50% + 1 is 5 votes.

Bernard Holzapfel was designated full power to cast the vote on behalf of his German colleagues. It was confirmed that the two Swiss representatives have one vote between them. It was agreed that the operating agent will serve for up to a two year period, and that a basic contract will be drafted to set the rules and expectations for the operating agent. It was suggested that the contract should be available for signing in 6-8 weeks. It was determined that each candidate should leave the room when the other is presenting.

Luciano Martini shared a list of all the duties for which the operating agent should be responsible. It was stressed that the operating agent is efficient and effective in assisting the ExCo to go through the next process of extending the IA. The operating agent is critical in helping to communicate the value of the IA to countries that will be invited to participate (Norway, Spain, China, India, etc.). The operating agent will also serve to gain more visibility within IEA, and within the Superconductivity community internationally.

The ExCo agreed that it is a good idea to wait until the new operating agent is selected before beginning new communications efforts. It was also agreed that in order to increase participation, ExCo meetings should be organized in advance, and the value that will be added for each country should be stressed. It was also suggested that the IA produce a 6 page summary of a longer technical report, and a roadmap in the coming year.
It was stressed that ISGAN, DSM, 4E and HTS are the four electrical IAs, and there should be coordination and collaboration with them. The operating agent should assist in meetings, support publications, and be aware of other HTS interest groups in order to fulfill the goal of promoting IA visibility.

HTS technology is in a difficult situation because the price of electricity is so cheap, countries are not supporting as much research as in the past. It could be beneficial for the IA to reach out to China and India to extend the community. NEDO is supporting demonstration projects abroad, and it would be beneficial for each of the countries to present their most recent projects. Superconductivity is a niche application, and the IA can focus on the benefits of using it in large cities, and storage applications.
Dates for future ExCo meetings were discussed and the following was determined:

June 2014 - Milan, Italy
December 2014 - Jeju Island, Korea
Spring 2015 – Montreal, Canada

D: Session I – OA candidate 1 presentation (Brian Marchionini), Q&A and discussion
Debbie Haught introduced Brian Marchionini, and explained his relationship with DOE.

Brian Marchionini thanked the committee, and presented a high level outline of his presentation. He explained that if he were selected as the operating agent, there would be significant support from his colleagues at Energetics including meeting coordination, website, editing and graphics. He provided information about his background, certifications, and professional affiliations. He mentioned the relevant workshops and meetings that he organized and documented, and highlighted communications products which he developed, including a video clip produced to highlight the LIPA HTS cable in Long Island. He mentioned examples of technical analysis, and explained the modeling tool that was used for benefits analysis. He discussed his specific experience with various IEA IAs, and his experience and familiarity with the HTS IA specifically.

Mr. Marchionini provided an overview of Energetics, and the company's capabilities, and mentioned other relevant international experience. He provided the budget estimate, the approach and potential next steps (strategic planning, website updates, mapping partners and potential members, investigating the use of Superconductive devices that create resilient cities). He provided examples of communications materials to pass around to the ExCo.

Mr. Marchionini was asked to elaborate more on his international experience, how he would bring in new members to the ExCo, and what countries he works with in the ISGAN group. He was asked how he would create the link with utilities and relationships with industry and other important stakeholders so that the ExCo can communicate the benefits of Superconductive devices in the electric system. A question was also posed about his specific technical experience, and his technical education. A final question was posed about how he might reach out internationally to utilities to get information and make contacts.

E: Session II – OA candidate 2 presentation (Tsutomu Watanabe, ISTEC), Q&A and discussion
Nobuhiko Kusunose provided an introduction of Tsutomu Watanabe, and highlighted his technical experience in the field of electrical engineering.

Tsutomu Watanabe provided a high level overview of his presentation. He explained his affiliation with ISTEC, his education and his professional experience as a power system engineer with TEPCO. He highlighted his international experience in China, India and Malaysia in the planning and application of transmission technology. His current position with ISTEC involves developing Superconductivity technology in Japan. Mr. Watanabe mentioned his professional affiliations, including CIGRE. He presented his publications, and discussed the advantages he has in his technical experience, in the application of new technologies. He mentioned that he can utilize the capabilities of ISTEC. Mr. Watanabe discussed his understanding of the requirements for the position in regard to communication, networking, analysis framed in regard to electricity industry and policy makers. He mentioned that the website should be redesigned to make it a more useful tool for communications. He suggested new sections to be added for cables and transformers in addition to non-destructive test using SQUID technology.

Mr. Watanabe plans to familiarize himself with the relevant HTS community in the first two months of the period of performance, and he will facilitate new memberships though members of CIGRE and Cired, and will use the ISTEC network. He stressed the potential of partnerships with Asian countries, and mentioned that the financial division in ISTEC can support the financial management of the IA. Mr. Watanabe suggested that young scientists and engineers should be considered a target audience. He presented a diagram displaying coordination efforts between stakeholders and target groups. He presented the number of hours required to handle the work of the ExCo, and presented his budget estimate.

A question was posed asking if there would be a conflict of interest in the link to ISTEC. Mr. Watanabe was asked to elaborate on how he plans to bring young professionals from many countries into the supporting group. Mr. Watanabe was asked if he still has strong relationships with his former colleagues at TEPCO, and whether he has similar international utility contacts. He was also asked about the relevance of his prior experience in developing countries to Superconductive technologies, whether ISTEC has been involved in other sections or annexes, and if the secretary that he is bringing on is a technical expert in the field.

E: Joint Session
During the joint session, both candidates were invited into the discussion with the ExCo. It was noted that the presentations were comparable in cost.
Brian Marchionini asked what challenges the ExCo needs to overcome in the near future. The response was that the IA has not been able to show the benefit of membership, and to keep it alive, membership needs to be expanded. Additionally, the Superconductivity IA needs to gain credibility with utility stakeholders and engage with them.
It was explained that one task of the operating agent consists of writing up the minutes of the meeting, and that is very important, because there are only two meetings a year, so when there are important points, they need to be included in the minutes. Mr. Watanabe was asked if he would feel comfortable with that task, and if not, how he would manage it. He replied that he would manage the task by bringing a note taker that is very skilled in English to record the meeting minutes.

Brian Marchionini asked why there are only 2 ExCo meetings per year and suggested that two in person meetings per year is fine, and perhaps there should be a monthly call/meeting to coordinate the group, especially in advance of the in-person meetings. A response to the question was that the ExCo felt that 2 times per year was adequate in most cases to conduct business.

It was mentioned that there is some uncertainty about the number of countries that will remain in the ExCo, and the candidates were asked if there is a lower budget, would it be possible to reduce the amount of effort so that the work could be done at a lower effort. Both candidates agreed that, yes, as consultants, they are familiar with having to reduce effort and make adjustments as budgets are reduced. There would need to be a prioritization of activities so that the most important ones were completed first.

F: Closed session – ExCo member discussion on OA candidate selection
To begin the discussion about the selection of the operating agent, Luciano Martini suggested that the IA could hire both candidates as operating agents as they have complementary skills and abilities. He said that it is important to cover Asia, which would be more easily done by Mr. Watanabe, and the marketing and communications efforts could more easily be handled by Mr. Marchionini. He suggested that the IA could try this arrangement for a two-year period, and make sure that the tasks for each operating agent is very well defined. The group agreed that this could be a very beneficial arrangement. The group will consult with the members who were not able to be present to determine if they see any drawback in the proposed plan.

There was a discussion about whether the contract would be with the person, or if it would be a contract with their organization. The previous agreement was made with Alan Wolsky directly. It was determined that the arrangements would be discussed with the candidates directly.

There was then a discussion about reconsidering how much each country is paying for support. The current rates were based on the GDP of each country at the inception of the IA in the 1970's which has resulted in a situation where there is a large gap between those that pay the lowest fees and those that pay the highest. It was suggested that one option would be that there are two levels of contribution perhaps $12,500 and $25,000. It was determined that this topic should be decided before potential new members are approached.

There was a suggestion to start with reducing the two highest fees, those of the U.S. and Japan, and leaving the others where they are currently. As it stands, if the fees are reduced, there are still enough funds to cover both candidates.

One duty of the operating agent is to collect the fees, and it was suggested that they be paid in two installments, a down payment and then a final payment, which could also be the method of payment for the operating agents. A concern that was mentioned is that the operating agents' contracts would be

for two years, but there is no guarantee how many countries will stay on in 2015, so the budget for 2015 is not firm.

Budget details were discussed further to see how the work could be covered financially. It was determined that the work hours should be split so that there is an even amount of effort. The group agreed that there should be a discussion with IAs that have co-operating agents. It was agreed that visibility and communications should be the responsibility of Brian Marchionini (Energetics), and Tsutomu Watanabe (ISTEC) can provide the technical expertise.

G: Final evaluation result: ExCo member final decision
The candidates rejoined the group for the discussion and were informed that the group had decided that both candidates complement each other's abilities. There was a discussion about how the duties would be divided between them, and the official Programme of Work was consulted with the following comments:

ANNEX I - Programme of Work (Year 2014-2015)
Activities for Operating Agent (OA) for the
IEA Implementing Agreement for a Co-Operative Programme for Assessing the Impacts of High-Temperature Superconductivity on the Electric Power Sector

Report on Subjects of Interest
1) Identify topics about which the ExCo might want to know more
2) After discussion with and agreement by the ExCo, **prepare presentations on topics** for each of Two ExCo meetings per year.
3) After discussion with and agreement by the ExCo, **prepare written reports on topics of interest**. These reports should be subject to review by experts inside and outside the ExCo.
4) As the occasion requires, **prepare briefing papers** for senior managers/policy makers on matters touching HTS and the power sector. These should include both text and appealing graphics

> ***ExCo Discussion/Suggestion:*** Technical report – 2 reports first year, one technical and one roadmap, etc., so each operating agent can take responsibility for one report (ISTEC and Energetics)

Enhance Web-Site
5) Identify, hire & manage webmaster to maintain and modify web-site, as directed by OA
6) **Enhance content of IA's web-site** and otherwise keep up-to-date. This content now includes:
6.1) Reasons for enthusiasm about HTS
6.2) IA's raison d'être, as well as purpose & scope
6.3) Information about IA's members
6.4) Information about IA's past reports, workshops, activities
6.5) Introduction to IEA and its relation to IA
6.6) Credible information for the public (e.g., a utility engineer who knows little or nothing about progress on HTS). Now there is a section on FCL, sections on cables and transformers could be added.
6.8) Links to other sites from which relevant information can be obtained
6.9) Information for members, enabling them to download documents that have been made available to them by other members
6.10) information on forthcoming meetings and related
NB: This web-site should be something that staff from the IEA Secretariat can refer to, as well as staff from whatever firms, utilities, etc. you wish to interact with. In short, it should be able to serve as a letter of introduction from the IA to whatever organization the IA wants to engage.

> ***ExCo Discussion/Suggestion:*** The group agrees that the Superconductivity IA website needs to be professional. It is currently in two places, the old domain (superconductivityiea.com) and the RSE server. The public area is for everyone, the members-only area still has the same name and password for member access. There is a need to increase the IA visibility, and this is an important tool to accomplish that goal. Content will be provided by ExCo members and the technical operating agent, Mr. Watanabe. It will require more than just maintenance, and in the beginning it will need to have many updates (Energetics)

Document IA activities
7) Prepare minutes for ExCo Meetings and distribute to ExCo and IEA. This IA's Desk Officer is

now David Elzinga. The cognizant staff member (formerly Anne Lechartier) in the Office of Legal Council is To Be Determined.)

8) **Prepare two-pagers** for the semi-annual meeting of the IEA's End User Working Party (EUWP) Submit to appropriate EUWP contact, now Michael Moser.
9) **Prepare annual report** (including mention of new projects and/or significant milestones of projects underway of which the ExCo should be aware), roughly ten pages, for ExCo Members' reference and use.
10) **Prepare entries for documents that the IEA** Secretariat, in particular the Technology R&D Networks, may wish to publish. The Programme Manager, Technology R&D Networks is now Carrie Pottinger.

> ***ExCo Discussion/Suggestion:*** Minutes for the meetings, two-pager, annual report and communications (Energetics)

Be Cognizant of Relevant Considerations within the IEA Secretariat

11) Maintain cordial, **frequent and effective relations with OA's of other relevant IAs**. (NB relevance fluctuates over time.)
12) Maintain cordial, frequent and effective relations with desk officers of other relevant IAs. (NB relevance fluctuates over time.)
13) Maintain a good **working relations with three distinct offices within the IEA-Secretariat** which are: the desk officer, the head of the Technology R&D Network, and the Office of Legal Council (OLC). It cannot be assumed that these positions communicate with each other.
14) Maintain good **working relations with whomever the End User Working Party designnates** as the cognizant person for "electrical IAs". (This person is now Michael Moser and the "electrical IAs" are DSM, ISGAN, 4E and HTS.) Note that the IEA Secretariat is overseen by representatives of the governments that fund the Secretariat. Some of these representatives constitute the CERT, (i.e., Committee on Energy Research and Technology) which gives direction to the Secretariat. The CERT sets up some committees, each looks after its own part of the Secretariat and related. One of these is the End User Working Party which itself design nates one of its members to look after the Electrical IAs of which HTS is one.
15) **Prepare the documentation required to renew this Implementing Agreement**. The required paper work varied has varied over time. The Desk Officer can advise the OA and ExCo Officers as to what is customary at that time. The paperwork will be carried forward to the EUWP by its member in charge of electrical IAs. The views of the IEA secretariat carry some weight in the process.

> ***ExCo Discussion/Suggestion:*** Maintain cordial and frequent relations with OA's of other IA's (there are 42 currently) (both OAs)
> Prepare the documentation required to renew this implementing agreement. (both OA's)

Facilitate New Memberships – New Contracting Parties and Corporate Sponsors

16) Solicit new members. (This should not be only the responsibility of the OA.)
17) **Guide prospective new members through the process of joining that has been established by the IEA –Secretariat**
18) **Prepare the paperwork that IEA requires of applicants for membership in IAs**

> ***ExCo Discussion/Suggestion:*** There was discussion that this responsibility is not as critical as some of the others, and could fall more on the Chairman and other members to approach potential new members of the IA. The operating agents can help identify organizations and individuals who can then be approached by the ExCo (both OA's)

Support Individual Members' Efforts, as appropriate

19) Facilitate contacts between individual members of the IA and between them and others as desired.
20) Support individual members' efforts to advance goals compatible with IA's purpose and scope.
ExCo Discussion/Suggestion: There was not a specific discussion about this topic area

Be Cognizant of Other HTS Interest Groups

22) **Maintain awareness of and/or contact with other HTS interest groups** (e.g., ISIS, CIGRE WG D1.38, CONNECTUS, IV Supra RASMES etc). This should not be only the responsibility of the OA. Each ExCo member should contribute.
ExCo Discussion/Suggestion: There was not a specific discussion about this topic area

Finances

23) Collect money from members of the IA

23) P**rovide detailed financial report, income and expenses.**

ExCo Discussion/Suggestion: There was not a specific discussion about this topic area

Support in promoting IA visibility

24) To promote IA participation at IEA meetings and Workshops, HTS conferences, other events

25) To prepare draft material to be presented as IA contribution to the above events

ExCo Discussion/Suggestion: The group determined that both OAs could be responsible for this effort

Other: to be done and **agreed upon.**

H: First meeting with the new OAs – formalities, next steps and initial duties

The candidates were consulted and it was determined that there will be two contracts; one will be signed with Energetics and the other with Mr. Watanabe. The group determined that this should be completed within 2 months, and that the respective legal representatives from both operating agents need to review contract drafts. There should be a reference to clearly show that there are two OAs performing the work.

It was determined that coordination should be another task that is added to the operating agent list. An initial duty identified for the operating agents is to collect information to incorporate into a draft roadmap which should be available in autumn. Finally, there was an official vote and it was decided that both OA candidates will work cooperatively.

I: Short update about new HTS projects from selected countries NEDO's new HTS Cable project for 2014-2016

Mr. Kusunose provided an overview of the *Safety and Reliability Verification Project for HTS Cable System* project in Japan. This project includes industry partners from all over Japan and the support of NEDO.

J: Present status of the IA-HTS website and discussion

It was determined that the OA should go through the site, check the links, and make necessary updates initially. It was also suggested that the site should have additional sections for cables and transformers added, and could be made more robust so that it is a better tool for communication and outreach.

K: HTS-IA new account: FY14 Invoices, collected fees and status

The status of the fee collection was reviewed, and it was determined that a few countries have paid, but gentle reminders will be provided to those that have not yet sent their contribution.

There are 2 more years left in the IA, and it was determined that the group will request a 5 year extension. Work will need to be done to show the value of the HTS IA. Financial information was discussed, and the account status was shared.

L: Date and place of the next ExCo meeting(s)

Dates for upcoming ExCo meetings were suggested, and will be circulated among the group to determine availability:

- Milan, Italy; 1st choice is June 9-13; 2nd choice June 17-20, 2014
- Jeju Island, Korea December 3-5, 2014
- Montreal, Canada; Spring 2015

M: End of ExCo meeting (Decisions)

Agreed Decision or Action at ExCo meeting in Washington D.C. on 20/02/2014	Involved Team	Due Date	Status	Notes
Operating agents contract format feedback	OAs	March 7, 2014		
Man power and financial revision + coordination	U.S. and Japan	March 7, 2014		About -30%
Inform ExCo members about meeting outcomes	Martini	March 7, 2014		OA status, minutes draft, ExCo meeting date

				proposals, member fee
Agreed list of first OA duties – priority list	Dalstrom	Feb. 28, 2014		
Minutes draft		Feb. 25, 2014		
Feedback on minutes text by present ExCo members	ExCo	Feb. 27, 2014		
OA contracts (2) duly signed	ExCo-OAs	April 28, 2014		
Down payment to OAs	RSE	?		

Appreciation of the Host
The ExCo greatly appreciated the DOE efforts to host the ExCo meeting and Workshop at the Energetics office in Washington, DC.

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Prepared by Tenley Dalstrom (Energetics)

Annex II

IEA-HTS-IA-ISS Young Generation Award

Nov. 26: Presentation

Nov.26 (Wed) 9:00 to 11:00
Introduction on IEA-HTS-IA and Objectives — Tsutomu Watanabe, ISTEC,
Greetings from Chairman — Luciano Martini , IEA-HTS-IA Chairman)
Introduction ofExaminers, Examination Method
Presentations : 8min
Questions and Answers : 5min
Discussion with Lunch using Score Sheet

Nov.27: Award ceremony
Date and time — Nov.27 (Thu) 15:45 to 15:55

1. Award of Excellence — Giver: Shima Shima Masahide, NEDO
2. Winner of Young generation Award — Giver: Luciano Martini (RSE),
15:55 — END (Photo)

Anhang III

3: IEA ExCo meeting, Jeju (Korea)

"HTS Applications in the Power Sector"

3 – 5 December 2014

Program:
Introduction to HTS Workshop Scope and Objectives

Possible applications for MgB2
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