

**IEEE PES HVDC & FACTS SUBCOMMITTEE MEETING**

**2006 IEEE PES Technical Committee Meeting**

**Minutes of Meeting**

**21 June 2006, Montreal**

IEEE PES HVDC AND FACTS SUBCOMMITTEE  
2006 SUMMER MEETING

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**IEEE HVDC AND FACTS SUBCOMMITTEE  
2006 SUMMER MEETING**

**1 MEETING INFORMATION**

Time: 8:30AM-12:00PM, Wednesday June 21, 2006  
Location: 2006 IEEE-PES General Meeting  
Room 518c  
Palais des congrès de Montréal  
159, rue Saint-Antoine Ouest, 9e étage  
Montréal, Québec, Canada

**2 WELCOME AND ANNOUNCEMENTS**

Dennis Woodford, Chair, welcomed everyone to the meeting, and made the following announcements:

- Dennis noted that this would be the last meeting where he would be acting as Chair. Ben Mehraban, Vice-Chair, will assume the position of Chair as of January 1, 2007. Robyn Taylor has agreed to serve as the Secretary for this meeting, and will assume the position of Vice Chair as of January 1, 2007.
- Gunnar Asplund, who received the 2006 Uno Lamm award, was acknowledged.
- Abdel-Aty Edris, who received the 2006 Nari Hingorani FACTS award, was acknowledged.
- Peter Lips provided some insight to his background, as he is running for Division VII Director-Elect.
- Joanne Hu was thanked for the minutes she provided for the January 18, 2006 meeting, and she and Pei Wang were congratulated on their new baby.

**3 INTRODUCTIONS**

The HVDC & FACTS Subcommittee members made introductions, and the sign-in sheet was sent around. The list of attendees is provided in Appendix A.

**4 JANUARY 18, 2006 MEETING MINUTES**

The January 18, 2006 meeting minutes were disbursed prior to the June 21, 2006 meeting.

**4.1 Business Arising from the Minutes**

*Update on proposed Winter Power Meeting*

A Technical Meeting is scheduled to be held in Orlando from January 8 to 10, 2007.

*Update on HVDC and FACTS Website*

The website will be updated by Brian Johnson. The bibliography, HVDC Projects Listing, Meeting Minutes, etc. will be included on the website.

*New Working Groups*

Four new Working Groups are being considered, which may be further expanded. These WG have been approved, but are not yet organized. Volunteers interested in Chairing the new Working Groups were requested, and as no one volunteered, Dennis and Ben will follow up with potential candidates:

1. Task force for topical HVDC and FACTS articles
2. Working Group on AC to DC Transmission Conversion. This WG has been created to include right-of-way issues for dc transmission such as narrow width, use of rail ROW for new dc lines, economics and technical considerations of conversion, performance enhancements, reliability, tripole, bipole, etc.
3. Working Group on Compensation and Interconnection of Wind Farms, Reactive power and ac voltage control, Rating of FACTS compensators, Performance, Interconnection through dc converters.
4. Working Group on Refurbishment of HVDC and FACTS Controls and Protections. This working group would prepare a guide.

## **4.2 Approval**

Wayne Litzenberger moved that the January 18, 2006 minutes be approved with the above amendments, which was seconded Hubert Bideau.

## **5 WORKING GROUP REPORTS**

### **5.1 WG 15.05.02 - Dynamic Performance and Modelling of HVDC Systems and Power Electronics for Transmission Systems**

There were 20 members and guests in attendance at the June 19, 2006 meeting chaired by Ram Adapa.

Position papers on 4 different topics were discussed at the meeting:

1. EMTP for conventional DC type models – work in progress
2. EMTP models for FACTS – done
3. EMTP VSC Based FACTS – draft circulated to WG members. In good shape. Ready for the Tampa meeting.
4. VSC Based DC Transmission – Dennis circulated – work in progress

This WG is also working on a benchmark test system. One test system is being developed for small/medium system data (Ani Gole published paper at this meeting) and one test system is being developed for large system data (complete).

A topic to be followed up on is wind generation in power networks. The WG wants to model the wind as not much has been done to date. It was noted that the wind turbine manufacturers don't like to let their models out. They will release the information to their customers, but with confidentiality agreements. There is a need to approach manufacturers.

A document on FACTS and HVDC Installation is being worked on, and has been circulated to the members of the WG.

## **5.2 WG 15.05.08 - HVDC and FACTS Economics and Operating Strategies**

There were 15 members and guests in attendance at the June 19, 2006 meeting chaired by Mark Reynolds.

The Group wants to establish a panel for the 2007 Summer Meeting, with a topic highlighting economics relative to refurbishment.

It was recognized that the 2007 Summer Meeting deadline was within the next few weeks.

## **5.3 Awards Committees**

### **5.3.1 Uno Lamm Award**

Dave Fletcher, Chair of the Uno Lamm award committee requested nominations from the group. The deadline for the 2007 award is November 2006.

### **5.3.2 Nari Hingorani Award**

Wayne Litzenberger, Chair of the Custom Power award committee also requested nominations from the group. He indicated that information on the award and nomination forms are available on the IEEE PES awards website.

## **5.4 WG 15.05.14 - HVDC and FACTS Devices Education**

There were 8 members and guests in attendance at the June 20, 2006 meeting chaired by Bill Long.

The following agenda items were discussed:

1. A two-hour Dynamic Reactive Power panel session was successfully presented at the May, 2006 T&D Conference in Dallas. A total of 70 persons attended. Panelists included Heinz Tyll (Siemens), Doug Mader and Sharma Kolluri (Entergy), and Ani Gole (University of Manitoba). The panel was a major revision of the previously-offered Basics of VAR Technology panel session presented in New York at the 2002 PES Winter Meeting.
2. A new panel session titled "HVDC System Solutions" will be presented at the fall, 2006 Power Systems Conference and Exposition in Atlanta. The intended audience is system planners and developers, and transmission engineers. General topics include what is HVDC, roles played by HVDC in power systems, the evolution of the Pacific Intertie, point of interconnection issues, and system planning including study tools. Brian Johnson (University of Idaho) will lead this activity, the panelists will be Mike Henderson (ISO-NE), Mike Bahrman (ABB), and Wayne Litzenberger (BPA). The summary papers are now in the review process.
3. It is likely that this panel session will form the basis of a future issue of the PES Power and Energy magazine dedicated to HVDC technology. In addition to the topics mentioned above

there is a possible article on the interest in +/- 800 kV now being considered in China, India, Brazil, and Southern Africa.

4. A proposed future panel session topic for the 2007 General Meeting is increasing the capacity of existing rights-of-way. Mark Reynolds led a discussion on this item, including ROW use, ac to dc line conversion, HVDC as a 230 kV ac line overbuild, FERC/DOE congested path studies, Lionel Barthold's three-phase ac to dc operating concept, and the need to transmit a very large amount of wind power energy from Scotland to England.
5. It was agreed that the "tutorial" panel format used for the sessions sponsored by this working group is very successful, as evidenced by the attendance and discussion participation.
6. This was the final meeting for Chair Bill Long as he will step down as of July 1, 2006. He has been chairing the working group since its formation in 2001. Brian Johnson will succeed Bill Long.

The Chair thanked Bill for all of his efforts, as this was his last official act as Chair of Working Group 15.05.14.

### **5.5 WG 15.05.15 - Use of Power Electronics in Major Grid for Generation Requirements**

There were 11 members and guests in attendance and the June 21, 2006 meeting chaired by Geza Joos.

A revised draft document in outline form was reviewed. Its title is: "Use of Power Electronics in Major Grids for Wind Generation Projects." It is anticipated that the sections assigned to authors will be prepared by year-end.

A new subcommittee under the T&D Committee is being established and titled: "Integration of Renewable Energy into Transmission and Distribution Systems." It is proposed that this working group would become a joint working group under this new subcommittee and HVDC and FACTS Subcommittee

The next meeting of the working group will be held the week of January 8th, 2007 in Orlando, Florida at the Winter Technical Meeting.

### **5.6 WG 15.05.17 - HVDC and FACTS Bibliography**

There were 15 members and guests in attendance (the largest group so far!) at the June 20, 2006 meeting chaired by Dr. Rajiv Varma.

Four papers were presented for the year 2004/2005 (3 papers on FACTS and 1 paper on HVDC Transmission). The papers listed were written English, and were obtained by searching the IEEE/IEE Journals and Conferences, obtained mainly from IEEE Xplore. It was noted that 40-60% of the papers listed were non-IEEE/IEE papers. Individuals were identified to obtain international/regional non-IEEE journals and conference papers for future lists.

The group reviewed the HVDC Projects List, and it was noted that the FACTS Projects List still needs to be consolidated (last done in 1998).

The group intends to continue with providing papers for the 2007 Summer Meeting, listing the 2005/2006 papers. The group will then focus on the papers published from 1998-2004 as bibliography listings were not completed.

## **5.7 HVDC Projects List**

Robyn Taylor revised the year 2000 version of the HVDC Projects Listing. Paper copies were distributed to the Subcommittee attendees.

The basis of the HVDC Projects List above was the 2005 version of the CIGRE Compendium of HVDC Schemes Throughout the World. Changes to the list were made, incorporating changes from:

- Mike Barhman, ABB - January 2006
- Neil Kirby, AREVA - April 2006
- Robyn Taylor, Teshmont - modifications based on the detailed descriptions from the 2005 version of CIGRE AG B4.04, COMPENDIUM OF HVDC SCHEMES THROUGHOUT THE WORLD text
- Robyn Taylor, Teshmont - modifications based on the IEEE HVDC Projects Listing, January 2000 Issue

Further modifications to the list are required. The list is provided in Appendix B (Excel spreadsheet). All are asked to provide revisions as required.

**ACTION:** Dennis to request that this Subcommittee be provided with the authority to link our website to the CIGRE B4 Compendium. Dennis will also coordinate our activities with the CIGRE SVC/FACTS device information lists.

## **5.8 Substations Subcommittee**

George Karady, Chair of the Substations Subcommittee, provided updates on their activities. (It was noted that the HVDC & FACTS Subcommittee is to hold meetings in conjunction with the Substation Subcommittee in the future.)



## **Subcommittee activities I0**

### **WG I1 Power Electronics Equipment**

#### **Standards**

**Std 857** Report from I1TF1 by Chair Dr. G. Karady:

The Std 857 "IEEE Recommended Practice for Test Procedures for High-Voltage Direct-Current Thyristor Valves" was reaffirmed in 2004 and a task force I1TF1 was created to start the harmonization process with IEC. Several attempts to draw comments from members failed. I1TF1 concludes there is no interest in the technical community to maintain this standard. I1TF1 is recommending not to pursue the harmonizing efforts with IEC.

**1240-2000** IEEE Guide for the Evaluation of the Reliability of HVDC Converter Stations (Chair: John Hormozi) – IO. Chaired by H. Bilodeau. The standard has been reaffirmed. The results will be sent to rev com in April

#### **Future Projects**

The subcommittee is looking at new projects to attract the participation of new members. The following possibilities were discussed.

**Position paper** on economic aspect of the used of power electronics; short term and long term advantages

#### **Tutorials:**

Present already developed tutorials: tutorial on SVC at the next Substation Committee meeting  
Developing additional tutorials; Tutorial on FACTS in general in line with chapter 5 of the Substation Handbook; Tutorial on HVDC.

#### **Working group**

Working Group on Active filter, the scope of the working group will be to conduct a survey on existing installations; conduct panel session, write position papers.

Investigate interface protocol with IEC on FACTS devices; approach the C subcommittee to investigate on this possibility .

#### **New activities for Working Group I5**

Reliability survey on STATCOM under WG I5 similarly to WG i4 on SVC

#### **Collaboration with IEC**

Pursuing the collaboration with IEC; Reply to the invitation of IEC to participate in a working group on fire protection; Investigate the advantages of liaison type A with IEC as suggested by L. Travin of IEC.

### WG14 Static Var Compensators

The meeting was held all day on Tuesday and emphasis was given to the two TF for revising the guides 1031 and 1303.

**1031-2000** IEEE Guide for the Functional Specification of Transmission Static Var Compensators (Chair: Michael Baker) – IO A PAR has been requested in November. H. Tyll will chair the Task Force. The first meeting is taken place on Tuesday.

**1303-1994 (R2000)** IEEE Guide for Static Var Compensator Field Tests (Chair: Michael Baker) – IO . A PAR has been received. C. Horwill will chair the Task Force. The first meeting is taken place on Tuesday.

**Reliability Survey** - The number of respondents to the survey has been increased to 30. An invitation letter has been finalized. The invitation will be sent in May for an expected reply by October 2006.

**SVC Refurbishment** – The objective is to publish a document on SVC refurbishment centered around the cases represented in the Panel Session in Toronto. No progress has been achieved since the last meeting in San Francisco. A draft document is being prepared for the Montreal meeting.

**SVC Users List** - The list for 2005 has been finalized.

### WG 15 Voltage Sourced Converter

A two day task force meeting took place to finalize the document on Voltage Sourced Converter. A final draft is being prepared for the Montreal meeting.

### WG 18 Power Electronics Building Block Concepts

No meeting took place in April. The WG and TF1 and TF2 will be meeting at the T&D conference on May 21-26 at the Dallas Convention Center in Texas and at the GM2006 in Montreal.

**WG18TF1 Task Force 1** A draft outline for the guide paper titled "Guide for Control Architecture for High Power Electronics Converters (1 MW and Greater) used in Electric Power Transmission and Distribution Systems" will be discussed at the T&D meeting in Texas.

### WG18TF2 Task Force 2

No meeting took place in April.

## 5.9 Liaison reports

### 5.9.1 IEEE SA Board Metrification Policy

Karl Mortensen provided an update on the two HVDC & FACTS standards that are being worked on at present:

- DC Side Harmonics
- Design on HVDC Converters for Short Circuit

A number of years ago the IEEE adopted a policy to remove all English units from the standards (metrification policy). This was a concern to a lot of people primarily due to safety concerns. It has been suggested that the standards use of metric units with imperial units in parenthesis. The Transformers Committee is still trying to have this modification made.

A number of standards are being balloted. All who are interested were asked to join the IEEE Standards Association. It is possible to sign up to receive notification of any standards being balloted in a particular

area of the IEEE. (It was noted that as a benefit, you are given the draft version of the standard for balloting.)

### **5.9.2 CIGRE Liaison**

Bill Long indicated that the next CIGRE meeting is scheduled for the end of August in Paris, and that the 2007 meeting is to be held in Japan.

## **6 PRESENTATIONS**

### **6.1 Latest HVDC Light Developments**

Gunnar Asplund provided a presentation entitled “Latest HVDC Light Developments”. A copy of this presentation is provided in Appendix C.

### **6.2 Optimization-Enabled Electromagnetic Transients Simulation for the Design of HVDC Systems**

Paul Wilson provided the presentation entitled “Optimization-Enabled Electromagnetic Transients Simulation for the Design of HVDC Systems” on behalf of Ani Gole, who was unable to attend the meeting. A copy of this presentation is provided in Appendix D.

### **6.3 Konti Skan Refurbishment and Upgrade**

Neil Kirby provided a presentation entitled “Konti Skan Refurbishment and Upgrade”. A copy of this presentation is provided in Appendix E.

## **7 GENERAL REPORTS ON HVDC AND FACTS PROJECTS**

The members and guests at the meeting provided the following information:

- **ABB**
  - The Gulf State Interconnector in Saudi Arabia will provide an ac backbone linking six gulf states (3-600 MW back to backs)
- **Siemens**
  - DC is definitely gaining in popularity again.
  - The cable business is picking up in the US. The Neptune project is under construction, and Siemens are in discussion with a proposed cable from Pittsburgh – San Francisco (300 MW). The TransWest Express and Frontier projects are on the horizon
- **EPRI**
  - Four areas are presently being focused on: Life Extension, Advanced HVDC 800 kV & above, HVDC Light, and one other...

- An EPRI Conference is being held from July 12-14 in South Africa. (Contact Ram Adapa for further information.)
- The next HVDC Conference may be in Winnipeg, MB.
- BPA
  - BPA are looking for an HVDC engineer. Must be a US citizen.
  - A 50 MVAR SVC specification has just been issued.
- Teshmont Consultants LP
  - Eel River is looking into life extension.
  - Transpower New Zealand are looking to replace the mercury arc valves and building a new pole with thyristors
- AREVA
  - 250 MW rectifier for the de-icing the transmission lines is nearing completion. The rectifier can also be used as an SVC during good weather.
- Manitoba HVDC Research Centre
  - Manitoba Hydro's Ponton SVC has been commissioned and is in service

## **8 ADJOURNMENT**

The IEEE PES HVDC & FACTS Subcommittee Meeting Adjourned at 12.00PM.

Dennis Woodford was thanked for acting as Chair of the group.

**APPENDIX A**  
**LIST OF ATTENDEES**

**IEEE HVDC & FACTS Subcommittee Meeting**  
**Chair: Dennis Woodford, Vice-Chair: Ben Mehraban**  
**8.30AM-12.00PM on Wednesday June 21, 2006, Palais des Congres de Montreal, Room 518c**

No.	Name	Affiliation	E-mail Address	Member	Guest
01	Wayne Litzenberger	BPA	wlitzenberger@bpa.gov	√	
02	Chris Horwill	AREVA T&D	chris.horwill@areva-td.com	√	
03	Georg Karady	Arizona State	karady@asu.edu	√	
04	Hubert Bilodeau	Hydro Quebec	Bilodeau.Hubert@hydro.qc.ca	√	
05	Karl Mortensen	Great River Energy	kmortensen@grenergy.com	√	
06	Peter Lips		p.lips@t-online.de	√	
07	John Bowles	Bodeven Inc.	jbowles@ieee.org	√	
08	Albert Keri	AEP	ajkeri@aep.com		
09	Urban Strandberg	ABB	Urban.strandberg@us.abb.com		√
10	Brian Johnson	University of Idaho	b.k.johnson@ieee.org	√	
11	Neil Kirby	AREVA T&D	neil.kirby@areva-td.com	√	
12	Todd Campbell	GE	todd.campbell@ge.com		√
13	Bill Long	University of Wisconsin	willis@engr.wisc.edu	√	
14	Andrew Isaacs	Electranix Corp.	ai@electranix.com		
15	Pei Wang	Manitoba HVDC Research Centre	peiw@hvdc.ca		√
16	Paul Wilson	Manitoba HVDC Research Centre	plwilson@hvdc.ca		
17	Vajira Pathirana	Teshmont Consultants LP	vpathirana@teshmont.com		√
18	Peter Lehn	University of Toronto	lehn@ecf.utorouto.ca	√	
19	Gerard Moreau	Hydro Quebec Technologies	moreau.gerard@hydro.qc.ca		√
20	Ben Mehraban	AEP	bmehraban@aep.com	√	
21	David Fletcher	Teshmont Consultants LP	dfletcher@teshmont.com	√	
22	Mark A. Reynolds	Siemens	mark.reynolds@ptd.siemens.com	√	
23	Aty Edris	EPRI	aedris@epri.com	√	
24	Ram Adapa	EPRI	radapa@epri.com	√	
25	Tom Weaver	Consultant	tlweaver2013@cs.com	√	

**IEEE HVDC & FACTS Subcommittee Meeting**  
**Chair: Dennis Woodford, Vice-Chair: Ben Mehraban**  
**8.30AM-12.00PM on Wednesday June 21, 2006, Palais des Congres de Montreal, Room 518c**

<b>No.</b>	<b>Name</b>	<b>Affiliation</b>	<b>E-mail Address</b>	<b>Member</b>	<b>Guest</b>
26	Willie Wong	ABB	willie.wong@us.abb.com		√
27	Jan Johansson	ABB	jan.g.johansson@se.abb.com		√
28	Mike Bahrman	ABB	mike.p.bahrman@us.abb.com	√	
29	Gunnar Asplund	ABB	gunnar.asplund@se.abb.com		√
30	Dragan Jovcic	University of Aberdeen	d.jovcic@abdu.ac.uk	√	
31	Geza Joos	McGill University	geza.joos@mcgill.ca		
32	Per Lindberg	ABB	per.a.lindberg@se.abb.com		√
33	Rajiv Varma	University of Western Ontario	rkvarma@uwo.ca	√	
34	Dennis Woodford	Electranix	daw@electranix.com	√	
35	Robyn Taylor	Teshmont Consultants LP	rtaylor@teshmont.com	√	

**APPENDIX B**  
**HVDC PROJECTS LIST**



**The HVDC Projects List was appended as an Excel document.**

**APPENDIX C**  
**LATEST HVDC LIGHT DEVELOPMENTS**

**APPENDIX D**

**OPTIMIZATION-ENABLED ELECTROMAGNETIC TRANSIENTS SIMULATION FOR THE  
DESIGN OF HVDC SYSTEMS**

**APPENDIX E**

**KONTI SKAN REFURBISHMENT AND UPGRADE**