

## **HVDC-HVDC-FACTS SUBCOMMITTEE MEETING**

### **PES SUMMER POWER MEETING,**

**June 15, 2005, San Francisco, CA**

#### **Minutes of Meeting**

**Chair:** Dennis Woodford

**Vice Chair/Secretary:** Ben Mehraban

#### **1. Minutes**

It was moved by Wayne Litzenberger and second by Ani Gole to approve the minutes of the meeting held on June 9, 2004, in Denver. Minutes were approved. Motion carried.

#### **2. Sub-Committee General Business**

##### a) Awards Recognition

Recognition was given to Michael Woodhouse for the Uno Lamm High Voltage Direct Current Award.

b) Proposed January joint Technical Committees meeting with other IEEE-PES Committees—Discussions were made about the possibility of holding a technical meeting, possibly in Las Vegas, in January.

c) New Working Groups—Dennis Woodford requested new ideas on forming new WGs. Two new WGs were proposed: “Ultra HVDC Links” and “Refurbishment of the HVDC/FACTS Devices”

d) HVDC and FACTS Functional Coordinators—Dennis Woodford announced names of the T&D functional coordinators:

Kal Sen—Transaction paper Review, Dragen jovic—Conference Paper Review Coordinator, Donald Shoup—Panel session Coordinator, Jack Christofersen—Web Coordinator, Andrew Isaacs—Meeting Coordinator, and Karl Mortensen--Standards subcommittee Member.

e) Sub-Committee Website—the subcommittee website is being assembled by Jack Christofersen

#### **3. Reports of T&D Working Groups**

##### **A) WG 15.05.02 Dynamic Performance and Modeling of HVDC Systems and Power Electronics for Transmission Systems, Chair: Ram Adapa**

The working group met on June 13, 2005. There were 15 persons in attendance. The main items of business were:

##### 1. Status of Position Papers

EMTP-type Models for Conventional DC Systems--It was resolved to solicit contributors

EMTP-type Models for FACTS (not including VSC-Voltage Source Converter based)—It was completed. **IEEE accepted this position paper and it was published in the IEEE Transactions. This WG received the T&D best WG paper Award for this work.**

EMTP-type Models for VSC based FACTS--Work in progress.

EMTP-type Models for VSC based DC Transmission—Work near completion

New Position paper on Models related to Inclusion of Wind Generation in Power Networks. The principal focus is on the power electronics circuits and controls. There was a discussion about any other WGs developing these types of models. It was also suggested that we invite manufacturers of wind generation such as GE Wind to make a technical presentation to this group.

## 2. Benchmark Test Systems to validate HVDC and FACTS

The purpose of these test systems is to observe load flow control, transient stability, small signal stability, and voltage stability phenomena. The small test system and the medium test system (as originally planned) are combined and will be provided as one test system.

It is decided to write a WG paper on this Test System with more contributions from various WG members.

Reduced WECC system with about 107 buses—Work is completed. This test system data is already available from EPRI. Ram Adapa sent this test system data to all the WG members by email and this will be posted on the IEEE WG website location.

## 3. Investigate Common Information Model (CIM) applications to HVDC and FACTS models: work in progress

There is a lot of work done in the data standardization and common information model (CIM) development in the EMS area so that the data can be easily transferable from one application to the other. The goal is to see if the CIM work could be extended to DC and FACTS models so that the data can be exchanged easily among several applications using a common database.

## 4. Develop a fact sheet with some minimal information on existing FACTS installations around the world: work in progress

The goal is to develop a one page listing of all the existing FACTS installations (excluding SVC installations as there are many SVC installations) similar to the one that is presently available for HVDC systems. Dennis Woodford presented a partial list of FACTS including SVC, with over 1000 entries from the IEEE website. There was also a discussion about updating the list of HVDC Installations and was agreed that CIGRE is also developing a similar list for HVDC installations and Dennis Woodford will look into this CIGRE activity and provide the list to this WG.

## **B) WG 15.05.14 Education on HVDC/FACTS Education, Chair: Bill Long**

The Working Group met with six members and guests were in attendance. The main items of business were:

1. A two-hour Dynamic Reactive Power panel session is ready for presentation at the October 2005 T&D Conference. The panel will be tutorial in nature; it is a revision of the previously-offered VAR Basics panel session.

2. The new panel session "Reactive Compensation for Wind Farms" was not offered at the June 2005 General Meeting in San Francisco as there were many other wind farm sessions and this seemed redundant.

3. A new panel session tentatively titled "HVDC System Solutions" is being planned for the fall, 2006 Power Systems Conference and Exposition in Atlanta. The intended audience is system planners and developers, and transmission engineers. Proposed topics include recent applications of HVDC systems, the technical and business case for these projects, merchant systems, blackout and regulatory issues, the synchronous operation of dc links, and future HVDC system applications.

4. Chair Bill Long will step down July 1, 2006. He has headed the working group since its inception in 2001.

### **C) Uno Lamm HVDC Award Committee**

The Uno Lamm Committee is pleased to announce that the 2005 Award was made to Michael Woodhouse, AREVA T&D, "For contributions to the understanding of the stresses in high-voltage thyristor valves and for the dissemination of this information." The award was presented at the PES 2005 Awards Luncheon. Mike was nominated by Michael Baker, formerly of AREVA T&D. Nominations for the 2006 award are encouraged; they must be received by November 30, 2005. The nomination form is on the PES web site under "Awards." They should be sent to David Fletcher, who is the new chair of the committee.

### **D) WORKING GROUP 15.05.15 – Use of Power Electronics in Major Grids for Generation Requirements, Chair: Geza Joos**

The working group met on Tuesday June 14, with 6 persons in attendance. The main items of business were:

#### 1. Working Group Web Site

The Chair reported on the IEEE and CIGRE activities in power electronics, which included other groups involved in wind generation, power electronics and interconnection issues. In addition, there is a standard being developed for interconnection of generation to distribution system that is being integrated into IEEE 15.47.

#### 2. Review of Report Outline

Section 4 of the WG document, Description of Major Power Grid(s) of the Future, has been drafted to include; a) Concepts, vision and requirements, b) Economics, quality, environment, c) Generation expansion, d) Power system security, e) Security of the electric power supply (fuel security), f) Transmission upgrade, g) Life extension, h) Integration coal-wind (environmental), i) Storage, j) Communication, monitoring, control and protection, k) Segmentation, and l) Customer reliability, energy efficiency. It is proposed that this section be prepared between now and the end of the year and have it evolve into a panel session for the summer meeting 06.

### **E) Working Group 15.05.17 - HVDC & FACTS Bibliography, Chair: Rajiv Varma**

The WG on HVDC and FACTS BIBLIOGRAPHY met on Monday June 13, 2005. Three persons were in attendance. The main items of business were:

#### 1. Progress on the HVDC and FACTS Bibliography for year 2004

Rajiv Varma presented the data compiled for the Bibliography for the year 2004. This data included the titles, citations and abstracts of various papers compiled from the following databases: IEEE Xplore, Engineering Village 2, Compendex, INSPEC and Scopus. There were several papers, both in international journals and Conferences which were not available from IEEE Xplore or Google searches, and could only be obtained from the other databases as mentioned above. This clearly demonstrated the need for pursuing this Bibliography preparation activity.

It was decided to include only English language papers in this Bibliography.

#### 2. Financial Support for compiling the HVDC and FACTS Bibliography

The Bibliography for 2004 is about 200 pages long and required extensive searches on a voluntary basis by graduate students at University of Western Ontario. Since the scope of the Working Group is to prepare the Bibliography from 1998 until present, the magnitude of work involved is enormous. In future, this can only be sustained if some remuneration is provided to the graduate students for their time. Rajiv Varma proposed that a nominal budget be created for compensating the graduate students involved in this activity. It was decided to explore the possibility of setting up an account with IEEE Canada which can support this activity.

### 3. Dissemination of the Bibliography

CDs were given to the members of the Committee that contained the draft form of the Bibliography for 2004, for review. It was proposed to make copies of the CD available to some members in the HVDC and FACTS Subcommittee for review and comments.

### **F) WORKING GROUP 15.05.08-HVDC & FACTS ECONOMICS AND OPERATING STRATEGIES-- Chair: Mark Reynolds**

The WG met on Tuesday June 14 with 10 persons in attendance. The main items of business were:

WG Issues--A key aspect of this working group is to discuss projects that are in progress. This could be considered as a deliverable, along with sponsoring of panel sessions. Issues that could be considered for the Working Group are:

1. Staff issues of maintaining critical plant, such as controls and protections.
2. Ensuring the controls and protections with their software can be easily replaceable and programmable, and long life.
3. Shelf aging of thyristors, snubbers, and other components.
4. Line convertibility. It is difficult to take a line out of service to upgrade it. Line upgrading is therefore inhibited. Therefore, using new gas generation is often the solution.

### **4. Reports from Substations Subcommittee**

HIGH VOLTAGE POWER ELECTRONICS STATIONS SUBCOMMITTEE (I0), Chair: Hubert Bilodeau

### **I- Subcommittee activities I0**

The subcommittee met at the annual Substations Committee meeting in Tampa, FL. Two presentations were given. One on the De-icer project from Hydro-Québec given by H. Bilodeau and C. Horwill of Areva and the other presentation given by D. Nix on the current status of the HVDC project at Lamar, CO.

Three standards are scheduled for revision or reaffirmation by October 2005, namely:

**1031-2000** IEEE Guide for the Functional Specification of Transmission Static Var Compensators (Chair: Michael Baker) – IO . Revisions are needed for this guide. A task Force Chair by H. Tyll will initiate the process.

**1303-1994 (R2000)** IEEE Guide for Static Var Compensator Field Tests (Chair: Michael Baker) – IO . Revisions are needed; a task Force Chair by C. Horwill will initiate the process.

**1240-2000** IEEE Guide for the Evaluation of the Reliability of HVDC Converter Stations (Chair: John Hormozi) – IO. Chair J. Hormozi will be contacted to initiate the procedure for reaffirmation.

Discussions on restructuring the Working Groups were initiated but no final decisions were made at this point.

The next meeting will take place at the 2006 Substation Committee Meeting in Phoenix.

### **II -Working Group Activities**

## **WG I1 Power Electronic Equipment**

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. Members have been invited to join the task force. No official meeting took place this year since most of members are corresponding by Email.

## **WG14 Static Var Compensators**

A one day **tutorial** on "Static Var Compensator" was presented in San Francisco.

**Reliability Survey** - C. Horwill presented results compiled from present survey. The pool of SVC installations has been increased to 20.

**SVC Refurbishment** – The objective is to publish a document on SVC refurbishment centered around the cases presented in the Panel Session in Toronto. It is requested from all authors to complete the sections from the cases presented. This task is continuing in 2006.

**SVC Users List** - WG I4 recognized the work of Yanny Fu in appreciation of her diligent work in Maintenance of the SVC Users List. Hamid Sharifnia volunteered to take over from Y. Fu the task of maintenance.

## **WG I5 Voltage Sourced Converter**

The WG is about to finalize a special publication on Voltage Sourced Converter. Draft 1.5 of the document was submitted in San Francisco and a final document will be presented in 2006. All the activities are coordinated with Cigré WG 14.37 and T&D WG15.05.13. Duplications with WG's 15.05.13.document must be addressed and finalized before the end of August 2005.

## **WG I8 Power Electronics Building Block Concepts**

The working group met at the annual Substations Committee meeting in April but did not meet at the SPM 2005 in San Francisco.

The document number 04TP170 on Power Electronics Building Block (PEBB) Concepts, is now available and can be ordered through IEEE customer service department email: [customer-service@ieee.org](mailto:customer-service@ieee.org), cost is \$13.00

A panel session at the IEEE Electric Ship Technologies Symposium on July 25-27 in Philadelphia has been proposed. The topic of the panel session will be "PEBB Applications to Marine Systems".

**WG18 TF1 Task Force 1** "Control Architecture for Power Electronics Building Blocks", met in April with 10 attendees. Randy Wachal is stepping down as Task Force Chairman. Joe Sullivan is taking the position of chairman and Fred Wang will be recording secretary.

A PAR as been requested, P1676, but is not yet approved. The PAR is titled "Guide for Control Architecture for High Power Electronics". Nari Hingorani is the Working Group Chair for P1676, and Joe Sullivan is the Co-Chair/Official Reporter/Document Custodian.

Peter Steimer (ABB) presented an overview of the Powerlink Communications protocol. And Fred Wang presented the status and reviewed the initial draft of the P1676 guide.

Participation of more utility members and other equipment suppliers (Areva and Siemens) to the task force is sought.

**WG18TF2 Task Force 2** --The TF2 initiated a new working document on "Design Tools for PEBB-Based System written by Ani Gole. The document has 6 chapters discussing tools related to the design of the PEBB assembly as well as tools for evaluating the performance of the overall power system with the PEBB based device. A Panel Session plan has been submitted for the 2006 PES General Meeting in Montreal "Design and Verification Process for Power Electronics Equipment in Power Systems Applications" Nari Hingorani and Ani Gole will be Co-Chairs for this panel session.

#### **5. Liaison Reports**

A number of reports were given.

#### **6. Presentations**

- a) Ram Adapa gave a presentation entitled "New initiatives in the HVDC System"
- b) Don Ramey gave presentation on the Transmission System Application Requirements for FACTS Controllers WG 15.05.13 document.

These presentations were very informative and beneficial to the members.

#### **7. Future PES Meetings**

- a) T&D Conference and Exposition, New Orleans, October 9-14, 2005
- b) Winter Technical Meeting – Las Vegas, January 2005

Respectfully Submitted,

Ben Mehraban

HVDC and FACTS Subcommittee Secretary