

**CIGRE STUDY COMMITTEE B4 - HVDC AND
POWER ELECTRONIC EQUIPMENT
The 39th Session Regular Meeting
Thursday September 2, 2004
Paris, France
9:00 am to 5:00 pm**

Chair: Marcio Szechtman

Secretary: Willis Long

1.0 Opening Comments

Chair Marcio Szechtman opened the meeting at 0900. There were 62 persons in attendance. He welcomed the members, observers, conveners, and guests. Attendees introduced themselves (see below). Marcio read a letter of commendation to Jack Christofersen who has ably served as webmaster for the Study Committee.

2.0 Membership

2.1 New and Retiring Members

Guangfu Tang, replacing Wentao Zhang, (CHN)
Victor Lescale, replacing Bjorn Ekehov (SWE)
Stig Nilsson, replacing Wayne Litzenberger (USA)
Shyful Bahrin Ismail, replacing Basha Ismail Amir (MYS)
Hartmut Huang replacing Peter Lips (DEU)

Marcio commented that there were several observer countries that may change to member countries in 2006 replacing countries that participate minimally.

2.2 Absences, apologies

Giorgi Alberto (ITA) represented by Massimo Pozzi

Shyful Bahrin Ismail (MYS)

Jiri Pavelka (CZE)

Attendance at this meeting is as follows:

Attending Regular Members

Australia/NZ	Mohamed Zavahir	Italy	Massimo Pozzi representing Alberto Giorgi
Austria	Klaus Papp	Japan	Toshiyuki Hayashi
Belgium	Karim Karoui	Netherlands	Yanny Fu
Brazil	Carlos Gama	Norway	Hakon Borgen
Canada	Mohammed Rashwan	Romania	Mircea Eremia
China	Guangfu Tang	Russia	Viktor Ivakin
Denmark	Kent Soebrink	South Africa	Andrew Williamson
France	Samuel Nguefeu	Sweden	Victor Lescale
Finland	Jussi Jyrinsalo	Switzerland	Dirk Westermann
Germany	Hartmut Huang	UK	Bjarne Andersen
India	V. K. Prasher	United States	Stig Nilsson

Observer Members

Ireland	Clement Harvey
Korea	Tae Kyoo Oh
Mexico	Jesus Gonzalez
Poland	Krzystof Madajewski
Spain	Juan M. Rodriguez-Garcia

WG/TF Conveners, AG Members

Canada	Brett Davies
Germany	Dietmar Retzman
Norway	Kirsten Faugstad
Sweden	Kjell Eriksson
US	Aty Edris
	John Paserba
	Ivars Vancers

Guests

Austria	Alex Grisenti
Brazil	John Graham
Canada	Dennis Brandt
	Murray Bennett
	Dan Kell
	Narinder Dhaliwal
	Ani Gole
	John McNichol
	John Reeve
China	Ding Zhong Meng
Denmark	Peter Christensen
	Peter Sorensen
Finland	Pehr-Olov Lindh
	Bo Wikstrom
Germany	Peter Lips
	Dusan Povh
	Georg Wild
Ireland	Maurice Smith
Japan	Isao Iyoda
	Hiroo Konishi
	Masahiro Takasaki
Norway	Arve Strandem
Russia	Lev Travin
Sweden	Gunnar Asplund
	Magnus Lalander
UK	Norman MacLeod
USA	Lionel Barthold
	John Vithayathil

3.0 Minutes of Nuremberg 2003 Meeting

Long

There were no changes or corrections. The minutes from this meeting along with available reports can be found on the SC web site.

4.0 Technical Committee Report

Szechtman

The Cigre Technical Committee met in April, 2004. They confirmed the new SC B4 structure; Marcio reported that the plans were very well received. There were no Working Group changes for B4. All Study Committees were asked to be selective in their choices of Preferential Subjects. Cigre is international so we should be attentive for developing countries' needs. Regarding *Electra*, the Paris office needs an ongoing estimate of all Study Committees' publishing plans.

5.0 Strategic Plan and Advisory Groups

5.1 Status of Strategic Plan

Szechtman

The Strategic Plan had been approved at the 2003 SC meeting in Nuremberg. It is very important that we make the role of the Advisory Groups clear. From a strategic perspective this will help the Working Groups to achieve their goals. Our purpose is to disseminate/promote/enhance information exchange about HVDC and FACTS. We want to have more and more people accepting the technology.

5.2 AG 01: Strategic Advisory Group

Zavahir

Mohamed Zavahir reviewed the presentation from the Nuremberg meeting. We want to meet the needs of our identified Target Groups by defining objectives and strategies. The Action Item was to establish 4 Advisory Groups to achieve this. To clarify, the technical work belongs to the Working Groups, not the Advisory Groups. Advisory Groups may have task forces. Communication is the key element that will determine our success.

It was commented that it is important for companies to support the Cigre work, but how can we encourage this? Should there be an official invitation from the Study Committee? Can the National Committees help by providing their endorsement? Marcio stated that we need to promote ourselves and communicate better. He will write a letter from the Study Committee if asked. The question was raised about the age profile of SC and WG members. How might we attract younger members? (Some national committees do this via travel support.) John Paserba, Convener of Task Force 2 of AG 01, asked those in attendance to please complete the TF survey to collect information regarding which activities are participated in, and added a request to keep him informed so as to enhance communication. One question asks for WG suggestions for future Preferential Subjects. The TF will publish a report summarizing the results. There was also a comment on the importance of avoiding conflicts with other SCs (C1, C4, and C6 were especially mentioned).

5.3 AG 02: WG Conception and Guidelines

Soebrink

Advisory Group 02 has developed a questionnaire to solicit ideas for new Working Groups. There is a concern regarding duplication of similar organizations' activities (e.g., IEEE/PES). The AG members intend to develop a database for SC activities to help identify new work and Preferential Subjects; they intend to pay attention to Target Groups and involve them as active partners. AG2 will also develop a publication table. A guideline for proposed new projects will be located on the web site. It will define the need for the work, the scope, the target groups, etc.

It was commented that we also have to address non-technical target groups. We must involve system planning/analysis people, not just talk to ourselves. It was suggested to have an AG assigned to monitor other Study Committees and coordinate joint contact with Target Groups. There was a discussion how to effectively do this: informally, via colloquia, via Electra, by having Regular Members promote activities in their own countries. It was mentioned that SC B4 WG members now participate in IEC subcommittees (notably WG 37, VSC converters for HVDC Transmission). Marcio emphasized that Joint Working Groups are not favored by the Technical Committee, although cooperation with another Study Committee via joint members on Working Groups is acceptable.

5.4 AG 03: Environmental Issues

Faugstad

This Advisory Group is just getting underway. Immediate concerns include audible noise, electrodes, E/M fields from converters and lines, and the visual impact of lines. There needs to be a correlation between good environmental understanding and project planning and acceptance. For cable systems, a monopole w/electrodes is a better solution regarding losses. There will be two task forces: one will cooperate with SC C3, the other will develop an environmental database.

There was a discussion of ground currents. It was agreed that this is an important topic area and that a Working Group should be established. The AG should consider environmental issues for FACTS and not just for HVDC, but HVDC will receive the initial attention. It was noted that national guidelines must be included in the work of the AG.

5.5 AG 04: HVDC System Performance

Vancers

This Advisory Group was previously identified as Working Group B4-04 but is now an AG because of its permanent nature. There are two task forces: the biennial Reliability Survey paper and the compendium. The AG wants to increase the number of systems reporting, and Ivars will attend the next HVDC Users Group meeting to try to increase the participation. There are now 67 projects included in the compendium and the intention is to locate it on the SC B4 website in the near future.

There was a question asking if the AG plans to capture environmental information? There is currently little or no information available on this topic, Advisory Group 03 will pursue this.

6.0 Working Group Reports

6.1 B4.33: DC/FACTS for Distribution Systems

The final meeting was held 30/08/04 and the document is being completed. It will then be sent to the Regular Members for 60 day review. The market is not ready for the technology as costs remain too high compared with traditional distribution system solutions. The document will be useful for special solutions such as windpower.

Eriksson

6.2 B4.37: DC Transmission Using Voltage-Source Converters

Andersen

The work is complete, the last meeting was held in May, 2004. The focus is on converter ratings in excess of 100 MW/100 kV. The report is ready for 60-day review. IEC requested a study of testing of VSCs, The WG decided that further development of the technology is needed before taking that step. It should be noted that VSCs are used in FACTS controllers as well as for HVDC.

6.3 B4.38: Simulation of HVDC and FACTS

Retzmann

This WG has added a new task: Guidance of HVDC/FACTS Studies. The membership is closed at 23 members. The report is intended to increase the understanding of HVDC and FACTS among Target Groups. Persons doing simulation should have training in HVDC and FACTS. It is expected that draft reports will come together in December, 2004, and the final report is to be finished in March, 2005. A question was raised asking if there is cooperation with an IEEE/PES Working Group? (Yes)

6.4 B4.39: Integration of Large Scale Wind

Power with HVDC and Power Electronics **Andersen**

This Working Group has been relaunched with Bjarne Andersen as chairman. The issue is of growing importance as windpower installations increase. There is a two-year target date for the final report. Bjarne asks that all previous members contact him; new members are welcome (especially modeling and simulation) but are expected to contribute. The principal Target Group is windfarm developers.

6.5 B4.40: Static Series Synchronous

Compensator (SSSC) **Edris**

This Working Group held its initial meeting in June, 2004. There are 15 members. An outline for the report has been prepared and the report is expected to be finished in December, 2006. There are presently three SSSCs installed, two with UPFCs and one with a CSC.

6.6 B4.41: Systems with Multiple HVDC Infeed

Davies

A 3-way videoconference was held in the spring with 14 persons attending. Using a planned system near Winnipeg, the WG has done studies of the Potential Interaction Diagram, looking at the interaction factor between/among converters. The intent is to investigate whether the developed concepts can be useful for operations as well as planning. There is a 2006 target date for the report.

6.7 B4.43: Increased System Efficiency by Use

Of New Generations of Power Semiconductors **Westermann**

The Working Group has held 3 meetings to date, there are 13 members (include 4 corresponding). The focus is to project 10 yrs ahead – what does will the technology be? One expects lower losses, higher frequencies, modularization. They will explore both a component view and a station view. Building blocks may be a key element. There are four task forces, the report is projected to be finished in September 2006.

6.8 JWG B2/B4.17: Impacts of HVDC Lines on

Economics of HVDC Projects **Gama**

This Joint Working Group (under the leadership of SC B2) has just been formed, the scope being approved in May, 2004. The first meeting will be held in the beginning of 2005. They will review and update data on costs for converters and dc lines, and expect to study the cost of losses, interest rates, break-even

distances, etc. Interested B4 members should send a message to Carlos, copy to Marcio and Bill.

6.9 JWG A2/B4.28: HVDC Converter Transformer Test Procedures **Dhaliwal, Fu, Prasher**

This Joint Working Group takes the numbering from A2 as the lead Study Committee. They met this week in Paris; there was wide representation at the meeting (15 members). There followed a long discussion of whether there is a need for this WG (consensus - yes). The failure rates of AC and HVDC transformers are similar but the impact of a converter transformer failure is much greater. Also, there are many identical converter transformers in a station, not distributed throughout the network. The previous JTF B4.04/A2.1 indicated a need for additional work beyond their scope/final report. A new detailed scope has now been developed. The deliverable will be a report expected December 2006 and recommendations to IEC and IEEE standards bodies.

7.0 2004 Paris SC Technical Session **Szechtman, Borgen, Andersen**

Bjarne Andersen and Hakon Borgen expressed their thanks to all of the contributors. It was considered to be a very interesting session with more than 60 contributions. A report has been posted at Conference Secretariat. Time was allocated for spontaneous contributions, and these were valuable. Time was also available at end of the session for additional topics of special interest. The intent is to get all presentations on the SC web site.

8.0 Future Study Committee Meetings

8.1 2005 Meeting in India **Prasher**

V. K. Prasher distributed the Call for Papers brochure with details for the meeting in Bangalore, India Sept 17-24, 2005. Working Group meetings are scheduled for September 19-20-21, and the Study Committee meeting will be on September 22. Four half-day Tutorial presentations will be held on September 17-18. A Colloquium on the Role of HVDC, FACTS, and Emerging Technologies in Evolving Power Systems will be held September 23-24. The venue is the Hotel Meridien (note: later changed to The Grand Ashok). Temperatures are expected to be moderate, in the 20s. A travel agent will be selected soon. Technical and touristic visits are planned, along with post-conference tours. Advisory Group 1 will work with V. K. Prasher to coordinate the Study Committee participation.

8.2 2006 Paris Meeting **Szechtman**

The next Paris meeting will be August 27 – September 1, 2006. Marcio introduced the 2006 Preferential Subjects to be presented to the Technical Committee:

1. New HVDC and Power Electronic (PE) Technologies and Projects

- Enhanced Voltage Sourced Converter Applications
 - Advances in PE Devices
 - Novel PE Applications
 - New HVDC Projects
2. Issues Concerning HVDC and Power Electronic Projects
 - Environmental Requirements for New Applications and Upgrades
 - Environmental Monitoring Programs for Existing Schemes
 - Fault Diagnosis and Lifetime Prediction at Operation and Maintenance Levels
 - Operating Experiences of Projects
 - Studies and Experiences on Cost Reduction
 3. Role of HVDC and Facts to assist System Performance
 - Dynamic Design Requirements of Projects for Severe Operating Conditions
 - HVDC and PE Technologies' Contributions to System Restoration
 - Studies and Experiences on How to Incorporate HVDC and PE Modeling into System Planning
 - Technical and Economic Benefits Experienced

8.3 2007 Meeting Invitation

Hayashi

Toshiyuki Hayashi presented a formal invitation on behalf of the Japanese National Committee. The meeting would be in conjunction with Study Committees B1 and C1; SC meetings will be in parallel and a joint colloquium will follow. The time would be in Spring or Fall 2007. Marcio accepted the invitation with thanks on behalf of the Study Committee.

9.0 Reports from IEEE and IEC

9.1 IEEE

Woodford

The IEEE Power Engineering Society Winter Meeting no longer exists. A new Power Systems Conference and Exposition will be held in New York in October (this meeting will alternate with the T&D Conference and Exposition). Dennis reviewed the current Working Group activities. The 2004 Uno Lamm Award was presented to Dennis at the IEEE/PES meeting in Denver. Nominations for the 2005 award are to be sent to Bill Long by November 30, 2004.

9.2 IEC

Travin

The last meeting was held in October in Montreal. A report on HVDC system performance (revised from 1988) is expected to be published by the end of 2004, with second and third parts in 2006 and 2008. A new Working Group (12) is preparing a standard on audible noise. A report on ground electrodes was rejected because of a lack of experts. (They will try another approach.) An IEC/CIGRE double-logo document on system tests for HVDC was approved, likewise a document on high-voltage filters (published). A first draft of a TCSC report is expected to be issued by the end of 2004. Again, participation from SC B4 in IEC work is requested,

along with SC B4 committee reports in electronic format to IEC for information. Marcio will explore this issue of availability of reports. New German Regular Member Hartmut Huang will serve as the SC liaison member from Europe.

10.0 Reports from Other Committees or Organizations

No verbal reports were presented because of time constraints, please refer to the SC web site for available reports.

11.0 HVDC and FACTS Schemes Under Construction or Planned

(Please refer to the web site for available reports.)

Ding Zhong Meng discussed the need to avoid voltage collapse by means of parallel ac/dc/coordination. Bipolar outages have been 1/yr but with a 3-phase or severe 1-phase fault the ac voltage drops resulting in a commutation failure. This will shift 7000 MW to the ac network leading to a voltage collapse and possible blackout. The key question is how to improve system performance.

Lionel Barthold presented a new concept in the conversion of ac lines to dc. It uses all 3 conductors by cycling conductor current while observing thermal limits. The modulation period is 2-3 minutes, and could be as much as 10 min. The best arrangement might be 1 pole carrying positive current, 1 carrying negative current, and one cycling (modulated). Marcio extended the Study Committee's thanks for this interesting contribution.

Carlos Gama stated that Brazil is looking at a 1600km, 500 kV, 2500 MW (2 lines) to Manaus. They are also studying a 1500 km, 3 circuit 765 kV ac system (and might consider dc).

Hakon Borgen presented new plans for the Norway-Netherlands cable project, 580 km, 450 kV, 600 MW.

V. K. Prasher reported on projects in India.

12.0 Operational Experiences of Existing HVDC and FACTS Schemes

(Please refer to the web site for available reports.)

Carlos Gama reported on Brazilian TCSC operation: 99% availability for the first two installations, the second two are too new to report reliable data.

Norman MacLeod reported on the improvements to the Konti-Skan project.

Peter Lips described the status of the 3000 MW project in China. He noted that a 600 MW cable connecting New Jersey and New York is under study.

Victor Lescale discussed several ABB Projects.

V. K. Prasher reported on existing projects in India.

13.0 Other Business

Andrew Williamson read a letter to the Study Committee regarding a book on the history of the Cahora Bassa system. The book was written by Eustace Raynham, who had been the South African Regular Member for many years. Andrew presented the book to Marcio representing the Study Committee.

On behalf of Advisory Group B4.02, Working Group Conception and Guidelines, Kent Soebrink offered three new Working Group proposals:

1. A Planning Guideline for HVDC environmental issues (to begin under AG 3)
2. Life cycle assessment of HVDC and Power Electronics projects (to be considered by an AG)
3. Power Electronics education tools on the Study Committee website (to be pursued by an AG)

Gunnar Asplund suggested topics including dc vs.ac technical/economic planning, similarly for cable systems, and a B4-C4 joint study of system technical performance relating to HVDC/FACTS issues.

Marcio noted that joint working groups are not looked on with favor at this time. He asked that interested persons submit ideas for new working groups to Kent Soebrink.

Marcio announced that the Technical Committee Award for 2003 has been given to Study Committee former chairman Dusan Povh. A proposal for the 2004 awardees has been submitted.

Departing Regular Members Wentao Zhang, Wayne Litzenberger, Bjorn Ekehov, Peter Lips, and Basha Ismail Amir were thanked for their service, and their replacements were welcomed to the Study Committee.

14.0 Adjournment

Chairman Marcio Szechtman adjourned the meeting at 5:00 p.m.
Minutes submitted by Bill Long, Secretary, Study Committee B4.

Willis F. Long
January, 2005

