

**CIGRE STUDY COMMITTEE 14 - HVDC AND
POWER ELECTRONICS
The 39th Session Regular Meeting
August 29, 2002
Paris, France**

Chair: Dr. Dusan Povh (DE)

Secretary: Dr. Willis Long (US) for Mark Reynolds (US)

1.0 Opening Comments

Chair Dusan Povh opened the Study Committee meeting at 0900. He welcomed those in attendance and noted that this will be the last meeting of Study Committee 14. Following the close of the CIGRE Meeting we will become Study Committee B4.

Marcio Szechtman was introduced as the incoming chair of SC B4. Bill Long was introduced as Secretary for this meeting, replacing Mark Reynolds; he will continue as Secretary of SC B4.

2.0 Membership

Chair Povh extended thanks and appreciation to the retiring Regular Members and Observers.

Changes in membership are as follows:

1. Countries with retiring Regular Members and accepted new nominations

Canada: J. F. Allaire (RM) replaced by M. Rashwan (RM)

China: Zhang Wentao (RM), replacement still open, but B4 needs a Chinese Member, as China will be the country with the most large-scale HVDC Transmission in the future. The nomination is expected shortly.

Finland: M.J. Lathinen (RM) replaced by J. Jyrinsalo (RM)

France: A. Le Du (RM) replaced by S. Nguefeu (RM)

Germany: H.-P. Lips (RM), extension for additional 2 years accepted

US: E.V. Larsen(RM) replaced by W.H. Litzemberger(RM)

Netherlands: J. A. Abraham (RM) replaced by Y. H. Fu (RM)

2. Countries with retiring Observers and new nominations, and suggested nominations for Regular Members Status instead of Observer Status

Ireland: M.C. Harvey (OBS) accepted as a new Observer.

Romania: D. Catalin (OBS) retired, and M. Eremia (RM) suggested to replace him with the status of Regular Member. This is acceptable as one position for RM became vacant due to resigning of Greece representative.

Spain: R.C. Criado (OBS) replaced by G.J.M. Rodriguez(OBS)

Korea: Oh Tae-kyoo (OBS) remains observer because of limitation of number of Regular Members to 24

Poland: K. Madajewski (OBS) remains observer because of limitation of Regular Members to 24

An updated list of Regular Members will be posted on the SC B4 web site.

Attendance at this meeting is as follows:

Attending Regular Members

Australia Mohamed Zavahir
Austria Klaus Papp
Belgium Karim Karoui
Brazil Carlos Gama
Canada Mohammed Rashwan
Czech Jiri Pavelka
Denmark Kent Soebrink
Finland Jussi Jyrinsalo
France Samuel Nguéfeu
Germany Peter Lips
India V. K. Prasher
Italy Alberto Giorgi
Japan Toshiyuki Yokohama
Netherlands Yanny Fu
Norway Hakon Borgen
Romania Mircea Eremia
Russia Viktor Ivakin
South Africa Andrew Williamson
Sweden Bjorn Ekehov
Switzerland Dirk Westermann
UK Bjarne Andersen
US Wayne Litzenberger

Absent Regular Members

China Zhang Wentao (with
apologies)
Malaysia Amir Basha Ismail

Observer Members

Korea Tae-kyoo Oh
Mexico Jesus Gonzalez
Poland Krzysztof Madajewski
Spain Juan Rodriguez

WG/TF Conveners

Canada Dennis Woodford
Denmark Peter Christensen
Germany Dietmar Retzman
Switzerland Goran Andersson
US Aty Edris
Jack Christofersen
John Vithayathil
Ivars Vancers

Guests

Austria Alex Grisenti
Canada Jacques Allaire
Dennis Brandt
J. Brett Davies
Narinder Dhaliwal
Reza Iravani
Garth Irwin
Daniel Kell
John McNichol
John Reeve
Jack Scriven
Finland Matti Lahtinen

Germany	Hartmut Huang	Norway	Kirsten Faugstad
	Kadry Sadek	Russia	Lev Traviu
	Michael Weinhold	Sweden	Gunnar Asplund
	Georg Wild	Switzerland	Adel Hammad
Japan	Isao Iyoda	UK	Michael Baker
	Hisao Taoka		Neil Kirby
	Akihiko Yokoyama		
Netherlands	Geert Damstra		

3.0 Minutes of the SC 14 on August 29, 2001 in Yichang, China

The minutes were prepared by Jack Christofersen. He commented that Regular Members are expected to attend or be represented by a colleague. He expressed thanks to the Chinese hosts for their hospitality at the meeting and subsequent colloquium. Chair Povh commented that China along with India have become the most active HVDC communities.

The minutes were accepted with no changes, with appreciation to Jack Christofersen. Jack asked those attending to note the SC 14 web site that he has set up:

www.tc.umn.edu/~chris143/CIGRE2002SC_B4

This web site will change to the CIGRE web site in the near future.

4.0 Report on Work of the Technical Committee

Chair Povh presented the new organization of Study Committees in CIGRE. Study Committee 14 will become Study Committee B4 at the close of the Paris Session. Our new scope enables us to go more deeply into system aspects of HVDC/FACTS. Note especially the power electronics emphasis:

Mission

To facilitate and promote the progress of engineering and the international exchange of information and knowledge in the field of HVDC and power electronics. To add value to this information and knowledge by means of synthesizing state-of-the-art practices and developing recommendations.

Scope

The work of the Study Committee addresses all the relevant Target Groups in Power Industry interested in Power Electronics. In addition to technical aspects also economical and environmental subjects of this technology are covered.

The Study Committee activities include following subjects:

HVDC: economics of HVDC, applications, planning aspects, design, performance, control, protection, control and testing of converter stations, i.e. the converting equipment itself and also the equipment associated with HVDC link.

Power Electronic for AC Transmission and Distribution systems and Power Quality Improvement: economics, applications, planning, design, performance, control, protection, construction and testing.

Advanced Power Electronics: development of new converter technologies including controls, use of new semiconductor devices, applications of these technologies in HVDC, Power Electronics for AC systems and Power Quality Improvement. Power Electronics used in other fields of the Electric Power Industry, interesting for other Study Committees, will be covered by demand, this Committee being the Sponsoring Committee.

Chair Povh also commented on the structure of future Paris sessions. There will be a reduction in the number of parallel sessions, more joint sessions/panel sessions/workshops. The aim is to have fewer conflicts and enable more participation. There will be an increased emphasis on environmental issues. He raised the question as to how to accommodate this in SC B4 activities. We need to be alert to opportunities for cooperation with other Study Committees.

5.0 Strategic Plan and Action Plan

This task is to be passed to the new SC Chair, Marcio Szechtman, to create a draft for presentation to the Technical Committee meeting in Brazil in April 2003. It will then be reviewed by SC B4.

##At this point Chair Povh asked for introductions of the persons attending the SC meeting.

6.0 SC 14 Working Groups

Chair Povh reviewed the WG activities completed in 2001-2002. The WGs have produced about 25 brochures and 10 publications, an excellent record. It is important that we observe interfaces with other WGs; e.g., 14-33 with C6, 14-04/12-1 with A2, 14-30 with C8.

A spread sheet of the currently active working groups follows on the next page. Marcio Szechtman noted that WG reports need to include membership and countries. The CIGRE Technical Committee has suggested that targets be established for the WGs. Marcio requested conveners to comment on targets and affiliations. The intent is to broaden the representation on the WGs. Targets are T = Technology, A = Application, C = Criticism, M = Competitiveness, R = Realization, J = Joint with other SCs. Affiliations are as follows:

UT = Universities, Teaching; RD = Research and Development Activities; MV = Manufacturing and Suppliers, Vendors; UC = Utilities and SPC; CE = Consultants, Studies, and Engineering Services; FO = Funding Organizations.

Number	Title	Convener Name	Created	Target date	Target
B4-04	HVDC System Performance	I. Vancers (USA)	1970	Permanent	T
B4-04/12-1	Analysis of HVDC System Performance Correlated to Converter Transformer	J. Christofersen (USA)	2000	2004	T, J, C
B4-19	STATCOM	I. A. Enrimez (GBR)	1993	2002	T, A, M

Number	Title	Convener Name	Created	Target date	Target
B4-28	Active Harmonic Filters	G. Damstra (NLD)	1998	2002	T, A
B4-33	DC and FACTS for distribution systems	K. Eriksson (SWE)	1998	2003	A
B4-34	DC stations with series capacitors	D.A. Woodford (CAN)	1998	2003	T, A, M
B4-35	Thyristor controlled voltage regulators (TCVR)	J. J. Vithayathil (USA)	1998	2003	T, A
B4-37	DC Transmission Using Voltage Source Converters	B. Andersen (GBR)	2000	2003	T, A, C, M
B4-38	Simulation of HVDC and FACTS	D. Retzmann (DEU)	2000	2004	A, R
B4-39	Integration of Large Scale Wind Power with HVDC and Power Electronics	P. Christensen (DNK)	2001	2004	A, R
B4-40	Static Synchronous Series Compensators (SSSC)	A. Edris (USA)	2001	2004	T, A, M
B4-41	Systems with Multiple HVDC Infeed	B. Davies (CAN)	2003	2005	A, C
JWG B2/B4-42	Impacts of HVDC Lines on Economics of HVDC Projects	Liaison: T. Weaver (USA)	2003	2005	M, A, J
JWG B4-43/A3/B3/C1	Increased system efficiency by use of new generations of power semiconductors	D. Westermann (CHE)	2003	2006	T, M, J

Incoming SC B4 chair Marcio Szechtman led a discussion on proposals for new working groups:

WG B4-41: Systems with Multiple DC Infeed Brett Davies presented a proposed scope and direction of activities. The outcome is to be a guide for HVDC inverter multi-infeed

planning. About ten persons volunteered to participate themselves or through a representative.

JWG B2/B4-42: Impacts of HVDC Lines on Economics of HVDC Projects. Tom Weaver will be liaison, additional members from B4 will be needed. There was a discussion of the need for environmental issues to be included along with economic and reliability factors. Economics is a key issue in developing countries.

JWG B4-43/A3/B3/C1: Increased system efficiency by use of new generations of power semiconductors. This results from a suggestion from the Substations Study Committee (A3). Dirk Westermann will be the convener and SC B4 will take the lead. Volunteer members from B4 and other SCs are needed. The scope will be developed with the Substations SC.

Under evaluation: Guide for Functional Specifications for Custom Power Equipment (B. Andersen and S. Nilsson are to write a proposal).

There is an ongoing WG of B2 looking at the conversion of AC lines to DC. Dennis Woodford will be liaison with this WG.

Acting/Incoming B4 Secretary Bill Long presented a proposed Annual Activity Report as requested by the CIGRE Technical Committee. Bill and Marcio will modify this document and distribute it to the RMs for completion by the end of 2002. SC Chairs are to summarize this information for the Technical Committee.

7.0

There was no agenda item 7.0.

8.0 Preview of Group 14 Meeting on August 30, 2002

Peter Lips summarized the plans for the Group 14 session. There are 25 papers and 18 questions, with 50 prepared discussions. He expects time to be available for spontaneous discussions. There will be no presentations of papers as there are too many. It would be preferable, he said, to have about 18 papers.

9.0 B4 Meeting in 2003 in Nuremberg, Germany

Peter Lips reported on the 2003 SC B4 meeting. It will be held in Nuremberg, Germany, September 22-26, 2003. The schedule includes working group meetings on September 22-23, the SC meeting on September 24, an HVDC/FACTS Colloquium on September 25, and a tour of manufacturing facilities on September 26 followed by a visit to Medieval Rothenburg. The Colloquium will include presentations from the host country, working group reports, and other presentations to be determined by Peter Lips/Marcio Szechtman/Bill Long.

10.0 2004 SC B4 Meeting in Paris

Marcio Szechtman presented a list of proposed preferential subjects for discussion. There were two new topic areas, 1) Large power/energy transfers, and 2) Power electronic application improvements in new areas. During discussion it was recommended that we should clarify ways that FACTS can receive consideration for new systems, expansions, etc.

The 2004 preferential subjects are now as follows:

1. HVDC and FACTS Use for Large Power and Energy Transfers: Technical and Economic Challenges
 - Interconnections
 - Conversion of HVAC to HVDC Lines
 - Opportunities and barriers posed by new market structures

1. Transmission Projects Based on HVDC and FACTS
 - Feasibility studies
 - New applications and new designs
 - Impact of environmental issues on projects economics
 - Control aspects to enhance system behaviour
 - Operating experiences
 - Upgrading of existing systems

1. Power Electronics Applications and Innovations in New Areas-
 - Distribution systems
 - Power quality
 - Distributed generation
 - Wind power
 - Oil platforms

11.0 SC B4 Meeting in 2005 in India

An invitation was extended by RM V. K. Prasher to meet in India in 2005. The date and location are to be determined. The Study Committee has accepted this invitation.

RM Toshiyuki Yokohama (Japan) noted that we can expect a future invitation from Japan.

12.0 WG/JWG/TF Reports

*(Note that complete reports are located on the SC web site:
www.tc.umn.edu/~chris143/CIGRE2002SC_B4)*

- WG 14-04, Performance of HVDC Systems, Ivars Vancers. The WG has an active web site that will be linked to the SC web site. There was a discussion of incomplete reporting - in 1999-2002 26 systems reported, there were 22 systems who previously reported but not for 1999-2000, and there were 5 systems who had never reported. How can this response be improved?

Chair Dusan Povh noted that Ivars Vancers and Jack Christofersen have been nominated for a 2002 Technical Committee Award. Peter Lips and Mohammed Rashwan were nominated last year.

- JTF 14-04/12-1, Analysis of HVDC Performance Correlated to Converter Transformer Performance, Jack Christofersen. There are 4-5 systems that dominate the data, the report includes details indicating the cause and outage durations. Again, there is need for reporting from more projects so as to see the whole picture accurately.
- 14-05, Interaction Between AC and DC Systems, Goran Anderson. The report is now ready for submission to the SC RMs for review and publication. It is 76 pages long and includes a page commemorating Clarence Thio's contributions. Chair Povh thanked Goran for his excellent work.
- 14-19, STATCOM, Matti Lahtinen reporting for Arslan Erinmez. The supplemental report for flicker control is estimated to be ready for submission to the SC by the end of 2002; more examples are needed.
- 14-26, HVDC Stations Audible Noise, Bjorn Ekehov, a guide has already been published, the last meeting was in 2000. The guide needs to be put on the SC web site.
- 14-28, Active Filters. G. Damstra reported that the DC and AC reports have been combined. The final report will be distributed to the RMs for their comments.
- 14-31, Custom Power, Dennis Woodford reporting for Nari Hingorani. A brochure has been prepared and submitted to CIGRE for publication. A summary report has been prepared and submitted for publication in ELECTRA. The work is complete and the Working Group is now disbanded
- 14-33, DC and FACTS for Distribution Systems, Bjorn Ekehov reporting for Kjell Eriksson. There have been few responses to their questionnaire, they will send out a new one and ask for a better response.
- 14-34, DC Stations with Series Capacitors, Dennis Woodford. The working group has been slow in getting started due to the involvement of the Convenor in other working groups. Invitations have been sent out to a working group of experts who are very familiar with this subject. It is planned to have a paper for Electra in a well drafted state by the end of 2002.

- 14-35, John Vithayathil. The technical input is ready and the work is expected to be finished by the Nuremberg meeting
- 14-36, Guide to the Specification and Design Evaluation of Filters for SVC and FACTS Devices, Dietmar Retzman reporting for N.M.MacLeod. The DC and AC reports are combined and now ready for review. The WG should then be disbanded.
- 14-37, DC Transmission Using Voltage Source Converters, Bjarne Andersen. The goal of the Working Group is to study the ability of VSC for DC transmission. The work should focus on ratings over 100 MW and voltages over 100 kV. There have been five meetings with good contributions from the members. A report is planned to be ready for the SC meeting in Nuremberg.
- 14-38, Simulation of HVDC and FACTS, Dietmar Retzman. A report is expected by the end of 2003.
- 14-39, Integration of Large Scale Wind Power with HVDC and Power Electronics, Peter Christensen. Work has not started yet, there are eight members. Topics will include the state of the art, new drivers, power electronics applications, tools needed.
- 14-40, Static Series Synchronous Compensators (SSSC), Aty Edris. Work has not started yet, interested persons are invited to join the WG.

Marcio Szechtman commented that the SC web site should have the WG terms of reference and membership along with the convener's e-mail address.

13,0 Reports from IEEE and IEC.

IEEE

Jack Christofersen presented a review of recent awards, committee and working group chairs, and activities. Of particular note is that there will no longer be a Winter Meeting of the Power Engineering Society. There will be a spring General meeting and beginning in 2003 a combined Substations Committee and T&D Committee meeting (in Las Vegas in late January).

IEC

Peter Lips has resigned from the chairmanship of IEC Technical Committee 22, he reported for Lev Travin, Secretary of Subcommittee 22F (whose report can be found on the web site). A new liaison reporter will be needed for the next SC meeting. 22F is very interested in WG 37 (HVDC Transmission Using VSCs), especially regarding testing and specifications. Documents from SC B4 must go to IEC through the SC chair.

IEE

Michael Baker introduced the new Professional Networks of the IEE. There are 35 separate Networks of Professionals on a wide range of topics. Those of interest to SC 14 members are:

Power Conversion & Applications; all types of generation and utilization where energy conversion is required.

Power System Equipment; every equipment in generation, transmission and distribution.

Power Trading & Control; the markets of electrical energy and their regulation, including economics and planning.

Sustainable Energy; all matters of policy and application towards a sustainable energy economy.

14.0 Reports from Other Organizations

These were not presented at the meeting, they are available on the web site.

(Note to persons submitting report:; kindly check the web site to be sure your reports are there, if not please re-send them to Jack Christofersen <chris143@tc.umn.edu> with a copy to the Secretary <willis@epd.engr.wisc.edu>. Thank you.)

15.0 HVDC, FACTS, and Custom Power Projects and

16.0 Operational Experiences

Note: for details of the reports please contact the person reporting.)

Peter Lips reported on the Guizhou-Guandong HVDC project (China) and the Tian Guang TCSC. He also described the TPSC (thyristor-protected series capacitor) including the fault performance of the Vincent TPSC in the US.

Hakon Borgen reported on the North Sea HVDC projects including the Interconnector to the UK (under negotiation), Norway-Netherlands (under discussion), and Norway - Oil Fields (5 platforms - early phase of discussions).

Jacques Allaire reported that the James Bay HVDC link is operating continuously in 3-terminal mode.

Narinder Dhaliwal reported that they will replace the remaining Nelson River Hg arc valves. They are having high transformer unavailability because of the lack of spares.

Carlos Gama reported that the Brazilian TCSCs have an availability of 99.5%. They are expecting to add a second AC line again with two TCSCs.

V.K.Prasher reported that two HVDC projects are about to be commissioned in India; also 17 series compensation capacitor banks with 6 being TCSCs.

Kent Soebrink reported on Knoti-Skan upgrades; the ac system has changed with the arrival of distributed wind generation. There may be multi-infeed problems now with low SCRs.

Bjorn Ekehov reported on Garabi, the equipment has been in customs clearance for five months. The Cross-Sound VSC HVDC link has been completed and is ready for operation. There will be a new Rapid City CCC BTB, 2x100 MW. The Sylmar converter valve replacement project will be 500kV, 3100 A. The Three Gorges converter stations (nearing completion) are 500kV, 3000A. They are developing an HVDC cable to electrify oil platforms using VSCs.

Wayne Litzenberger reported that the Celilo valve replacement is proceeding, light-triggered valves will be used.

17.0 Other Business

None to report.

18.0 Change in Chairmanship

Outgoing Chair Dusan Povh thanked the Study Committee for their cooperation over the past six years and stated that we did a lot. He extended best wishes to incoming Chair Marcio Szechtman and Secretary Bill Long.

Marcio expressed thanks to Dusan, noting that he had done a superb job as chair. He added that he will try his best.

19.0 Adjournment

The Study Committee 14 meeting was adjourned by 4:18 p.m.

Respectfully submitted,

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Willis F. Long
Acting Secretary
Study Committee 14