

Cigre Study Committee A3 (HV Equipment) Seminar Report HV Circuit Breakers – Standards and Guidelines

Introduction

A Study Committee A3 seminar on “HV Circuit Breakers – Standards and Guidelines” was held on 15 and 16 November 2007 in Sydney, Australia. The two day seminar was a great success with some participants stating it was the best value seminar they had ever attended. This report provides information to assist with the replication of this seminar in other countries and forums. It includes discussion of:

- Basis for the seminar
- Topics
- Presenters
- Program
- Seminar Notes
- Advertising and Participants
- Timing, Funding and Sponsorship
- Recommendations for Repeating the Seminar

There are also two attachments:

- Seminar Program; and
- Presentation to the Australian National Committee which includes pictures from the seminar.

The Australian National Committee of Cigre is very appreciative of the efforts by the presenters to provide an excellent quality seminar.

Basis for the Seminar

There have been important revisions to international circuit breaker standards in recent years. The standards are considered to be complex and there is a diminishing expertise and understanding of current interruption in high voltage networks. To deal with these issues, Cigre established WG A3.11 to produce guidelines to the circuit breaker standards. These guidelines were published in 2006 as reference documents 305 and 306.

This seminar has its basis in the work of WG A3.11.

Topics

The topics covered in the seminar were selected from the scope of work of WG A3.11. It included:

- Introductions to both the Cigre guide and the IEC standards.
- Classification of circuit breakers.
- Transient recovery voltages including terminal faults, generator cbs, short line faults, three phase faults, ITRV, etc.
- Inductive current switching
- Synthetic testing
- Capacitive current switching
- Harmonisation of international standards
- Transport, erection, commissioning and maintenance
- Controlled switching
- Circuit breaker selection

Each presenter prepared PowerPoint files and notes for the allocated topics. Although the presentations were prepared for the Sydney seminar, they could be easily adapted to other seminars because of the topics are of international interest.

Presenters

The seminar used four of the members of WG A3.11 as presenters:

- Denis Dufournet
- Anne Bosma
- Dave Peelo
- Steven Jones

It was important that the presenters had strong links to both Cigre and IEC.

Program

The seminar program is attached. The seminar was organised to cover the topics in two days.

The program was organised to provide a logical sequence of topics but also to spread the presentation workload of each presenter across the two days.

The two introductory presentations were important to introduce the work of both Cigre and IEC and give some insight into the relationship between the two organisations.

The main technical presentations are relatively independent and could have been arranged in almost any order.

The last three presentations are more application based and logically followed the main technical presentations. For example, controlled switching is mentioned at many points during the presentations as a strategy for addressing interruption issues. It was therefore useful to have the application of controlled switching as one of the final presentations.

The final presentation on Circuit Breaker Selection covered each of the issues that need to be considered when selecting the appropriate circuit breaker. It was an effective summary of all the issues presented over the previous two days and was used as an interactive presentation with the audience to summarise the seminar topics.

The seminar ended with an open session where any topic of interest could be discussed. It is a rare opportunity to have international experts together and the audience took the opportunity to get answers on a range of issues.

Seminar Notes

The PowerPoint presentations were detailed and it was therefore decided that all the presentation slides would be printed and placed in a folder for each participant. No other notes were provided. Any participant that needed further detail was referred to the published Cigre guides as the presentations closely followed these guides.

The notes were printed with two slides per page but still totalled over 200 pages.

No electronic copies of presentations were provided.

Advertising and Participants

The number of participants was capped at 60 and all places were filled. There was strong representation from all states of Australia and New Zealand.

The seminar was advertised in the local power industry magazines and by email to all local Cigre members and attendees of previous seminars.

The seminar was promoted as suitable for circuit breakers specialists, asset managers and network analysts. It was stated that it would be a useful seminar for young engineers but some knowledge of circuit breakers and networks was recommended because the presentations have a lot of technical detail.

The participants appreciated the mix of topics and depth of technical detail in the presentations.

Timing, Funding and Sponsorship

There was a cost for attendance at the seminar which was determined by the Australian National Committee in line with other seminars. These payments covered the costs associated with running the seminar.

Seminar fees could not have covered the full cost of bringing all the international presenters to Australia. The timing of the seminar was selected when presenters would be available in Australia. This opportunistic approach to the timing of the seminar reduced the seminar costs and suited the presenters. Some reliance was therefore placed on employers of presenters to bring the presenters to Australia and these organisations were considered sponsors of the event in all advertising, notes, etc.

Recommendations for Repeating the Seminar

The seminar was very successful in Australia and could also be successful in other countries.

The topics were chosen to be relevant in an international context. Only minor changes would be needed to the presentations to make them relevant for another seminar location.

The PowerPoint files are only held by the original presenters and use of the presentations would need to be discussed with those presenters.

A reduced range of topics could be compiled to form a one day seminar as there is not a high interdependence between the presentations. The timings shown in the attached program give a good guide of the time that is needed by each topic.

A cooperative approach is needed by local representatives and members of the Study Committee or Working Group to organise the seminar. The enthusiasm of the presenters and audience was evident when the two can be brought together successfully.

Attachments:

1. Seminar program
2. Presentation to the Australian National Committee

Steven Jones

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2nd January 2007

CIRCUIT BREAKER SEMINAR – STANDARDS AND GUIDELINES

Sample Program showing topics, presenters and timings.

	<u>Day 1</u>	Presenter	Duration
8:30 am	Registration		
9:00 am	Opening Address - CIGRE		
9:10 am	Introduction to the Cigre Guide	S. Jones	30 minutes
9:40 am	Introduction to IEC Standards - Including Classification of CBs	A. Bosma	40 minutes
10:30 am	Break		
10:50 am	TRV (part 1) - General considerations, terminal faults, generator cbs	D. Dufournet	1 hour 40 minutes (part 2 on 2 nd day)
12:30 pm	Lunch		
1:45 pm	X/R and asymmetrical faults	A. Bosma	1 hour 15 minutes
2:10 pm	Inductive Current Switching (part 1)	D. Peelo	2 hours total
3:20 pm	Break		
3:40 pm	Inductive Current Switching (part 2)	D. Peelo	See above
4:45 pm	Summary and Questions	S. Jones	Available time
5:00 pm	Close (day 1)	S. Jones	
	<u>Day 2</u>		
8:30	Synthetic Testing	A. Bosma	30 minutes
9:00 am	TRV (part 2) - Short line, 3 phase, ITRV, out of phase, selection	D. Dufournet	1 hour (part 1 on 1 st day)
10:00 am	Capacitive Current Switching (part 1)	A. Bosma	1 hour 40 minutes
10:30 am	Break		
10:50 am	Capacitive Current Switching (part 2)	A. Bosma	See above
12:00 pm	Harmonisation of international standards	D. Dufournet	30 minutes
12:30 pm	Lunch		
1:45 pm	Controlled Switching	D. Peelo	40 minutes
2:25 pm	Transport, storage, erection, maintenance	S. Jones	20 minutes
2:45 pm	CB selection	S. Jones	45 minutes
3:30 pm	Open Session: Question and Answers	Panel	
4:30 pm	Close	S. Jones	



CIGRE AP-A3 HV Circuit Breakers – Standards and Guidelines

15 and 16 November 2007

Marriott Hotel, Sydney



CIRCUIT BREAKER SEMINAR – STANDARDS AND GUIDELINES
Report to ANC



Why have a Circuit Breaker Seminar?

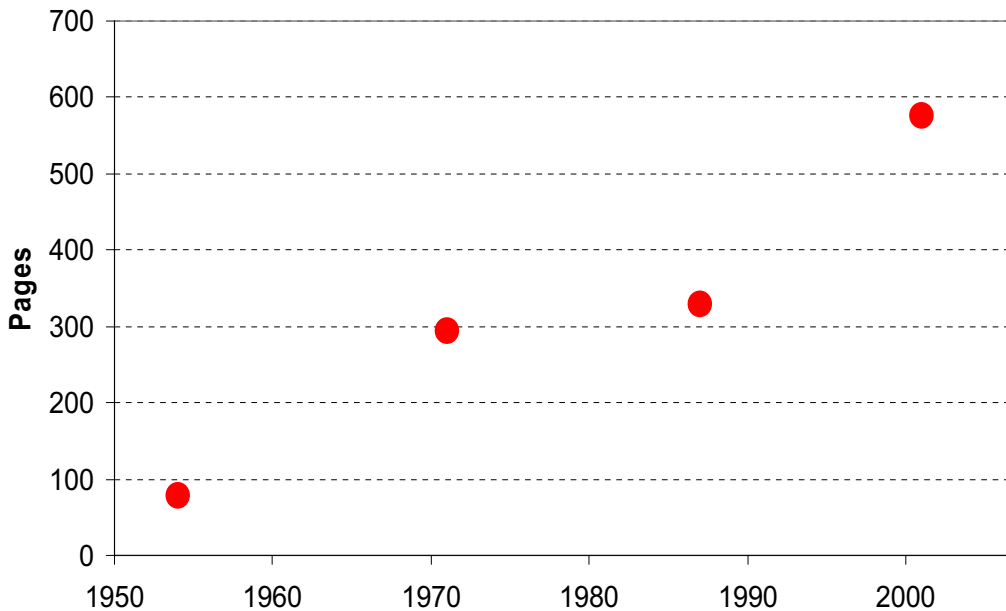
- There have been important revisions to international circuit breaker standards
- Circuit breaker standards are complex and often misunderstood.
- There is a diminishing expertise and understanding of current interruption in high voltage networks.
- To deal with these issues, Cigre WG A3.11 produced guidelines to the CB standards (Ref 304 & 305) in 2006
- Three international experts from WG A3.11 and IEC were available in Sydney for a unique local opportunity to learn about circuit breaker application issues.

Circuit breakers have reduced in size over the years but



. the IEC standards have grown over the years.

Growth of IEC 56



CIRCUIT BREAKER SEMINAR – STANDARDS AND GUIDELINES Report to ANC



2007
Most popular
documents
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Sydney CB Seminar 2007

CIRCUIT BREAKER SEMINAR – STANDARDS AND GUIDELINES Report to ANC



Working Group A3.11 members

F.J. Amon (Brazil),
J.-M. Biasse (France),
J.Y. Blanc (France),
A. Bosma (Sweden),
D. Dufournet (France),
D. Fuechsle (Switzerland),
S.M. Ghufran Ali (UK),
E. Haginomori (Japan),
R. Jeanjean (France),
S.L. Jones (Australia),
S. de A. Morais (Brazil),

I.D. Naylor (UK),
J. Pasteau (France),
D.F. Peelo (Canada),
H. Peters (Germany),
J. Reid (UK),
H.-H. Schramm (Germany, convenor),
H.M. Smith (USA),
S. Theoleyre (France),
Z. Vostracky (Czech Rep.),
Ch. Wagner (USA).
M. Waldron (UK)

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International Presenters

Denis Dufournet

Head of circuit breaker research at Areva T&D.

Chairman of IEC Technical Committee 17 (Switchgear and Controlgear) and Subcommittee 17A (High Voltage Switchgear and Controlgear).



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International Presenters

Anne Bosma

Circuit breaker expert from ABB.

Secretary of IEC Technical Committee 17 and Subcommittee 17A.

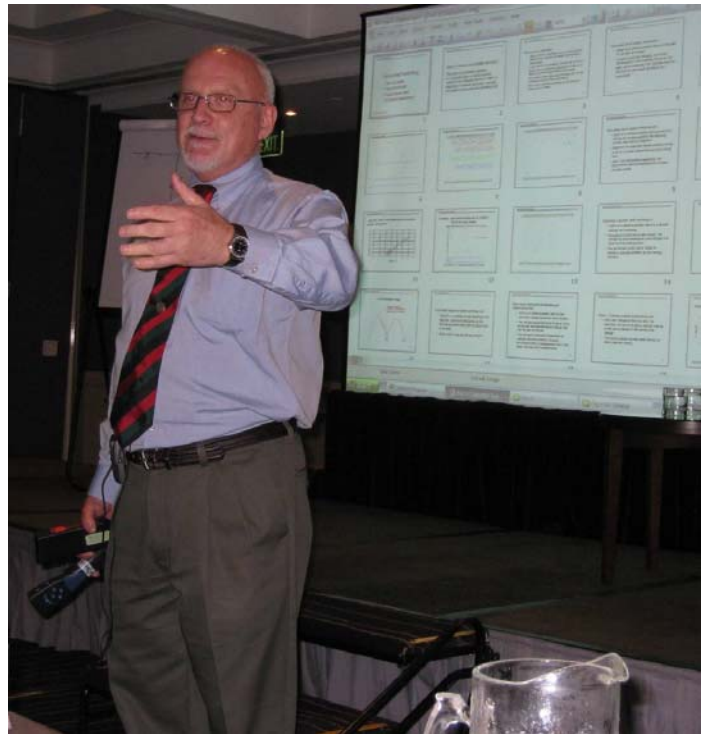


International Presenters

Dave Peelo

Independent consultant since retiring from BC Hydro.

Convener of IEC teams including inductive load switching.



Highlights of the Seminar Program – Day 1

Introduction to the Cigre Guide	S. Jones
Introduction to IEC Standards -Including Classification of CBs	A. Bosma
TRV – Part 1 -Terminal faults, generator cbs	D. Dufournet
X/R and asymmetrical faults	A. Bosma
Inductive Current Switching	D. Peelo
Summary and Questions	S. Jones

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Highlights of the Seminar Program – Day 2

Synthetic Testing	A. Bosma
TRV – Part 2 -Short line and 3 phase faults, ITRV, etc	D. Dufournet
Capacitive Current Switching	A. Bosma
Harmonisation of international standards	D. Dufournet
Controlled Switching	D. Peelo
CB selection	S. Jones
Transport, erection, commissioning, maintenance	S. Jones
Open Session: Question and Answers	Panel

Sydney CB Seminar 2007

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Attendees

Numbers capped at 60 total.

All available places filled.

Attendees from all 6 states, NZ and USA.

Attendees stayed to the end of the final session on Friday afternoon.



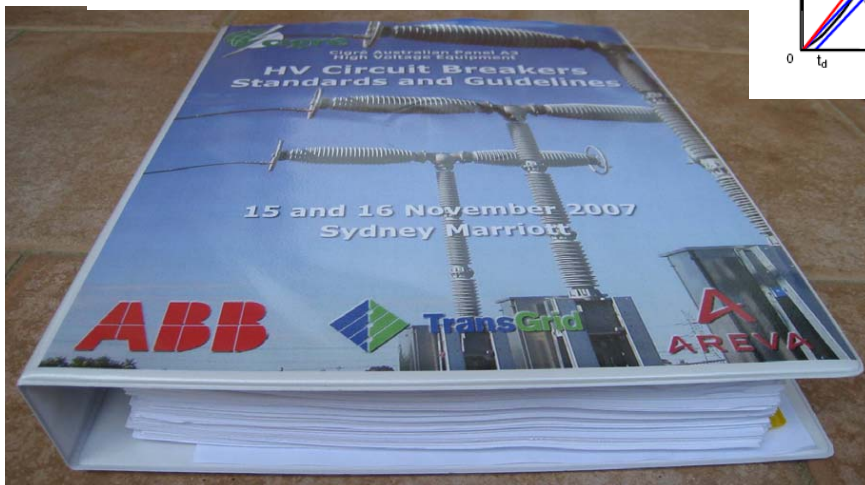
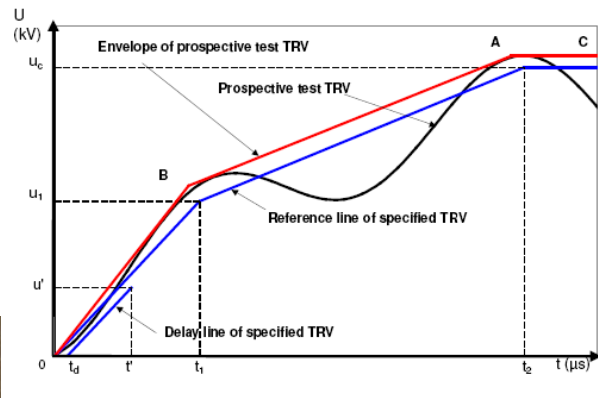
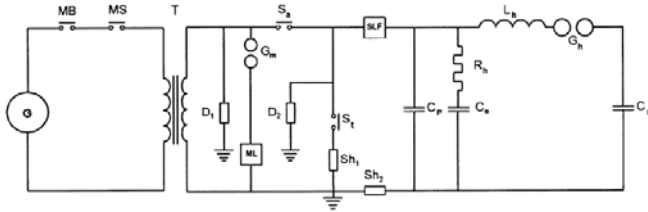
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Content

Detailed technical presentations.

Over 200 pages of notes



$$k_a = (1+K) \sqrt{1 + \left(\frac{1.5}{1+K} \right) \left(\frac{N\lambda^2}{\omega Q} \right) \left(\frac{C_p}{C_L} + 1 \right)} - K$$

CIRCUIT BREAKER SEMINAR – STANDARDS AND GUIDELINES Report to ANC

Sponsors

ABB and AREVA funded two speakers as well as sponsorship.

International Seminar

First full seminar based on work of WG A3.11

Strong interest from other countries.

Seminar structured to be suitable in other countries.

Good example of cooperation between the Study Committee, local AP and the ANC to produce a quality seminar that has value internationally.

Another successful CIGRE Seminar

