



CONSEIL INTERNATIONAL DES GRANDS RESEAUX ELECTRIQUES
INTERNATIONAL COUNCIL ON LARGE ELECTRIC SYSTEMS

STUDY COMMITTEE D1
MATERIALS AND EMERGING TEST TECHNIQUES

Presentation of CIGRE activities on Materials and Emerging Test Techniques

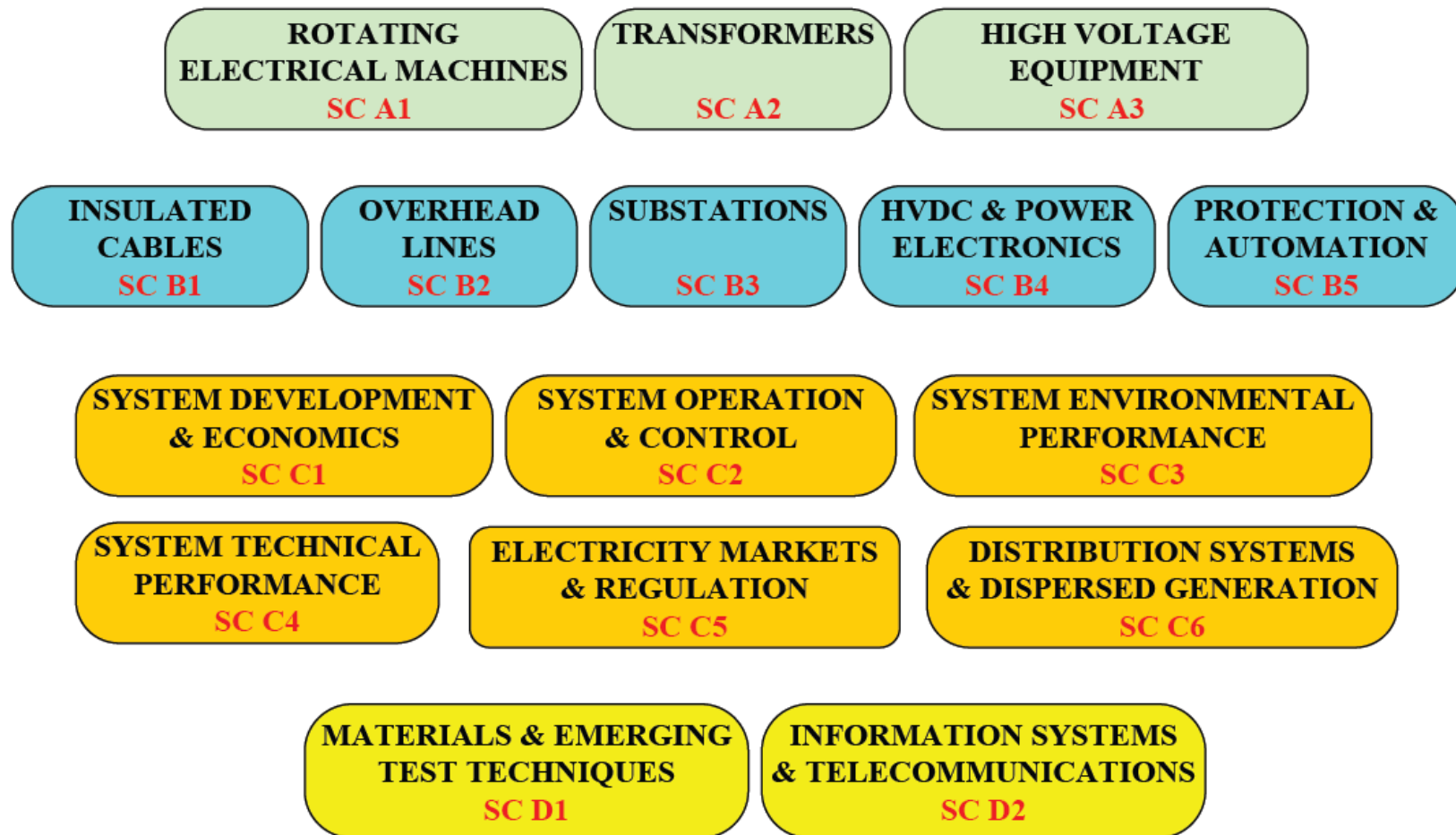
Josef Kindersberger (DE)

CIGRE SC A2 & D1 Colloquium, Kyoto (JP), Sept. 11-16, 2011



Study Committee D1 – Organisation

CIGRE Study Committees



CIGRE SC A2 & D1 Colloquium, Kyoto (JP), Sept. 11-16, 2011



Study Committee D1

Scope

The activities of CIGRE Study Committee D1 concern the monitoring and evaluation of:

- new and existing materials for electrotechnology,
- diagnostic techniques and related knowledge rules,
- emerging test techniques which may be expected to have a significant impact on power systems in the medium to long term.
- support of other study committees in their analysis of recently introduced and developing materials, emerging test techniques and diagnosis techniques

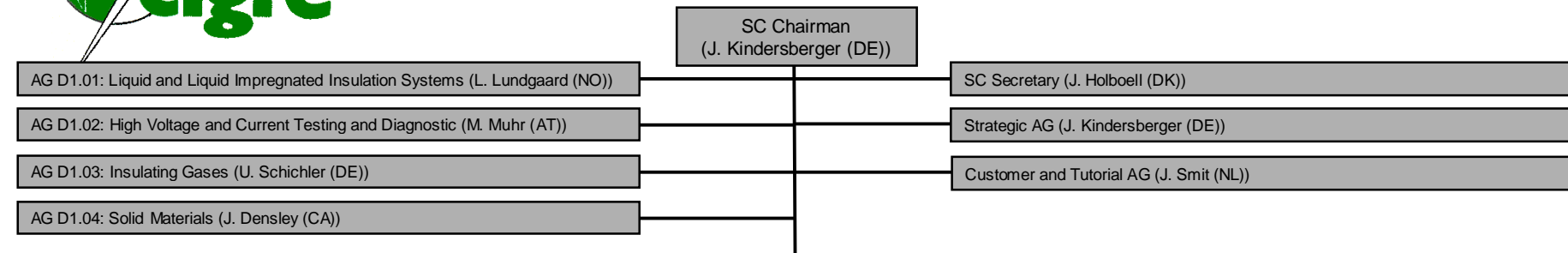


Study Committee D1 – Organisation Members and Working Bodies

- 24 Regular Members
- 11 Observer Members
- 6 Advisory Groups
- 25 Working Groups (incl. 3 JWGs with A2 & 1 JWG with B1)
- 28 Countries represented (as per 2009)
- 123 Experts (as per 2009)



SC D1 – Organisation chart



Liquids and impregnated systems	Testing & Diagnostics	Gases	Solids	Solids
WG D1.29 PD recognition in liquid impregnated systems for transformers	WG D1.35 Performance of high-voltage and high-current measurement systems for high voltage testing	WG D1.25 Application Guide for PD Detection in GIS using UHF or Acoustic Methods	WG D1.19 Solid insulation endurance stressed by rep. Transient voltages caused by power electronics	WG D.1.26 Basic Principles to Determinate Methane Content of Cross-linked Solid Extruded Insulation of MV and HV Cables
WG D1.30 Oxidation stability of transformer liquids	WG D1.36 Special requirements for dielectric testing of UHV equipment	WG D1.28 Optimized Gas insulated Systems by Advanced Dielectric Coatings and Functionally Graded Materials	JWG D1/B1.20 Water Tree Detection in XLPE insulation	WG D1.27 Material Properties for New and Nonceramic Insulation
WG D1.31 Dielectric performance of insulating liquids for transformers	WG D1.37 Maintenance and evaluation of measuring procedures for conventional and unconventional partial discharge testing		WG D1.23 Diagnostics and accelerated life endurance testing of polymeric materials for HVDC application	WG D1.40 Functional Nanomaterials for Electric Power Industry
WG D1.34 Condition assessment for oil-impregnated insulation used in ac cables	WG D1.38 Emerging test techniques common to High Temperature Superconducting power applications		WG D1.24 Potential of Polymer Nanocomposites as Electrical Insulation for Highly Stressed Insulation Material in AC and DC Application	WG D1.42 Radiation Ageing of Polymeric Insulating Material
JWG D1/A2.47 New frontiers of DGA interpretation for transformers and their accessories	WG D1.39 Methods for diagnostic/failure data collection and analysis		WG D1.12 Material properties for HVDC applications	WG D1.43 Rotating machine insulation voltage endurance under fast repetitive voltage transients

JWG A2/D1.41
HVDC transformer polarity reversal: Role of oil conductivity

JWG A2/D1.46
Field experience with transformer solid insulating ageing markers

WG under D1 resp.

JWG not under D1 resp.

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Study Committee D1 – Organisation Working Bodies

Advisory Groups (6)

- Strategic AG / J. Kindersberger (DE)
- Customer and Tutorial AG / J. Smit (NL)
- AG D1.01 / L. Lundgaard (NO)
Liquid and Liquid Impregnated Insulation Systems
- AG D1.02 / M. Muhr (AT)
High Voltage and Current Testing and Diagnostic
- AG D1.03 / U. Schichler (DE)
Insulating Gases
- AG D1.04 / J. Densley (CA)
Solid Materials



Study Committee D1 – Organisation WGs Solid Materials

WG D1.29 / J. Fuhr (CH)

PD recognition in liquid impregnated systems for transformers

- PD-Detection systems suitable for power transformers
- Common types of defects in transformer insulation, and methods for their identification
- Methods for detecting the location of PD-sources in transformer insulating system (electrical and acoustical)
- Possible alternative methods and criteria for evaluation of severity of PD-sources



Study Committee D1 – Organisation WGs Solid Materials

WG D1.30 / I. Höhlelein (DE)

Oxidation stability of transformer liquids

- Review of the working environment for a transformer liquid
- Review of oil specifications with respect to stability tests
- Methods to test the oxidation stability
- Criteria for actions to maintain oil properties and delaying the breakdown time



Study Committee D1 – Organisation WGs Solid Materials

WG D1.31 / L. Lundgaard (NO)

Dielectric performance of insulating liquids for
transformers

For new liquids and mineral oils of modified compositions:

- Review of mechanisms and test methods for breakdown initiation and propagation under various voltage stresses and geometries of relevant insulation systems
- Dependence of the breakdown mechanism on particles, moisture, chemical and composition
- Review of today's standardized test methods for insulating liquids



Study Committee D1 – Organisation WGs Solid Materials

JWG D1/A2.47 / M. Duval (CA)

New frontiers of DGA interpretation for
transformers and their accessories

- Review progress in the field of DGA
- Significance of CO, CO₂ and CO₂/CO for detecting paper involvement in faults
- Case studies and suggestions for typical problems and actions initiated by DGA interpretation



Study Committee D1 – Organisation WGs Liquid & Liquid Impregnated Systems

- WG D1.34 / S. Cherukupalli (CA)
Condition assessment for oil-impregnated insulation used in ac cables

JWGs under the roof of A2

- JWG A2/D1.41 / A. KÜchler (DE)
HVDC transformer polarity reversal: Role of oil conductivity
- JWG A2/D1.46 / R. Mertens (BE)
Field experience with transformer solid insulating ageing markers



Study Committee D1 – Organisation WGs Testing and Diagnostic

- WG D1.35 / Y. Li (AU)
Performance of high-voltage and high-current measurement systems for high voltage testing
- WG D1.36 / U. Riechert (CH)
Special requirements for dielectric testing of UHV equipment
- WG D1.37 / E. Gulski (NL)
Maintenance and evaluation of measuring procedures for conventional and unconventional partial discharge testing



Study Committee D1 – Organisation WGs Testing and Diagnostic

- WG D1.38 / M. Noe (DE)
Emerging test techniques common to High Temperature Superconducting power applications
- WG D1.39 / P. Morshuis (NL)
Methods for diagnostic/failure data collection and analysis

Under approval: Evaluation of insulator performance under non-standardized environmental conditions

- WG D1.44 Testing of naturally polluted insulators
- WG D1.45 Testing of insulator performance under heavy rain



Study Committee D1 – Organisation WGs Insulating Gases

- WG D1.25 / U. Schichler (DE)
Application Guide for PD Detection in GIS using UHF or Acoustic Methods
- WG D1.28 / H. Hama (JP)
Optimized Gas insulated Systems by Advanced Dielectric Coatings and Functionally Graded Materials



Study Committee D1 – Organisation WGs Solid Materials

- WG D1.12 / J. Densley, P. Morshuis
Material properties for HVDC applications
- JWG D1/B1.20 / J. Densley (CA)
Water Tree Detection in XLPE Insulation
- WG D1.19 / J. Holboell (DK)
Solid insulation endurance stressed by repetitive transient voltages caused by power electronics



Study Committee D1 – Organisation WGs Solid Materials

- WG D1.23 / G.C. Montanari (IT)
Diagnostics and accelerated life endurance testing of polymeric materials for HVDC application
- WG D1.24 / T. Tanaka (JP)
Potential of polymer nanocomposites as electrical insulation for highly stressed insulation material in AC and DC application
- WG D1.26 / S. Pélissou (CA)
Basic principles to determinate methane content of crosslinked solid extruded insulation of MV and HV cables



Study Committee D1 – Organisation WGs Solid Materials

- WG D1.27 / J. Seifert (DE)
Material Properties for New and Nonceramic Insulation
- WG D1.40 / M. Fréchette (CA)
Functional Nanomaterials for Electric Power Industry
- WG D1.42 / T. Okamoto (JP)
Radiation Ageing of Polymeric Insulating Material
- WG D1.43 / A. Cavallini (IT)
Rotating machine insulation voltage endurance under fast repetitive voltage transients



Study Committee D1 – Highlights 2010

- Reconfirmation of existing Advisory Groups
- New AG: Customer and Tutorial Advisory Group
- 8 new WGs were launched
- 8 TBs were published since April 2010



Study Committee D1 – Publications TBs in 2010

Publications since the last TC meeting in April 2010 (1/2)

- CIGRE TB 413 Insulating oil regeneration and dehalogenation (WG D1.01 (TF 12))
- CIGRE TB 414 Dielectric response diagnoses for transformer windings (WG D1.01 (TF 14))
- CIGRE TB 418 Status of development and field test experience with high-temperature superconducting power equipment (WG D1.15)
- CIGRE TB 420 Generic guidelines for life time condition assessment of HV assets and related knowledge rules (WG D1.17)



Study Committee D1 – Publications TBs in 2010

Publications since the last TC meeting in April 2010 (2/2)

- CIGRE TB 442 Evaluation of dynamic hydrophobicity properties of polymeric materials for non-ceramic outdoor insulation – Retention and transfer of hydrophobicity (WG D1.14)
- CIGRE TB 443 DGA in non-mineral oils and load tap changers and improved DGA diagnosis criteria (WG D1.32)
- CIGRE TB 444 Guidelines for unconventional partial discharge measurements (WG D1.33)
- CIGRE TB 451 Polymer Nanocomposites – Fundamentals and possible application to power sectors (WG D1.24)



Study Committee D1 – Publications

Publication plan for 2011

Publication plan for the coming year (1/2)

- CIGRE TB – Furanic compounds for diagnosis (WG D1.01 (TF 13))
- CIGRE TB – HV On-Site Testing with Partial Discharge Measurement (WG D1.33 (TF 05))
- CIGRE TB – Non destructive water-tree detection in XLPE cable insulation (JWG D1/B1.20)
- CIGRE TB – Solid insulation endurance stressed by repetitive transient voltages caused by power electronics (WG D1.19)



Study Committee D1 – Publications

Publication plan for 2011

Publication plan for the coming year (2/2)

- CIGRE TB – Requirements on testing flammability of polymeric materials for outdoor insulation (WG D1.14)
- CIGRE TB – Resistance of polymeric materials to weathering and UV (WG D1.14)
- CIGRE TB – Important material properties of RTV silicone rubber insulator coatings (WG D1.14)
- CIGRE TB – Resistance of polymeric materials to corona and ozone (WG D1.14)



Study Committee D1

Tutorials and workshops in 2010/11

- Workshop on “Progress with nanodielectrics”, T. Tanaka, Aug. 23, 2010, Paris
- Lecture on “Polymer nanocomposites – Fundamentals and possible application to power sectors” to SC A1, A2, A3, B1, B2, B3, B4, D1 during CIGRE Session, 2010, Paris
- Workshop on “Dielectric response diagnoses for transformer windings”, S. Gubanski, Sept. 14, 2011, Kyoto
- Workshop on “Oxidation stability of liquid insulating systems”, I. Höhle, Sept. 14, 2011, Kyoto

CIGRE SC A2 & D1 Colloquium, Kyoto (JP), Sept. 11-16, 2011



Study Committee D1

Strategic Plan and Action Plan

- Support of other study committees in their analysis of recently introduced and developing materials, emerging test and diagnosis techniques
 - Continued care of customer relations
 - Intensification of Workshop/Tutorial activities



Study Committee D1

Relations with other organisations

- Good relations to the relevant IEC Technical Committees, very often by same members in the different organisations. The main partners within IEC are:
 - TC 2 “Rotating Machines”,
 - TC 10 “Fluids for Electrotechnical Applications”,
 - TC 33 “Power Capacitors”,
 - TC 36 “Insulators”,
 - TC 42 “High Voltage Test Techniques”,
 - TC 112 “Evaluation and Qualification of Electrical Insulating Materials and Systems“



Study Committee D1

Relations with other organisations

- The chairman of SC D1 is also chairman of IEC TC 36 Insulators;
the past chairman of SC D1 is now chairman of IEC TC 42 High-Voltage Test Techniques (since August 1, 2011).
The chairmen of the relevant IEC Technical Committees are always invited to the relevant meetings if they are not members.
- SC D1 has also a good relationship to the relevant IEEE organisations mainly by the same members in the two organisations.



Study Committee D1

Preferential Subjects – Paris 2012

- **PS1 Dielectric performance and ageing of insulation materials**
 - Influence of ambient conditions
 - Environmentally friendly materials
 - Acceptable field stresses
- **PS2 Test Techniques for UHV including HVDC**
 - Impulse voltage shapes, wet tests, atmospheric correction
 - Test circuits and techniques for HVDC
 - PD measurements under DC
- **PS3 Diagnostic tools**
 - Material ageing assessment and defect detection
 - New tools for interpretation
 - Tools for monitoring in smart grids



Study Committee D1
Materials and Emerging Test Techniques

*Thank you for your attendance
and
kind attention*