US National Committee of Cigre
2022
Cigre Session Meeting

cigre
For power system expertise

Sunday, August 28, 2022

Paris, FRANCE

Agenda – August 28, 2022

- Welcome and Introductions
- President's Remarks
- Technical Activities
- Comments of US Representatives to CIGRE Study Committees

Technical Activities

John McDonald - GE Grid Solutions (johnd.mcdonald@ge.com)

cigre

For power system expertise

Technical Activities Committee

- USNC Regular Members and Regular Additional Members to CIGRE Study Committees & Appointment Dates
- USNC Synopses Selection Process for Paris Session
- GOTF Paper Submission and Evaluation
- Working Groups/Task Forces Member Selection Process
- CIGRE WG and Young Expert Country Origins
- Ladies in CIGRE WGs Country Origins
- Ladies WG Convener Country Origins

U.S. Regular Members to CIGRE Study Committees & Appointment Dates

- A1-Hugh Zhu (Consultant) - 2018
- A2-Mike Lamb (Dominion Energy) – 2018
- A3-Albert Livshitz (Qualus) – 2018
- B1-Rusty Bascom (Electrical Consulting Engineers, P.C.) – 2018
- B2-Erik Ruggeri (POWER Engineers) – 2020
- B3-George Becker (POWER Engineers) – 2020
- B4-Neil Kirby (GE Grid Solutions) – 2018
- B5-Mladen Kezunovic (Texas A&M University) – 2018

U.S. Regular Members to CIGRE Study Committees & Appointment Dates

- C1-Jeff Palermo (PJP Consulting) – 2016
- C2-Todd Ramey (MISO) – 2018
- C3-Randy Grass (POWER Engineers) - 2020
- C4-Gaurav Singh (EPRI) - 2020
- C5- Jeff Bladen (Meta) - 2020
- C6-Sundar Venkataraman (Nexant) – 2018
- D1-Luke Van der Zel (EPRI) – 2018
- D2-Chen-Ching Liu (Virginia Tech) – 2020

U.S. Regular Additional Members to CIGRE Study Committees & Appointment Dates

- A1-None
- A2-None
- A3-Brian O’Neil (RMS Energy Co., LLC) - 2020
- B1-Tom Zhao (EPRI) – 2022
- B2-Doug Proctor (Proctor Engineering) – 2018
- B3-None
- B4-David Roop (MEPPI) – 2020
- B5-None

U.S. Regular Additional Members to CIGRE Study Committees & Appointment Dates

- C1-None
- C2-None
- C3-None
- C4-None
- C5-None
- C6-None
- D1-Bill Larzelere (Evergreen High Voltage) – 2018
- D2-None

2022 Synopses Selection Process for Paris Session

1. 80 Abstracts Received and Forwarded to USNC Study Committee Reps for their Advisory Committee Review (75 Received for 2020; 47 for 2018; 48 for 2016)
2. Abstracts Reviewed and Scored with Following Criteria:
   - Relevance to SC Preferential Subjects
   - Technical Content
   - Clarity of Synopsis
   - Avoid Commercialism
3. 80 Synopses Submitted to Paris (75 Synopses Accepted for 2022)
4. Historical Acceptance Rate: 75/80 (94%) Accepted for 2022; 57/60 (95%) for 2020, 27/30 (90%) for 2018, 93% for 2016, 87% for 2014, 83% for 2012

CIGRE USNC 2022 Grid of the Future (GOTF) Paper Process

- Call For Papers
  - Theme: Technology for the 21st Century Electric Utility
- No Abstract Step – Full Papers Only – Submitted by August 15, 2022
- Use Paper Preparation Template
- Papers Reviewed in August
- Reviewer's Comments Incorporated in September
- 25 Paper Sessions Created for 2022 GOTF Technical Program

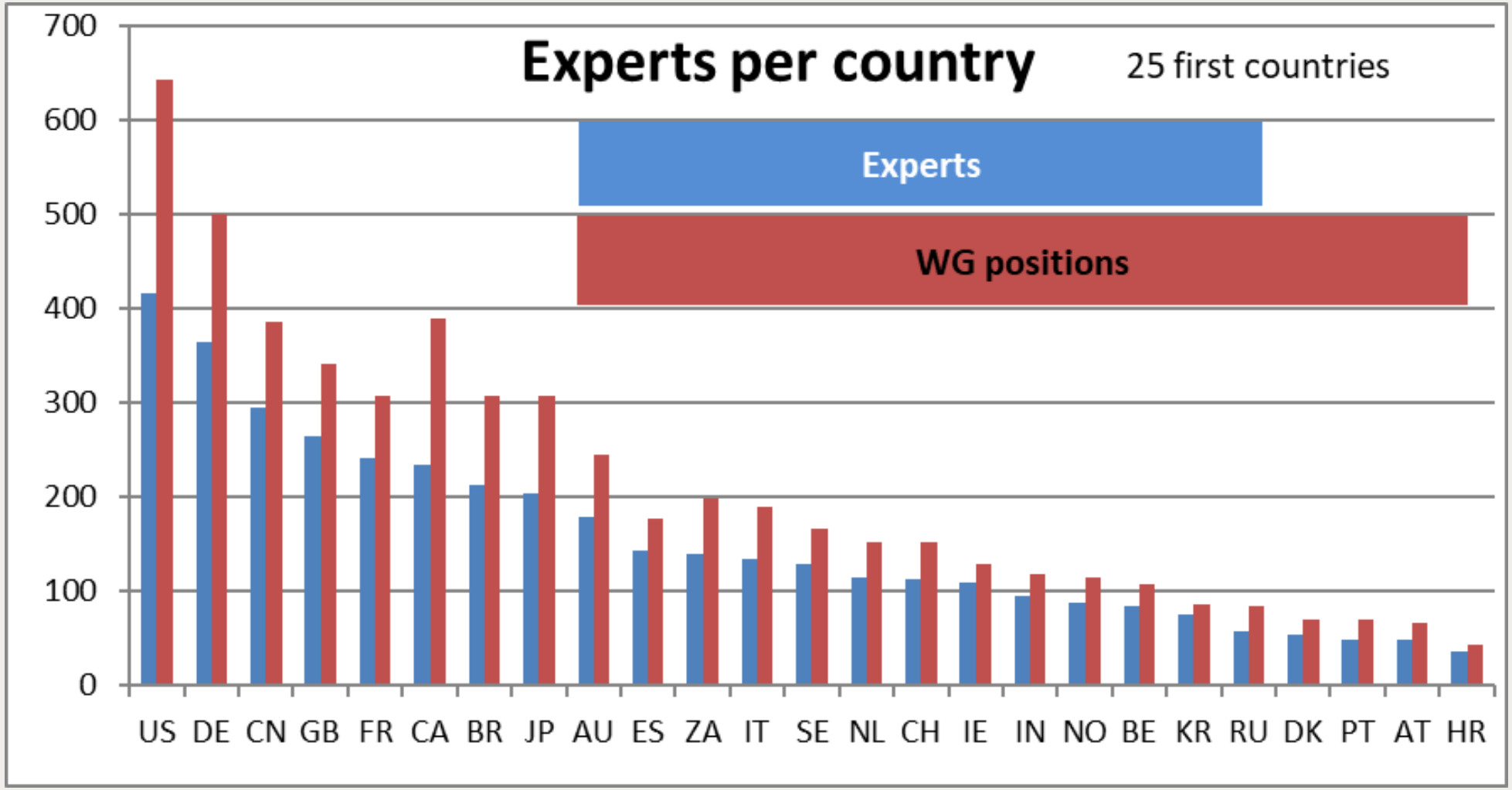
GOTF Paper Evaluation Process

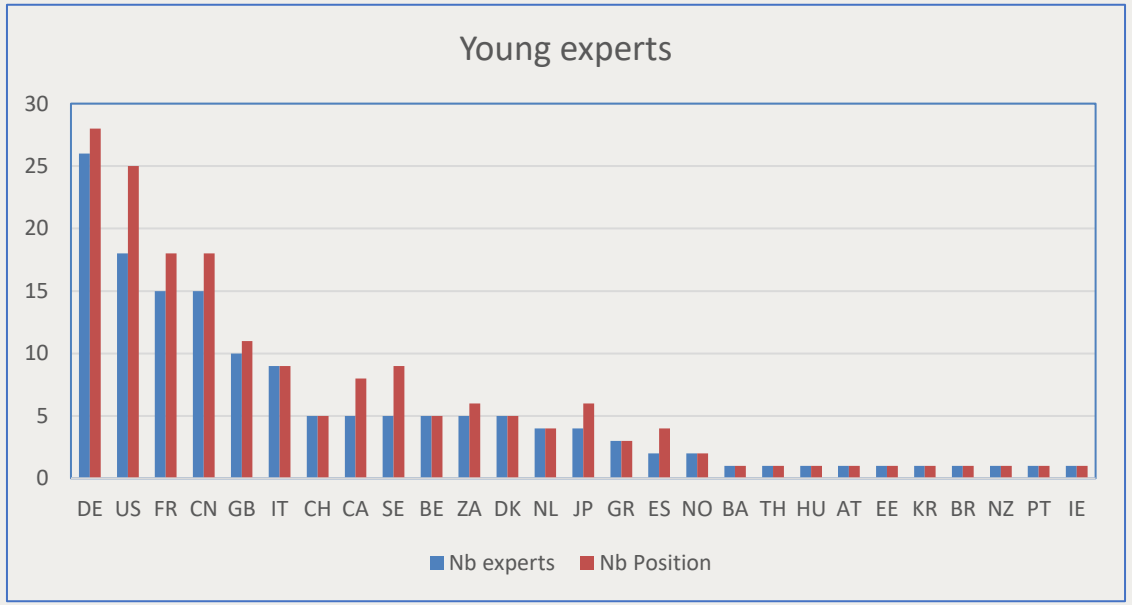
- Submitted Papers Forwarded to USNC Study Committee Reps for their Advisory Committee Review
- Evaluation Criteria
  - Novel and Innovative Technical Content (Concept with Implementation Results)
  - Clarity of Paper
  - No Commercialism
  - Adherence to Required Formatting (Use Paper Preparation Template)

Working Groups/Task Forces
Member Selection Process

- Interested candidates must have Individual Member dues paid and send CV
- Obtain email address for new WG Convener and submit candidates' CVs directly to Convener
- Request Convener to confirm candidates' membership
- If no USNC candidates interested in a new WG, will ask new WG Convener for knowledge of US experts, and will contact them to see if they are interested in joining
- If more candidates are interested in same WG than CIGRE policy allows, set up a "Shadow WG" within the USNC

Experts and positions per country




Young experts
30
25
20
15
10
5
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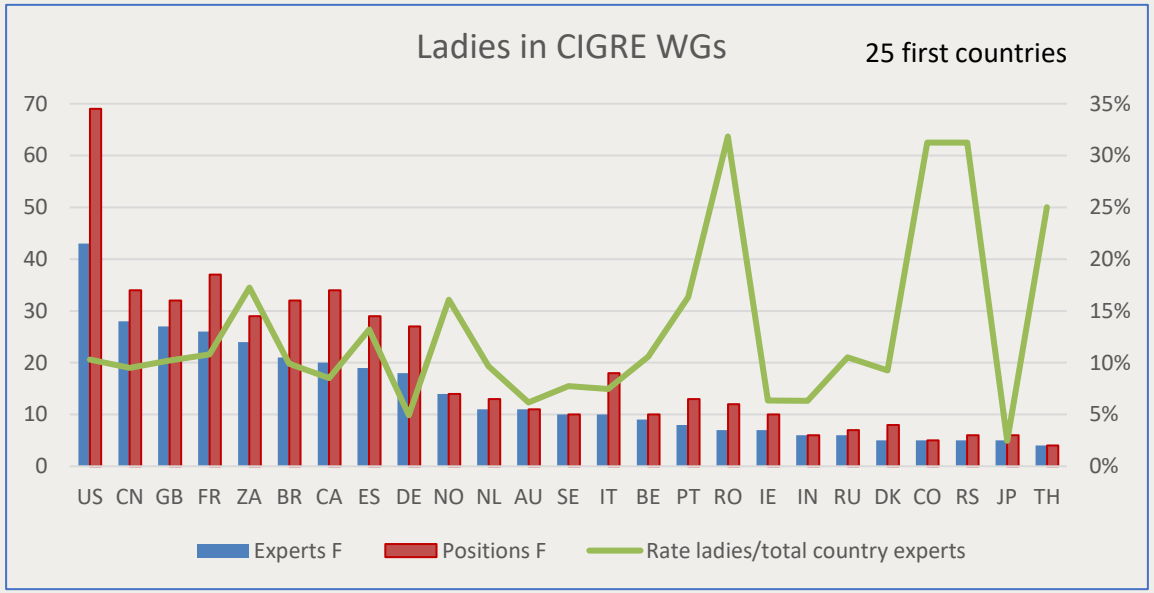
DE US FR CN GB IT CH CA SE BE ZA DK NL JP GR ES NO BA TH HU AT EE KR BR NZ PT IE
Nb experts
Nb Position


Ladies in CIGRE WGs
25 first countries
70
60
50
40
30
20
10
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35%
30%
25%
20%
15%
10%
5%
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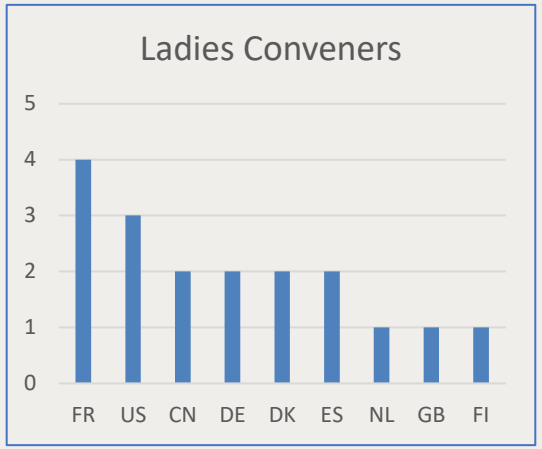
US CN GB FR ZA BR CA ES DE NO NL AU SE IT BE PT RO IE IN RU DK CO RS JP TH
Experts F
Positions F
Rate ladies/total country experts

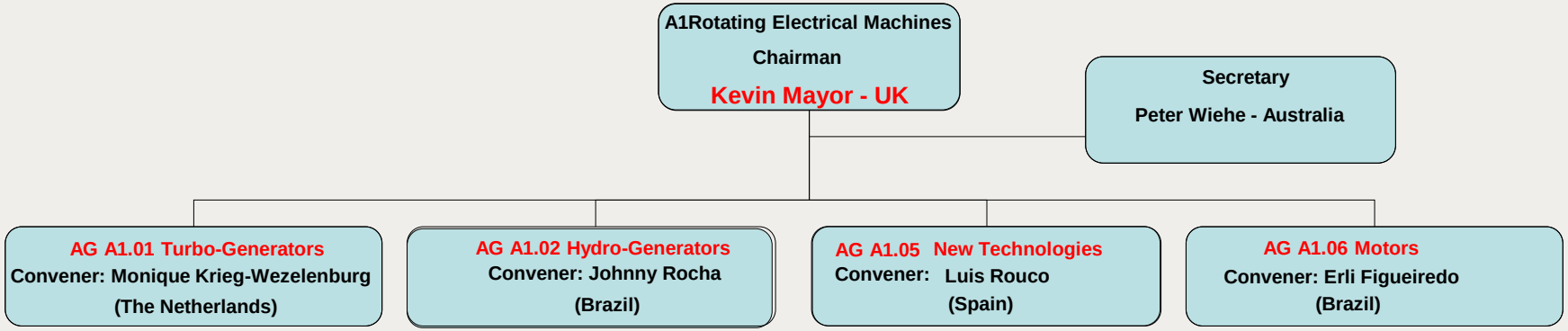

Ladies Conveners
5
4
3
2
1
0
FR
US
CN
DE
DK
ES
NL
GB
FI

SC A1 – Rotating Electrical Machines

Hugh Zhu – Consultant (hughzhu18@outlook.com)

For power system expertise

SC A1



2021 A1– Virtual Centennial Session

- 20 contributions including a contribution from the USA
- 20 contributions and 25 questions posted in the Special Report
- 7 invited presentations
- 1 tutorial

It was a successful virtual meeting.

SC A1

26 Active WG's

WG Nr.	ADVISORY GROUP	WG TITLE	CONVENOR	STATUS
A1.33	AG-01	Guide For Cleanliness And Storage Of Generators	Kevin Mayor	TB 860 published in e-cigre. Extract published in ELECTRA 360
A1.42	AG-02	Influence of key requirements to optimize the value of hydro generators	Eduardo Guerra	Draft TB available. Further review/rework required before circulation under the 6-week rule
A1.43	AG-02	State of the art of rotor temperature measurement	Stjepan Tvoric	TB reviewed. Associated documents to be compiled for submission
A1.44	AG-01	Guideline on Testing of Turbo and Hydrogenerators	Mladen SASIC	6-week review completed. TB updated. Associated documents in preparation for submission.
A1.45	AG-06	Guide for Determining the Health Index of Large Electric Motors	Dr Zhang Pinjia	Need more responses to the questionnaire - recirculate
A1.48	AG-01	Guidance on the Requirements for High Speed Balancing / Over-speed Testing of Turbine Generator Rotors Following Maintenance or Repair.	Ben Adams	6-week review completed. Documents updated and ready for submission
A1-C4.52	AG-05	Wind generators and frequency-active power control of power systems	Nick Miller	TB in preparation
A1.53	AG-06	Guide on Design Requirements of Motors for Variable Speed Drive Application	AK Gupta	In revision following 6-week rule feedback.
A1.54	AG-06	Impact of Flexible Operation on Large Motors	John Doyle	6-week review completed. TB updated. Associated documents in preparation for submission.
A1.55	AG-02	Survey on Split Core Stators	Sun Yutian	Pending feedback from convener
A1.56	AG-02	Survey on Lap and Wave Winding and their Consequences on Maintenance and Performance	Richard Perers	TB prepared. To be sent for review under the 6-week rule
A1.58	AG-06	Selection of Copper Versus Aluminium Rotors for Induction Motors	Fredemar Rüncos	Report prepared & in checking for 6-week review.
A1.59	AG-02	Survey on Industry Practices and Effects associated with the Cutting Out of Stator Coils in Hydrogenerators.	Charles Millet	TB+Electra abstract prepared. To be sent for review under the 6-week rule
A1.60	AG-02	Guide on economic evaluation for refurbishment or replacement decisions on hydro generators	Mark Bruintjies	In work. TB chapters defined & allocated. Needs more WG members.
A1.61	AG-06	Survey of Partial Discharge Monitoring in Large Motors	André Tomaz de Carvalho	Pending feedback from convener

SC A1

26 Active WG's

A1.62	AG-02	Thrust Bearings for Hydropower - A Survey of Known Problems and Root Causes	Daniel Langmayr	Need more responses to the questionnaire - recirculate
A1.63	AG-01	Turbo Generator Stator Winding Bushings and Lead Connections – Field Experience, Failures and Design Improvements	Jabulani Bembe	Working Group re-established and in progress. Questionnaire being finalised.
A1.64	AG-06	Guide for Evaluating the Repair / Replacement of Standard Efficiency Motors	Erli Ferreira Figueiredo	Report in preparation
A1/C4.66	AG-05	Guide on the Assessment, Specification and Design of Synchronous Condensers for Power Systems with Predominance of Low or Zero Inertia Generators	D.K. Chaturvedi	TB review under 6-week rule completed on 22 April 2022. Feedback being assessed.
A1.67	AG-02	State of the Art in methods, experience and limits in end winding corona testing for Hydro Generators	Hélio de Paiva Amorim Junior	Pending feedback from convener
A1.68	AG-06	Evaluating Quality Performance of Electric Motor Manufacturing and Repair Facilities	Kondra Nagesh	Renewed call for WG members sent out on 4 May 2022. Needs more participation from manufacturers and responses.
A1.69	AG-02	Hydro-Generator Excitation Current Anomalies	J. Johnny Rocha E.	Team assembled.
A1.70	AG-01	Dielectric Dissipation Factor Measurements on Stator Windings	Monique Krieg-Wezelenburg	Questionnaire and collection of information completed; Analysis in progress.
A1.71	AG-02	Survey on damper-winding Concepts and its operational experience on hydro generators and motor-generators	Thomas Hildinger	Team assembled – start in 2022
A1.72	AG-02	Survey on multi-turn coils with dedicated turn insulation versus coils without dedicated turn insulation	Yoon Duk Seol	Team assembled – start in Sept 2022
A1.73	AG-02	Customer Requirements for Qualification of Form Wound Stator Insulation Systems for Hydro Generators	Franz Ramsauer	Team assembled – start in 2022

SC A1

2 Joint WG's

WG Name	WG Nr	Status and next step	Date
Wind generators and frequency-active power control of power systems	JWG A1/C4.52	TB in progress. Status in WG report presented on 19 August 2021	Revised schedule to 2022
Guide on the Assessment, Specification and Design of Synchronous Condensers for Power Systems with Predominance of Low or Zero Inertia Generators	JWG A1/C4.66	TB in advance state of preparation. Status in WG report presented on 19 August 2021	Revised schedule to 2022

New WG Proposals

- Voltage-reactive power control of wind generation.
- Developments in electric machines for renewable generation.
- Insulation issues in machines for wind generator
- Monitoring, Reliability and Availability of Wind Generators (previously discontinued WG)

SC A1

2022 Paris & Beyond

- Preferential subjects for the 2022 SC A1 Session:
  - PS1-Generation Mix of the Future
  - PS2-Asset Management of Electrical Machines
  - PS3-Development of Rotating Machines and Operational Experience
- 24 Technical Papers from SC A1 were accepted
- 1 Tutorial for 2022 Session
- 2023 A1 meeting in Japan is planned, September 2023

SC A2 – Power Transformers and Reactors

Mike Lamb – Dominion Energy (mike.lamb@dominionenergy.com)

cigre

For power system expertise

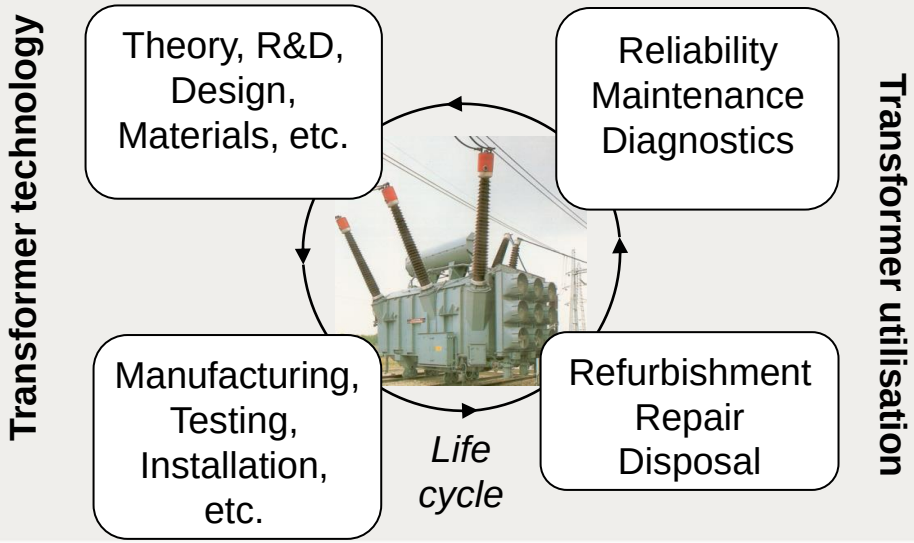
A2 – Power Transformers and Reactors

Scope

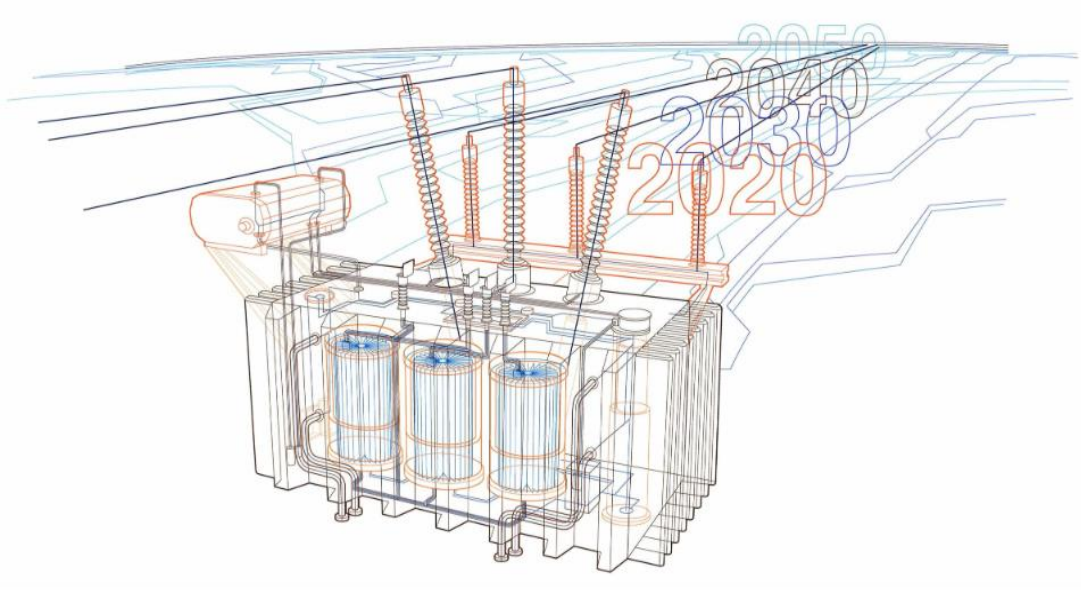
Design, construction, manufacture and operation for all kinds of power transformers, including industrial, DC converters and phase-shift transformers and for all types of reactors and transformer components (bushings, tap-changers…)

In the past *(known as SC12)* activities were focused on design problems related to the rapid increase of rated voltage and power

Today's SC A2 Key Areas of Attention



A2 – Power Transformers and Reactors



Chairman – Pascal MÜLLER(CH)
Secretary - Marc FOATA (DE)
30 regular members
17 observer members

14 WG’s, which include 5 JWG’s
350 Experts from 40+ countries
8 Advisory Groups

A2 – Present Working Groups

WG	Title	Focus Area
A2/C4.52	HF modelling	MODELING
A2.54	Audible sound requirements	SOUND
A2.55	TR life extension	LIFE EXTENSION
A2.56	TR efficiency	EFFICIENCY
A2.57	Effects of DC Bias	DC BIAS
A2.58	Site Installation and Pre-commissioning of Power Transformers and Shunt Reactors	SITE INSTALLATION
A2.60	Dynamic Thermal Behaviour of Power Transformers	THERMAL
A2.62	Analysis of Transformer Reliability	RELIABLITY
A2.63	Transformer impulse testing	TESTING
A2.64	Condition of cellulose insulation in oil immersed transformers after factory acceptance test	CONDITION ASSESSMENT

A2 – Present Working Groups

WG	Title	Focus Area
A2/D2.65	Transformer Digital Twin – concept and future perspectives	DIGITALIZATION
A3/A2/A1/B1.44	Limitations in Operation of High Voltage Equipment Resulting of Frequent Temporary Overvoltage's	CONDITION ASSESSMENT
D1/A2.77	Liquid Tests for Electrical Equipment	LIQUID TESTING
A2/D1.67	Guideline for Online Dissolved Gas Analysis Monitoring	MONITORING

A2 - Recent Technical Brochures (https://e-cigre.org/)

TB	Description
735	Transformer post-mortem analysis (2018)
755	Transformer bushing reliability (2019)
761	Condition assessment of power transformers (2019)
771	Advances in DGA interpretation (D1/A2) (2019)
779	Field experience with transformer solid insulation ageing markers (A2/D1) (2019)
783	DGA monitoring systems (D1/A2) (2019)
812	Advances in the interpretation of transformer frequency response analysis (FRA) (2020)
857	On-Site Assembly, On-Site Rebuild, and On-Site High Voltage Testing of Power Transformers (2021)
861	Improvements to PD measurements for factory and site acceptance tests of power transformers (A2/D1) (2022)

A2 - Technical Activities during 2022 Paris Session

Tutorial
Monday, 29 August at 0830-1030 in Salle Maillot Level 2
Life extension of oil-filled transformers and shunt reactors

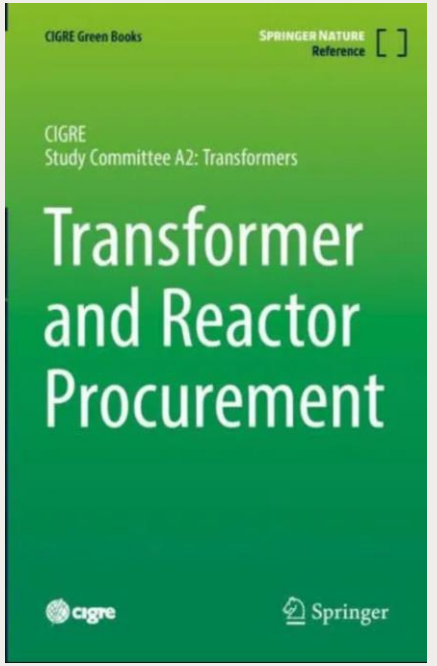
Poster Session
Monday, 29 August at 1430-1800 in Halle Ternes Level 1

Group Discussion Meeting
Thursday, 1 September at 0845-1800 in Amphitheatre Bleu, Level 2
40+ papers
PS 1 – Experience and new requirements for transformers for renewable generation
PS 2 – Beyond the mineral oil-immersed transformers and reactors
PS 3 – Best practices in transformer and reactor procurement

A2 - Upcoming Technical Activities

SC A2 & 6th ICTRAM Joint Colloquium
October 4-7, 2023 in Split, Croatia
https://ictram.org
Modeling and Simulation
Materials, Components and New Technologies
Transformer Life Management
Digital Twins
Trends in Transformer Maintenance
Design Performance in Service

Green Book - Transformer and Reactor Procurement
Scheduled release by Springer in September 2022
https://www.springer.com/series/15209
1st Green Book publication by A2, work started in 2018
400+ page reference book on all topics associated with procurement including specs, design reviews, loss evaluations, factory evaluations and inspections, testing, transporatation, site assembly and testing, plus more….



SC A3 - Transmission & Distribution Equipment

Albert Livshitz – Qualus Power Services (albert.livshitz@qualusmail.com)

cigre

For power system expertise

- Chair
- Secretary
- Social Media
- Webmaster
- Strategic Planning Group
- WG Conveners
- Utility Advisory Group
- Special Reporters / Poster
- Green books
- Document Advisors
- Tutorials / Webinars
- NC members:

Existing

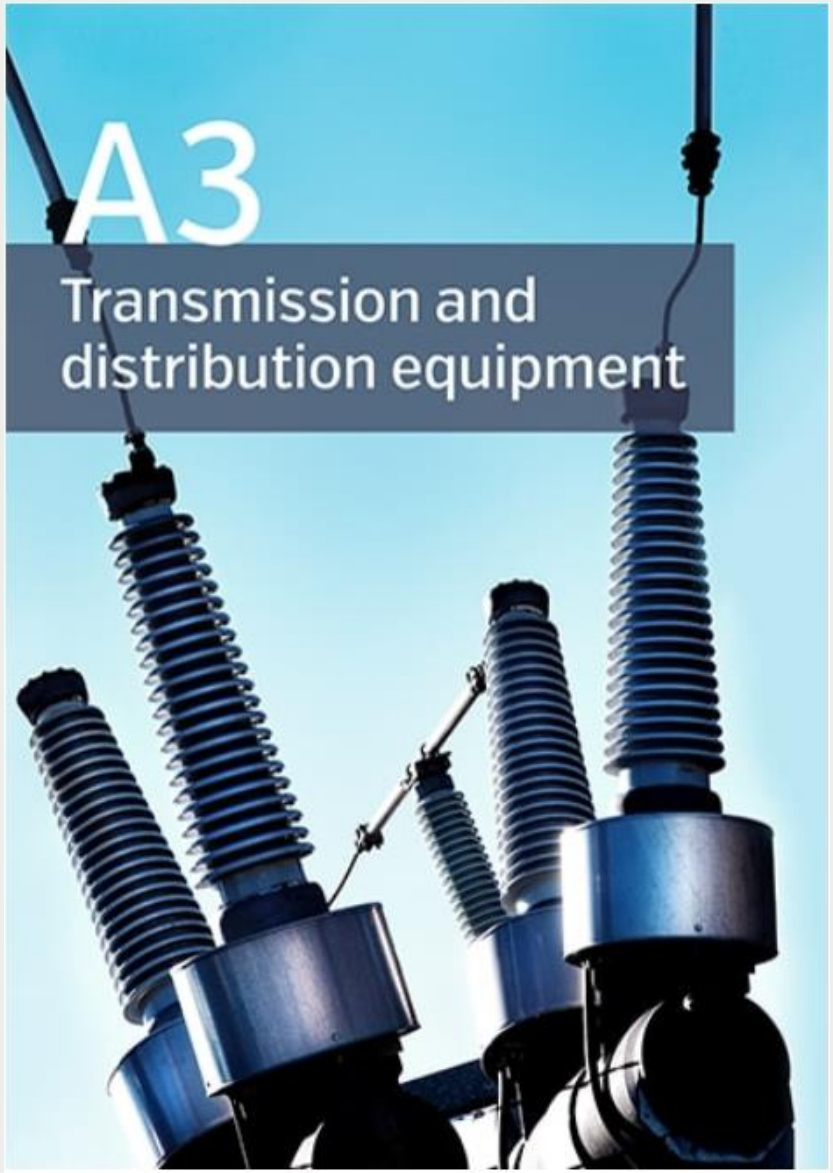
New / modified

- IEEE Liaison
- IEC Liaison
- Distribution
- Current Zero Club Liaison
- Africa Project

- 6 new members from distribution sector
- Added IEC TC 38 liaison to Strategic Board
- Added webmaster/social media
- Added UAB
- Added liaison to Africa project

- 24 regular
- 6 regular (distr.)
- 16 observing

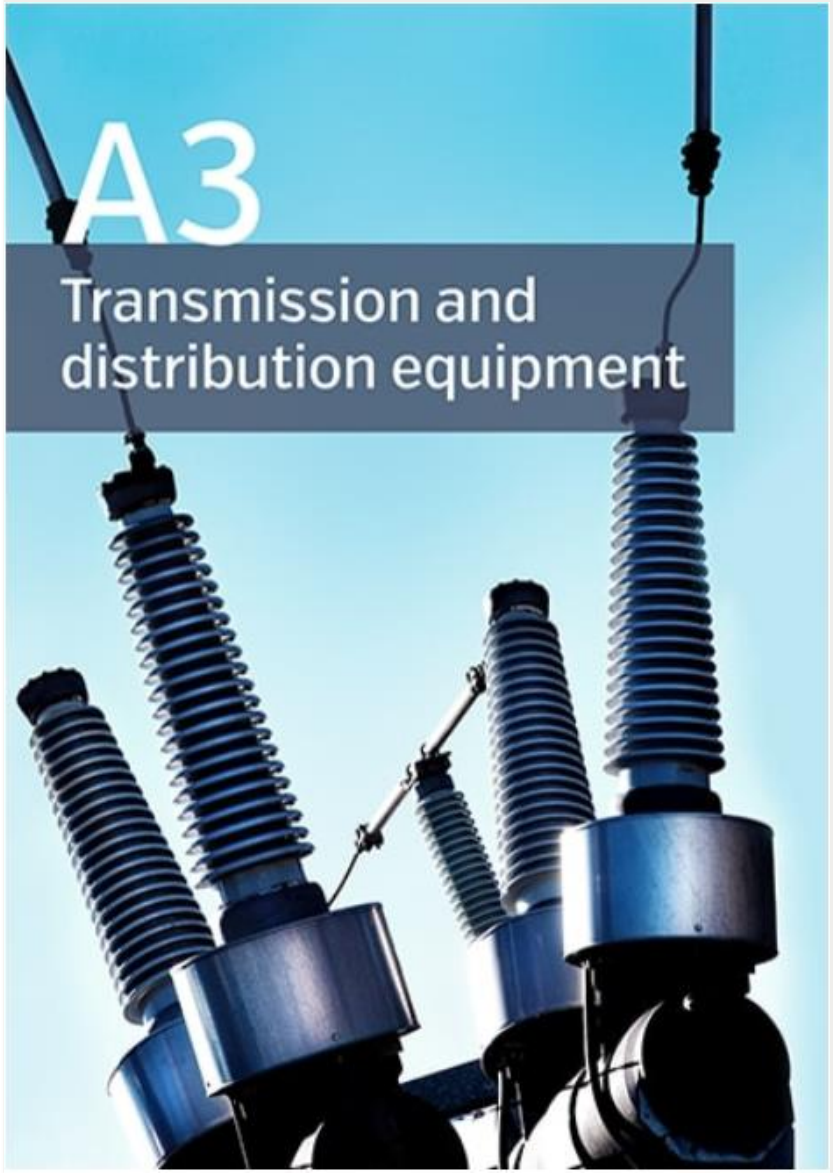
Study Committee A3



SCOPE OF WORK

- Devices for switching, interrupting, or limiting currents
- Surge arresters,
- Capacitors,
- Busbar and equipment insulators,
- Instrument Transformers,
- Bushings,
- Other T&D equipment not specifically covered under another study committee’s scopes

Technical Challanges

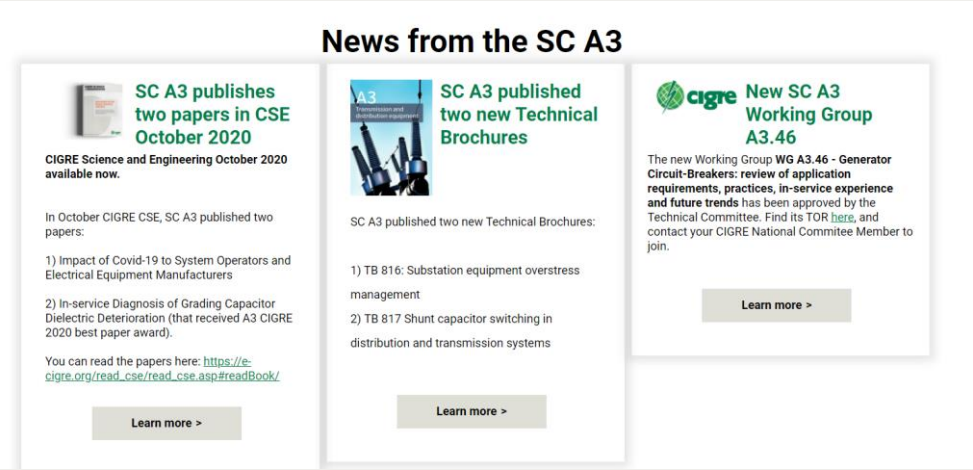


- Impact of renewables on T&D equipment
- Environmental and climate impact on T&D equipment
- Sustainability in the whole lifecycle of T&D equipment
- Digitalization & automatization
- Advanced sensors and data analytics
- Asset management / Condition assessment

SC A3 Website and Contacts

For more information visit

https://a3.cigre.org/



- Chair: Nenad Uzelac (US): Nenad.Uzelac@cigre.org

- Secretary: Frank Richter (FR) Frank.Richter@50hertz.com

- Webmaster: Mahir Muratovic (CH) mahir.muratovic@gmail.com

Utility Advisory Board (UAB)

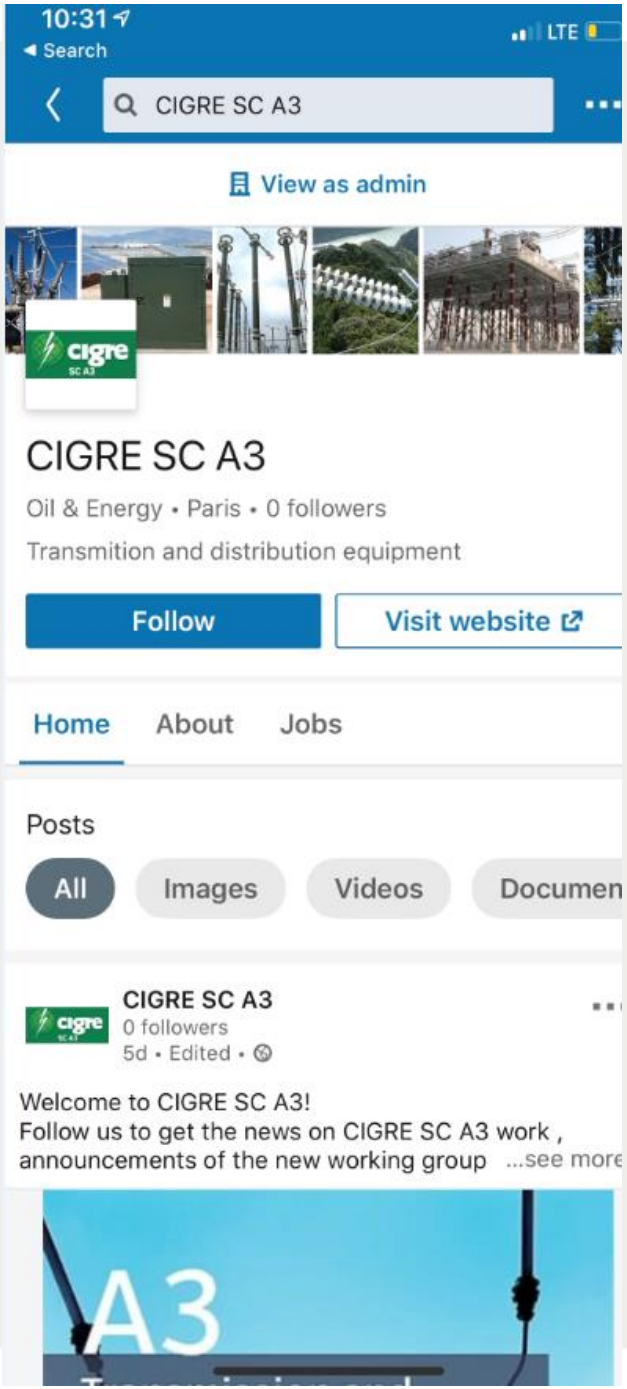
Chair
Robert LeRoux
ESBI International
robert.leroux@esb.ie

- Recently formed the UAB - the ‘Voice’ of utilities at Cigre.
- UAB consists of Cigre members employed by utilities
- The task is to discuss the needs of utilities and formulate a strategic plan from a utility point of view to advise Cigre of the requirements of utilities with respect to the tasks of A3.
- Accepting new members.
- Example: “Influence of pandemic on T&D Equipment”article published in CIGRE CSE

A3 LinkedIn

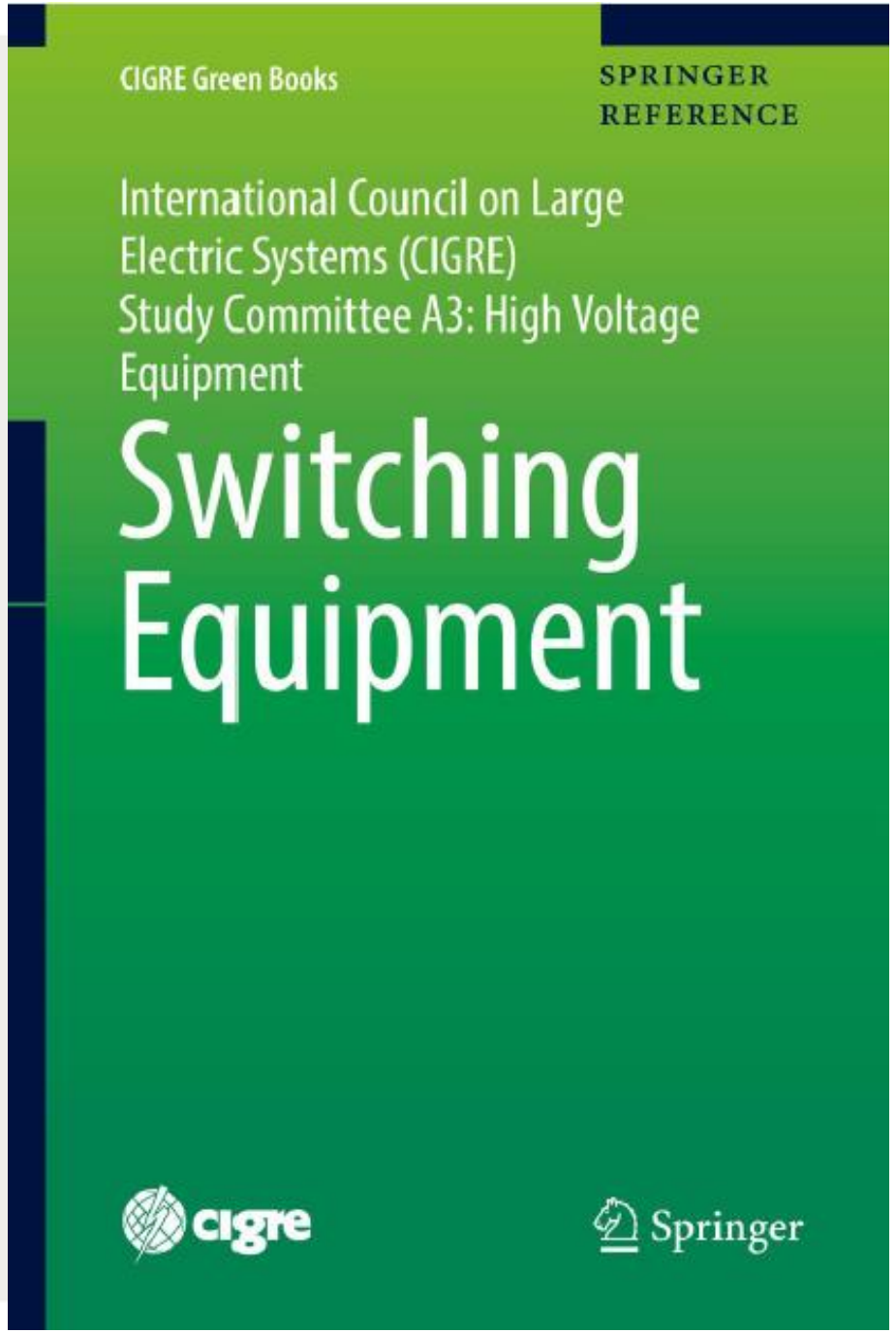
- https://www.linkedin.com/company/cigre-sc-a3

- A3 created LinkedIn account for new announcements, events, publications, collecting feedback, etc…
- If you have LinkedIn account, please follow this page and share it among your network



A3 Green Book,
first edition 2018

- The SC A3 Green Book should be revised: it is planned to publish a second edition.
- Revise the chapter about HV vacuum breakers, SF6 alternatives because of publications by WG A3.41.
- Revise the chapters for instrument transformers and surge arresters
- The content of “Asset Management” chapter should include recommended procedures as well as provide case studies
- For the Green Book project volunteers are very welcome



New Green Book - Electricity Supply Systems of the Future

- Introduction and Overview
- Rotating Electrical Machines
- Power Transformers and Reactors
- Transmission and Distribution Equipment
- Insulated Cables
- Overhead Lines
- Substations and Electrical Installations
- DC Systems and Power Electronics
- Protection and Automation
- Power System Development and Economics
- Power System Operation and Control
- Power System Environmental Performance
- Power System Technical Performance
- Electricity Markets and Regulation
- Active Distributed Systems and Distributed Energy Resources
- Materials and Emerging Test Techniques
- Information Systems and Telecommunications

- Transmission and Distribution Equipment
  - 1 Introduction
  - 2 Developments in HV Switchgear
  - 3 Developments in MV Switchgear
  - 4 Developments in Instrument Transformers
  - 5 Summary
  - References

Hiroki Ito,
René Peter Paul Smeets,
Venanzio Ferraro,
Lorenzo Peretto
Nenad Uzelac





Published documents

A3.36 (Martin Kriegel)

Reference: **817**

Type:
TECHNICAL BROCHURES

Title:
Shunt capacitor switching in distribution and transmission systems

The performance of switchgear for capacitor banks in service is compared with their performance during type testing. A survey interrogated capacitor size, switching rates and maintenance practices. For SF_6 and vacuum devices, state-of-the-art was collected on the probability of restrikes in relation to inrush current and frequency aiming on electrical endurance. Alternative devices are described and peculiarities of filter bank switching.

File Size: 7 MB
Pages NB: 95

Study Committee: A3
WG (TF): WG A3.38
Year: 2020

Published documents (cont.)

A3.38 (Edgar Dullni)

Reference: **830**

Type:
TECHNICAL BROCHURES

Title:
Application and Benchmark of Multiphysics Simulation Tools for Temperature Rise Calculations

The development of MV and HV switchgear comes along with a bundle of simulation and testing tasks to ensure a safe and reliable operation of the equipment over several decades. During normal operation as well as in case of short-circuit events the temperature inside the switchgear rises above ambient level. The ability to carry the rated nominal current without exceeding the allowed temperature rise limits is demonstrated in a temperature rise test. Temperature rise limits are given in the standards, depending on the used insulating gas, in order to prevent accelerated ageing of the equipment. The optimization of existing as well as the development of future switchgear requires the knowledge to predict the temperature rise of the equipment during the different iterations of the development process. For this purpose, simulation tools and methods are required, which strongly depend on the used physical models and material parameters. The TB gives a guideline to handle temperature rise simulations and their results. The working group conducted a benchmark study and applied multiphysics simulation tools to calculate the temperature rise of unknown test devices, that were designed and manufactured by the working group. Deviations between the simulation results as well as between experiment and simulation are discussed and explained by differences in the modelling of heat generation and heat dissipation

View more

File Size: 9 MB
Pages NB: 111

Study Committee: A3
WG (TF): WG A3.36
Year: 2021

Published documents (cont.)

A3.31 (Farnoosh Rahmatian)

Type:

WORKING GROUP REPORTS

Title:

Accuracy and Calibration of Instrument Transformers with Digital Output

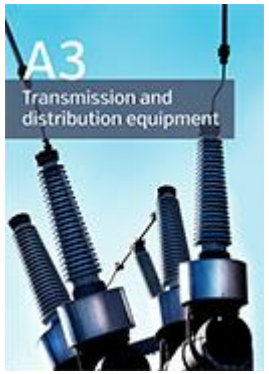
Issues related to the accuracy and calibration of instrument transformers with digital output are presented, addressing both laboratory and field calibration. Both IEC and IEEE accuracy definitions are considered, and appropriate circuits for high-accuracy calibration are reviewed. An update on EURAMET EMPIR Futuregrid II project is provided, showing the latest efforts in enabling deployment of digital voltage and current sensors in the evolving grid. Finally, examples of the use of digital low power instrument transformers for practical field calibration of other instrument transformers are presented.

File Size: 2,2 MB
Pages NB: 26

Study Committee: A3
WG (TF): WG A3.31
Year: 2021

Published Documents (cont.)

A3.41 (Rene Smeets)



Type: **TECHNICAL BROCHURE 871**
Title: **Current Interruption in SF6-free Switchgear**

The Technical Brochure of WG A3.41 deals with the technology, availability and application of SF6-free transmission and distribution switchgear. It focuses on the mainstream of upcoming SF6-free current interruption technologies, on the one hand based on interruption in natural-origin gases and their mixtures with fluoronitrile (C4-FN), fluoroketone (C5-FK), and on the other hand based on technical air-insulated vacuum circuit breakers. Despite the different physical characteristics of the SF6-free alternatives, minor modifications enable similar performance, application range and size as their SF6 equivalents, at present up to 170 kV.
Products and (pilot) projects with SF6-free switchgear are reported in this Technical Brochure.

File Size: 17,4 MB
Pages NB: 260
Study Committee: A3
WG (TF): WG A3.41
Year: 2022

Published Documents (cont.)

Type:
TECHNICAL BROCHURES 873
Title:
Design, test and application of HVDC circuit breakers

This Technical Brochure presents a comprehensive guides to the design, test and application of HVDC CBs. Starting with a summary of the relevant works carried out by other academic organizations, the Brochure first discusses HVDC system and conversion technologies in addition to the fault detection, identification and management strategies. Design insights of voltage grading, mechanical switching, control and protection, and condition monitoring of CBs are then discussed. Key functional requirement of HVDC CBs and their interactions with HVDC systems are specifically analyzed. This is followed by the proposed approaches for rating, modelling and real-time HIL tests of CB for a given HVDC system and protection strategy. Guide for defining the type-test requirements of HVDC CBs and their sub-components are provided together with the recommended circuits for current interruption test. Examples CBs installed in multi-terminal VSC-HVDC systems and these developed in laboratories are particularly presented together with the test circuits and obtained results of both manufacturer and on-site fault current tests.

File Size: 13,2 MB

Pages NB: 236

Study Committee: A3, B4 ?

WG (TF): JWG B4/A3.80

Year: 2022

Working Groups under SC A3

WG A3.39: Application and field experience with Metal Oxide Surge Arresters

- There was some delay due to the Covid 19 pandemic crises. The TB publication targeting end of 2021.

WG A3.40: Technical Requirements and Testing Recommendations for MV DC switching equipment at distribution levels

- In the course of working on the topic it was found that it takes longer to work on some topics (e.g. collecting existing operational experience). WG proposes to publish an interim report in Electra, CSE or prepare a short version of a technical brochure about the work already done. Still under consideration.

WG A3.42: Failure analysis and risk mitigation for recent incidents of AIS instrument transformers

- Continue working on the TB draft

WG A3.43 Tools for lifecycle management of T&D switchgear based on data from condition monitoring systems

- WG targeting end of 2021 – beginning of 2022 for the publication of TB. First draft is to be discussed in May during next online meeting

JWG A3/A2/A1/B1.44 Limitations in operation of High Voltage Equipment resulting of frequent temporary overvoltages

- WG started in 2020. Several online meetings held. Tasks identified.

Working Groups under SC A3 (cont.)

WG A3.45 Methods for identification of frequency response characteristic of voltage measurement systems

- WG targeting early 2021 for first TB draft review

WG A3.46 Generator Circuit-Breakers: review of application requirements, practices, in-service experience and future trends

- New WG started in early 2020. TB to serve as educational resource on GCB topics and "cookbook" for users

JWG C4/A3.53: Application Effects of Low-Residual-Voltage Surge Arresters in Suppressing Overvoltages in UHV AC Systems

- JWG was interrupted due to COVID. Planning to restart in 2022.

JWG B3/A3.59: Guidelines for SF6 end-of-life treatment of T&D equipment (>1kV) in Substations

- The WG is assembled in 2020. Outline of the future TB were developed.

Working Groups under SC A3 (cont.)

WG A3.47 Lifetime Management of Medium Voltage Indoor Switchgear

- Approved, to start 2022

JWG B3/A3.60 User guide for non-SF6 gases and gas mixtures in Substations

- Approved, started in 2021

JWG **B4/A3.84: Fault Current Limiting Technologies for DC Grids**

- WG started in 2020. Several online meetings held. Tasks identified.

SC B1 – Insulated Cables

Rusty Bascom – Electrical Consulting Engineers, P.C. (r.bascom@ec-engineers.com)

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For power system expertise

SC B1 – Insulated Cables

Earle C. (Rusty) Bascom III, Electrical Consulting Engineers, P.C.
Tom Zhao, Electric Power Research Institute

Schedule for the week

Date	Meeting
Monday, 29-August-2022	SC B1 New Member Orientation (closed meeting)
Tuesday, 30-August-2022 (10:40-12:30)	**B1 Tutorial: A New Era for Submarine Cables** ***Room: Salle Maillot (Level 2)***
Tuesday, 30-August-2022 (16:30-18:00)	**B1 Poster Sesion** ***Room: Halle Ternes (Level 1)***
Wednesday, 31-August-2022 (08:45-18:00)	**B1 Group Discussion (Preferential Subjects)** ***Room: Amphithetre Havane (Level 3)***
1-September-2022	B1 Study Committee Meeting (closed meeting)
2-September-2022	B1 Study Committee Meeting (closed meeting)

SC B1 - Preferential Subjects for 2022

Preferential Subject 1 (PS1), Learning from experiences

- The subject covers:
  - Design, manufacturing, installation techniques, maintenance and operation,
  - Quality, monitoring, condition assessment, diagnostic testing, fault location, upgrading and uprating methodologies and relevant management,
  - Lessons learned from permitting, consent and implementation.

- This preferential subject attracted 35 contributions, which was the most of any preferential subject in Study Committee B1 and generated six discussion questions.

SC B1 - Preferential Subjects for 2022

Preferential Subject 2 (PS2), Future functionalities and applications

- The subject covers:
  - Innovative cables and systems, exploring the limits,
  - Role and requirements of power cables in tomorrow's grids,
  - Prospective impacts from the Internet of Things, Big Data and Industry 4.0 on power cable systems.

- This preferential subject attracted 15 contributions.

SC B1 - Preferential Subjects for 2022

Preferential Subject 3 (PS3), Towards sustainability

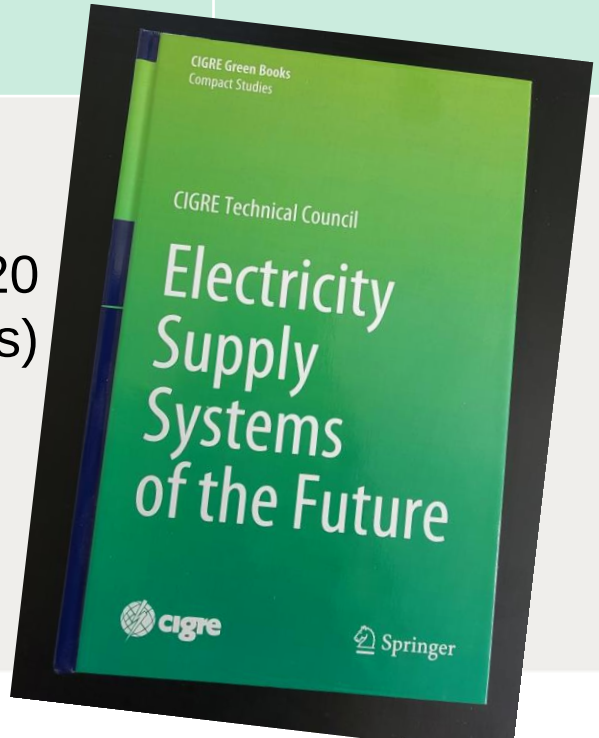
- This subject covers:
  - Environmental challenges impacting current, planned and future cable systems,
  - Safety considerations, cyber and physical security, including case studies,
  - Projects and initiatives to promote access to affordable, reliable, sustainable distribution and transmission cable lines for all

- This preferential subject attracted 3 contributions.

SC B1 – 2022-2023 Main Events

Event	Place	Date
Study Committee B1 Meeting	Cairns, Australia	September 2023
JiCable	Lyon, France	June 2023
Sheath Bonding of AC Cable Systems (TB 797) (Record 943 registrants, for B1)	Webinar	22-April-2022 (earlier this year)

Published in 2020
(includes a chapter on insulated cables)



U.S. National Committee B1 Participation

First Name	Last Name	WG Role	WG# & TF#	Young member	WG & TF Title
Benjamin	T. Lanz	Expert	TF B1.78	No	Status detection, condition monitoring and rejuvenation for power cables
Rachel	Mosier	Expert	TF B1.81	No	How to have statistics every 2 years
Wael	Moutassem	Expert	TF B1.84	No	Update of IEC 60853 (cyclic and emergency current rating of cable) and IEC 62095 (Finite element method - current
{vacant}			TF B1.88		Non-SF6 GIS terminations
Arie	Makovoza	Expert	TF B1.89	No	Guidance for conducting cable systems failure analysis
Walter	Zenger	Convenor	TF B1.89	No	Guidance for conducting cable systems failure analysis
Earle C. (Rusty)	BASCOM III	Expert	WG B1.56	No	Cable Rating Verification
Wael	Moutassem	Expert	WG B1.56	Yes	Cable Rating Verification
Earle C. (Rusty)	BASCOM III	Expert	WG B1.72	No	Cable rating verification – application in complex situations
Wael	Moutassem	Expert	WG B1.72	Yes	Cable rating verification – application in complex situations
Jay	Herman	Expert	WG B1.73	No	Recommendations for the use and testing of Fibre Optic Cables used in Land Cable Systems
Rachel	Mosier	Expert	WG B1.76	No	Increasing the role of quality assurance and quality control to reduce the cable failure possibility
Landry	Molimbi	Expert	WG B1.80	No	Guidelines for Site Acceptance Tests of DTS and DAS Systems used for cable systems monitoring
Sherif	Kamel	Expert	WG B1.82	No	MVDC Cable system requirements
Paul	Knapp	Convenor	WG B1.82	No	MVDC Cable system requirements
Robert	Hobson	Expert	WG B1.83	No	Grounding aspects for long HVDC land cable connections
Peter	Tirinzoni	Expert	WG B1.86	No	Assessment, Prevention and Mitigation of Safety Risk in Cable Systems
Tiebin (Tom)	Zhao	Expert	WG B1.87	No	Finite Element Analysis for Cable Rating Calculations

Publications (2019 - 2022)

WG #	Name of the Publication	Publication Date	Technical Brochure #
B1.63	Recommendations for mechanical testing of submarine cables for dynamic applications	2022	TB 862
B1.66	Recommendations for testing DC lapped cable systems for power transmission at a rated voltage up to and including 800 kV	2021	TB 853
B1.62	Recommendations for testing DC extruded cable systems for power transmission at a rated voltage up to and including 800 kV	2021	TB 852
JWG D1/B1.49	Harmonised test for the measurement of residual methane in insulating materials	2021	TB 850
B1.38	After laying tests on AC and DC cable systems with new technologies	2021	TB 841
B1.60	Maintenance of HV Cable Systems	2021	TB 825
B1.57	Update of service experience of HV underground and submarine cable systems	2020	TB 815

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Publications
(2019 - 2022) ***continued***

WG #	Name of the Publication	Publication Date	Technical Brochure #
B1.44	Guidelines for safe work on cable systems under induced voltages or currents	2020	TB 801
B1.50	Sheath bonding systems of AC transmission cables - design, testing, and maintenance	2020	TB 797
JWG B1/B3.49	Standard design of a common, dry type plug-in interface for GIS and power cables up to 145 kV	2019	TB 784
B1.52	Fault location on land and submarine links (AC & DC)	2019	TB 773
B1.48	Trenchless technologies	2019	TB 770
B1.46	Test regimes for HV and EHV cable connectors	2019	TB 758
B1.45	Thermal monitoring of cable circuits and grid operators' use of dynamic rating systems	2019	TB 756

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Publications (2016 - 2018)

WG #	Name of the Publication	Publication Date	Technical Brochure #
WG B1.28	On-site Partial Discharge assessment of HV and EHV cable systems	2018	TB 728
WG B1.55	Recommendations for additional testing for submarine cables from 6 KV (UM=7.2 KV) up to 60 KV (UM = 72.5 KV) - April 2018	2018	TB 722
WG B1.51	Fire issues for insulated cables in air - March 2018	2018	TB 720
WG B1.41	Long term performance of soil and backfill systems	2017	TB 714
WG B1.36	Life Cycle Assessment and Environmental Impact of Underground Cable Systems	2017	TB 689
WG B1.47	Implementation of Long AC HV & EHV Cable Systems	2017	TB 680
WG B1.34	Mechanical forces in large cross section cables systems -	2016	TB 669
B1.37	Guide for the operation of fluid filled cable systems	2016	TB 652

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U.S. Activities Coordinated with SC B1

IEEE/ICC

- Provided updates on CIGRE activities at ICC meeting held in Anaheim, California 1-4 May 2022.
- IEEE Insulated Conductors Committee is related technical committee to CIGRE B1.
- Upcoming IEEE ICC meetings:
  - 30-October to 2-November 2022: Orlando, FL
  - 30-April to 3-May 2023: Denver, CO
  - 29-October to 1-November 2023: New Orleans, LA
  - 12-15 May 2024: Palm Springs, CA

IEEE Transmission & Distribution Conference: 6-9 May 2024 (Anaheim, CA)

SC B2 – Overhead Transmission Lines

Erik Ruggeri – POWER Engineers (erik.ruggeri@powereng.com)

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For power system expertise

SC B2 TAGs

TAG 04: Electrical Performance

- Chair: Javier Iglesias (Spain)

TAG 05: Towers, Foundations, Insulators

- Chair: João Da Silva (Brazil)

TAG 06: Mechanical Behaviour of Conductors & Fittings

- Chair: Pierre Van Dyke (CA)

TAG 07: Asset Management, Reliability, Availability

- Chair: John McCormack (Australia)

TAG 04 MEETING SCHEDULE – 2022

CONVENOR – Javier Iglesias
jiglesias@ree.es

SECRETARY – Diarmid Loudon
diarmid.loudon@efla.no

TAG-04 Meeting

August 2022 Paris (FR)

Meeting Room: 111-112-113 (Palais des Congrès)

	Friday August 26, 2022	Saturday August 27, 2022	Sunday August 28, 2022	
08:30-10:30		**WG B2.59** Forecasting dynamic thermal line ratings **George Watt**	**WG B2.78** HTLS conductors for new overhead lines **Rob Stephen**	**WG B2.80** Numerical Simulation of EF on insulator strings **Fabian Lehretz** **(Different Room)**
10:30-12:30		**TAG 04** Electrical Aspects (General) **Javier Iglesias**	**WG B2.83** Mitigation of induced noises by corona activity **Oswaldo Regis**	
12:30-14:00	**Lunch**			
14:00-16:00		**WG B2.79** Weather Measurements for Enhancing Line Ratings **George Watt**	**WG B2/C4.76** Lightning & Grounding for rebuilding and refurbishing **Bill Chisholm**	
16:00-18:00		**WG B2.79** Weather Measurements for Enhancing Line Ratings **George Watt**	**WG B2/C4.76** Lightning & Grounding for rebuilding and refurbishing **Bill Chisholm**	
20:00	**TAG 06 dinner**			

TAG 04 – ACTIVE WORKING GROUPS

WG	Name	Convener	Secretary	Established	Comment
WG B2.59	Forecasting dynamic thermal line ratings	Dale Douglass (US)	Gerhard Biedenbach (DE)	2014	Under revision. Expected Publication 2022
WG B2.62	Compact DC overhead lines	Javier Iglesias (ES)	Stefan Steeven (DE)	2016	**Published in 2021. TB831** (see: https://e-cigre.org)
JWG B2/C4.76	Lightning & Grounding Considerations for Overhead Line Rebuilding and Refurbishing Projects, AC and DC	W.A. Chisholm (CA)	Fernando Silveira (BR)	2019	Previous work as XWG3. Expected Publication 2022
WG B2.78	Use of High Temperature Conductors in New Overhead Line Design	Rob Stephen (ZA)		2020	Previous work as XWG2. Expected Publication 2024
WG B2.79	Enhancing Overhead Line Rating Prediction by Improving Weather Parameters Measurements	George Watt (CA)	Gabriela Molinar (DE)	2020	Previous work as XWG5. Expected Publication 2024
WG B2.80 (TAG5)	Numerical Simulation of electrical fields on AC and DC Overhead Line Insulator Strings	Fabian Lehretz (DE)		2020	Expected Publication 2023 (This WG belongs to TAG5)
WG B2.83	Mitigation of induced noises by corona activity in overhead AC and DC lines	Oswaldo Regis (BR)	Alvaro Menezes (BR)	2020	Previous work as XWG1. Expected Publication 2024. Expected CSE Article in 2022

TAG 04 – New Work Proposals and Future Topics of Interest

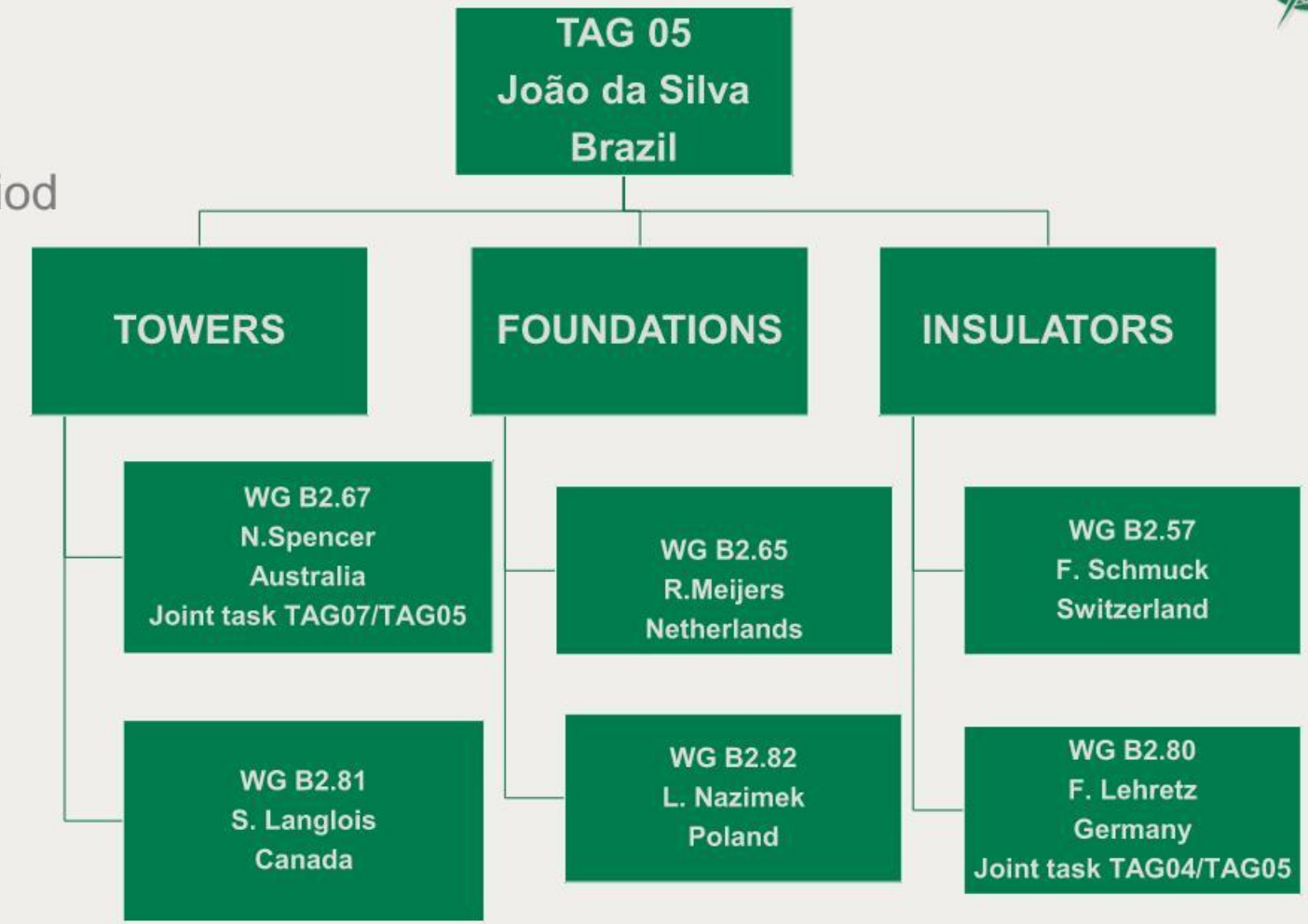
- Corona Discharge and its Environmental effects of HV AC and DC Overhead Transmission Lines During Rain
- Transition Facilities Between Overhead Lines and Underground Cables
- XWG 1: (Created WG B2.83) Mitigation of Electrically Induced Audible Noise from OHL’s.
- XWG 2 (Created WG B2.78) Use of HTLS Conductors in New Line Design
- XWG 5 (Created WG B2.79) Weather Parameter Measurement for OHL Rating Improvement

TAG 04 - TUTORIALS

- TB 763 “Conductors for the Uprating of Existing OHL” (WG B2.55)
- TB 782 “Compact AC Overhead Lines (WG B2.63)
- TB 831 “Compact DC Overhead Lines (WG B2.62)

1 – TAG-05 Structure

Notes:
- No TAG05 Secretary
- No meeting in the period



Last Publications

- TOWERS
  - TB 809 – “Dynamic Loading Effects on Overhead Lines: Impact on Structures”. June 2020, Electra 311.
  - TB818 – “Transmission Line Structures with Fibre Reinforced Polymer (FRP)” – November 2020, Electra 313 (In memoriam of Arni Jonasson)
- INSULATORS
  - TB 481 – “On the Assessment of Composite Insulators after Service” – December 2011, Electra 259
  - TB 545 – “Assessment of in-service Composite Insulators by Using Diagnostic Tools” – August 2013, Electra 269
- FOUNDATIONS
  - TB 516 – “Geotechnical Aspects of Overhead Transmission Line Routing – An Overview” – October 2012, Electra 264
  - TB 788 – “Dynamic Loading Effects on Overhead Lines – Impact on Foundations” – January 2020, Electra 308

Last Tutorials

- “Transmission Line Structures with FRP Composites” – India, February 10th 2021 – Janos Toth

TAG -05 Ongoing Working Groups

- WG B2.57 - “Survey of Operational Composite Insulators Experience & Applications” - Predicted: 2022. ?? To be confirmed.
- WG B2.65 - “Detection, Prevention and Repair of Sub surface Corrosion in Overhead Line Supports, Anchors and Foundations” - Predicted: 2022 !! To be confirmed.
- WG B2.67 - “Assessment and Testing of Wood and Alternative Material Type Poles” (Joint task TAG07) - Predicted: July 2022. ?? To be confirmed.
- WG B2.80 – “Numerical Simulation of electrical fields on AC and DC Overhead Line Insulator Strings” (Joint task TAG04) - Predicted: 2023.
- WG B2.81 - “Increasing the Strength Capacity of Existing Overhead Transmission Line Structures” - Predicted: 2023.
- WG B2.82 – “Overhead Line Foundations for Difficult Soil and Geological Conditions” - Predicted: 2023.

TAG-05 Potential New Groups

TOWERS

- "Non-synoptic wind effects on the Structural Design of Transmission Lines" – R. Menezes (BR)

- "Impact of the length in establishing structural reliability of Overhead Transmission Lines" - R. Menezes (BR)

- "Dynamic Analysis on Transmission Line Poles" - Sergey Kolosov (RS)

- "Assessment of the strength factor ØR for OHL supports" – TAG old demand.

- "Sensitive analysis on the OHL supports reliability" – R. Menezes (BR)

Foundations:

- "Foundation Inspection Methods" – "CAG old demand"

TAG-05 Potential New Groups (Continued)

Insulators:

- "Impact of Pollution Levels in the Insulator Strings of HVDC Lines: Design and Operation Aspects" - A. Pigini (IT)
- "Behavior of Porcelain and Glass Insulators Covered with RTV Silicone" - "CAG old demand"
- "OHL Outages due to Birds' action on Insulators" – "CAG old demand"

Construction:

- "Improvements on construction techniques for OHL's"- E.Jacobs (ZA)

Green Books Under Preparation

Structural Dynamic Loading Effects on Overhead Lines: Impact on Supports and Foundations

Progress: 70%

Innovative Solutions for Overhead Line Supports
Progress: 30%

TAG 06 -

B2-AG-06 2022 Meeting
August 25 to 27, 2022 in France

Venue: Meeting room in Palais des Congres

	Thursday August 25, 2022	Friday August 26, 2022	Saturday August 27, 2022
8:30-12:30	WG B2.70 AWM and bird flight diverters N. Sahlani	WG B2.66 Handling HTLS conductors V. Chari	WG B2.68 Line sustainability C. Rozé
12:30-14:00	Lunch		
14:00-18:00	WG B2.71 Interphase spacers J.P. Paradis	WG B2.84 Modelling limitations G. Diana	B2 TAG 06 Mechanical behaviour of conductors and fittings P. Van Dyke
20:00		8h00 pm TAG 06 & 04 joint dinner	

Note: Meeting room # will be informed later.

TAG 06 WG Reports (06-10-2022 Virtual Meeting)

- WG B2.66 HTLS Counductors: Handling and Installation (V. Chari)
- WG B2.68 Sustainability of Conductors and Fittings (C. Roze)
- WG B2.70 AWM and Bird Flight Diverters (N. Sahlani)
- WG B2. 71 Interphase Spacers (J.P. Paradis)
- WG B2.84 Wind-Induced Conductor Motion Methodologies (G. Diana)

New Topics Proposed:

- WGs B2.66 and B2.68 will complete their activities in 2023
- Conductor Selection Process (TAG 04 and TAG 06 Joint Effort)
- Measurement of Vibration Severity on Clamps Using Elastomer and/or Helical Rods and Dead-ends
- Elastomer Performance in Fittings – Life Expectancy
- Damping of Long Spans (>1000m)
- Tower Vibration
- Conductor Creep
- Spacer Dampers and the Reliability of OHL Fittings

SUMMARY *TAG 07 – Asset Management, Reliability*

Convener:	John McCormack (AU)	
	Balint Nemeth (HU) commencing Oct 2022	
Secretary:	Balint Nemeth (HU)	
TAG Membership:	31 Regular members, 29 Corresponding members	
Publications:	1	
Tutorials:	0	
WG status:	Active (total incl new):	9 (including 2x JWG)
	Completed:	2
	New WG since 2021:	3
	New Proposals:	2
Meetings:	August 2021	Paris (Virtual)
	2022	3x strategy meetings (Virtual)
	August 2022	Paris (Hybrid)

TAG 05 WG – Status as of August 2022 (1 of 2)

WG	Convenor	Title	Start Date	ToR Scheduled Finish Date	Status/ Target Finish Date	Progress/ Scheduled Events
B2.40	Robert Lake (Australia)	Calculations of the electrical distances between live parts and obstacles for OHL	2014	2017	Disbanded 2022	Final Summary Paper and Tutorial Issued.
WG60	Viven Naidoo (Norway)	Affordable Overhead Transmission Lines for Sub-Saharan Countries	Restart 2017		Rescheduled (new convenor) Target Finish 2022/23	TB Draft In Progress
WG64	Balint Nemeth (Hungary)	Inspection & Testing of Equipment and Training for Live-Line Work on OHL	2017	2021	Disbanded 2022	TB issued for publication
WG67	Nathan Spencer (Australia)	Assessment & Testing of Wood Poles	2017	2020	Rescheduled (new convenor) Target Finish 2022	TB draft under preparation
JWG B2/D2.72	Ying Chen (China)	Condition Monitoring & Remote Sensing of OHL	2019	2022	Target Finish 2023	Draft TB v2.0 by Aug 2022. Next Meeting Paris: August 2022 (Hybrid)
WG 73	Peter Dulhunty (Australia)	The role of OHL electrical assets with respect to the initiation and prevention of bushfires	2019	2022	Target Finish 2023	Work in progress. Nest Meeting: August 2022 (Virtual)

WG – Status as at Aug 2022 (2 of 2)

WG	Convenor	Title	Start Date	ToR Scheduled Finish Date	Status/ Target Finish Date	Progress/ Scheduled Events
WG 74	Nishal Mahath (South Africa)	UAV for maintenance of OH distribution lines	2019	2022	Target Finish 2023	Survey prepared for issue. Next Meeting: Paris August 2022 (Hybrid)
WG 77	Asif Bhangor (Australia)	Risk Mgt of OHL: A model for identification, evaluation & mitigation of operational risks	2020	2023	Target Finish 2024	Work in progress. Next Meeting: Paris August 2022 (Hybrid)
WG 85	Bing Lin (Australia) New Convenor.	Emergency Restoration of OHL	2021	2024	New WG. Rescheduled (new convenor) Target Finish 2025	Kick-off meeting: Paris Aug 2022 (Hybrid)
JWG B2/C1.86	Viktor Lorencic (B2) Slovenia; Yury Tsimberg (C1) Canada	Asset Management of OH Transmission Lines	2022	2025	New WG. Kick off meeting February 2022	Work in progress. Next Meeting: Paris August 2022 (Hybrid)
WG 87	Balint Nemeth (Hungary)	Safety Guidelines for Live Work on OHL	2022	2025	New WG. Kick-off meeting Turin, June 2022	Work in progress. Next Meeting: UK Autumn 2022 (Hybrid)

ToR Proposals as of August 2022

	Proposed Convenor	Proposed Topic	Status	Proposed Start Date	Comment
WG.xx	tba	OHL Construction Methodology	Draft ToR Issued to TAG05/CAG for comment	2023	ToR developed in response to CAG Customer Needs Survey 2014. Joint WG TAG05/07? Linked to "Safety Guidelines for Const. & Maint." - prefer both WG operate concurrently.
WG.xx	John McCormack (Australia)	Safety Guidelines for OHL Construction & Maintenance	Final Draft ToR Submitted to CAG for approval	2022/23	TAG07 initiative. Linked to "OHL Construction Methodology" - prefer both WG operate concurrently.

SC B3 – Substations and Electrical Installations

George Becker - POWER Engineers (george.becker@powereng.com)

cigre

For power system expertise

U.S. Representatives on CIGRÉ Study Committees

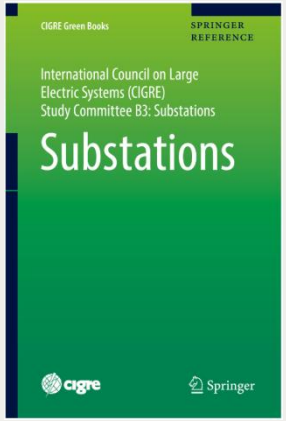
- Preferential Subjects
- SC Meetings
  - Agenda
  - Issues
- SC Organization
  - Working Groups
  - Task Forces
  - Mirror Panels

B3 – Substations and Electrical Installations

2022 B3 Study Committee Schedule for the week:

Please contact the WG convener if you wish to attend

Date	Description	Meeting	Room	Open	Contact/Comments
Friday 26 Aug 2022	B3.58 – Knowledge Transfer of Substation Engineering and Experiences	Working Group	341, Level 3	No	Akira Okada akira.okada@hitachienergy.com/ Full Day Jeffery CAMDEN cam08529@sbcglobal.net
	B3.54 – Earthing System Testing Methods - historic approaches, recent developments and recommended approaches	Working Group	338, Level 3	No	Stephen PALMER spalmer@safearth.com / Full day
Sat 27 Aug	B3.54 – Earthing System Testing Methods - historic approaches, recent developments and recommended approaches	Working Group	338, Level 3	No	Stephen PALMER spalmer@safearth.com / Full day
Sun 28 Aug	B3.49 – Review of Substation Busbar Component Reliability	Working Group	223, Level 2	No	Milan RADOSAVLJEVIC milan.radosavljevic@svk.se/ Afternoon
Monday 29 Aug 2022	Official opening Panel	Opening	Grand Amphi	Yes	08:45-12:00, Open to all delegates – Level 1
	TF – Substations Training Course Project Meeting	Task Force	235, Level 2	No	Hugh CUNNINGHAM hugh.cunningham@esb.ie/ Morning
	B3.64 – Guidelines on Optimising Seismic Design of Substations for Power Resiliency	Working Group	226, Level 2	No	Atshushi ETO eto.atsushi@tepco.co.jp/ Full day
	B3.56 – Application of 3D Technologies in Substation Engineering Works	Working Group	327, Level 3	No	Philip KONIG philip.konig@gmail.com / Afternoon Samuel NGUEFEU samuel.nguefeu@rte-france.com
	B3.57 – Impact on Engineering and Lifetime Management of Outdoor HV GIS	Working Group	326, Level 3	No	Toshiyuki SAIDA toshiyuki.saida@toshiba.co.jp / Full day Namita UPPAL namita.uppal@atkinsglobal.com
	B3/A3.60 User guide for non-SF_6 gases and gas mixtures	Working Group	313, Level 3	No	Piet KNOL Piet.Knol@tatasteeleurope.com / Afternoon Bernard LUTZ Bernhard.Lutz@fichtner.de
	SC B3 – Poster session	SC B3 event	Hall Ternes	Yes	14:30 – 18:00 ; Hall Ternes is located at Level 1



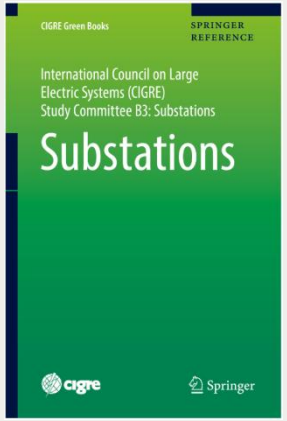
B3 – Substations and Electrical Installations

2022 B3 Study Committee Schedule for the week:

Please contact the WG convener if you wish to attend

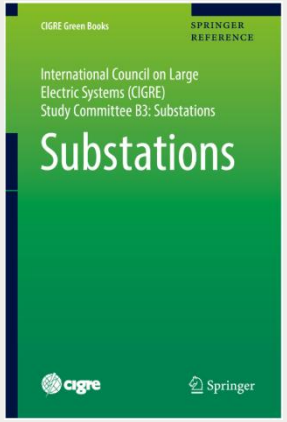
Tuesday 30 Aug 2022	**SC B3 – Group Discussion Meeting**	Discussion Meeting	Grand Amphi	Yes	08:45 – 18:00, All delegates welcome. Contributors must attend in person. PS3 discussion jointly with B5.
Wednesday 31 Aug 2022	**A3/B3 Joint Workshop**: "SF_6 alternatives for T&D substations and their switchgear"	SC A3/B3 Workshop	251, Level 2	No	Pre-registration from CIGRE registration system required 08:30 – 12:30,
	B3/D2.62 – Life-long Supervision and Management of Substations by use of Sensors, Mobile Devices, Information and Communication Technologies	Working Group	343, Level 3	No	Nicolaie FANTANA nicolaie.fantana@outlook.com / Full day
	B3/D1.63 – Guideline for assessing the toxicity of used SF_6 gas onsite and in the lab of T&D equipment above 1 kV in substations	Working Group	363, Level 3	No	Roland KURTE roland.kurte@wika.com / Afternoon
	B3.51 – Service continuity guide in context of maintenance, repair and extension of HV GIS	Working Group	136-137, Level 1	No	Mark KUSCHEL mark.kuschel@siemens-energy.com / Jens HETTLER jens.hettler@swissgrid.ch /Afternoon
	B3 Tutorial (B3.48): "Asset health indices for equipment in existing substations"	SC B3 Tutorial	Salle Maillot Level 2		Pre-registration from CIGRE registration system required 14:00 – 15:30,
Thursday 1st Sep 2022	**SC B3 – 59th Annual Meeting**	Regular SC meeting	342 B	No	Open to all SC Members (Regular, Observer, Additional) and WG Convenors/Secretaries
	Cocktail reception	"Pavillons de Bercy"	All delegates	Yes	Cocktail reception 19:30 – 23:30 "Pavillons de Bercy - Musée des arts Forains"
Friday 2nd Sep 2022	**B3 Workshop:** "Knowledge Transfer of Substation Engineering and Experiences" (B3.58)	SC B3 Workshop	251, Level 2	No	Pre-registration from CIGRE registration system required 08:30 – 12:30,

Any questions? https://b3.cigre.org/ or contact samuel.nguefeu@rte-france.com (B3 secretary)



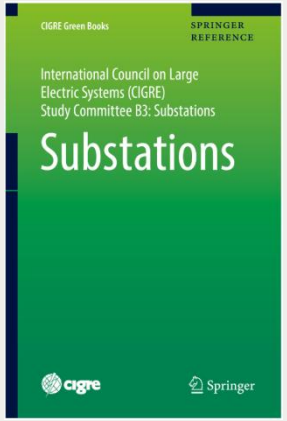
Study Committee B3 Active Working Groups

- **B3.64**: Guidelines on Optimizing Seismic Design of Substations for Power Resiliency
- **B3/D1.63**: Guideline for assessing the toxicity of used SF_6 gas onsite and in the lab of T&D equipment above 1 kV in substations
- **B3/D2.62**: Life-long Supervision and Management in Substations by Sensors, Mobile Devices and ICTs
- **B3/A3.59**: Guidelines for SF_6 end-of-life treatment of T&D equipment (>1kV) in Substations
- **B3.58**: Knowledge Transfer of Substation Engineering and Experiences
- **B1/B3.74**: Recommendations for a performance guideline of Polymer Insulated Busbars
- **B3.49:** Review of Substation Busbar Component Reliability
- **B3.41:** Mobile Substations Incorporating GIS - Design Aspects



Study Committee B3 Active Working Groups

- **B1/B3/D1.79**: Recommendations for dielectric testing of HVDC gas insulated system cable sealing ends
- **B3.57**: Impact on Engineering and Lifetime Management of Outdoor HV GIS
- **B3.56**: Application of 3D Technologies in Substation Engineering Works
- **B3.54**: Earthing System Testing Methods - historic approaches, recent developments and recommended approaches
- **B3.52**: Neutral Grounding Method Selection and Fault Handling for Substations in the Distribution Grid
- **B3.50**: Concepts for on-site HV testing of GIS after installation, extension, retrofit or repair
- **SF_6 Green Book**: Reference book on SF_6

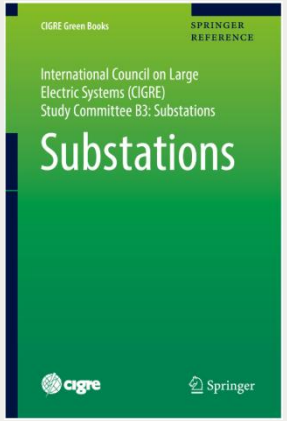


Study Committee B3 Newer Working Groups

- **B3.61: Risk and asset health-based decision making in existing substations**
- **B3/A3.60: User guide for non-SF_6 gases and gas mixtures**

Study Committee B3 Pending Working Groups

- **B3.65: Escape routes for substations rated above 1kV AC and 1.5 kV DC**



Study Committee B3 Organization

Strategic Advisory Group (Koji Kawakita)

Quality Assurance Team (Terry Krieg, John Finn, Colm Twomey)

SC B3 Secretary (Samuel NGUEFEU)

Chairperson
Koji Kawakita

Customer Advisory Group (John Randolph)

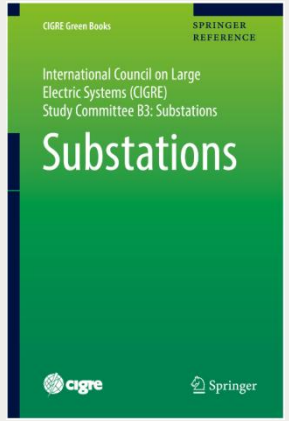
Tutorial Advisory Group (Hugh Cunningham)

Study Committee
24 Regular Members, 4 Additional Regular Members, 17 Observer Members + 4 Area Advisors, all WG Convenors/Secretaries

Work Area: AA1	AA2	AA3	AA4
Substation Concepts and Development Advisor: Mark Osborne	Gas Insulated Substations Advisor: Mark Kuschel	Air Insulated Substations Advisor: Mark McVey	Substation Management & Digital Integtation Advisor: Johan Smit
B3.49 Review of substation busbar components reliability	B3.41 Mobile Substations Incorporating HV GIS	B3.53 Guidelines for Fire Risk Management in Substations	B3.48 Asset health indices for equipment in existing Substations
B3.52 Neutral Grounding Mode Selection and Fault Handling for Substation in Distribution Grid	B3.50 Concepts for on-site HV testing of GIS	B3.58 Knowledge Transfer of Substation Engineering and Experiences	B3.56 Application of 3D Technologies in Substation Engineering Works
B3.54 Earthing System Test Methods	B3.51 Service continuity guide for the maintenance, repair and extension of HV GIS		B3.61 Risk and asset health-based decision making in existing substations
B3.55 Design guidelines for substations connecting battery energy storage solutions (BESS)	B3.57 Impact on Engineering and Lifetime Management of Outdoor HV GIS		
JWG B1/B3.74 Recommendations for a performance guideline of Polymer Insulated Busbars	JWG B3/A3.59 Guidelines for SF6 end-of-life treatment of T&D equipment (>1kV) in Substations		
	JWG B3/A3.60 User guide for non-SF6 gases and gas mixtures in Substations	Greenbook Project 2 - SF6 Guidebook	
	JWG D1/B3.57 Dielectric Testing of GIS HVDC Systems		
	JWG B1/B3/D1.79 Recommendations for dielectric testing of HVDC gas insulated system cable sealing ends		

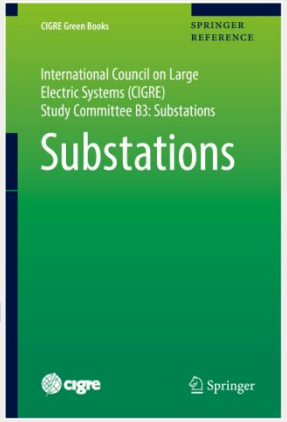
Legend:
- Current
- Joint WG led by B3
- Joint WG led by Other SCs
- Special Project
- New Working Group

13 WGs, 3 JWGs,
1 Special project



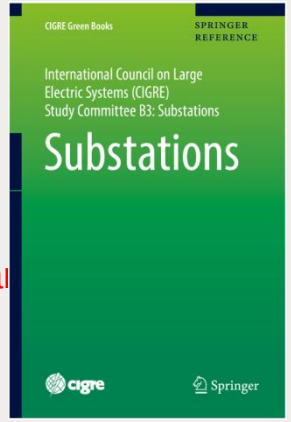
Study Committee B3 Recent Brochures

- **TB 802:** Application of Non-SF_6 Gases or Gas-mixtures in Medium and High Voltage Gas-insulated Switchgear
- **TB 805:** Guide for Safe Work Methods in Substations
- **TB 807:** Application of Robotics in Substations
- **TB 814:** LPIT applications in HV Gas Insulated Switchgear
- **TB 823:** Substation servicing and supervision using mobile devices ad smart sensing
- **TB 834:** Reliability analysis and design guidelines for LV AC auxiliary systems
- **TB 858:** Asset health indices for equipment in existing substations
- **TB 870:** Service continuity Guide for HV GIS above 52kV
- **Draft B3.53:** Guidelines for Fire Risk Management in Substations
- **Draft B3.55:** Design Guideline for Substations connecting Battery Energy Storage Solution



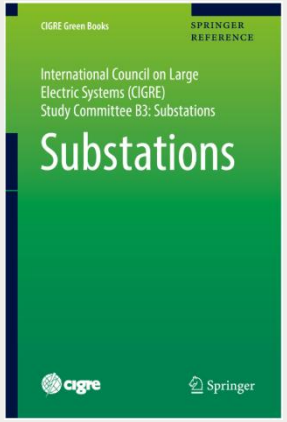
Study Committee B3 Tutorials

- Residual Life Aspects on GIS (Karsten Pohlink, TB 499)
- Upgrading & Uprating Substations (Akira Okada, TB 532)
- Obtaining Value from On-line Monitoring (Arthur Mackrell, TB 462)
- Standardization vs. Innovation in Substation Design (Terry Krieg, TB 389)
- Application Guidelines for Turn-Key Projects (Akira Okada, Gilles Tremouille TB 439)
- Circuit Configuration Optimization (Gerd Lingner, TB 585)
- Responsible Use of SF_6 - Challenges and Options (Peter Glaubitz)
- High Voltage Offshore AC substations (John Finn, TB 483)
- SF6 analysis for AIS, GIS and MTS Condition Assessment (Eamonn Duggan TB 567)
- Considerations for AC Collector Systems and Substations connected with HVDC Wind (Douglas Ramsay TB 612)
- Substation Design for Severe Climate Condition (Mark McVey, TB 614)
- Saving Through Optimized Maintenance of AIS Substations (Hugh Cunningham, TB 660)
- NEW - Application of Non-SF_6 Gases or Gas-mixtures in Medium Voltage and High Voltage Gas-insulated Switchgear TB 802)
- NEW - NCIT Applications in HV Gas Insulated Switchgear (Robert Luescher, TB 814)



Study Committee B3 Meetings and Events

- Hybrid CIGRE Symposium in Kyoto, Japan, held on April 5, to 8, 2022
- SEERC Colloquium in Vienna, Austria, held on May 30, to June 2, 2022
- Workspot X in Foz de Iguazu, Brazil: to be held November 27, to 30, 2022
- Pre-Announcement of 2023 B3/A3 Joint Colloquium in Birmingham, UK: (tentative) to be held May 8, to 12, 2023



Study Committee B3 Preferential Subjects for 2022

- Preferential Subject 1: Increased Impact of Clean Transition on Substation Design
  - ✓ On-offshore wind, PV, geothermal, etc.
  - ✓ Energy storage, hydrogen, synchronous compensators, etc.
  - ✓ GIS/GIL application for DC network.

- Preferential Subject 2: Sustainability Management Challenges in Substations
  - ✓ External drivers for substation intervention such as resilience, reliability, security of supply, life expectancy coordination, etc.
  - ✓ SF_6 alternatives and emission management, circular economy of materials such as reuse, reduce and recycle.
  - ✓ New set of skills for new technologies, knowledge transfer and high standards of education in engineering skills of assets by optimizing their lifetime.

- Preferential Subject 3: Integration of Intelligence on Substations
  - ✓ Data analytics, remote supervising & monitoring and autonomy applications.
  - ✓ IoT and machine learning applications based on protection automation and control data including asset manage monitoring and data analysis.
  - ✓ Expectations and benefits from digital substations, IEC 61850 principles and applications to substations.

USNC Mirror Panel For Study Committee B3

Mirror Panel US.B3

Pages
Blog
Dashboard
User Admin

PAGE TREE
- 0 US.B3 General Instructions and Policies
- 1 US.B3 Contact Details and Access Permissions
- United States User engagement in international SC
- US.B3 Discussion on Topics of Interest
- US.B3 Discussions on Published Technical Brochures
- US.B3 Events
- US.B3 Liaison and Reporting
- US.B3 Resources, Links and Reference Material
- Call for papers: 2021 CIGRE SC A2 & SC B3 Joint Co
- 06 US.B3 Preferential Subject Proposals for internat
- 05 US.B3 Working Group Proposals for international
- 04 US.B3 Panel Meetings

Space tools

Mirror Panel US.B3 Home

Created by Gary Williams, last modified by George BECKER just a moment ago

Welcome to B3 Substations and Electrical Installations - National Committee of the United States

Our Mission

The National Committee of the United States and the local B3 Substations and Electrical Installations representative organization of CIGRE in the United States are an important part of CIGRE's global knowledge program of work. The local B3 Substations and Electrical Installations representative organization is committed to understanding our local conditions and feeding that into the CIGRE global knowledge technical program to find solutions for our local challenges, as well as contribute to the global CIGRE community.

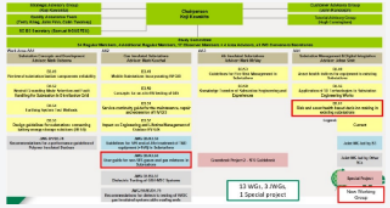
Our Objectives

1. Represent the views of the National Committee of the United States related to Substations and Electrical Installations - Study Committee B3.
2. Present proposals for new work based on the needs and requirements generated by the views of the National Committee of the United States for B3 Substations and Electrical Installations.
3. Recruit experts to participate and contribute to Working Groups and Task Forces in cooperation with the National Committee of the United States.
4. Act as liaison for Study Committee B3 with the National Committee of the United States.
5. Act as liaison for Study Committee B3 with IEEE Substation Committee and IEEE Switchgear Committee.
6. Inform Mirror Panel Members about Study Committee B3 activities such as: Working Groups, Technical Sessions, Symposiums, Colloquium, etc.
7. Contribute to the life and workings of Study Committee B3 by encouraging the National Committee of the United States to participate in Study Committee B3 Meetings and Events.

Study Committee B3 Information

Study Committee B3 Substations and Electrical Installations - Scope

Study Committee B3 Substations and Electrical Installations - Structure



Active CIGRE Study Committee B3 Working Group List Link

Active Study Committee B3 Working Groups

Study Committee B3 Substations and Electrical Installations - 2022 Preferential Subjects

PS 1 Increased Impact of Clean Transition on Substation Design

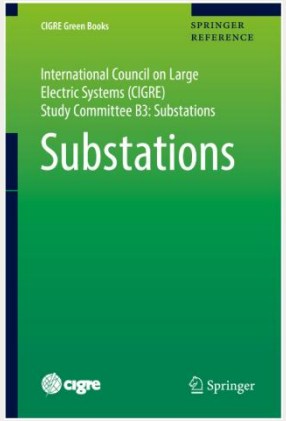
- On-offshore wind, PV, geothermal, etc.
- Energy storage, hydrogen, synchronous compensators, etc.
- GIS/GIL application for DC network.

PS 2 Sustainability Management Challenges in Substations

- External drivers for substation intervention such as resilience, reliability, security of supply, life expectancy coordination, etc.
- SF_6 alternatives and emission management, circular economy of materials such as reuse, reduce and recycle.
- New set of skills for new technologies, knowledge transfer and high standards of education in engineering skills.

PS3 Integration of Intelligence on Substations

- Data analytics, remote supervising & monitoring and autonomy applications.
- IoT and machine learning applications based on protection automation and control data including asset management, monitoring and data analysis.
- Expectations and benefits from digital substations, IEC 61850 principles and applications to substations.



SC B4 – DC Systems and Power Electronics

Neil Kirby - GE Grid Solutions (neil.kirby1@ge.com)

cigre

For power system expertise

SC B4 – Structure and Scope

Chairman: **Joanne HU**
Secretary: **Rebecca OSTASH**
Webmaster: **Carmen LONGAS-VEIJO**

3 Advisory Groups
~19 Working Groups (including 5 JWG)
1 Task Force

Scope:

- High Voltage Direct Current systems and power electronic equipment for AC systems.
- DC systems and equipment and Power Electronics for other applications such as Distribution, and Power Quality improvement.
- DC converters for energy storage.
- (Overhead lines or cables are not included SC B4)

SC B4 – Advisory Groups

AG/WGs		Title	Convener	Secretary	Publish Date	TB #	Report
B4.AG01		Strategic advisory group	Joanne Hu	Rebecca Ostash			
B4.AG02		B4 Newsletter	Ting An	Dechao Kong			
B4.AG03		Communication and website	Carmen Longás Viejo				
B4.AG04		HVDC/FACTS System performance	Lyle Crowe	Phaedra Taiarol			
HVDC		Protocol for reporting Operation Performance of HVDC			2014	590	
HVDC	TF4	Development of Protocol for DC Grids	Sergio DE Santo	Neil Kirby	2022	?	Draft issued for review
HVDC					Paris Session Years		Biennial HVDC performance survey results
FACTS		Protocol for reporting Operational Performance of FACTS			2018	717	
FACTS					Paris Session Years		Biennial Static Var Compensator / STATCOM performance survey results
TRF					2021	859	HVDC transformer failure survey results from 2013 to 2020
B4.NGN		B4 NGN group	Dave Roop				

SC B4 – Recent Published Brochures

WG / JWG	Title	Convenor	Publication Date	TB #
B4/B5.59	Protection and local control of HVDC-grids	Kees Koreman	2018	739
B4.67	AC side harmonics and appropriate harmonic limits for VSC HVDC	Nigel Shore	2019	754
B4.66	Implications for harmonics and filtering of the installation of HVDC converter stations in close proximity	F. Cattan-Jusan	2020	798
B4.68	DC side harmonics and filtering in HVDC transmission systems	Nigel Shore	2020	811
B4.72	DC grid benchmark models for system studies	T. An	2020	804
C2/B4.38	Capabilities and requirements definition for Power Electronics based technology for secure and efficient system operation and control	Jan van Putten	2020	821
C2/B4.38			2020	WBN021
B4.70	Guide for Electromagnetic Transient Studies involving VSC converters	Sébastien Dennetière	2021	WBN032
B4.70			2021	832
B4.75	Feasibility Study for assessment of lab losses of VSC Valves measurement of VSC valves	Christian Rathke	2021	844
B4.76	DC-DC converters in HVDC Grids and for connections to HVDC systems	Dragan Jovcic	2021	827
B4.78	Cyber Asset Management for HVDC/FACTS Systems	Kerry Walker	2021	847
B4.74	Guide to Develop Real Time Simulation Models (RTSM) for HVDC Operational Studies	Qi Guo	2022	864
B4.83	Flexible AC Transmission Systems (FACTS) controllers' commissioning, compliance testing and model validation tests	Babak Badrzadeh	2022	867

SC B4 – Active Working Groups

WG / JWG	Title	Convenor	Secretary	Start Date	End Date
B4.64	Impact of AC System Characteristics on the Performance of HVDC schemes	Jef Beerten	Alejandro Bayo Salas	Mar-13	Dec-16
B4.69	Minimizing loss of transmitted power by VSC during Overhead line fault	Dennis Woodford	Maryam Salimi	Jan-15	Dec-17
B4/B1/C4.73	Surge and extended overvoltage testing of HVDC Cable Systems	Markus Saltzer	Anders Gustafsson	Jan-16	Dec-17
B4.77	AC Fault response options for VSC HVDC Converters	John Gleadow	Mike Barnes	Oct-17	Oct-18
B4.71	Application guide for the insulation coordination of Voltage Source Converter HVDC (VSC HVDC) stations	Mohaddes Mojtaba	Adapa Ram	Mar-15	Dec-18
C4/B4.52	Guidelines for Sub-synchronous Oscillation Studies in Power Electronics Dominated Power Systems	Chandana Karawita	Udaya Annakkage	Jan-19	Jan-21
C6/B4.37	Medium Voltage DC distribution systems	James Yu		Aug-18	Jul-21
TF B4/B1.88	Insulation coordination procedure for DC cable systems in HVDC stations with Voltage Source Converters (VSC)	Kees Koreman		Jul-20	Dec-21
B4.79	Hybrid LCC/VSC HVDC Systems	Hong Rao	Yi Zhang	Oct-18	Jan-22
B4/A3.86	Fault limiting technologies for DC grids	Zhiyuan He		Mar-20	Mar-22
B4.87	Voltage Source Converters (VSC) HVDC responses to disturbances and faults in AC systems which have low synchronous generation.	Carl Barker		Jan-20	Apr-22
B4.81	Interaction between nearby VSC-HVDC converters, FACTs devices, HV power electronic devices and conventional AC equipment	Kamran Sharifabadi	Phlilippe de Rua	Mar-19	Aug-22
B4/A3.80	HVDC Circuit Breakers- Technical Requirements, Stresses and Testing Methods to investigate the interaction with the system	Junzheng Cao	Jiachen Wang	Jan-19	Aug-22
B4.89	Condition Health Monitoring and predictive maintenance of HVDC Converter Stations	Nadine Chapalain		Jun-20	Sep-22
B4.84	Feasibility study and application of electric energy storage systems embedded in HVDC systems	Hani Saad		Jan-20	Dec-22
B4.82	Guidelines for Use of Real Code in EMT Models for HVDC, FACTS and Inverter based generators in Power Systems Analysis	Garth Irwin		Sep-19	Apr-23
B4.85	Interoperability in HVDC systems based on partially open-source software	Staffan Norrga		Jan-20	Jul-23
B4.90	Operation and maintenance of HVDC and FACTS Facilities	Les Brand		Dec-20	Oct-23
B4.91	Power-electronics-based transformer technology, design, grid integration and services provision to the distribution grid	Marco Liserre	Giovanni De Carne	Dec-20	Dec-23
B4.92	STATCOMs at Distribution Voltages	John Wright-Smith		Oct-20	Dec-23
C2/B4.43	The impact of offshore wind power hybrid AC/DC connections on system operations and system design.	Christer Norlander		Jul-22	May-24
B4/C4.93	Development of Grid Forming Converters for Secure and Reliable Operation of Future Electricity Systems	Dechao Kong		Sep-22	Aug-25
C4/B4.72	Lightning and Switching Induced Electromagnetic Compatibility (EMC) issues in DC power systems and new emerging power electronics-based DC equipment	Qingmin Li		Aug-22	Oct-25

SC B4 – Green Books

- GB7 – Flexible AC Transmission Systems
- GB? – Coming soon ….. High Voltage DC
    - Editors-in-Chief : Stig Nilsson + Bjarne Andersen
    - Many contributors active
    - E.t.a. : 2023 ?

SC B4 – 2022 Paris Session B4 Activities

Activity	Details	Day	Time	Room	Floor
Opening Ceremony	Welcome Address, Keynote Speech, Welcome Cocktails	Sunday 28th August	16:00 (17:00 Cocktails)	Grand Amphitheatre (Hall Ternes)	Level 0 (Level 1)
Opening Panel – Energy Transition	Session 1 - Energy Transition on Power Equipment (SCs A1, A2, A3, B1, B2, B3, B4, C5, D1)	Monday 29th August	08:45-9:45	Grand Amphitheatre	Level 2
Tutorial	B4 : DC grid benchmark models for system studies Presentation of Technical Brochure 804 prepared by WG B4.72	Monday 29th August	14:00	Salle Maillot	Level 2
SC Workshop	B1+B2+B4+C1	Monday 29th August	14:00	Grand Amphitheatre	Level 1
Poster Session	B4	Tuesday 30th August	14:30	Hall Ternes	Level 1
Group Discussion	B4 Preferential Subjects: - High voltage direct current (HVDC) systems and their applications - Direct current (DC) for distribution systems - Flexible alternating current transmission systems (FACTS) and power electronic (PE)	Wednesday 31st August	08:45	Grand Amphitheatre	Level 2

SC B5 – Protection and Automation

Mladen Kezunovic – Texas A&M University (m-kezunov@tamu.edu)

Given by Rich Hunt – Quanta Technology (rhunt@quanta-technology.com)

cigre

For power system expertise

SC B5 – Structure and Scope

Chair: **Rannveig S. J. Loken NO**
Secretary: **Richard Adams GB**
Webmaster: **Richard Adams GB**

5 Advisory Groups
24 Working Groups (including 3 JWG)

Scope:

- Power system protection
- Substation control and automation
- Remote control systems and equipment
- Metering systems and equipment

SC B5 – Advisory Groups

AG/WGs	Title	Convener	Secretary
SAG	Strategic advisory group	Rannveig Loken	Richard Adams
TG.51	Substation Automation and Remote Control	Volker Leitlof (FR)	
TG.52	Protection and Monitoring	Cedric Moors (BE)	
TG.53	New Network Requirement	Nirmal Nair (NZ)	
TAG	Technical Advisory Group	Klaus-Peter Brand (CH)	

SC B5 – Recent Published Brochures

WG / JWG	Title	Publication Date	TB #
B5.52	Analysis and comparison of fault location systems in AC power networks	2021	854
B5.62	Life Cycle Testing of Synchrophasor Based Systems used for Protection, Monitoring and Control	2021	843
C4/B5.41	Challenges with series compensation applications in power systems when overcompensating lines	2021	829
B5.50	IEC 61850 based substation automation systems – Users expectations and stakeholders interactions	2020	819
B5.54	Protection and automation issues of islanded systems during system restoration/black start	2020	810
B5.47	Network protection performance audits	2020	800
B5.66	Cybersecurity requirements for PACS and the resilience of PAC architectures	2020	790
B5.41	Improved metering systems for billing purposes in substations	2020	789
B5.24	Protection requirements on transient response of digital acquisition chain	2019	768
B5.53	Test strategy for Protection, Automation and Control (PAC) functions in a fully digital substation based on IEC 61850 applications	2019	760

SC B5 – Active Working Groups

WG / JWG	Year	Title	Convenor
B5.48	2012	Protection for developing network with limited fault current capability of generation	Tianshu Bi (CN)
B5.51	2013	Methods & Application of Remotely Accessed Information for SAS Maintenance and Operation	Li Li (CN)
B5.55	2015	Application of Travelling Wave Technology for Protection and Automation	Peter Crossley (GB)
B5.56	2015	Optimization of Protection Automation and Control Systems	Peter Kreutzer (CH)
B5.57	2016	New challenges for frequency protection	Vladimir Terzija (GB)
B5.58	2016	Faster protection and network automation systems: implications and requirements	Andrei Podshivalin (RU)
B5.59	2016	Requirements for Near-Process Intelligent Electronic Devices	Xu Lei (CN)
B5.60	2017	Protection, Automation and Control Architectures with Functionality Independent of Hardware	Alexander Voloshin (RU)
B5.63	2017	Protection, Automation and Control System Asset Management	Massimo Petrini (IT)
B5.64	2017	Time in Communication Networks, Protection and Control Applications – Time Sources and Distribution Methods	Iony Patriota de Siqueira (BR)
B5.65	2018	Enhancing Protection System Performance by Optimising the Response of Inverter-Based Sources	Dr Farfilho (BR)
B5.68	2019	Optimisation of the IEC 61850 Protection, Automation and Control Systems (PACS) engineering process and tools	Camille Bloch
B5.69	2019	Experience gained and Recommendations for Implementation of Process Bus in Protection, Automation and Control Systems (PACS)	Alex Apostolov (US)
B5.70	2019	Reliability of Protection Automation and Control System (PACS) of power systems – Evaluation Methods and Comparison of Architectures	Alexander Voloshin (RU)
B5.71	2020	Protection, Automation and Control Systems Communication Requirements for Inter-Substation and Wide Area Applications	Cedric Moors (BE)
B5.72	2020	Modelling, Assessment, and Mitigation of Protection Performance Issues caused by power plants during Dynamic Grid Events	Sean McGuinness (IE)
B5.73	2020	Experiences and future trends related to functional integration	Bruno André (SE)
B5.74	2021	Busbar Protection Considerations When Using IEC 61850 Process Bus	Pablo H. Flores (BR)
B5.75	2021	Documentation and Version Handling Related to Protection, Automation and Control functions	Sushama Khot (CA)
B5.76	2021	Architecture, Standards and Specification for metering system in a Digital Substation and Protection, Automation and Control (PACS) Environment	Alex Roumpies (CH)
B5/C4.61	2017	Impact of Low Inertia Network on Protection and Control	Ray Zhang (GB)
B5/D2.67	2018	Time in Protection Applications – Time Sources and Distribution Methods	Yubo Yuan (B5) (CN) Roel de Vriew (D2) (US)
B5.78	2022	New requirements of network protection and control for renewable energy integration	Nirmal Nair (NZ)
B5/C4.79	2022	Protection Roadmap for Low Inertia and Low Fault Current Networks	Mukesh Nagpal (CA)

SC B5 – Green Books

- IEC 61850 Principles and Applications to Electric Power System
  - Just came from the launch meeting
  - Editors: Peter Bishop and Nirmal Nair

SC B5 – 2022 Paris Session B5 Activities

Activity	Details	Day	Time	Room	Floor
Opening Ceremony	Welcome Address, Keynote Speech, Welcome Cocktails	Sunday 28th August	16:00 (17:00 Cocktails)	Grand Amphitheatre (Hall Ternes)	Level 0 (Level 1)
Tutorial	B5 : System Integrity Protection Schemes in the Context of Evolving Power Grids	Tuesday 30th August	08:30	Salle Maillot	Level 2
Poster Session	B5	Thursday 1st September	14:30	Hall Ternes	Level 1
Group Discussion	B5 Preferential Subjects: - Addressing protection related challenges in network with low-inertia and low fault-current levels - Applications of emerging technology for protection, automation and control - Integration of intelligence on substations (Joint PS with B3)	Friday 2nd September	08:45	Grand Amphitheatre	Level 2

SC C1 – Power System Development and Economics

Jeff Palermo - PJP Consulting (jeff@pjp-consulting.com)

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For power system expertise

C1–System Development and Economics

- Covers all the system development and economic challenges relevant to the electricity power industry as well as asset management
- Supports electricity system planners worldwide in making the best plans possible in a changing energy environment including
  - Increased renewable and distributed generation and
  - Heightened uncertainty in
    - Social,
    - Environmental, and
    - Regulatory frameworks and expectations

C1—Recent Technical Brochures

TB	Description
863	Multi-energy System Interactions in Distribution Grids
848	Planning Coordination between ISOs, TSOs, and DSOs: Frameworks, Methods, and Allocation of Costs and Benefits
820	Optimal power system planning under growing uncertainty
791	Valuation as a comprehensive approach to asset management in view of emerging developments
787	ISO series 55000 standards: Implementation and information guidelines for utilities
786	Investment decisions in a changing and uncertain environment
775	Global electricity network - Feasibility study

C1—Active Working Groups

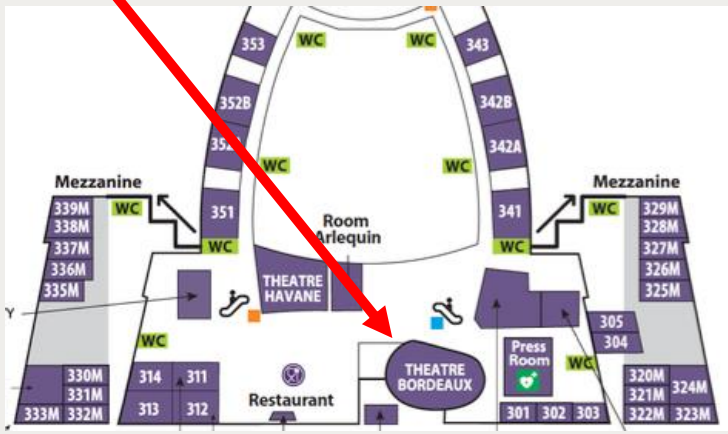
	WG	Description
√	**C1.40**	Planning coordination between ISOs, TSOs, and DSOs: frameworks, methods, and allocation of costs and benefits
√	**C1.41**	Closing the gap in understanding between stakeholders and electrical energy specialists
	C1.23	Transmission investment decision points and trees
	C1.33	Interface & Allocation Issues in multi-party and/or cross-jurisdiction power infrastructures projects
	C1/C6.37	Optimal transmission and distribution investment decisions under growing uncertainty
	C1/C6.42	Planning tools and methods for systems facing high levels of DERs
	C1/C4.36	Review of Large City & Metropolitan Area power system development trends taking into account new generation, grid, and information technologies
	C1.43	Defining a typical set of requirements for asset analytics data platforms and tools aimed at supporting asset management decision making processes
	C1.44	Global interconnected and sustainable electricity system: effects of storage, demand response, and trading rules
	C1.45	Harmonized metrics and consistent methodology for benefits assessment in cost-benefit analysis of electric interconnection projects
	C1/C4.46	Optimizing power system resilience in future grid design
√	**C1.47**	Energy sectors integration and impact on power grids
	C1.48	Role of green hydrogen in energy transition: opportunities and challenges from technical and economic perspectives
	B2/C1.86	Approach for Asset management of overhead transmission lines

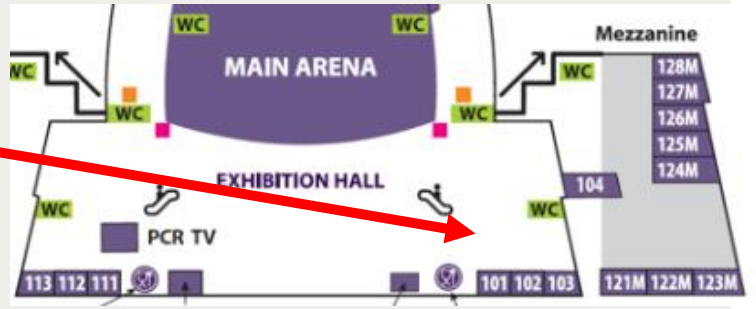
C1 Technical session—Wednesday in Bordeaux

PS1 System transition resilience & asset management response

1. Resilience metrics and measures to safeguard stakeholder value through grid forming, power electronics control, smart load shedding, fast restoration.
2. Response to unexpected emerging system and business risks during the energy transition.
3. New standards (equipment design and system planning) for resilient and life-cycle sustainable system.

Poster session—Tuesday morning, Hall Ternes?





C1 Technical session—Wednesday in Bordeaux

PS2 Energy sector integration and tackling the complexity of multi-faceted network projects

1. Energy sector integration, hydrogen & power-to-gas, deep electrification: technical and economic aspects.
2. Multi-purpose, multi-terminal, multi-actor, multi-jurisdiction grid projects: how to tackle their planning complexity.
3. Including in the planning process the flexibility options from non-network-assets and non-electric solutions (storage, virtual power plants, DR, energy communities, behind-the-meter resources).

Poster session—Tuesday morning, room 234

C1 Technical session—Wednesday in Bordeaux

PS3 Planning under uncertainty and with changing external constraints

1. Modelling the impact of environmental conditions, technical advancements, greater stakeholder involvement, generation fleet shift, new type of contingencies, use of data driven network methods for long-term load forecasting, including impact of COVID pandemic on load profiles, planning scenarios, investments patterns and assets' maintenance schemes.
2. Decision-making under pervasive energy policies: optimizing economic vs environmental benefits for consumers and matching centralized energy targets with private driven investments.
3. Leveraging the evolving system services, market products, and load profiles to optimize investment and timing, avoiding stranded assets (also from fossil plants dismissal).

Poster session—Tuesday morning, room 234

US C1 activities

- Planning advisors
  - Team of volunteer advisors
  - Assist with surveys
  - Advise on issues of interest
- Contact me if interested in joining

jeff@pjp-consulting.com

SC C2 – Power System Operation and Control

Todd Ramey – MISO (tramey@misoenergy.org)

cigre

For power system expertise

SC C2 – Objectives and Organization

1. Scope

The scope of the Study Committee C2 covers the technical, human resource and institutional aspects and conditions for the secure and economic operation of power systems under security requirements against system disintegration, equipment damages and human injuries.

2. Current Activities

- Management of ancillary services, monitoring of operational limits and congestion management.
- Reserves and emergency strategies, management of disturbances, restoration and resilience enhancement strategies.
- Developments and changes in the business of System Operators and their integration into the evolving environment.
- Requirements, methods, tools and performance indicators for Control Centers and training of System Operators.
- Development and use of power system analysis and security assessment functionalities within operational planning and real-time supervision.

3. Upcoming Events

International Symposium, September 4-7, 2023, Cairns, Australia

SC C2 – Publications and Awards

1. Published Technical Brochures

- TB 833 Operating Strategies and Preparedness For System Operational Resilience (WG C2.40)
- TB 845 TSO-DSO Co-Operation Control Center Tools Requirements (WG C2.40)
- TB 851 Impact of High Penetration of Inverter-Based Generation on System Inertia of Networks (WG C2/C4.41)

2. Tutorials & Webinars

- Webinar: Jayme Macêdo delivered a keynote speech titled "Desafíos para la integración en la operación de los sistemas de fuentes no sincrónicas y DER", in the “Agenda FISE-CIGRE CONFERENCE 2021 - Nuevos retos, nuevos caminos para la sostenibilidad”, organized by FISE and CIGRE Colombia NC, in November 18th 2021
- Tutorial: Impact of High Penetration of Inverter-Based Generation on SystemInertia of Networks (WG C2/C4.41) – April 2022 – CIGRE International Symposium – Kyoto - Japan

3. CIGRE Future Connections

-Energy Transition - New Studies for new challenges in System Operation – Jan van Putten, Antoine Marot, Ronan Jamieson and Jayme Macêdo

4. Awards

2020 - Technical Council Award: Dr. Renuka Chatterjee (MISO, US)

SC C2 – Active Working Groups

1. **WG C2.18** Wide Area Monitoring Protection and Control Systems – Decision Support for System Operators
2. **WG C2.24** Mitigating the Risk of Fire Starts and the Consequences of Fires near Overhead Lines for System Operations
3. **WG C2.26** Power system restoration accounting for a rapidly changing power system and generation mix
4. **WG C2.39** Operator Training in Electricity Grids at Different Control Levels and for Different Participants/Actors in the New Environment
5. **WG C2.42** The Impact of the growing use of machine learning/Artificial Intelligence in the operation and control of Power Networks from an Operational perspective
6. **JWG C2/C5.06** The Impact of Electricity Market Interventions by System Operators during Emergency Situations

SC C3 – Power System Environmental Performance

Randy Grass – POWER Engineers (randy.grass@powereng.com)

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For power system expertise

C3–History & Scope

- Created in 2002 …to produce unbiased positions and approaches on power system environmental performance impacts and their implications.
- 2019 broadening focus on sustainability: The goal is to facilitate and promote the principles of sustainable development through the global exchange of information and knowledge in the field of system environmental performance, by synthesizing state-of-the-art practices and developing recommendations in line with global best practice.

C3–Status

- Turnover of chairperson and Covid has slowed activity in 2021 & 2022
- 28 Regular members plus 8 Observers from 30 countries
- We need more active participation from the US & beyond
- 40% of the members are women

C3–2022 Preferential Subjects/Paris Papers

- PS1: Setting Ambitious Climate Strategies in the Energy Sector
- PS2: Biodiversity and the Supply of Electricity, Renewables-Based or Not: Risks, Challenges, Solutions and Opportunities
- PS3 (Joint w/ B2): Environmental and Safety Aspects From OHL's
- 35 Total Papers

C3 – Working Groups

AG C3.01 EMF and Human Health (Advisory group)
WG C3-09 A Corridor management
WG C3-14 Impact of Environmental liability on T&D activities
WG C3-15 Best environmental and socio-economic practices for improving public acceptance of high voltage substations
WG C3-16 Interactions between electrical infrastructure & wildlife
WG C3-17 Interactions between wildlife and emerging renewable energy sources and submarine cables
WG C3-18 Eco-friendly approaches in transmission and distribution
WG C3-20 Sustainability goals in the electric power sector
WG C3-21: Including stakeholders in the investment planning process
WG C3-22: Vegetation management in substations
WG C3-23: Eco-design methods for TSOs/DSOs under environmental transition
JWG B1/C85 Environmental impact of decommissioning UG and submarine cables, New 2021
WG C3-12 A. Greenhouse Gas Emissions inventory and report for TSO’s, Restart

C3 – Publications and Upcoming Events

1. **Published Technical Brochures**
   - None in 2021- 2022
   - **Scheduled for 2023**
     - TB for WG C3.16 Interaction between electrical infrastructure and wildlife
     - TB for WG C3.20 Sustainability goals in the electric power sector
2. **Paris Tutorial**
   - WG C3.16 Interaction between electrical infrastructure and wildlife
3. **Upcoming Events**
   - Colloquium 3-7 October 2023 Sendai Japan

SC C4 - System Technical Performance

Zia Emin (SC C4 Chair) on behalf of
Gaurav Singh – EPRI (gsingh@epri.com)

cigre
For power system expertise

SC C4 SCOPE

SC C4 deals with methods and tools for analysis related to the technical performance of power systems, with particular reference to dynamic and transient conditions and to the interaction between the power system and its apparatus/sub-systems. We cover system technical performance phenomena that range from nanoseconds to many hours, in the following fields:

- **Power Quality**
- **Electromagnetic Compatibility (EMC)**
- **Insulation Co-ordination**
- **Lightning**
- **Power System Dynamics and Numerical Analysis**

SC C4 STRUCTURE

SC C4 Chairman

Zia Emin

Regular & Observer Members

SC C4 Secretary

Genevieve Lietz

Strategic Directions Advisory Group (SAG)

Zia Emin

Customers Advisory Group (CAG)

Filipe Faria da Silva

Tutorials & Conferences Advisory Group (TAG)

Marta Val Escudero

IEC Liaison: Bill Radasky

IEEE Liaison: David Jacobson

WORKING GROUPS

SC C4 Membership 2022-2024

- Chair & Secretary
- 24 Regular M
- 2 Additional RM
- 18 Observer M
- 46 members
- 43 countries

Ireland	VAL ESCUDERO Marta	2022
Germany	LIETZ Genevieve	2018

Arab States Of The Gulf	AL-ZAHRANI Ahmad	2020
Australia	BADRZADEH Babak	2022
Austria	SCHWALT Lukas	2022
Brazil	DA COSTA OLIVEIRA ROCHA Angelica	2018
Canada	GUTTORMSON Wayne	2022
Chile	OLGUIN Gabriel	2022
China	HE Jinliang	2018
Denmark	KOCEWIAK Lukasz	2022
Finland	HARJULA Antti	2022
France	MARTINEZ DURO Manuel	2018
Germany	HENTER Lars	2018
India	PANDE Mr. Upendra	2022
Italy	PISANI Cosimo	2022
Japan	HOJO Masahide	2022
Netherlands	SCHUTTE Peet	2022
Norway	GUSTAVSEN Bjørn	2020
Portugal	LEIRIA Andreia	2022
Spain	SANTOS Sergio	2020
Sweden	NORLANDER Christer	2022
Switzerland	PAOLONE Mario	2018
Turkey	GÜNERI Melih	2020
United Kingdom	KARAMITSOS Spyros	2020
United States	SINGH Gaurav	2020
West Africa	EDUFUL Georges	2022

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China	LIU Chongru	2022
Japan	SEKIOKA Shozo	2018

Argentina	ISSOURIBEHERE Fernando	2022
Belgium	NENS Eric	2018
Bosnia Herzegovina	TOKIC Amir	2022
Colombia	PEREZ GONZALEZ Ernesto	2018
Croatia	FILIPOVIC-GRCIC Božidar	2018
Czech And Slovak Reps	MUSIL Ladislav	2020
Greece	MICHOS Dimitrios	2018
Hungary	LADANYI Jozsef	2018
Iceland	KRISTJANSSON Ragnar	2020
Iran	FOTUHI Mahmood	2018
Israel	KALYUZHNY Aharon	2022
Paraguay	CHAPARRO VIVEROS Enrique Ramon	2020
Peru	VAILLANT Daniel	2020
Poland	RZEPKA Piotr	2018
Romania	TOMA Lucian	2022
Russia	RYABCHENKO Vladimir	2018
Slovenia	RIBIC Janez	2020
Thailand	TAYJASANANT Thavatchai	2020

SC C4 ACTIVE WORKING GROUPS

WG #	WG TITLE	CONVENER
WG C4.36	Winter Lightning – Parameters and Engineering Consequences for Wind Turbines	M. Ishii (Japan)
JWG C4.40/CIRED	Revisions to IEC Technical Reports 61000-3-6, 61000-3-7, 61000-3-13, and 61000-3-14	M. Halpin (USA)
JWG C4.42/CIRED	Continuous assessment of low-order harmonic emissions from customer installations	I. Papič (Slovenia)
WG C4.43	Lightning problems and lightning risk management for nuclear power plants	T. Shindo (Japan)
WG C4.44	EMC for Large Photovoltaic Systems	E. Salinas (Sweden)
WG C4.46	Evaluation of Temporary Overvoltages in Power Systems due to Low Order Harmonic Resonances	F. F. da Silva (Denmark)
WG C4.47	Power System Resilience (PSR WG)	M. Panteli (Cyprus)
WG C4.49	Multi-frequency stability of converter-based modern power systems	Ł. Kocewiak (Denmark)
WG C4.50	Evaluation of Transient Performance of Grounding Systems in Substations and Its Impact on Primary and Secondary Systems	B. Zhang (China)
WG C4.51	Connection of Railway Traction Systems to Power Networks	D. Vujatovic (UK)
JWG C4/B4.52	Guidelines for Sub-synchronous Oscillation Studies in Power Electronics Dominated Power Systems	C. Karawita (Canada)
JWG C4/A3.53	Application Effects of Low-Residual-Voltage Surge Arresters in Suppressing Overvoltages in UHV AC Systems	J. He (China)
WG C4.54	Protection of high voltage power network control electronics from the High-altitude Electromagnetic Pulse (HEMP)	W.A. Radasky (USA)
WG C4.55	EMC related very-fast transients in gas-insulated substations - EMC interferences, measured characteristics, modelling and simulations	A. Ametani (Japan)
WG C4.56	Electromagnetic transient simulation models for large-scale system impact studies in power systems having a high penetration of inverter connected generation	B. Badrzadeh (Australia)
WG C4.57	Guidelines for the Estimation of Overhead Distribution Line Lightning Performance and its Application to Lightning Protection Design Scope	K. Michishita (Japan)
JWG C4/C2.58/IEEE	Evaluation of Voltage Stability Assessment Methodologies in Transmission Systems	U. Annakkage (Canada)
JWG C4/C2.62/IEEE	Review of Advancements in Synchrophasor Measurement Applications	A. Rajapakse (Canada)
WG C4.59	Real-time Lightning Protection of the Electricity Supply Systems of the Future	C. Tong (China)
WG C4.60	Generic EMT-Type Modelling of Inverter-Based Resources for Long Term Planning Studies	A. Haddadi (USA)
WG C4.61	Lightning transient sensing, monitoring and application in electric power systems	J. He (China)
WG C4.63	Harmonic power quality standards and compliance verification – a comparative assessment and practical guide	N. Shore (UK)
WG C4.64	Application of Real-Time Digital Simulation in Power Systems	C. Fang (Canada)
WG C4.65	Specification, Validation and Application of Harmonic Models of Inverter Based Resources	J. David (Australia)
WG C4.66	New concept for analysis of multiphase back-flashover phenomena of overhead transmission lines due to lightning	M. Miki (Japan)
WG C4.67	Lightning Protection of Hybrid Overhead Lines	A. Piantini (Brazil)
WG C4.68	Electromagnetic Compatibility (EMC) issues in modern and future power systems	P. Munhoz-Rojas (Brazil)
WG C4.69	Quantifying the lightning response of tower-footing electrodes of overhead transmission lines: methods of measurement	S. Visacro (Brazil)
WG C4.70	Application of space-based lightning detection in power systems	J. Montanyà (Spain)
WG C4.71	Small signal stability analysis in inverter based resource dominated power system	S. Goyal (Australia)
JWG C4/B4.72	Lightning and switching induced electromagnetic compatibility (EMC) issues in DC power systems and new emerging power electronics-based DC equipment	Q. Li (China)
JWG A2/C4.52	High-frequency transformer and reactor models for network studies	B. Gustavsen (Norway)
JWG A1/C4.52	Wind generators and frequency-active power control of power systems	N. Miller (USA)
JWG A1/C4.66	Guide on the Assessment, Specification and Design of Synchronous Condensers for Power Systems with Predominance of Low or Zero Inertia Generators	D. K. Chaturvedi (India)
JWG B1/C4.69	Recommendations for the insulation coordination on AC cable systems	T. du Plessis (South Africa)
JWG B4/B1/C4.73	Surge and extended overvoltage testing of HVDC Cable Systems	M. Saltzer (Sweden)
JWG B4/C4.93	Development of Grid Forming Converters for Secure and Reliable Operation of Future Electricity Systems	D. Kong (UK)
JWG B5/C4.61	Impact of Low Inertia Network on Protection and Control	R. Zhang (UK)
JWG C1/C4.36	Review of Large City & Metropolitan Area power system development trends taking into account new generation, grid and information technologies.	V. Jesus (Brazil)/S. Utts (Russia)
JWG B2/C4.76	Lightning & Grounding Considerations for Overhead Line Rebuilding and Refurbishing Projects, AC and DC	William A. Chisholm (Canada)
JWG C1/C4.46	Optimising power system resilience in future grid design	Christian Schaefer (Australia)
JWG B5/C4.79	Protection Roadmap for Low Inertia and Low Fault Current Networks	Mukesh Nagpal (Canada)

42 JWG/WGs

- **6 on PQ**
- **5 on EMC**
- **5 on IC**
- **10 on L**
- **16 on PSD**

C4 WG Status Reports - 1

- New WG/JWG since last SC meeting (26 August 2021)
  - WG C4.69 “Qualifying the lightning response of tower-footing electrodes of transmission lines: methods of measurement”
  - WG C4.70 “Application of space-based lightning detection in power systems ”
  - WG C4.71 “Small signal stability analysis in IBR dominated power system”
  - JWG C4/B4.72 “Lightning and Switching Induced Electromagnetic Compatibility (EMC) issues in DC power systems and new emerging power electronics-based DC equipment”
  - JWG B4/C4.93 “Development of Grid Forming Converters for Secure and Reliable Operation of Future Electricity Systems”
  - JWG B5/C4.79 “Protection Roadmap for Low Inertia and Low Fault Current Networks”

C4 WG Status Reports - 2

- Disbanded since last SC meeting (26 August 2021)
  - JWG C2/C4.41 “Impact of high penetration of inverter-based generation on system inertia of networks ”.
  - WG C4.39 “Effectiveness of line surge arresters for lightning protection of overhead transmission lines”.
  - WG C4.48 “Overvoltage Withstand Characteristics of Power System Equipment 35-1200 kV”. NO OUTPUT

Events

- Kyoto (Japan): “Power system transformation including active distribution”, moved from October 2021 →April 2022 due to covid-19 planned event changes.
- Cairns (Australia): “Renewables and challenges of integration and the impact of renewable generation on the Grid”, September 2023.
- International Colloquium on “Lightning and Power Systems”, 2021 Suzhou, China led by Dr Chong Tong is cancelled!
- ICLPS202x – decision during 2022 SC meeting

Recent TBs

- TB 799: TB 829: Challenges with Series Compensation Application in Power Systems when overcompensating Lines by JWG C4/B5.41
- TB 836: Measuring techniques and characteristics of fast and very fast transient overvoltages in substations and converter stations by WG C4.45
- TB 839: Guide to Procedures for Estimating the Lightning Performance of Transmission Lines by WG C4.23 (+ TB 063)
- TB 851: Impact of high penetration of inverter-based generation on system inertia of networks by JWG C2/C4.41
- TB 855: Effectiveness of line surge arresters for lightning protection of overhead transmission lines by WG C4.39

Plan ahead on TBs

- JWG A1/C4.66 “Guide on the Assessment, Specification and Design of Synchronous Condensers for Power Systems with Predominance of Low or Zero Inertia Generators”
- WG C4.56 “EMT simulation models for large-scale system impact studies in power systems having a high penetration of IBR”
- JWG A2/C4.52 “High-frequency transformer and reactor models for network studies”
- JWG C4/B4.52 “Guidelines for Sub-synchronous Oscillation Studies in Power Electronics Dominated Power Systems”
- JWG C4/C2.58/IEEE “Evaluation of Voltage Stability Assessment Methodologies in Transmission Systems”
- JWG C4.42/CIRED “Continuous assessment of low-order harmonic emissions from customer installations”
- JWG C4/A3.53 “Advanced metal-oxide varistors for surge arresters with better protection properties
- C1/C4.36 “Review of Large City & Metropolitan Area power system development trends taking into account new generation, grid and information technologies”
- WG C4.43 “Lightning problems and lightning risk management for nuclear power plants”
- WG C4.46 “Evaluation of Temporary Overvoltages in Power Systems due to Low Order Harmonic Resonances”
- WG C4.49 “Wideband stability of grid-tied converter-based modern power systems”
- WG C4.36 “Winter Lightning – Parameters and Engineering Consequences for Wind Turbines”
- WG C4.59 “Real-time Lightning Protection of the Electricity Supply Systems of the Future”
- JWG B4/B1/C4.73 “Surge and extended overvoltage testing of HVDC Cable Systems”
- JWG A1/C4.52 “Wind generators and frequency-active power control of power systems”
- WG C4.44 “EMC for Large Photovoltaic Systems”

Network of the Future GB – SC C4 Chapter

- PQ: Sarath Perera, Vic Gosbell
- EMC/EMI: John van Coller, HW Siew
- Ins Coordination: Claus Let Bak, Filipe da Silva & Stephan Pack
- Lightning: Ivo Uglesic and Stephan Pack
- System Dynamics: Liisa Haarla, David Jacobson and Andrew Halley
- Edited by: Genevieve Lietz and Zia Emin
- PUBLISHED

Power system dynamic modelling and analysis in evolving networks GB – SC C4

- Provide information about all aspects of contemporary power system dynamic modelling and analysis in a rapidly changing power system with increasing uptake of inverter-based resources.
- Provide a comparison of changes occurring between conventional power systems with the dominance of synchronous generators and an evolving power system with high share of grid-connected and distributed inverter-based resources in terms of dynamic phenomena experienced, analysis methods and simulation tools required, and enablers to achieve this.
- Describe different types of power system studies and associated analysis tools as the system evolves.
- Present modelling requirements for different power system components, both existing and emerging technologies, such that power system can be planned and operated securely and reliably.
- Present practical examples obtained from real power systems worldwide as a step-by-step study guide such that they can be applied by practicing engineers in their day-to-day tasks.
- Demonstrate the importance of power system model acceptance testing and validation by practical examples describing applications of various methods.

- Editors: Babak Badrzadeh & Zia Emin
- Number of volunteers from within SC C4

Preferential Subjects 2022

PS 1 : Challenges and advances in Power Quality (PQ) and Electromagnetic Compatibility (EMC)

- Modelling, measurement and assessment of PQ phenomena including emerging areas such as supraharmonics, harmonic instability, geomagnetically induced currents and other similar phenomena,
- Integration and application of advanced signal processing, artificial intelligence techniques and big data analytics for event diagnostics and system planning purposes such as hosting capacity or emission limit calculation,
- Impacts on equipment compatibility and immunity, and emerging mitigation approaches.

PS 2: Challenges and advances in Insulation Coordination and Lightning Research

- Insulation coordination practices for end-to-end power networks, including the effects of long lines, long cables and frequency dependent models,
- Development of insulation coordination in AC systems interfaced with power electronics based systems and devices, and the need for standardisation,
- Lightning evaluation of transmission and distribution systems covering new asset designs and extreme meteorological events.

PS 3: Challenges and advances in Power System Dynamics

- Modelling, analysis and validation of individual components and wide-area system interactions including system level protection schemes considering changing system dynamics,
- Impact of emerging technologies such as hydrogen and other storage devices, grid forming inverters and demand side management,
- Analysis of security and resilience of power systems having high share of grid-connected or distributed inverter-based resources including feasibility of providing system support such as black start, islanding, system strength and inertia.

SC C4 – Paris Meeting Schedule

- August 30, Tuesday – Workshop titled ‘Oscillatory instabilities and interactions in IBR dominated Power Systems’
- August 31, Wednesday – Tutorial titled ‘Evaluation of Temporary Overvoltages in Power Systems due to Low Order Harmonic Resonances’
- August 31, Wednesday – Poster Session/Contributor's Meeting
- September 1, Thursday – Group Discussion Meeting
- September 2, Friday – SC Meeting

SC C5 – Electricity Markets and Regulation

Jeff Bladen – Meta (bladen@fb.com)

cigre

For power system expertise

Update on C5 Activities – 2022 Session

1. SC C5 is presenting two tutorials; one on carbon pricing by Anthony Giacomoni and the other on Blockchain by Anant Venkateswaran.
2. David Bowker is also convening another joint IEEE/CIGRE panel on Blockchains which should also be interesting.
3. Greg Thorpe is again preparing the Large Disturbance Workshop with SC C2. It looks like we have a lot of disturbances to choose from this year.
4. We received 41 papers, including one student paper and one paper from the NGN
5. 40 papers are being presented from C5 this year in Paris

Update on C5 Activities – Current Noteworthy Plans

1. The working group on Blockchain is attracted a lot of interest from current participants. CIGRE and IEEE conducted a joint seminar and the working group conducted a webinar during the Centennial Session.
2. The Study Committee is seeking to examine new market forms as part of the integration of renewables, including sector integration with gas — particularly hydrogen.

Update on C5 Activities – 2021 Working Groups

1. No new working groups were formed in 2021:
2. No working groups were disbanded in 2021.
3. Total number of active, WGs, JWGs
   - C5.26 Auction Markets and Other Procurement Mechanisms for DR Services.
   - C5.28 Energy Price Formation in Wholesale Electricity Markets.
   - C5.31 Wholesale and Retail electricity cost impacts of flexible demand response.
   - C5.32 Carbon pricing in wholesale electricity markets.
   - C5.33 Trading electricity with Blockchain systems
4. JWG C5/C6.29 New Electricity Markets, Local Energy Communities.
5. New WG formed in 2022
   - JWG C5/C1.35 Integration of hydrogen into electricity markets and sector integration
   - C5.34 Summary of Current Uses of Electric Vehicle Charge/Discharge Flexibility in wholesale energy markets and reliable grid operations
   - C5.36 Certification of the electricity used to produce hydrogen.

Update on C5 Activities – Publications during 2021

- Two articles were published in Electra for SC C5 during 2021:
  - The application of Blockchain to electricity markets by David Bowker
  - Energy price formation in wholesale markets — a note on the work of WG C5.28 — by Natalie Tacka and Adam Keech.

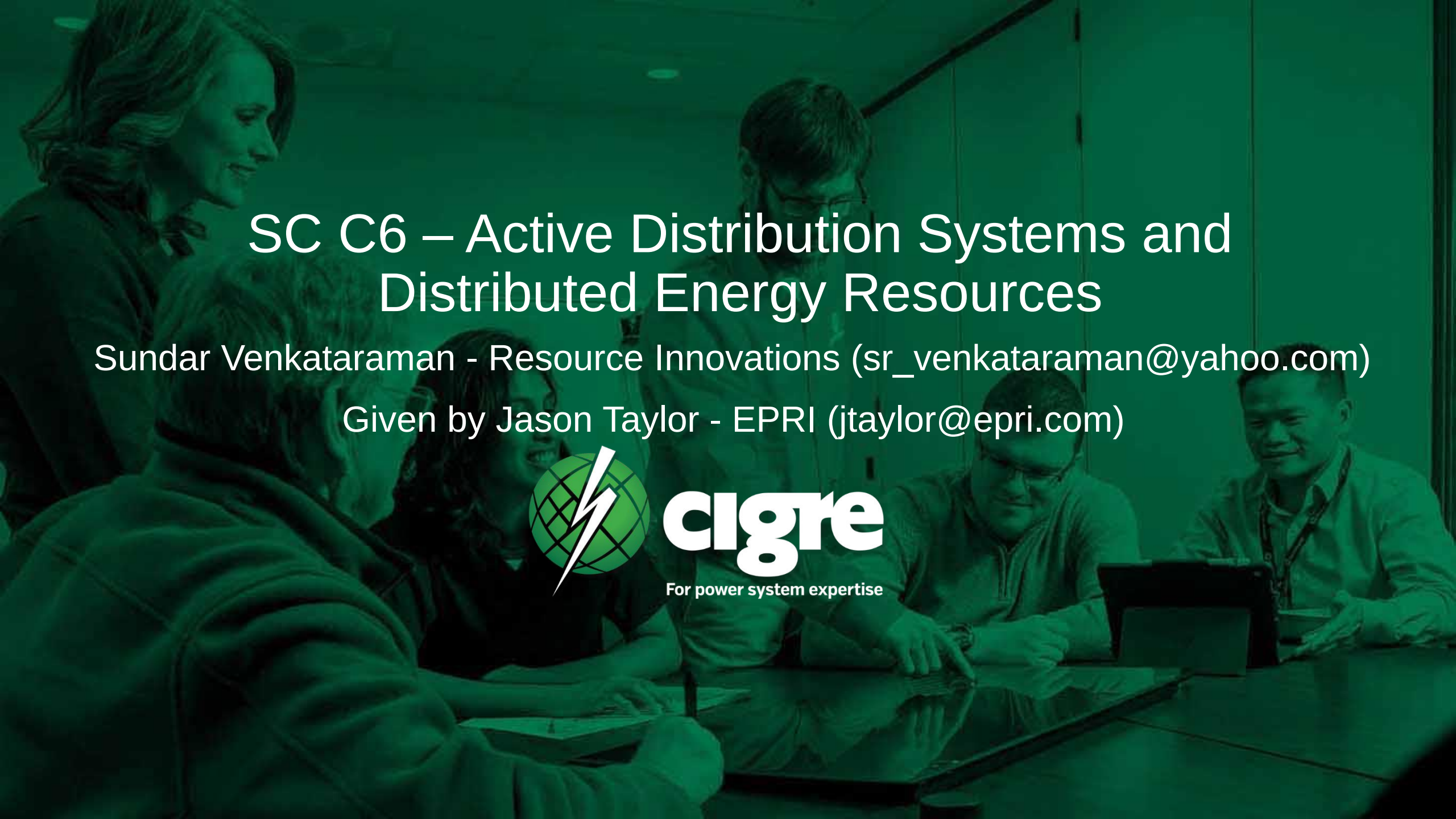
Update on C5 Activities – Publication plan for the coming year

1. The Study Committee expects to publish three Technical Brochures during 2022:
   - “Auction Markets and Other Procurement Mechanisms for DR Services”, working group C5.26 (delayed from 2021)
   - “Energy Price Formation in Wholesale Electricity Markets”, working group C5.28
   - “Wholesale and Retail electricity cost impacts of flexible demand response”, working group C5.31

2. Three articles are expected to be published in Electra during 2022
   - Two are on Virtual Power Plants by Gabrielle Kuiper, Alex Cruickshank and Lance Hoch. One will cover the extent of VPP in Australia and the second a modelled analysis of the economic benefits in the Western Australian Market.
   - “A season of high electricity prices in Europe” by Vincent Ringeissen, Christian Hewicker and Yannick Phulpin.

Update on C5 Activities – Other Noteworthy

1. Tutorials, webinars and workshops in 2020
   - Two tutorials were conducted by webinar during the Centennial Session. The first was on the outcomes of WG C5.27: Market Design for Short Term Flexibility and the second was based on the outcomes of WG C5.30: The Role of Blockchain in Electricity Markets.
   - There was a joint CIGRE/IEEE seminar on Blockchain at the same time as the Centennial Session.
2. Strategic Plan (2018-2028), SC Structure and Action Plan:
   - The strategic plan of SC C5 is being reviewed and a draft of the new plan was discussed by the Strategic Advisory Group during 2020 with a view to presenting the updates to the TC in 2021. This has not happened and the updates are proposed to be presented to the TC during 2022
   - The structure of the SC has been changed to include a new Technical Committee to manage the papers for each Session..
   - The action plan will be updated after the strategic plan is completed.
3. Planned SC meetings (in 2022 and next)
   - There was a meeting of SC C5, in person and by webinar earlier this year in Kyoto, Japan.
   - The 2022 annual meeting of SC C5 is being held in Paris, France during the 2022 Session.
   - The 2023 meeting of SC C5 will be held in Cairns, Australia.



SC C6 – Active Distribution Systems and Distributed Energy Resources

Sundar Venkataraman - Resource Innovations (sr_venkataraman@yahoo.com)

Given by Jason Taylor - EPRI (jtaylor@epri.com)

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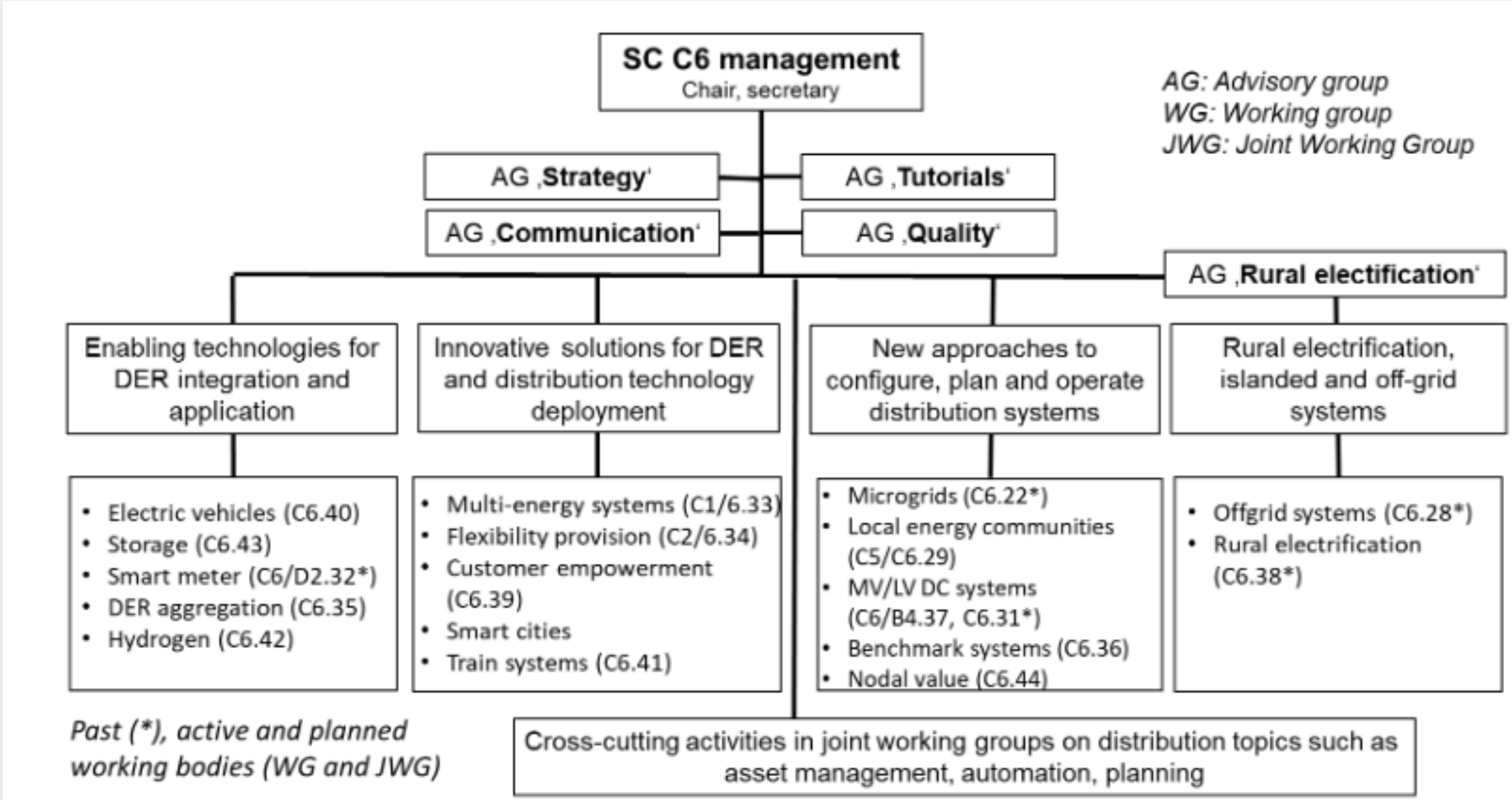
SC C6 – Structure and Scope



SC C6 Annual Report 2021

SC C6 – Recent Brochures

Hybrid systems for off-grid power supply
Brochure #826 WG C6.28

Rural electrification
Brochure #835 WG C6.38

Medium Voltage Direct Current (MVDC) grid feasibility study
Brochure #793 WG C6.31

System Operation Emphasizing DSO/TSO Interaction
Brochure #733 WG C2/C6.36

Modeling of inverter-based generation for power system dynamic studies
Brochure #727 WG C4/C6.35/CIRED

Asset management for distribution networks with high penetration of distributed energy resources
Brochure #726 WG C6.27

The impact of battery energy storage systems on distribution networks
Brochure #721 WG C6.30

SC C6 – Active Working Groups

WG #	Title	Convener
JWG D2/C6.47	Advanced Consumer Side Energy Resource Management Systems	led by D2
JWG C6/C2.34	Flexibility provision from distributed energy resources	Pierluigi Mancarella (Australia)
JWG C6/C1.33	Multi-energy system interactions in distribution grids	Birgitte Bak-Jensen (Denmark)
C6/B4.37	Medium Voltage DC distribution systems	James Vu (UK)
C6.44	Nodal Value of Distributed Renewable Energy Generation	Kilian Reiche (Germany)
C6.43	Aggregation of battery energy storage and DER, including Solar PV	Nikos Hatziargyriou (Greece)
C6.42	Electric Transportation Energy Supply	Geza Joos (Canada)
C6.41	Technologies for Railway Distribution Systems	Pablo Arboleya (Spain)
C6.40	Electric Vehicles as Distributed Energy Resource (DER) systems	Joao Peças Lopes (Portugal)
C6.39	Customer Empowerment	Michael Ross (Canada)
C6.36	Distributed Energy Resource Models for Impact Assessment	Jason Taylor (USA)
C6.35	DER aggregation platforms for the provision of flexibility services	Alexandre Oudalov (Switzerland)
C1.C6.37	Optimal transmission and distribution investment decisions under increasing energy scenario uncertainty	led by C1

SC C6 – Paris Schedule Highlights

Mon, Aug 29	8.45 – 12.00	Grand Amphitheatre	**Opening panel**
Mon, Aug 29	14.30 – 17.00	See program	**C6 contributor's meeting**
Tue, Aug 30	8:45 - 18:00	Amphitheatre Bleu	**Group Discussion Meeting C6**
Wed, Aug 31	9:00 - 12:00	Hall Ternes	**C6 Poster Session**
Thur, Sept 1	8:30 - 16:00	Room 243	**C6 Study Committee Meeting**
Thur, Sept 1	16.10 – 17.50	Salle Maillot	**C6 Tutorial - Electric Vehicles (WG C6.40)**

SC D1 – Materials and Emerging Test Techniques

Luke van der Zel - EPRI (lvanderz@epri.com)

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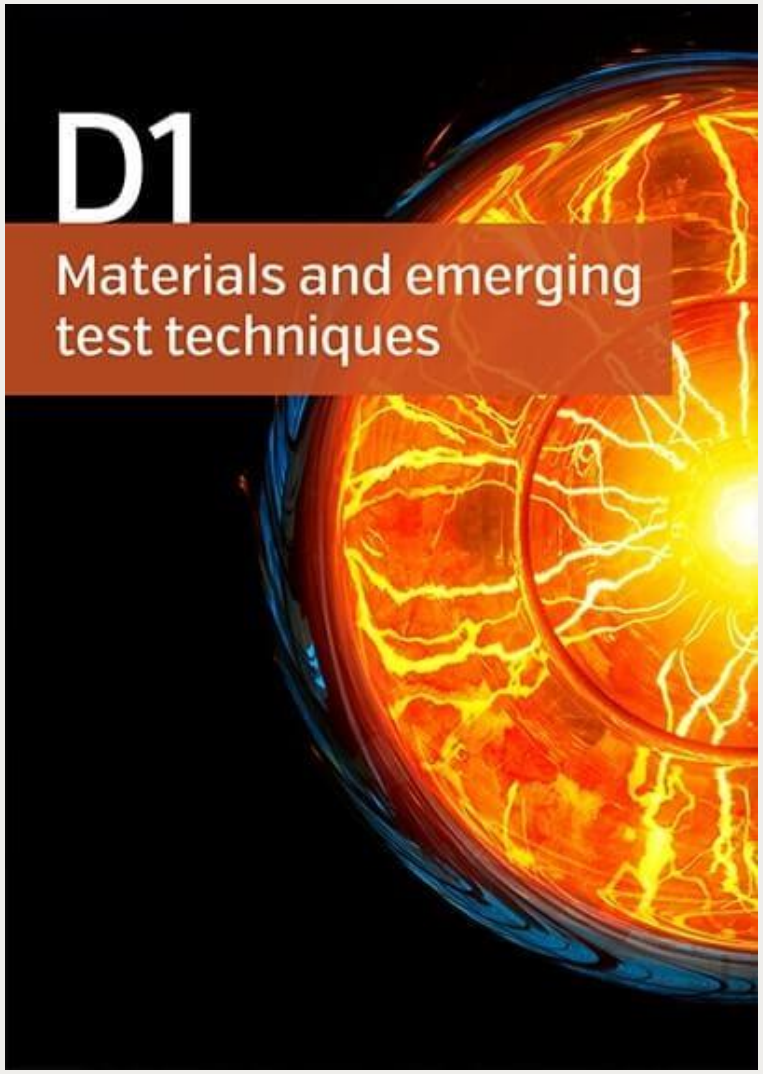
For power system expertise

SC CD1 – Structure

1. **Chairman**
   Ralf Pietsch, pietsch@highvolt.de

2. **Secretary**
   Johannes Seiler, johannes.seiler@siemens.com

3. **Webmaster**
   Jens Seifert, jseifert@lappinsulators.com



SC CD1 – Advisory Groups

AG	Title	Convener
AG D1.01	Liquid and liquid impregnated insulation systems	Lars Lundgaard (NO)
AG D1.02	High voltage and current testing and diagnosis	Uwe Riechert (CH)
AG D1.03	Solid materials	Simon Sutton (GB)
AG D1.04	Insulating gases and mixtures	Karsten Juhre (DE)
SCAG	Strategic and Customer Advisory Group	Ralf Pietsch (DE)
TAG D1	Tutorial Advisory Group	Ivanka Höhlein-Atanasova (DE)

SC CD1 – Objectives and Organization

1. Scope

The activities of SC D1 concern the evaluation and monitoring of:

- Fundamental aspects of new and existing materials for electro-technology (conducting and insulating materials for electrical use)
- Multi-component insulating arrangements with one or more electrical insulating materials used in conjunction with associated conducting parts
- Diagnostic techniques and related knowledge rules
- Emerging test techniques.

Provision of timely information on new developments and trends in the field of materials and emerging test techniques to other Study Committees and support for their analysis of the introduction and application of these materials and techniques.

2. Mission

To facilitate and promote the progress of engineering and the international exchange of in- formation and knowledge in the field of materials and emerging test techniques. To add value to this information and knowledge by means of synthesizing state-of-the-art practices and developing recommendations.

SC D1 – Recent Brochures

- **Improvements to PD measurements for factory and site acceptance tests of power transformers**
  - **Study Committee**: A2, D1
  - **Year**: 2022

- **Dielectric performance of insulating liquids for transformers**
  - **Study Committee**: D1, **WG (TF):** WG D1.70 TF3
  - **Year**: 2021

- **Harmonised test for the measurement of residual methane in insulating materials**
  - **Study Committee**: B1, D1 ?
  - **WG (TF):** JWG D1/B1.49
  - **Year**: 2021

- **Electric performance of new non- SF6 gases and gas mixtures for gas-insulated systems**
  - **Study Committee**: D1 ?
  - **WG (TF):** WG D1.67
  - **Year**: 2021

SC D1 – Recent Brochures

- **Electrical Insulation Systems at Cryogenic Temperatures**
  - **Study Committee**: D1 ?
  - **WG (TF):** WG D1.64
  - **Year**: 2021

- **Dielectric testing of gasinsulated HVDC systems**
  - **Study Committee**: B3, D1 ?
  - **WG (TF):** JWG D1/B3.57
  - **Year**: 2021

- **Methods for dielectric characterisation of polymeric insulating materials for outdoor applications**
  - **Study Committee**: D1 ?
  - **WG (TF):** WG D1.59
  - **Year**: 2020

- **Field grading in electrical insulation systems**
  - **Study Committee**: D1 ?
  - **WG (TF):** WG D1.56
  - **Year**: 2020

SC D1 – Recent Brochures

- **DGA monitoring systems**
  - **Study Committee**: A2, D1 ?
  - **WG (TF):** JWG D1/A2.47
  - **Year**: 2019

- **Field experience with transformer solid insulation ageing markers**
  - **Study Committee**: A2, D1 ?
  - **WG (TF):** JWG A2/D1.46
  - **Year**: 2019

- **Advances in DGA interpretation**
  - **Study Committee**: A2, D1 ?
  - **WG (TF):** JWG D1/A2.47
  - **Year**: 2019

- **Understanding and mitigating corrosion**
  - **Study Committee**: D1 ?
  - **WG (TF):** WG D1.71
  - **Year**: 2019

SC D1 – Current Activities

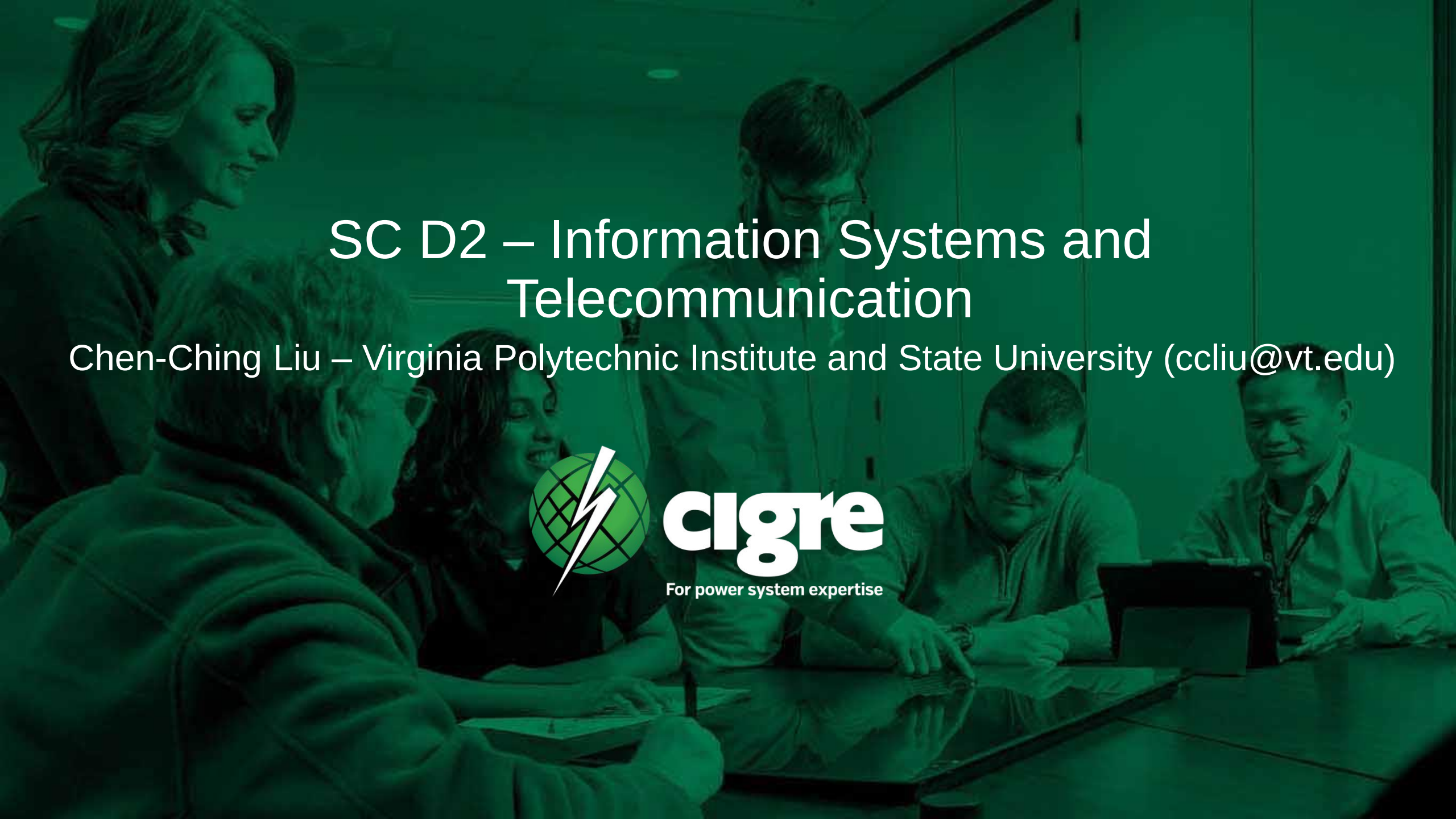
- Characterization of materials and electrical insulation systems (EIS).
- Study of emerging test and diagnosis techniques for HVDC.
- Development of diagnostic tools and related knowledge rules.
- Other specific Interests
  - Give guidance in the performance and use of materials in electrical insulation systems.
  - Dissemination of knowledge, e.g. by tutorials.
- CIGRE-IEC 2019 Conference on EHV and UHV (AC & DC),Hakodate, Japan, 23.4 - 26.4. 2019
- Joint CIGRE Colloquium with A2, B2 and D1,New Delhi, India, 20.11. - 22.11.2019

SC D1 – Active Working Groups

Number	Title	Name of convener
D1/B1-75	Strategies and tools for corrosion prevention for cable systems	Joe Tusek (AU)
D1-74	Partial discharge measurement on insulation systems stressed from HV power electronics	Andrea Cavallini (IT)
D1-73	Nanostructured dielectrics: Multi-functionality at the service of the electric power industry	Michel Frechette (CA)
D1-69	Guidelines for test techniques of High Temperature Superconducting (HTS) systems	Richard Taylor (AU)
D1-68	Natural and synthetic esters – Evaluation of the performance under fire and the impact on environment	Massimo Pompili (IT)
D1-70	Functional Properties of modern insulating liquids	Ivanka Atanasova-Höhlein (DE)
D1-66	Requirements for partial discharge monitoring systems for gas insulated systems	Wojciech Koltunowicz (AT)
D1-67	Dielectric performance of new non-SF6 gases and gas mixtures for gas-insulated systems	Christian FRANCK (CH)
D1-64	Electrical insulation systems at cryogenic temperatures	Naoki HAYAKAWA (JP)
D1-65	Mechanical properties of insulating materials and insulated conductors for oil insulated power transformers	Lars SCHMIDT (DE)
D1-63	Partial discharge detection under DC voltage stress	Ronald PLATH (DE)
D1-62	Surface Degradation of Polymeric Insulating Materials for OutdoorApplications	Bernd Komanschek (DE)
D1-61	Optical corona detection and measurement	Nishal Mahatho (ZA)
D1-60	Traceable measurement techniques for very fast transients	Yi Li (AU)
D1-59	Methods for dielectric characterisation of polymeric insulating materials for outdoor applications	Jens Seifert (DE)
D1-58	Evaluation of dynamic hydrophobicity of polymeric insulating materials under AC and DC voltage stress	Stefan KORNHUBER (DE)
D1/B3-57	Dielectric Testing of gas-insulated HVDC Systems	Claus Neumann (DE)
D1-56	Field grading in electrical insulation systems	Volker Hinrichsen (DE)
D1-54	Basic principles and practical methods to measure the AC and DC resistance of conductors of power cables and overhead lines	Boris Dardel (CH)
D1-50	Atmospheric and altitude correction factors for air gaps and clean insulators	Johannes Rickmann (US)
D1/B1-49	Harmonised test for the measurement of residual inflammable gases in insulating materials by gas chromatography	John-Peter Mattmann (CH)

SC D1 – Paris Schedule Highlights

- Sept 1, 2022: Tutorial: D1 – Electric performance of new non-SF6 gases and gas mixtures for gas-insulated systems, Salle Maillot, Level 2
- Sept 1, 2022: Poster session: Hall Ternes, Level 1
- Sept 2, 2022: Group discussion, Amphitheatre Bleu, Level 2



SC D2 – Information Systems and Telecommunication

Chen-Ching Liu – Virginia Polytechnic Institute and State University (ccliu@vt.edu)

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For power system expertise

SC D2 – Information Systems and Telecommunication
Chen-Ching Liu (Virginia Tech)
D2 Paris GS Program

2022	Sunday 28/08	Monday 29/08		Tuesday 30/08		Wednesday 31/08		Thursday 01/09	
	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
Time schedule	16:00 - 17:30	8:45 - 12:00							
Panel	Opening Ceremony	Opening panel							
Time schedule				08:45	18:00	08:45	18:00	08:45	18:00
Group Discussion Meetings						D2			
Contributors' meetings			D2						
Time schedule		9:00 - 12:30	14:30 - 18:00	9:00 - 12:30	14:30 - 18:00	9:00 - 12:30	14:30 - 18:00	9:00 - 12:30	14:30 - 18:00
Poster Sessions				D2					
Time schedule		8:30-10:20 10:40-12:30	14:00-15:50 16:10-18:00	8:30-10:20 10:40-12:30	14:00-15:50 16:10-18:00	8:30-10:20 10:40-12:30	14:00-15:50 16:10-18:00	8:30-10:20 10:40-12:30	14:00-15:50 16:10-18:00
Tutorials					D2				
Time schedule			14:00-18:00		15:00-18:00	8:30-12:30			
Workshops					D2				
Time schedule								08:45	17:00
Study Committee meetings								D2	

D2 Preferential Subjects for GS 2022

- **D2 - Information Systems & Telecommunication**
- **PS 1 The opportunities and challenges brought by emerging Information and Communication Technologies to Electric Power Utilities in their path to Digital Transformation**
  - IoT technologies and architectures in physical asset management,
  - Artificial intelligence, big data and analytics tools to improve asset management in power utilities,
  - Augmented and virtual reality technologies in electric power utilities and power plants.
- **PS 2 Cybersecurity techniques, technologies and applications for securing critical utility assets**
  - Cybersecurity directives, supporting standards and certification schemes – experiences from electric power utilities worldwide,
  - Cyber incident management and experiences in implementation of security operation centers,
  - Impact assessment and mitigation strategies for cyber-attacks to power system operations. Studies and experiences in the integration of information and communication technology (ICT) network and cybersecurity simulators with existing power system analysis tools.
- **PS 3 / Meeting the demands of the modern utility and DER with an agile and resilient telecommunication network**
  - Supporting operation technology (OT) services and applications using current and next generation cellular (4G/5G) and IoT-based wireless technologies,
  - Increasing efficiency and cyber security with the use of cloud-based techniques and intelligent networks including modern network management systems, network automation and service orchestration, network function virtualization and software defined wide area network,
  - Improving and maintaining reliability and resiliency of critical services including protection services using modern telecommunication techniques and technologies.

SC D2 – Information Systems and Telecommunication
Chen-Ching Liu (Virginia Tech)
D2 Working Groups

WG D2.56	Interdependence and Security of Cyber-Physical Power System	QINGLAI GUO (CN) guoqinglai@tsinghua.edu.cn
WG D2.55	Application of 5G Technology to Smart Grids	KUNLUN GAO (CN) gkl@sgcc.com.cn
WG D2.54	Regulatory approaches to enhance EPU's cybersecurity frameworks	D. K. HOLSTEIN (US) holsteindk@ocg2u.com
WG D2.53	Technology and Applications of Internet of Things in Power Systems	ZHENGYUN SUN szyd2@sgcc.com.cn
WG D2.52	Artificial Intelligence Application and Technology in Power Industry	KUNLUN GAO (CN) gkl@sgcc.com.cn
WG D2.51	Implementation of Security Operations Centers (SOC) in Electric Power Industry as Part of Situational Awareness System	V. KARANTAEV (RU) vladimir.karantaev@gmail.com
WG D2.49	Augmented reality / Virtual reality to support Operation and Maintenance In Electric Power Utilities	S. H. KHALAJ (IR) khalaj.siamak@monencogroup.com
JWG B2/D2.72	Condition Monitoring and Remote Sensing of Overhead Lines	A.KULKARNI (GB) akulkarni@orxagrid.com

D2 Working Groups (continued)

JWG D2/C2.48	Enhanced information and data exchange to enable future transmission and distribution interoperability	G. TAYLOR (GB) gareth.taylor@brunel.ac.uk
JWG D2/C6.47	Advanced consumer side energy resource management systems	A.A NEBERA (RU) nebera_aa@rtsoft.ru
WG D2.45	Impact of governance regulations and constraints EPU sensitive data distribution and location of	H. KLIMA (AT) herwig.klima@verbund.com
WG D2.44	Usage of public or private wireless communication infrastructures for monitoring and maintenance of grid assets and facilities	P. MULVEY (IE) paddy.mulvey@esb.ie
WG D2.43	Enabling Software Defined Networking for EPU telecom applications	V. TAN (AU) victor@vtanconsulting.com

Recent SC D2 Activities

Technical Brochure

SCD2 recently published the **TB 866**.

“Enabling software defined networking for electric power utilities”

2022 Kyoto Symposium Results

CIGRE 2022 Kyoto symposium has been held in April 2022 in a hybrid style. The Symposium General Report will be published in the next Electra issue.

SC D2 as a co-leading SC participated with 22 papers in 4 Oral Sessions, 5 papers were presented in Poster Sessions, 2 Tutorials were delivered:

D2/C6 Tutorial - Advanced Consumer-Side Energy-Resource Management Systems,

D2 Tutorial - Enabling Software Defined Networking for EPU telecom applications.