

Report to the CIGRE Australian Technical Committee 2023

Australian Panel AU B3

Activities



Crina-Miana Costan

Convenor CIGRE AU B3

Crina.m.costan@gmail.com



cigre

For power system expertise

SC B3 Overview

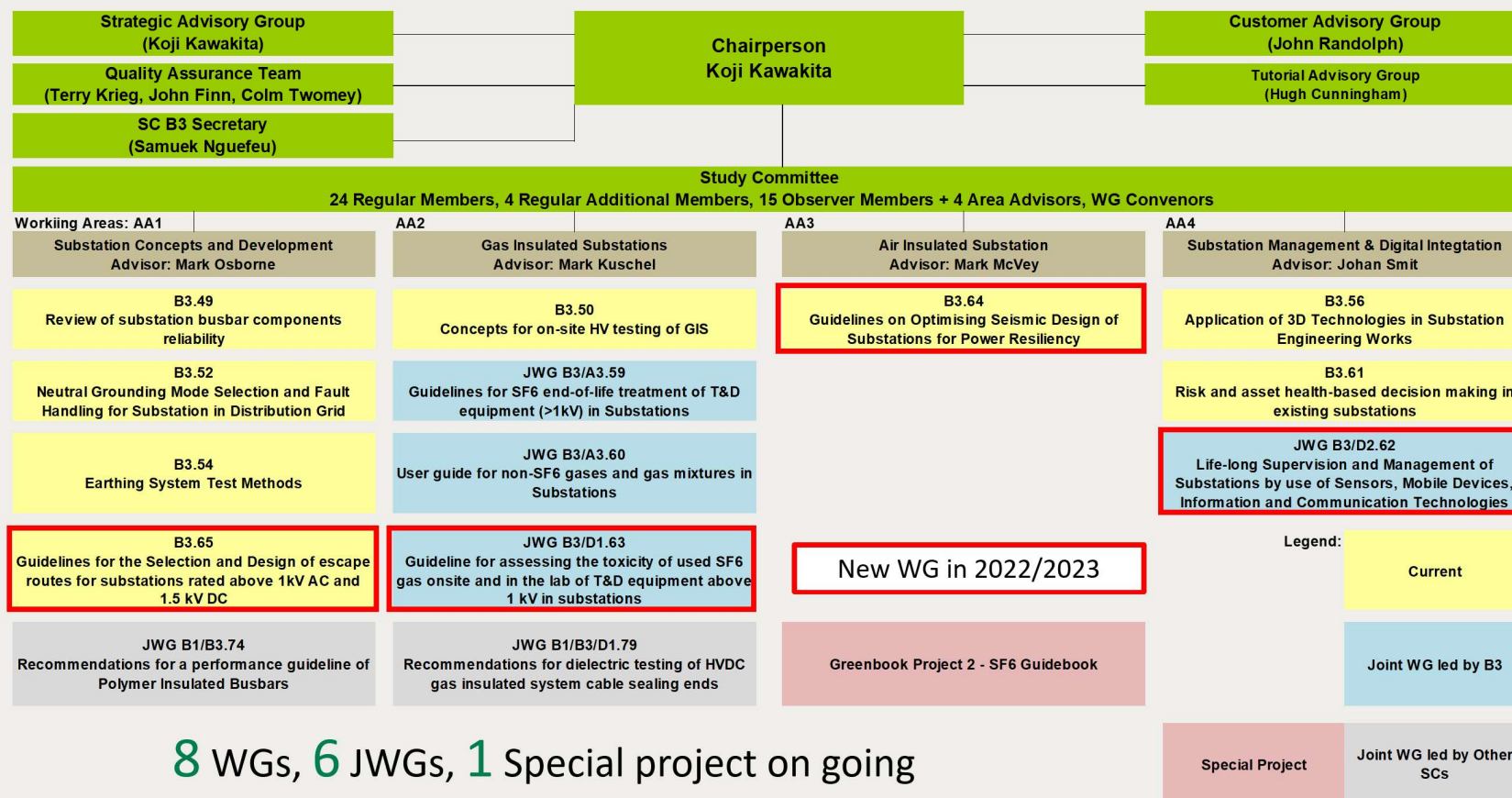
Study Committee Scope

- Research, development, design, construction, operation and maintenance and ongoing lifetime management
- Technical, economics, safety, environmental and social aspects
 - Improving reliability and availability, optimizing substation asset management, identifying best-value solutions
 - Minimizing environmental impact while recognizing social needs and priorities in facilitating the sustainable development of substations



SC B3 Overview

SC B3 Structure 2023

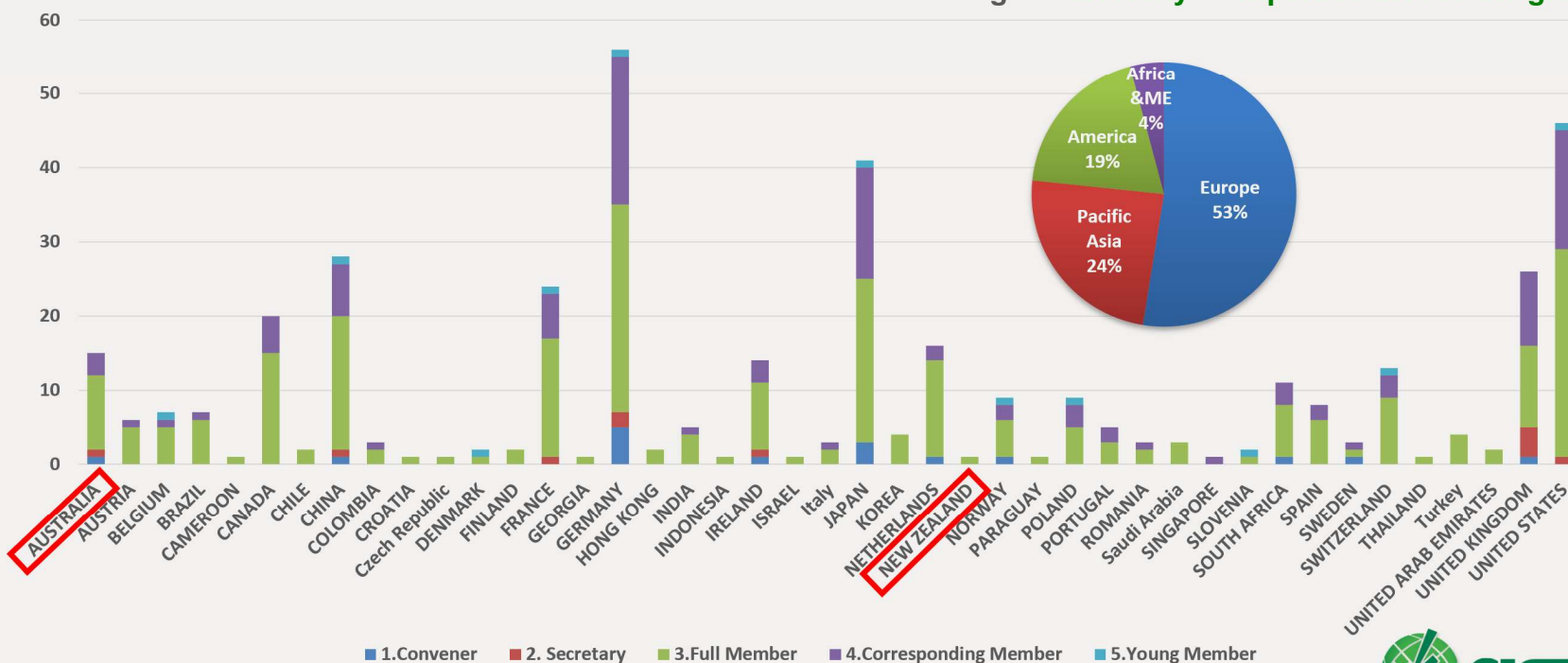


8 WGs, 6 JWGs, 1 Special project on going

SC B3 Overview

SC B3 WGs Membership

356 individual experts representing **44** countries, demonstrating the **diversity** of expertise across the globe.

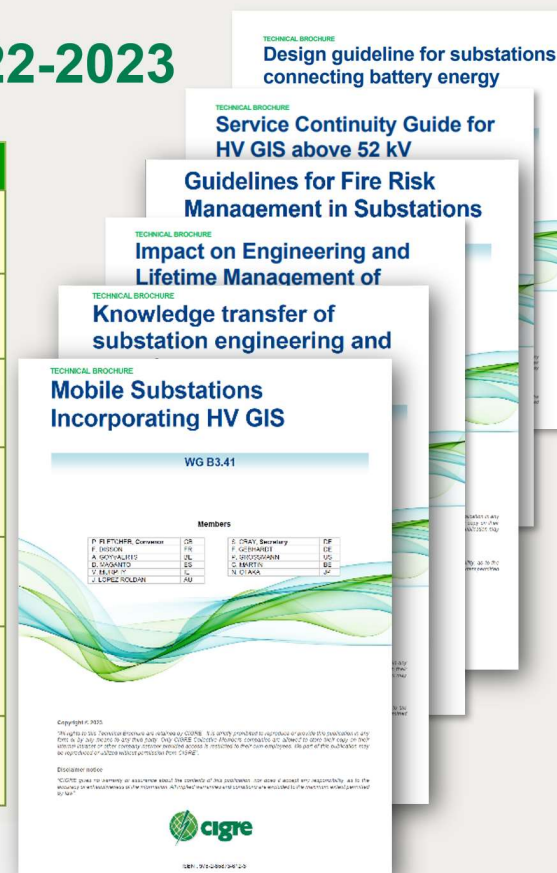


SC B3 Overview

SC B3 Technical Brochure Publications 2022-2023

No.	WG	Title	Convener
869	B3.55	Design guideline for substations connecting battery energy storage solutions (BESS)	Suriya Prungkhwu-nmuang (TH)
870	B3.51	Service Continuity Guide for HV GIS above 52 kV	Mark Kuschel (DE)
886	B3.53	Guidelines for Fire Risk Management in Substations	Shinki Noguchi (JP)
895	B3.57	Impact on Engineering and Lifetime Management of Outdoor HV GIS	Toshiyuki Saida (JP)
898	B3.58	Knowledge transfer of substation engineering and experiences	Akira Okada (JP)
907	B3.41	Mobile Substations Incorporating HV GIS	Paul Fletcher (GB)
NEW 914	B3/A3.59	Guidelines for SF6 End-of-Life Treatment of T&D Equipment (>1kV) in Substations	Maik Hyrenbach (DE)

CIGRE member free download from e-cigre (<https://e-cigre.org/>)



SC B3 Overview

CIGRE New Strategic Plan Toward 2030

- SC **B3** is deeply involved in this project and will play an important role in achieving its objects.
- SC **B3** preferential subjects for **2024 Paris Session** anticipate the **Energy Transitions** topics

PS1: Challenges & new solutions in T&D substation design and construction for **energy transition**

- Design impacts on substations from on-offshore **wind**, **PV**, **hydrogen**, small modular reactors, EV charging infrastructure etc.
- New functions in substations (**energy storage**, synchronous compensators, etc.).
- HV-MV DC substation and GIS/GIL application for a DC network.

PS2: Return on operational experiences for substation management

- Challenges of managing assets: Initiatives to **strengthen resilience**, reliability and security, best practice and end-of-life management considering **sustainability aspects**.
- Lessons learned from operational experience from **SF₆ alternatives solutions**, digital transformation solutions and digital substation.
- New competencies for new technologies, knowledge transfer methods and high standards of education in engineering skills.

SC B3 Overview: Active Working Groups

WG #	WG Title	Convener	Country
B3.41	Mobile Substations Incorporating HV GIS	Paul Fletcher	UK
B3.49	Review of substation busbar components reliability	Milan Radosavljević	Sweden
B3.50	Concepts for on-site HV testing of GIS	Mark Reuter	Germany
B3.52	Neutral Grounding Mode Selection and Fault Handling for Substation in Distribution Grid	Jinzhong Li	China
B3.53	Guidelines for Fire Risk Management in Substations	Shinki Noguchi	Japan
B3.54	Earthing System Test Methods	Stephen Palmer	Australia
B3.56	Application of 3D Technologies in Substation Engineering Works	Philip König	South Africa
B3.57	Impact on Engineering and Lifetime Management of Outdoor HV GIS	Toshiyuki Saida	Japan
B3.58	Knowledge Transfer of Substation Engineering and Experiences	Akira Okada	Japan
B3/A3.59	Guidelines for SF6 end-of-life treatment of T&D equipment (>1kV) in Substations	Maik Hyrenbach	Germany
B3/A3.60	User guide for non-SF6 gases and gas mixtures in Substations	Piet Knol	Netherlands
B3.61	Risk and asset health-based decision making in existing substations	Jan Bednarik	Ireland
B3/D2.62	Life-long Supervision and Management of Substations by use of Sensors, Mobile Devices, Information and Communication Technologies	Nicolaie Fantana	Germany
B3/D1.63	Guideline for assessing the toxicity of used SF6 gas onsite and in the lab of T&D equipment above 1 kV in substations	Roland Kurte	Germany
B3.64	Guidelines on Optimising Seismic Design of Substations for Power Resiliency	Atsushi Eto	Japan
B3.65	Guidelines for the Selection and Design of escape routes for substations rated above 1kV AC and 1.5 kV DC	Espen Masvik	Norway
Greenbook	SF6 Greenbook	Daniel Staiger	Germany

SC B3 Overview : Proposed Preferential Subjects Paris 2024

PS1 : Challenges & New Solutions in Design and Construction on T&D Substations for Energy Transition

- Design impacts on On-Offshore wind, PV, Hydrogen, EV charging infrastructure etc.
- New function in substation (energy storage, synchronous compensators, etc.)
- HV-MV DC substation and GIS/GIL application for DC network
- New design, manufacturing and construction toward circular economy

PS2 : Return on Operational Experiences for Sustainable Substation Management

- Initiatives to strengthen resilience, reliability and security
- Challenge of sustainable management (advanced asset management and end of life management)
- Lesson learned from operational experience of SF₆ alternatives solutions
- New findings from user experiences on digital transformation (DX) and digital substation
- New set of competency for new technologies, knowledge transfer and high standards of education in engineering skills

SC B3 Overview : Proposed Preferential Subjects Birmingham 2023

[Draft] 2023 A3/ B3 Joint Colloquium PS

Theme: The role and impact for Transmission & Distribution Substations and Equipment in delivering a Net Zero Carbon Future



PS1 : Emerging Substation & T&D equipment strategies to deliver the transition to a low carbon future

- Reducing the substation carbon footprint
- Developments and Roadmaps for alternative technologies
- Substation interventions to accommodate network growth
- What has to change?

PS2 : Impact of Net Zero on the Lifetime Management of SF6 solutions

- Performance & maturity of SF6 alternatives – report on industry experience
- Managing Legacy equipment - SF6-free Retrofit Solutions
- End of life management - What do we do with displaced SF6?
- Impact of emerging Legislation, regulations, and recommendations

PS 3: Opportunities for Sustainability with Substation & T&D equipment

- Threats and opportunities for Substation HV Equipment
- New Materials and Testing techniques
- Optimising substation operation and efficiency
- Evolving Asset Management philosophies

SC B3 Overview : Proposed Preferential Subjects Birmingham 2023



Key Takeaway from Joint CIGRE SC B3 & A3 Colloquium Birmingham, United Kingdom May 9-12, 2023

Purpose

Share the latest thinking and developments in SF₆ and its alternatives, both for new products and management of existing populations

Aim to address the resonance for our sector around reducing and managing our dependence on SF₆, so with this in mind the event considered the following questions within our community;

- The impact of delivering Net Zero for Substations and HV Equipment - is it all about SF₆ alternatives?
- What is the role for the Circular Economy on Substations and HV Equipment in a Net Zero Future?



SC B3 Overview: Cairns 2023

End-to-End Electricity System: Transition, Development Operation and Integration



- The Symposium focused on the integrated power system
- The transformation into the power system of the future
- Learning from experience
- Current developments in the power system
- Changes that are necessary to move towards a sustainable power system

SC B3 Overview : Proposed Preferential Subjects Cairns 2023

Theme: The End to End Electricity System: Transition, Development and Integration

PS1 : Learning from experiences

- What can we learn from the past experience to develop the power system

PS2 : Developing practices, functionalities and applications

- What are the current developments and their application to the future power system

PS3 : Towards a sustainable power system

- What are the future needs and requirements of the power system

SC B3 Program: Cairns 2023

Date	Time	Program	Room	Important role member
Tue, 5th September	08:30- 17:20	B3 Annual Meeting	M6+M7	B3 Chair, B3 Secretary B3 members (Regular, Regular Additional, Observer), WG Convener SAG/CAG/TAG members
Wed, 6th September	10:20- 12:10	B3 Tutorial-1: “Knowledge Transfer of Substation Engineering and Experiences”	M4+M5	TAG Chair: H. Cunningham (IE) Tutor: Hugh Cunningham (IE)
Wed, 6th September	13:10- 15:00	B3 Tutorial-2: “Air Insulated Substation Design for Severe Climate Conditions”	M4+M5	TAG Chair: H. Cunningham (IE) Tutor: Mark McVey (US)
Thu, 7th September	08:30- 17:20	B3 Oral Session	Audito- rium A	B3 Chair, B3 Secretary, Session Chair, All delegates

SC B3 Annual Meeting : Cairns Tuesday the 5th of September



ATC Seminar 2023

SC B3 Overview: Cairns Symposium Tutorial Knowledge Sharing

A presentation of TB 898 issued in 2022

How do we develop the Next Generation?



SC B3 Overview: Tutorial Air Insulated Substation Design for Severe Climate Conditions

A presentation of TB 614 issued in 2015:

- Significant impacts to reliability from severe weather conditions are no longer relegated to once-in-30-year or once-in-100-year events. Such severe climate conditions can include water flooding, extreme low and high temperature conditions, heavy snow and ice, and strong wind.



SC B3 Cairns Symposium Papers Session: Thursday the 7th of September

CIGRE Cairns Symposium - B3 Substation Session Program
Thursday, 7th September 2023

Session 1: Substation engineering challenges for the energy transitions

10:20-12:10 (110 min)

Session Chair: Stephen Palmer (spalmer@safearth.com)

Session Secretary: Doug Ray (doug.ray@vector.co.nz)

Time	PaperID	paper stream	title	keywords	Session speaker	authors	organisations
10:20-10:30			Welcome & introduction to Study Committee B3		Koji Kawakita	Koji Kawakita	Chair of SC B3
10:30-10:35			Introduction Session 1 and session guides		Stephen Palmer	Stephen Palmer	Chair of Session 1
10:35-10:50	1343	2. Developing practices, f	Mobile substations incorporating HV GIS	Mobile Substation, Gas Insulated Switchgear	Lopez-Roldan, Jose	Fletcher, Paul; Gray, Steffen; Dixon, Francois; Gubhardt, Frank; Guyvaerts, Andy; Grossmann, Peter; Maganto, Diego; Martin, Carlos; Murphy, Vincent; Otake, Nobuko; Lopez-Roldan, Jose	CIGRE WG B3.41
10:50-11:05	1174	2. Developing practices, f	BESS Integration to Substations Electrical Design and Australian Standards Compliance	BESS in substations, design compliance	Costan, Crina-Miana	Costan, Crina-Miana	ElectraNet, Australia
11:05-11:20	1339	3. Towards a sustainable	The First MVDC Station Project in Korea	Renewable, MVDC Station	Lee, Winsoo	Lee, Winsoo	Hyosung Heavy Industries, Korea, Republic of (South Korea)
11:20-11:35	1382	2. Developing practices, f	Application of 3D Technologies in Substation Engineering Works	3D, Modelling, Substations, Design, Construction	Stafford, Daniel James	Stafford, Daniel James	Jacobs, Australia
11:35-11:50	1291	2. Developing practices, f	Air Cored Reactors Installations in Substations	Air core reactor, configuration, earthing, switching, foundations	Smithson, James	Sanchez, Juan; Smithson, James; Costan, Crina-Miana	ElectraNet, Australia
11:50-12:00			Session 1 Concluding Remarks		Stephen Palmer	Stephen Palmer	Chair of Session 1

Session 2: Condition monitoring and managing assets in substations

13:10-15:00 (110 min)

Session Chair: Crina Costan (costan.crina3@electra.net.au)

Session Secretary: Samuel NGUEFEU (samuel.nguefeu@rte-france.com)

Time	paperID	paper stream	title	keywords	Session speaker	authors	organisations
13:10-13:25			Guidelines for SF6 end-of-life treatment of T&D equipment (-1kV) in Substations		Maik Hyrenbach	Maik Hyrenbach	Chair of JWG B3/A3.59
13:25-13:40			Introduction Session 2 and session guides		Crina Costan	Crina Costan	Chair of Session 2
13:40-13:55	1126	1. Learning from experien	Challenges in implementing comprehensive asset online monitoring solutions	Management, monitoring, transformers, assets, failures	Kring, Terry	Kring, Terry (1); McFaul, Tony (2)	1: Power Network Consulting, Australia; 2: Doble Engineering Company
13:55-14:10	1149	2. Developing practices, f	Using Automated Infrared Monitoring to Reduce Substation Maintenance Costs	Infrared, automated, substation, monitoring	Hamze, Ali	Harada, Richard; Nam, John; Hamze, Ali	Systems With Intelligence, Canada
14:10-14:25	1320	2. Developing practices, f	Development and Implementation of an Asset Information Platform for Substations	Asset, Data, Maintenance, Risk, Lifecycle	Sisic, Senad; Milne, Craig	Sisic, Senad; Milne, Craig	ElectraNet, Australia
14:25-14:40	1180	2. Developing practices, f	Estimation of degradation curves for substation equipment using text mining	text mining, degradation prediction, management of assets, risk base maintenance (RBM), substations equipment	Kobayashi, Tomohiro	Kobayashi, Tomohiro (1); Segawa, Osamu (2)	1: Chubu Electric Power Grid Co., Inc. Japan; 2: Chubu Electric Power Co., Inc. Japan
14:40-14:50			Session 2 Concluding Remarks		Crina Costan	Crina Costan	Chair of Session 2

Session 3: Sustainable substation solutions considering environmental impacts

15:30-17:20 (110 min)

Session Chair: Mark Kuschel (mark.kuschel@siemens-energy.com)

Session Secretary: Andreas Laubi (andreas.laub@saurecongroup.com)

Time	paperID	paper stream	title	keywords	Session speaker	authors	organisations
15:30-15:35			Introduction Session 3 and session guides		Mark Kuschel	Mark Kuschel	Chair of Session 3
15:35-15:50	1188	1. Learning from experien	Gas tightness technology for SF6 Gas Insulated Switchgear and application to synthetic air insulated switchgear	Gas tightness, SF6, SF6 alternative gas	Sato, Koma	Sato, Koma (1); Nakauchi, Shinichiro (1); Mori, Tsuyoshi (1); Sasamori, Kenji (1); Taketa, Koichi (2); Sasaki, Hoshito (2)	1: Mitsubishi Electric Corporation; 2: Kansai Transmission and Distribution Incorporated
15:50-16:05	1172	3. Towards a sustainable	Long-Term Use of Substation Equipment considering Environmental Impacts	Substation equipment, switchgear, transformer, long-term use, maintenance, environmental impacts, CO2 emission	Moriguchi, Seichi	Moriguchi, Seichi; Watanabe, Tatsuya	Chubu Electric Power Grid Co., Inc., Japan
16:05-16:20	1247	3. Towards a sustainable	An SF6 Switchgear Network Emissions Model to Inform Strategic Decisions	SF6, emissions, switchgear, alternate insulation, model, greenhouse, GHG	Lamplough, Evan	Lamplough, Evan (1); Blair, Timothy (1); Laubi, Andreas (2); Bakker, Tom (2); Bramigan-Onato, Alexander (2)	1: Transgrid, Australia; 2: Aurecon, Australia
16:20-16:35	1360	3. Towards a sustainable	Sustainable substation solutions	Construction - sustainable, geopolymer concrete, composite materials, timber, SF6-free gas, IEC 61850, fuel cell - hydrogen, HVO generator, electric vehicles	Kruk, Lara	Kruk, Lara; Stafford, Daniel	Jacobs, Australia
16:35-16:50	1378	1. Learning from experien	Development of Seismically Strengthened 500kV Air Insulated Disconnector and Practice of Seismic Countermeasures Based on the Experience of a Huge Earthquake	Earthquake, resilience, disconnector, seismic standard, damper, restoration, time history	ETO, Atsushi	ETO, Atsushi (1); YOKOHATA, Keisuke (1); ISHIKAWA, Yuki (1); SEIDA, Hiroyasu (2); OYAMA, Tomoyuki (2); NAGATA, Kiyoshi (2)	1: TEPCO Power Grid, Inc., Japan; 2: TAKAOKA TOKO CO., LTD.
16:50-17:05	1333	3. Towards a sustainable	New Zealand's new National Seismic Hazard Model (NSHM): Implications for the design of substations and electrical equipment	Seismic, hazard, sustainable	Valencia Restrepo, Doralba	Valencia Restrepo, Doralba	Transpower NZ, New Zealand
17:05-17:15			Session 3 Concluding Remarks		Mark Kuschel	Mark Kuschel	Chair of Session 3

ATC Seminar 2023



SC B3 Papers Session: Thursday the 7th of September



ATC Seminar 2023



AP B3 Overview: Working Group Activities

- AP.B3 members participate in SC.B3, SC.A3 working groups – approximately 14 members work across several SC.B3 WGs
- There are two panel members working with the Australian Standards Committees: Crina Costan, Stephen Palmer
- There is one panel member working with the IEC committees: Crina Costan
- There is one member working with IEEE committees: Steve Palmer
- One nomination for WG.B3 Convener for 'Guidelines for Managing Black Start Resilience in Substations – Crina Costan

AP B3 Activities

- Held one technical seminar Non-SF6 Switchgear in July 2023
- Had three guest speakers from GE Grid, Siemens-Energy and Hitachi
- Held one day AP.B3 annual meeting in Cairns on Sunday the 03rd of September – 50 people attended the meeting
- One site visit to the National Measurement Institute
- AP.B3 has 32 members and one NGN
- There are representatives from T &D suppliers, contractors, consultants, and BHP

AP B3 Summary of Activities July 2017-November 2023

- Organized a Substation Conference in Hobart 2019
- Held multiple Technical Seminars with national and international participation
- Nine new memberships to the AP.B3 panel
- 1-2 days Annual Panel Meetings
- Issued 2 position papers
- Increased liaison with AS and IEC