

B1 Cable Systems

AC/DC and on-shore/of-shore

Take Aways CIGRE session 2024

J.C. Smit



cigre

For power system expertise

Questionnaire



SC B1

CONTENT

1. General
2. Session 2024
3. Outlook

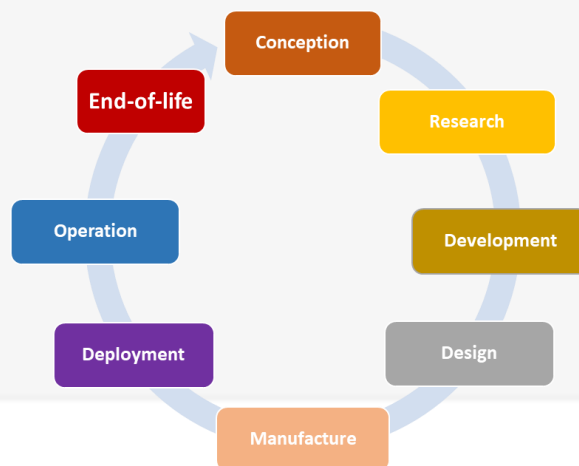
Scope

- **B1 Insulated Cables**

Scope: Theory, design, applications, manufacture, installation, testing, operation, maintenance and diagnostic techniques for land and sea cable systems for AC and DC voltage.

- If you would like more information or might be interested in playing an active role in the Study Committee, please contact the Chair of the Study Committee.

Questionnaire



Session 2024

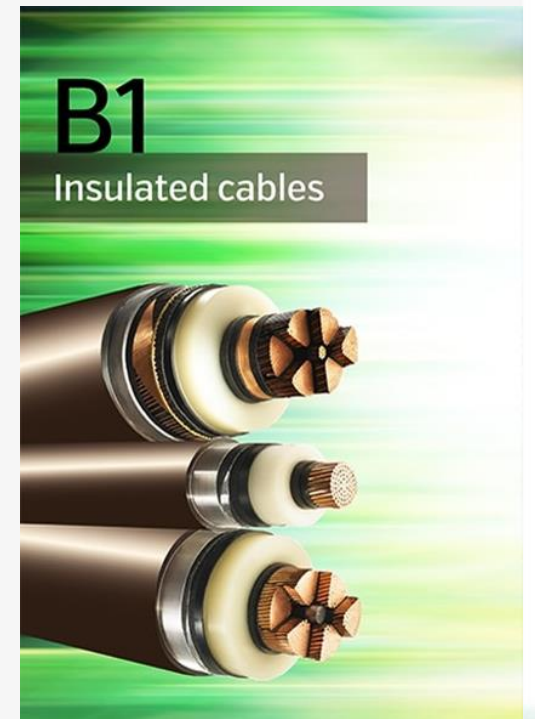
SC B1 is constituted as follows:

- A Chairman
- A secretary
- 24 regular members
- 15 observer members
- 6 additional members
- Conveners of AGs, WGs, TFs

Technical work performed through working bodies

- 4 Advisory Groups
- 18-20 Working Groups
- 2 preparatory Task Forces
- 9 Joint Working Groups

With participation of approx. 450 experts, 26% from Next Generation Network



CIGRE workflow

- National Representatives suggest proposal for Work
- 1 year Task Force to prepare Terms of Reference
- 3 year Working Group to produce Technical Brochure

Often copied to an IEC Standard.

Example of evolving from 2010:

B1.35 – Guide For ratings calculation (TB 640 - 2015)

B1.56 – Cable Rating verification (TB 880 – 2022)

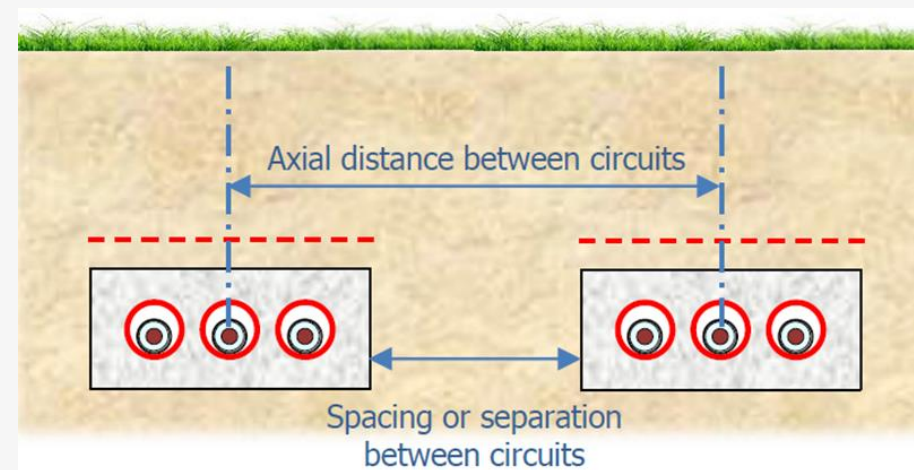
B1.64 – Evaluation of Losses in armoured three core power cables

B1.67 – Loading Pattern on cables connected to windfarms

B1.72 – Cable Rating verification – part 2

B1.87 – Finite Element Analysis for cable rating calculations

B1.91 – Calculation of Cycling current rating (IEC 60853)



Dutch B1 community

Chair	Jacco Smit	TenneT TSO	jacco.smit@tennet.eu
Secretary	Peter van der Wielen	DNV & TU Eindhoven	Peter.vanderWielen@dnv.com
Member	Frank de Vries	TenneT TSO	
Member	Alphons Baas	DEKRA Certification	
Member	Eef Beukers	Stedin	
Member	Wouter van Doeland	Energy Solutions	
Member	Dennis Kramer	Tata Steel & KEGROB	
Member	Pieter Kuijpers	CESI – KEMA labs	
Member	Sjoerd Nauta	Qirion	
Member	Laurens Pots	TKF	
Member	Jos van Rossum	Prysmian	
Member	Sander Meijer	EP-ics	
Member	Roy Zijderduin	TenneT TSO	

- 13 national members
- TSO, DSO's, Industry, Manufacturers, Consultancy
- 2 meetings per year
- Dutch B1 events
- Thoughts on:
“Civil contractors / installers and universities as co-consulting-connection”



Country report 2024 – main points

- General concerns about progress of TF/WG. Based on experience the 'work' takes too much time, members time spend or change roles/companies, etc. A proposal for decision making and/or changes is send to the CAG and received by SC B1.
- The 525 kVDC is coming quickly and first installations are conducted. The amount of these investments / kilometres give certain concerns on quality aspects, manufacturing, jointing etc. We as an community can expect challenges on short term and how to deal with this within SC B1?
- Bundling of critical infrastructures, e.g. H₂, CO₂, electricity, will need much more attention on the point of mutual interference like magnetic induction and explosion risks. Can we some how within CIGRE make a connection towards other type of industry and/or pipe line communities?
- For the Netherlands, the first multipurpose pipeline and cable corridor will be developed. This is the so called Delta Rhine Corridor where the feasibility check is ongoing to combine 525 kVDC with steel pipe filled with H₂, CO₂ and other fluids.
- First proof of building multipoint off-shore connection are ongoing. For the Netherlands and the UK is this the Lion-Link with a connection to a windfarm. All looks fine at the moment, however we need to understand the operational life time of the cable circuits related to the maintenance and repair strategy.
- At DSO level so many cable km's will be installed that this requires much cable and accessory production capacity that frameworks contracts need/will be launched to secure a spot in production. In the end more than 100.000 km LV, MV up to 50 kVAC is needed in the coming decade.



Send in Dutch new work initiatives

- Connection of large cable conductor size GIS cable compartments
 - ❖ > 2500 mm² conductor
 - ❖ New gasses use higher operating/testing pressure
 - ▶ related to thin wall thickness inner cone due to big cross sections
 - ❖ Not to open GIS cable compartment
- Improvements of Range of Approval criteria for HV and EHV power cables
 - ❖ How to deal with qualification of multiple changes like conductor material and cross section?
 - ❖ How to verify and compare confidential product information?
 - ❖ New extrusion lines, what is considered as ‘same technology / process’?
- Testing of Earth Screen of Array Cabling in Wind Farm Array
 - ❖ Inventory of the real current loading requirements including the effects of harmonics, transients, loading profiles and end-effects (3-core into 3 single cores).
 - ❖ Inventory and review the effects of shortening cycle time.
 - ❖ Recommendation for testing/qualification of earth screen connections in wind farm array cabling.



Session 2024

Preferential Subject 1 (PS1) - Learning from experiences

- Design, manufacturing, installation techniques, maintenance and operation
- Quality, monitoring, condition assessment, diagnostic testing, fault location
- Lessons learned from permitting, consent and safety issues from design to implementation

PS1 attracted authors from 25 different countries resulting finally in 56 papers and 33 contributions

Preferential Subject 2 (PS2) - Future functionalities and applications

- Innovative cables and systems, exploring the limits of both land and submarine cables
- Role and requirements of power cables in tomorrow's grids
- Prospective impacts from the Internet of Things, Big Data and Industry 4.0 and Robotics on power cable systems

PS2 attracted authors from 15 different countries resulting finally in 20 papers and 15 contributions



Session 2024

Preferential Subject 3 (PS3) - Towards sustainability

- Experience with technical sides of environmental challenges for current and future cable systems
- Technical impacts of recycling, roadmap to net zero, Lifecycle of system with upgrading and uprating, inclusion of new technologies such as Hydrogen
- Projects and initiatives to promote access to affordable, reliable, sustainable distribution and transmission cable systems for all

PS2 attracted authors from 8 different countries resulting finally in 9 papers and 5 contributions

In total 85 papers were sent in (2022: 55):

- 3-5 peer reviews per paper
- More than 80 co-reviewers handling the peer reviews
- 5 special reporters for the guidance, evaluation and leading the Paris session

Jacco Smit, Florian Ainhirn, Alexandra B Burgos Melguizo, Ivan Jovanovic, Søren Krüger Olsen



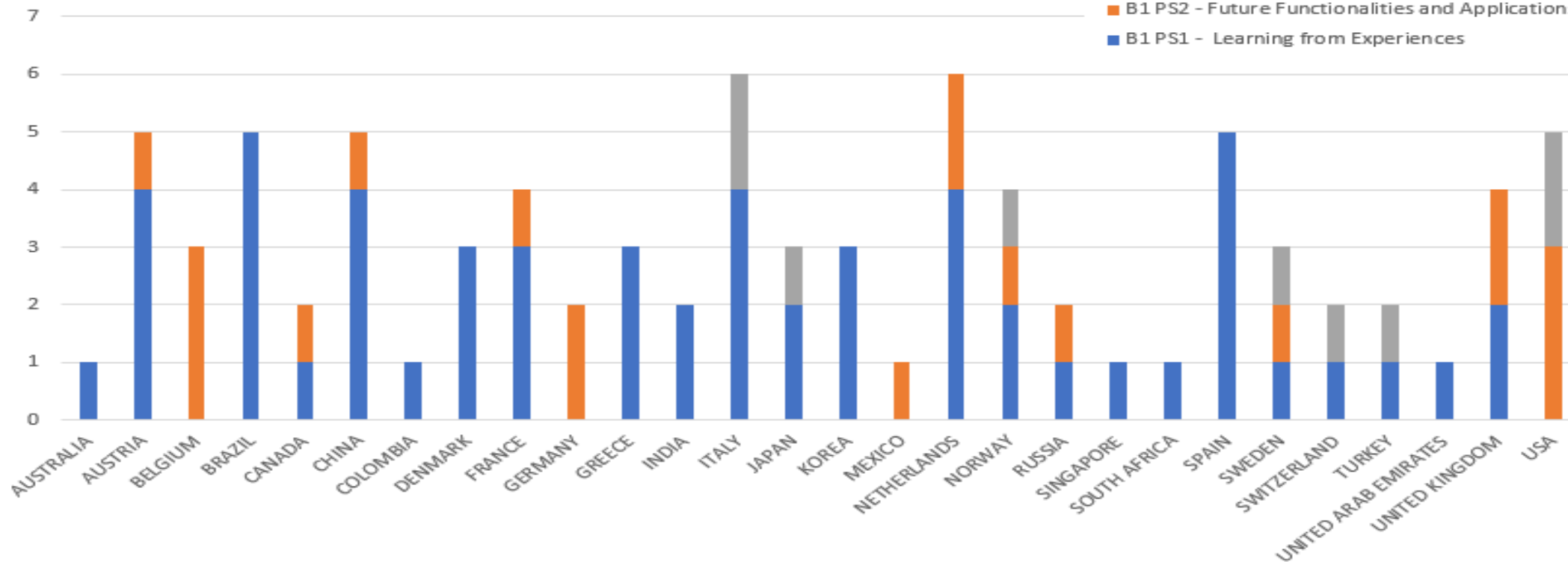
Session 2024

Accepted papers ▼

Number of papers

Topics ▼

- B1 PS3 - Towards Sustainability
- B1 PS2 - Future Functionalities and Applications
- B1 PS1 - Learning from Experiences



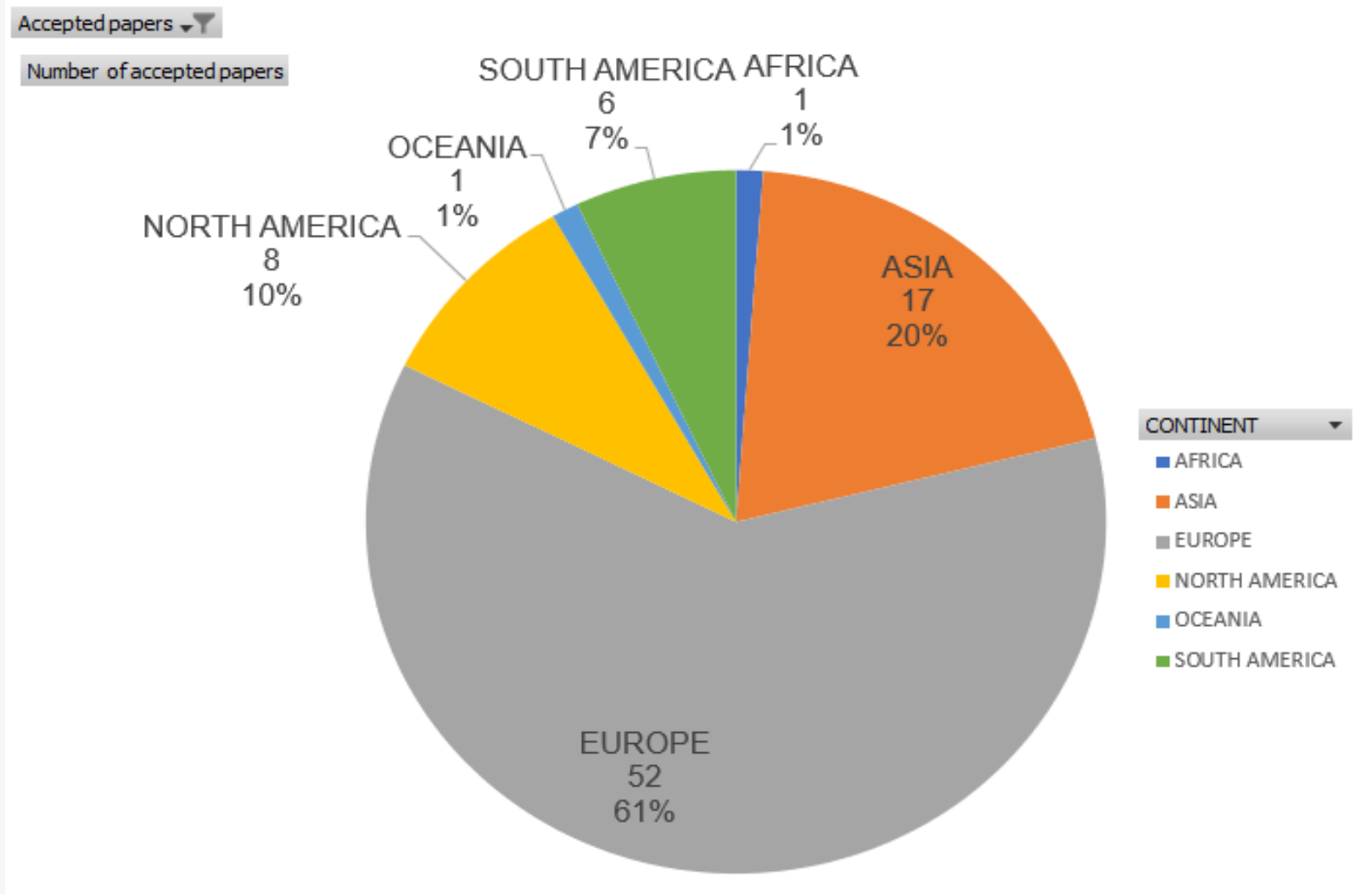
In total 8 Dutch paper contributions for B1:

- 8 contributions were fully accepted
- 2 contributions were not accepted

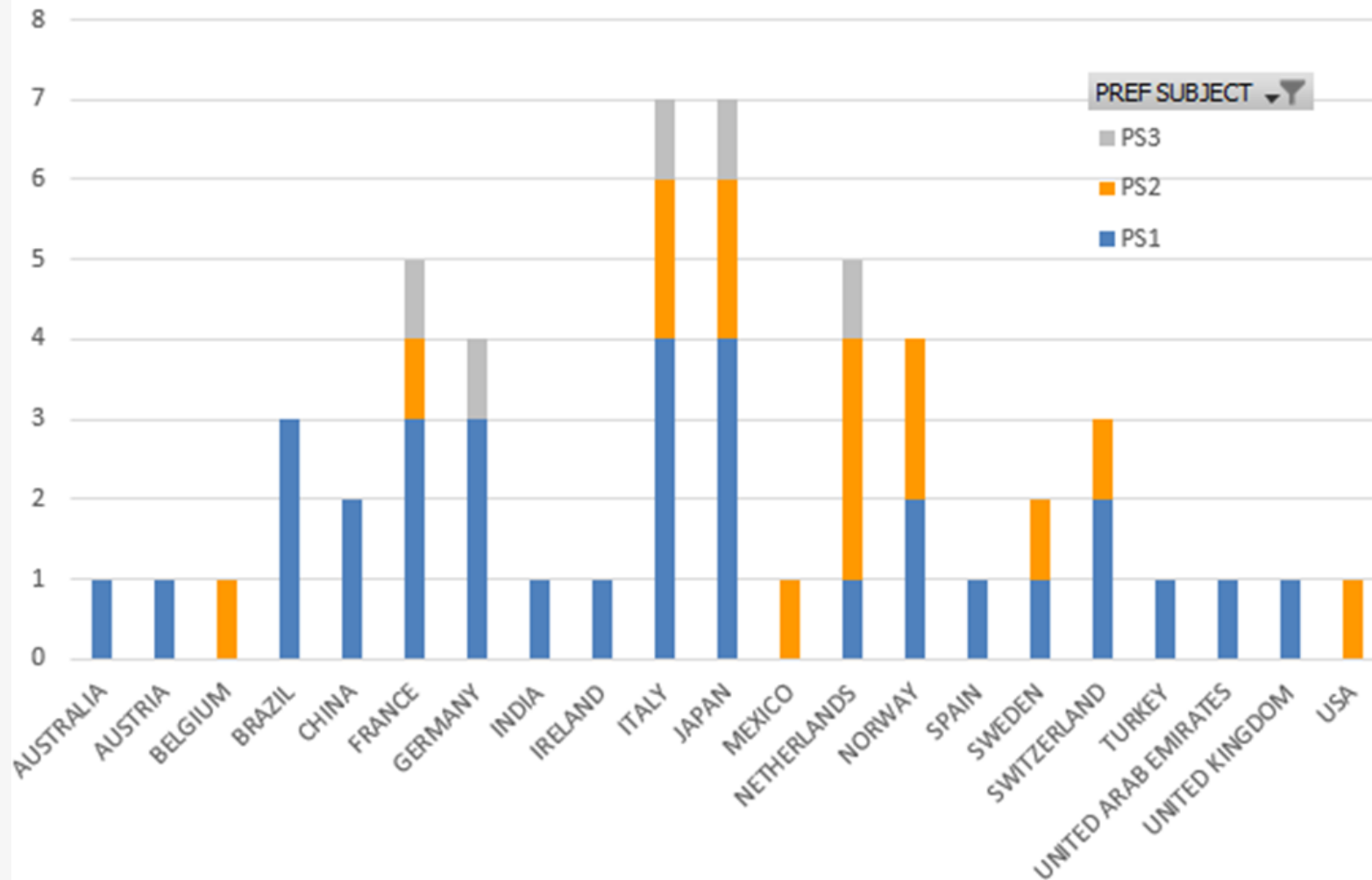


Session 2024

- Majority: Europe
- Africa and Oceania lagging expectations
- Asia still growing



Session 2024



- Total of 53 prepared contributions
- NL: 5 #



Session 2024

- New Work Initiatives

Final decisions during annual SCB1 meeting (August 28th, 2024) :

NWI proposals 2024 (final name to be adjusted)	WG or TF	number	Countries participating
TF B1.94 Grid operations (switching etc ...) and transient voltages in XLPE insulated cable systems possibly causing accelerated failure modes	TF	94	TF continues for 1 more year, to collect more data
TF B1.95 Mechanical performance and limits of submarine power cable systems	WG	95	FR, ES, IE, GB, CA, JP, DK, NO, BR, <u>NL</u> , KR, DE, US, CN, SE, IT
NWI-321 - Cable accessory failure hazard mitigation	TF	96	NZ, IT, CN, US, <u>NL</u> , CA, GB, BE, AU, IN, ES
NWI-345/349 - Improvements of Range of Approval criteria for HV and EHV power cables	TF	97	FR, BE, GB, ES, CA, IN, ZA, JP, NO, BR, <u>NL</u> , MX, AT, KR, DE, PT, US, SE, IT <i>SAG will handle the launch of this TF</i>
NWI-346 - Test Recommendations for Earth Screen Power Cable Connections in Wind Farm Array Cabling	TF	98	CH, GB, BE, ZA, DK, NO, <u>NL</u> , KR, DE, US, IT, SE, NZ
NWI-351 - Evaluation of sustainable Power cables	TF	99	FR, CH, BE, AU, IN, NO, RO, AT, <u>NL</u> , PT, CN, IT, NZ

One full member and one NGN are allowed per TF/WG

If interested contact: jacco.smit@tennet.eu



Outlook 2025

International SC B1 meeting:

- Host: The Netherlands
- Location: to be decided
- Agenda: 4 days meeting

National B1 Theme day:

- Idea: to combine with International SC B1 meeting
- Topic: could be ‘Tutorials’ ~ ‘Big corridors’ ~ ‘Speeding-up’

National B1 meeting:

- If you have e.g. ideas, suggestions, new topic please let jacco.smit@tennet.eu know



Outlook 2025

International SC B1 meeting:

- Host: The Netherlands
- Location: to be decided
- Agenda: 4 days meeting

National B1 Theme day:

- Idea: to combine with International SC B1 meeting
- Topic: could be ‘Tutorials’ ~ ‘Big corridors’ ~ ‘Speeding-up’

National B1 meeting:

- If you have e.g. ideas, suggestions, new topic please let jacco.smit@tennet.eu know



Outlook 2025



Call for Papers

Deadline synopsis: September 27th, 2024

CHANGES NEEDED IN THE POWER SYSTEM

for the Energy Transition

International Symposium hosted by the Nordic Regional Council of CIGRE (NRCC) in Trondheim, Norway on May 12–15, 2025



CIGRÉ 2025 International Symposium

Palais des Congrès de Montréal, Québec, Canada • From September 29, 2025 to October 2, 2025

