CIGRE PARIS SESSION 2024

SC D2: “Information Systems, Telecommunications, and Cybersecurity”

Cigre SC D2 – Key Take Aways Paris 2024

CIGRE KTA event – 26 sept 2024

Amadou Louh (NL)

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SCD2 – Scope

- SC D2 naamwijziging: “Information Systems, Telecommunications, and **Cybersecurity**”

INFORMATION SYSTEMS

Voorbeelden onderwerpen

- Artificial intelligence,
- Big data,
- Cloud computing,
- Server infrastructure,
- Edge computing

TELECOMMUNICATIONS

Voorbeelden onderwerpen

- Legacy systems,
- Packet-switched networks,
- Network management and automation,
- wireless and cellular technologies

CYBERSECURITY

Voorbeelden onderwerpen

- Cybersecurity standards and regulation,
- Cybersecurity architectures,
- Cybersecurity guidelines and controls

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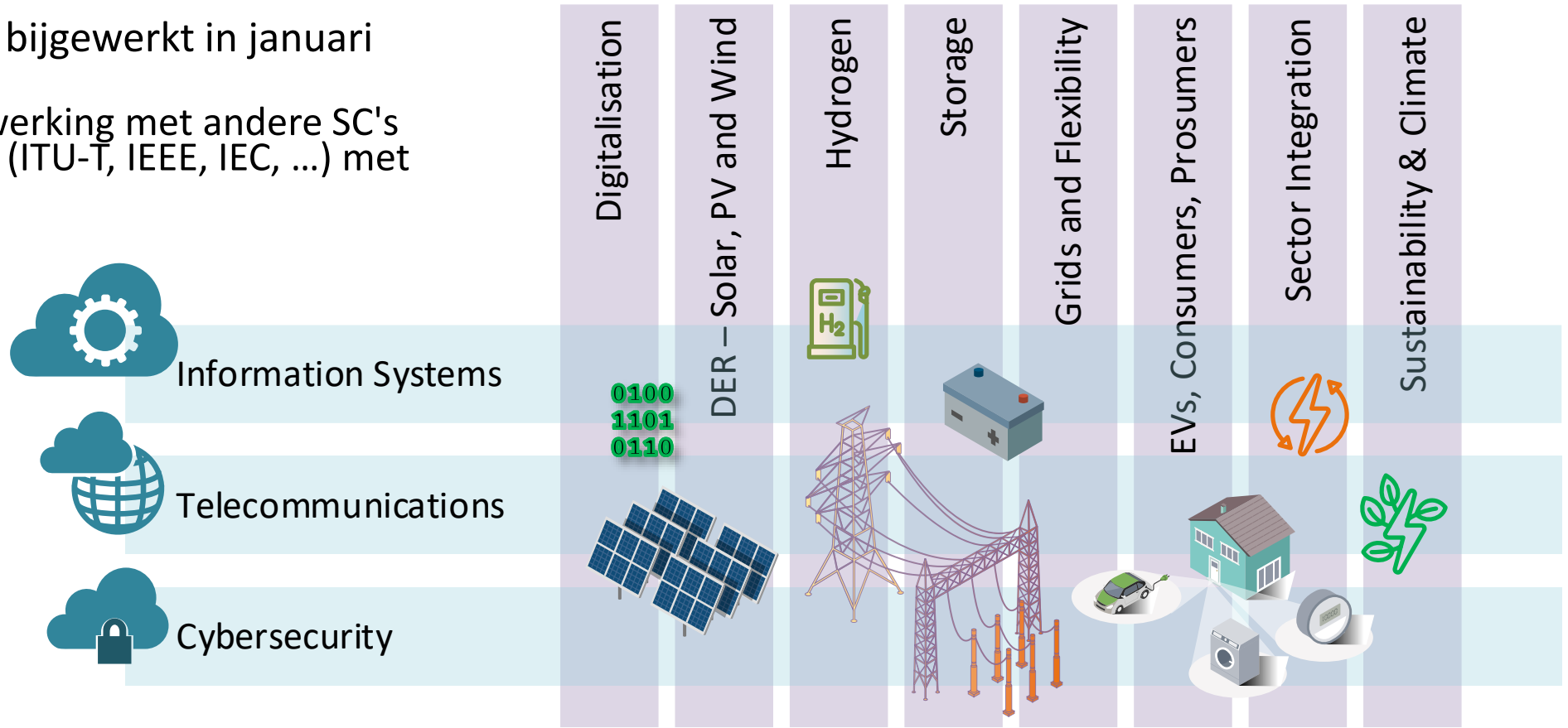
SCD2 – Missie, Strategie

- SC D2 missie: Study Committee D2's mission is to **develop**, ***facilitate collaboration***, and **disseminate knowledge** within the power industry in the areas of Information Systems, Telecommunications, and Cybersecurity.

- SC D2 **Strategisch Plan** bijgewerkt in januari 2024
  - Verhoogde samenwerking met andere SC's en externe partijen (ITU-T, IEEE, IEC, …) met meer openheid

- **JWG D2/B5**



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SCD2 – Prestaties in 2023/2024

- **SC D2 beoordelingscommissie opgericht:**
  - 29 deskundige beoordelaars uit verschillende landen
  - 76 recordbrekende aantal papers beoordeeld
  - Beoordeelt ook de technische brochures van de WG vóór publicatie.

- **Nieuwe werkgroepen gevormd:**
  - Julie 2023 : **WG D2.58** - Monitoring, Maintenance and Control of Packet Networks & Services: From Situational Awareness to Network Control; Convenor: Bongani Shezi (ZA)

- **Werkgroepen herstart:**
  - Julie 2023 : **WG D2.44** - Usage of public or private wireless communication infrastructures for monitoring and maintenance of grid assets and facilities; Convenor: Alexander Pinhel (BR)
  - November 2023 : **WG D2.49** - Augmented reality to support EPUs operation and maintenance; Convenor: Carolina Villasanti (PY)
  - December 2023: **WG D2.51** - Implementation of Security Operations Centers (SOC) in Electric Power Industry as Part of Situational Awareness System; Convenor: Bruce Large (AU)

SCD2 – Publicaties in 2023/2024

- SC D2 newsletters en LinkedIn newsletters:
  - August 2023, editor: Joël Nouard; Country in focus article: Rodrigo Leal (Brazil)
  - January 2024, editor: Joël Nouard; Country in focus article: Danilo Lalovic (Serbia)
  - June 2024, editor: Marcelo Araujo; Country in focus article: Chen-Ching Liu, Junho Hong (USA)
- Technical Brochures:
  - July 2024: JWG D2/C2.48 – TB 936: Enhanced Information and Data Exchange to Enable Future TSO-DSO Coordination and Interoperability; Convenor: Gareth Taylor (GB)
  - April 2024: JWG D2/C6.47 – TB 929 : Advanced Consumer Side Energy Resource Management Systems; Convenor: Aleksey Nebera (RU)
- Future Connection articles:
  - April 2024: Cybersecurity Maturity, Victor Tan
  - September 2023: Common Information Model (CIM), Roman Bogomolov, Nikolay Belyaev

SCD2 – Future works

- Nieuwe werkgroepen:
  - Consumer-side Digital Twin Models, proposed by Fedor Nepha (RU)
  - High Voltage Power Line Carrier Communications Current State and Future Application, proposed by Anton Merkulov (KZ)
  - Intelligent Computing for Power Industry, proposed by Kunlun Gao (CN)

- Upcoming Webinar:
  - Time in Communication Networks, Protection and Control Applications, presented by Antti Viro (FI); donderdag 3 oktober 2024 13:30-15:00; https://register.gotowebinar.com/register/8015297271293767513?source=CIGRE+website

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PS1: IT/OT solutions to improve the efficiency and resilience of electric power systems

Subtopics:

1. *Internet of things (IoT) architectures and applications in improving the resilience of electric power systems.*
2. *Applications and platforms of artificial intelligence, big data and analytics in operational technology.*
3. *Improving efficiency and resilience of power utilities with cloud technologies.*

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PS1 – Samenvatting

- *19 landen hebben papers ingediend*
- *40 papers geaccepteerd*
- IT/OT integratie
- Remote Monitoring en Predictive Maintenance
- AI-Driven Decision Support Systemen:
  - AI transformeert het beheer van het elektriciteitsnet door voorspellende analyses te bieden, het stroomverloop te optimaliseren en autonome besluitvorming mogelijk te maken, wat de betrouwbaarheid en operationele efficiëntie van het net verbetert.
- Big Data Analytics voor verbeterde monitoring :
  - De integratie van big data-analyseplatformen stelt nutsbedrijven in staat om enorme hoeveelheden operationele gegevens te verwerken, waardoor realtime monitoring, foutdetectie en proactieve onderhoudsstrategieën mogelijk worden.
- AI in Assetmanagement en Failure Prediction:
  - ML ML-modellen worden steeds vaker gebruikt voor voorspellend onderhoud, waardoor assetbeheer wordt geoptimaliseerd door uitrustingsfouten te voorspellen en downtime te verminderen, wat de levensduur van activa verlengt en de algehele systeemprestaties verbetert.

PS1 – Key take aways

Digital solutions becoming **more mature**

AI, IoT and Big Data use cases moving from the **periphery to the core**

PS2: Cybersecurity in emerging application domains and technologies for securing energy organisations

Subtopics:

1. *Cybersecurity for the control infrastructures of Distributed Energy Resources (DER), microgrids, and energy communities.*
2. *Cybersecurity for electric vehicle charging and discharging control.*
3. *Cybersecurity in cloud-based applications of power utilities.*

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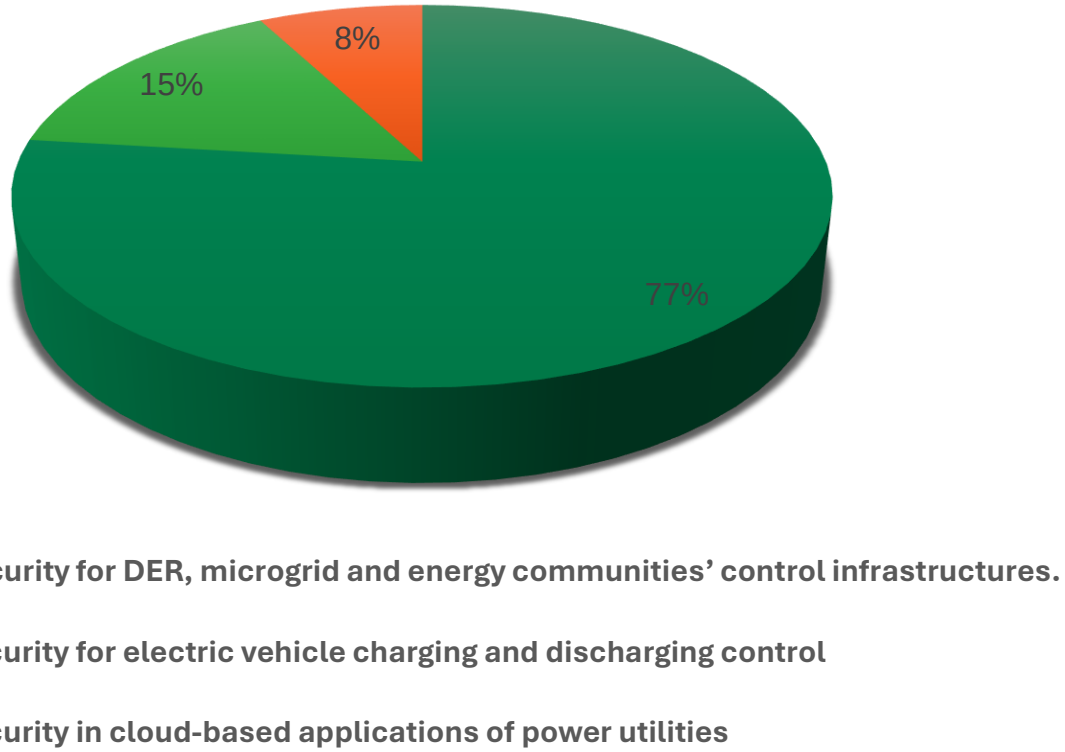
PS2 – Samenvatting

- 13 papers geaccepteerd
- Inhoud
  - Het identificeren van de belangrijkste risico's en het voorstellen van praktische en toepasbare oplossingen om deze te mitigeren.
  - Beveiligingsprotocollen in cloudapplicaties, bescherming van microgrid-infrastructuren en cybersecuritystrategieën voor EVs
- Aanbevelingen
  - implementatie van standaarden zoas IEC 62443 en ISO 27001
  - adoptie best-practices zoals Zero Trust en continuous risk management



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PS2 – Key take aways

In de toekomst wordt het steeds belangrijker om op een interdisciplinaire manier aan cybersecurity te werken, waarbij zowel juridische en regelgevende aspecten als fysieke beveiliging in overweging worden genomen.

- Naleving van cybersecurity-verplichtingen door de omzetting van Europese regelgeving en nationale wetgevingen
- Cybersecurity-certificeringsschema voor de energiesector
- Cybersecurity in de toeleveringsketen
- Cloud-cybersecurity voor energie-applicaties
- Oplossingen voor cyberdreigingsdetectieplatformen, operationele ondersteuningssystemen, big data- en AI-platformen
- Digital twins van cyber-elektrische systemen
- Integratie van fysieke en cyberbeveiliging om het beheer van activa binnen de elektriciteitssector te beschermen en te verbeteren

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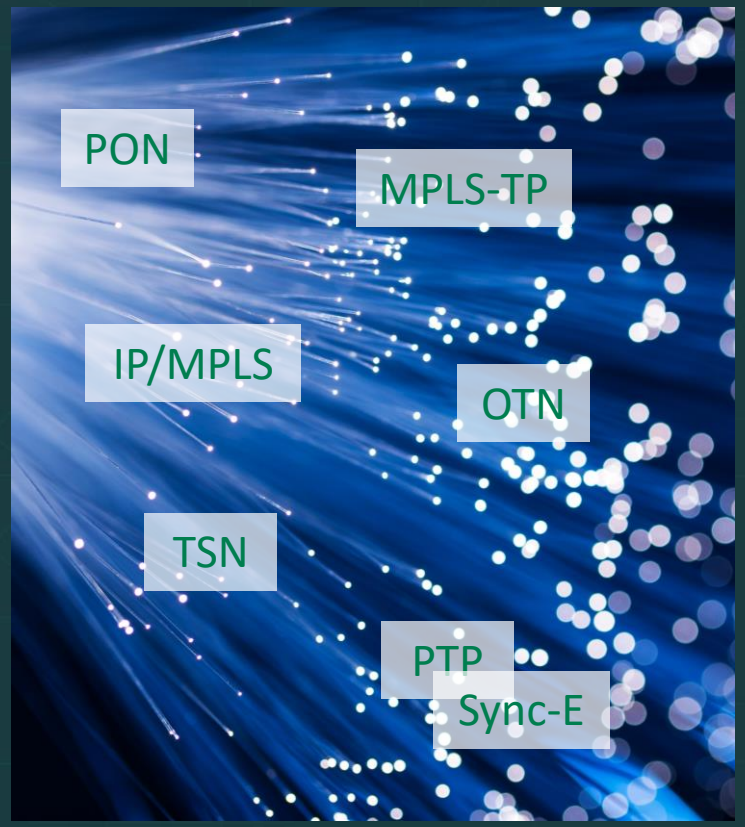
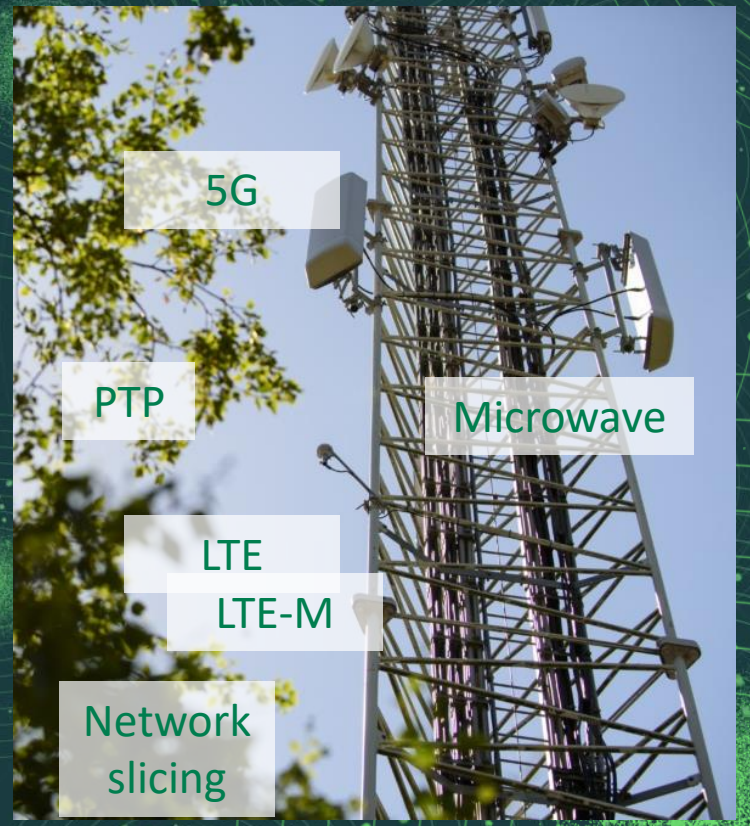
PS3: Meeting the challenges of energy transition with reliable, scalable, and efficient telecommunications networks



Subtopics:

1. Management, automation and orchestration solutions
2. Integration of current and new wireless technologies
3. Migrating legacy networks to support critical utility applications



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PS3 – Key take aways (Migratie naar pakket-geschakelde netwerken)

- SONET/SDH/PDH is een stervende technologie; Minder reserveonderdelen/ondersteuning/ontwikkeling; hogere onderhoudsrisico's; duur,
- **Bedrade** & **draadloze** fysieke laag
- van logische naar fysieke **segmentatie** (OTN, PON)
- ***n + (delay_long_path – short_path)***
- Verdergaande ontkoppeling control en data plane (**SDN**)
- Flexibiliteit, efficiency, less errors, gebruikersvriendelijkheid, i.r.t. schaalbaarheid en netwerk veranderingen (SDN)
- Nauwkeurige tijd (PTP) en frequentie (SyncE) **synchronisatie**

Circuit-based

TDM

Connection-oriented

Packet-based

IP/MPLS; MPLS-TP

Connection-less

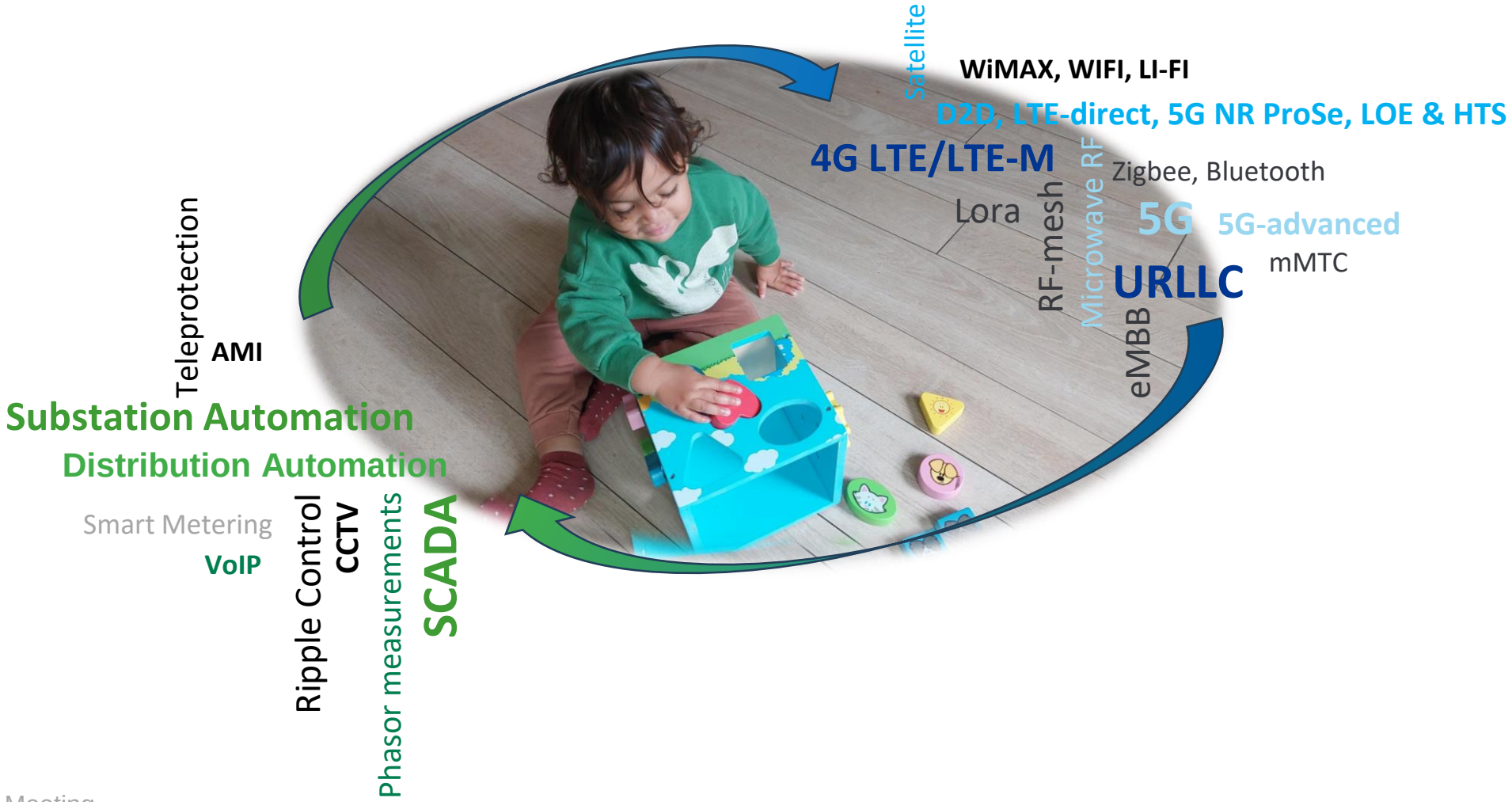
&

(can be made) Connection-oriented

PS3 – Key take aways (Grote verscheidenheid aan draadloze technologieën voor EPUs)

'The cheapest way to implement a smart grid is to integrate communication better', Heli KOKKONIEMI, contribution 42_3.5

- **26 papers**
- **Telecom requirements**
  - Bandwidth
  - Latency, jitter
  - Reliability, availability
  - Security
  - Device density
  - Environment
  - …
- **WG D2.44**
- **Meer samenwerking**



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Dank voor jullie aandacht!

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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

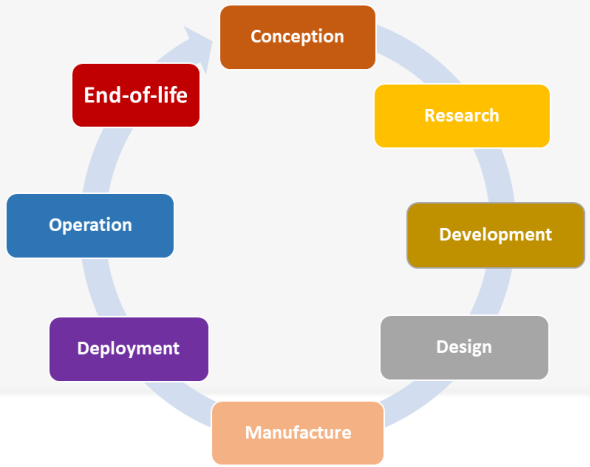
Scope

- **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

SC B1



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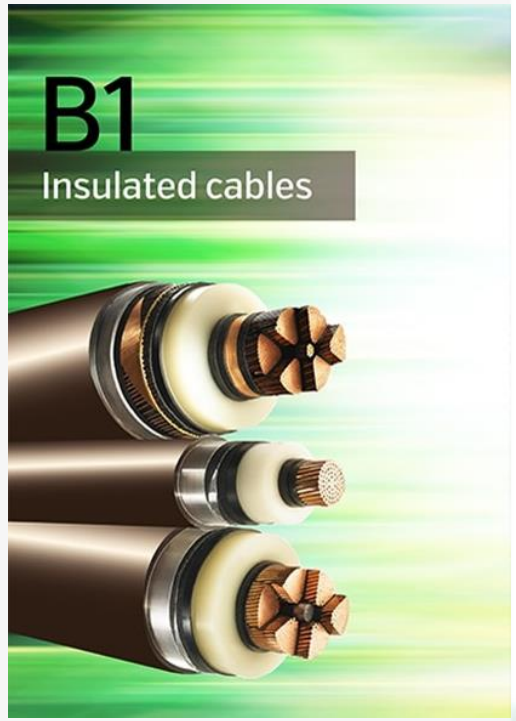


SC B1 is constituted as follows:

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

Technical work performed through working bodies

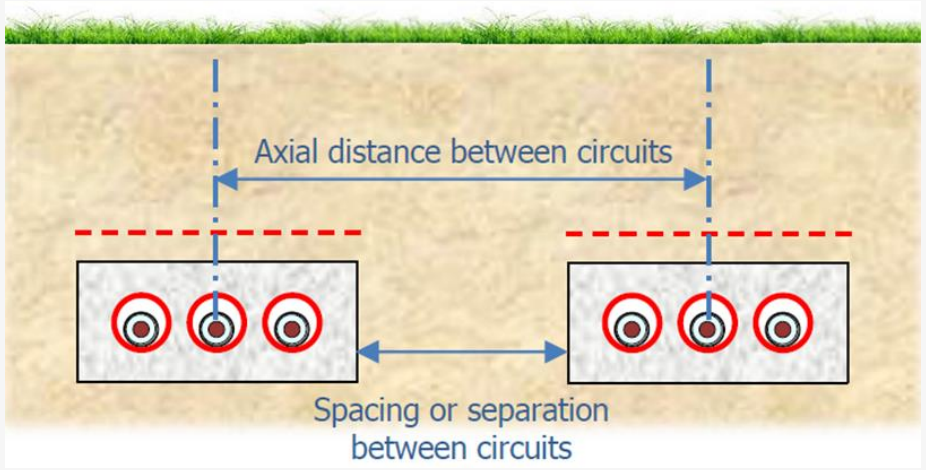
- 4 Advisory Groups
- 18-20 Working Groups
- 2 preparatory Task Forces
- 9 Joint Working Groups

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 Zuijderduin	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"

[Study Committee members B1 – National Committee (cigre.nl)]

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 on-going 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

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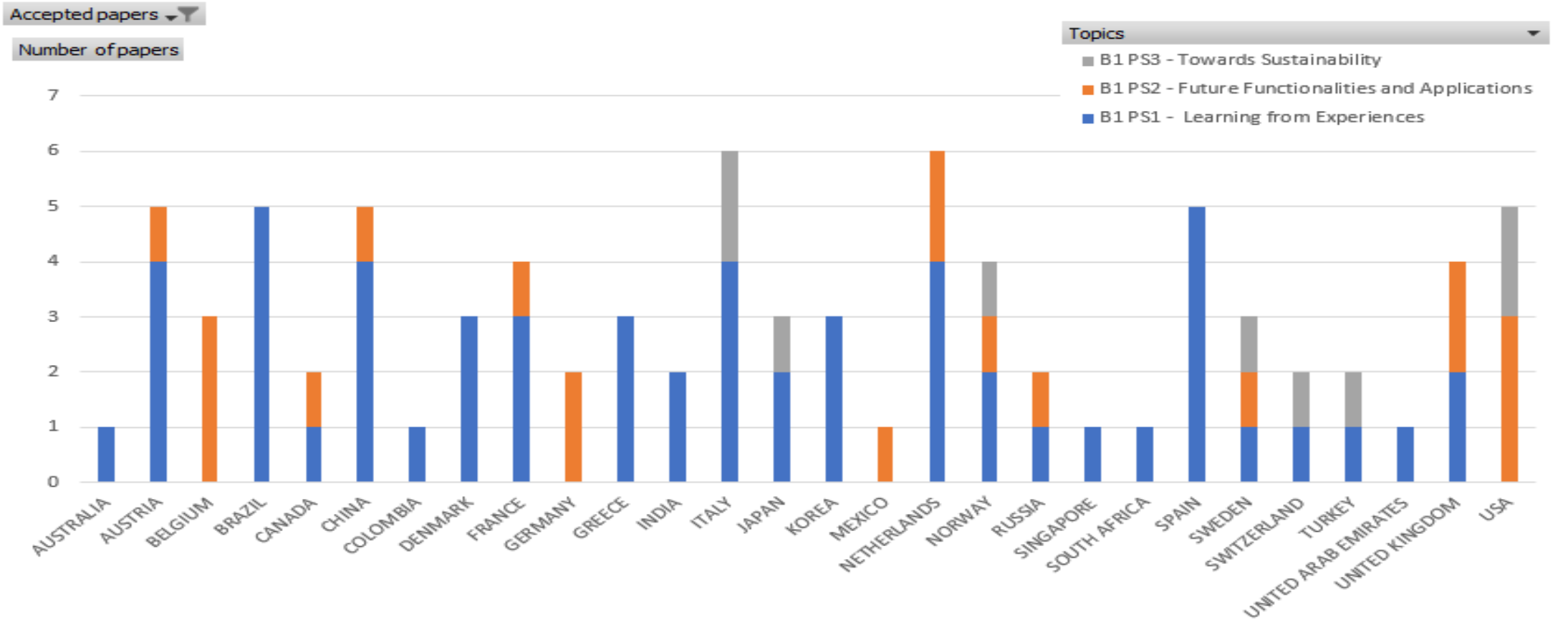
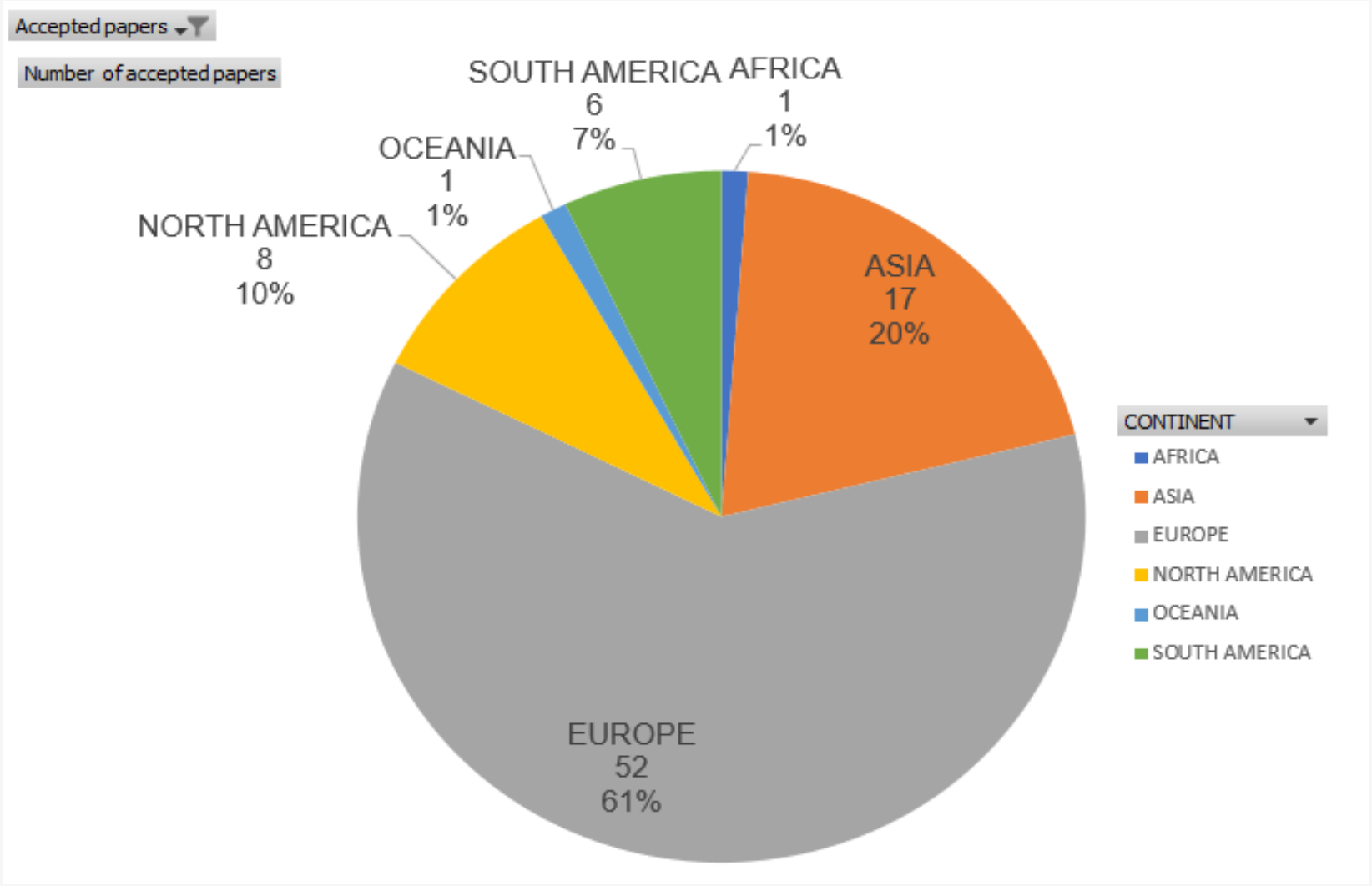


In total 8 Dutch paper contributions for B1:

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

Session 2024

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



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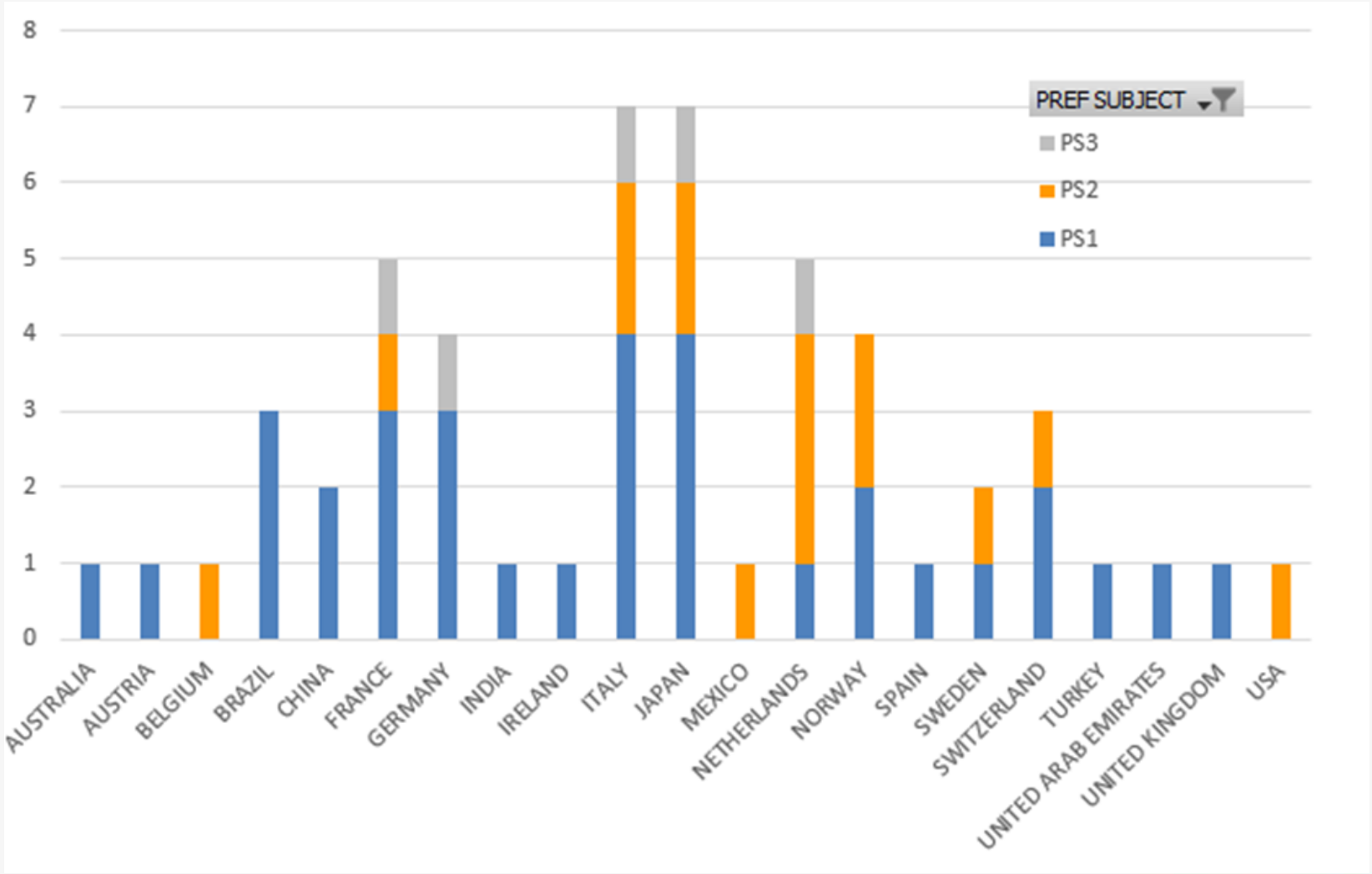

- Total of 53 prepared contributions
- NL: 5 #

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, NL, KR, DE, US, CN, SE, IT
NWI-321 - Cable accessory failure hazard mitigation	TF	96	NZ, IT, CN, US, NL, 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, NL, MX, AT, KR, DE, PT, US, SE, IT *SAG will handle the launch of this TF*
NWI-346 - Test Recommendations for Earth Screen Power Cable Connections in Wind Farm Array Cabling	TF	98	CH, GB, BE, ZA, DK, NO, NL, KR, DE, US, IT, SE, NZ
NWI-351 - Evaluation of sustainable Power cables	TF	99	FR, CH, BE, AU, IN, NO, RO, AT, NL, 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

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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

Canada

CIGRÉ 2025 International Symposium

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