Comitato Nazionale Italiano CIGRE

Panel Italiano SC A3 - HV EQUIPMENT

Meeting 18 Aprile 2023

cigre

For power system expertise

Paolo Mazza

Roberto Nicolini

COMITATO DI STUDIO A3
Transmission and Distribution equipment

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- General Discussion Meeting 2022 – Sintesi
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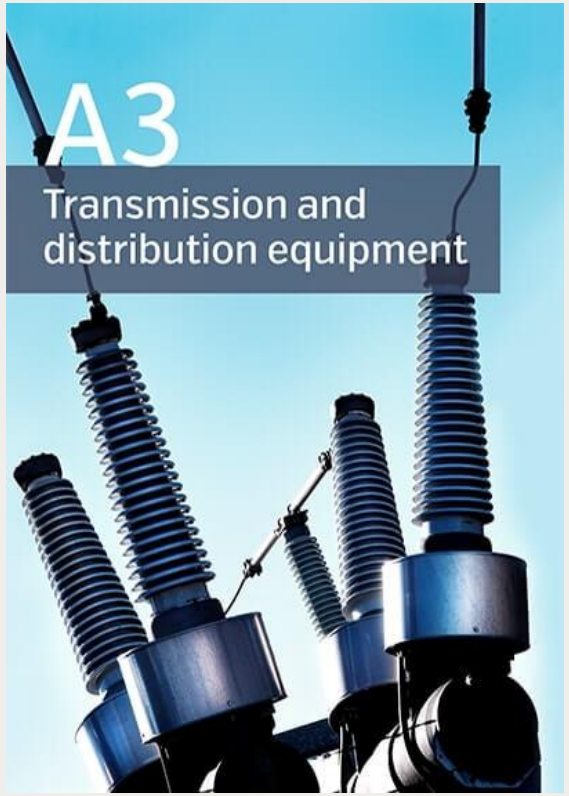
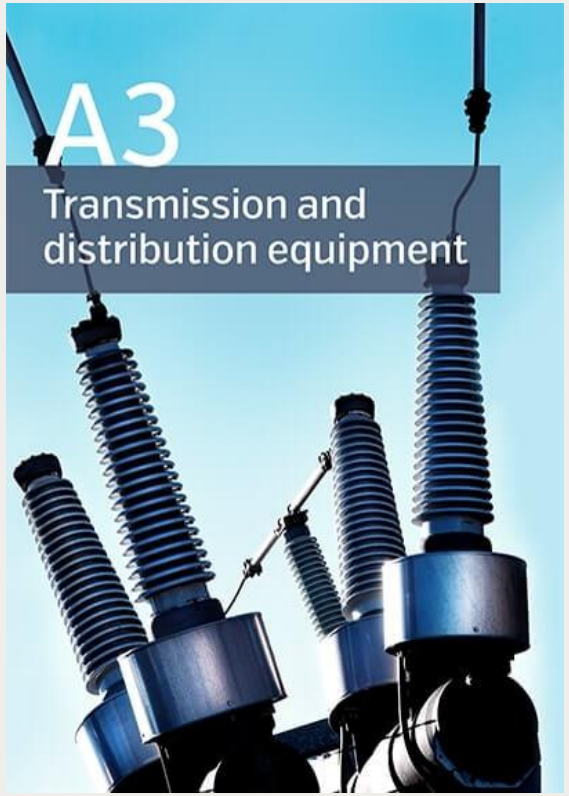


COMITATO DI STUDIO A3
Transmission and Distribution equipment

Il campo di attività del Comitato di Studio A3 copre le apparecchiature di commutazione, interruzione o limitazione di correnti, compresi interruttori, interruttori di manovra, *recloser*, *Ring Main Unit* (RMU), sezionatori, sezionatori di terra e fusibili limitatori di corrente, indipendentemente dalla tecnologia.

Comprende anche scaricatori di sovratensione, condensatori, sistemi sbarre, isolatori, trasformatori di misura, e tutte le altre apparecchiature non specificamente coperte da altri comitati di studio relativi ad apparecchiature.

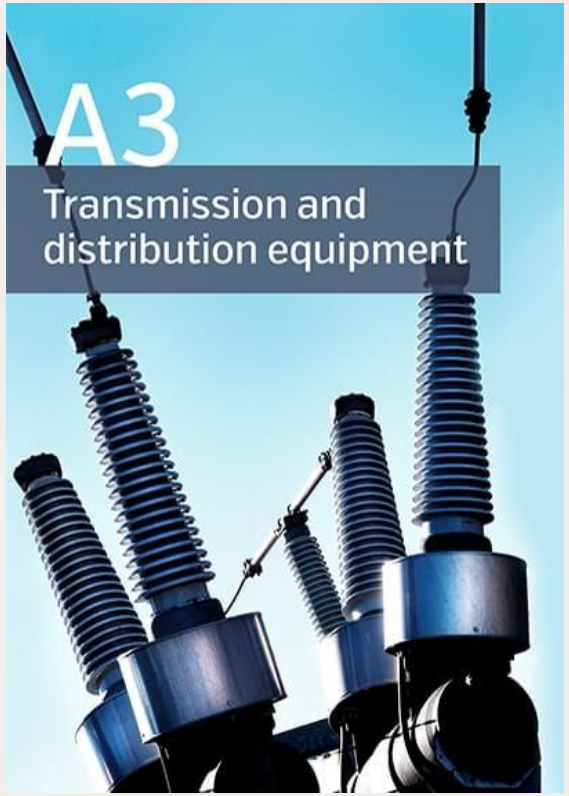
Infine, sono considerati tutti i tipi di isolamento (aria, gas o isolamento solido) e mezzi di interruzione (vuoto, gas…).



SCOPO

Relativamente al proprio campo di attività, il Comitato di Studio A3 affronta tutte le fasi del ciclo di vita delle apparecchiature; dalla concezione alla ricerca, allo sviluppo, progettazione, produzione, distribuzione, prove, installazione, funzionamento, manutenzione e al fine vita.

In tutte le fasi, vengono affrontati gli aspetti tecnici, di sicurezza, economici, ambientali e sociali, nonché le interazioni e l'integrazione con il sistema energetico in evoluzione e con l'ambiente. Tutti gli aspetti delle prestazioni, delle specifiche, delle prove e dell'applicazione delle tecniche di prova rientrano nell'ambito di applicazione, con un focus specifico sull'impatto dovuto all'evoluzione del sistema elettrico.



STRUTTURA

CHAIR Nenad Uzelac (G&W – US)

SEGRETARIO Frank Richter (50 Hz – Germany)

MEMBERSHIP 24 regular members (+6 additional)

15 observers

RAPPRESENTANTE ITALIANO Paolo Mazza

SEGRETARIO ITALIANO Roberto Nicolini

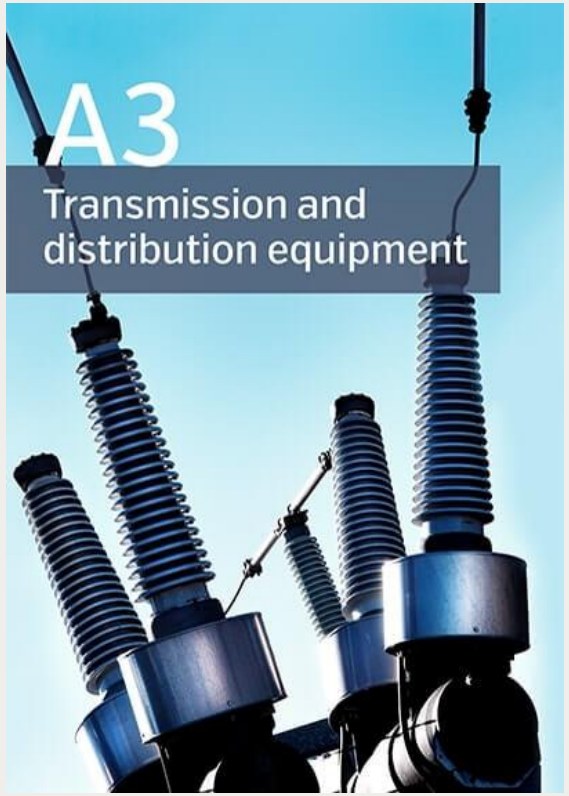
9 WORKING GROUP attivi + 5 JWG con partecipazione di A3

3 ADVISORY GROUP

AG 01 Strategic Planning (H. Ito)

AG 02 Tutorial Planning (R. Smeets)

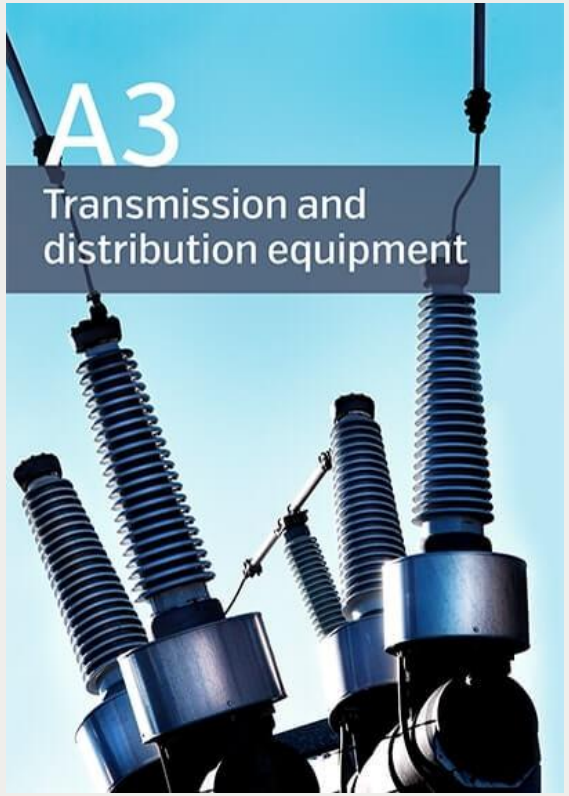
AG 03 Greenbook Project on “Switching Equipment (H. Ito)



ORIENTAMENTO STRATEGICO

SC A3 è caratterizzato dai seguenti obiettivi strategici "3D" (Decentramento, Decarbonizzazione e Digitalizzazione):

1. Design e tecnologie innovativi (es. interruttori DC, *rating* più elevati)
2. Requisiti per apparecchiature in particolari condizioni di rete e ambientali (es. applicazioni *offshore*, condizioni meteorologiche avverse)
3. Applicazioni *smart* nelle apparecchiature di T&D (es. commutazione controllata, LPIT, tecnologie *digital twin*, *machine learning*)
4. Monitoraggio e diagnostica delle apparecchiature di T&D (es. sensori avanzati, applicazione di tecnologie non invasive)
5. Tecniche di prova innovative (es. sollecitazioni sovraimposte per apparecchiature HVDC)
6. Valutazione dell'affidabilità e gestione della vita residua delle apparecchiature
7. Focus su ambiente e sostenibilità (es. apparecchiature a minore impronta di carbonio, tecnologie SF6 *free*)



PANEL SC A3 - ITALIA

«Il ruolo dei Comitati Nazionali è quello di diffondere informazioni tecniche tra i membri, organizzare conferenze in cui sono invitati comitati di studio o gruppi di lavoro internazionali per affiancare ingegneri locali a esperti internazionali. Il Comitato Nazionale dovrebbe istituire una struttura simile alla struttura CIGRE nella propria area, in modo da rispecchiare tutti i Comitati di Studio. Il membro nazionale del comitato di studio dovrebbe presiedere questo sottogruppo (denominato gruppo o panel di attività regionale) e invitare membri del mondo accademico, industriale, dei servizi pubblici, delle autorità di regolazione e di altre parti interessate a prendervi parte. Lo scopo del panel è raccogliere informazioni dai membri per comprendere i loro problemi e domande, nonché fornire feedback al panel sui lavori più recenti condotti dal Comitato di Studio internazionale. Il membro nazionale dovrebbe portare le domande e le richieste in sede di Comitato di Studio per metterle a fattor comune con altri paesi con lo stesso problema. Qualora non fosse già disponibile una soluzione, si può formulare una proposta per un Gruppo di Lavoro.»

Rob Stephen - Presidente CIGRE: “Importance of the National Committees”, ELECTRA N°308 - Febbraio 2020

L'elenco dei Working Group attivi e di quelli chiusi negli ultimi anni, delle Technical Brochure e dei documenti pubblicati ecentemente e degli esperti italiani partecipanti ai lavori dei WG è disponibile sul sito web del Panel italiano ai seguenti indirizzi:

WG CHE HANNO TERMINATO L'ATTIVITÀ 2020-22

https://cigregroups.org/display/ITA3/Mirror+Panel+IT.A3+Home?preview=/51973913/141756649/Lista%20WG%20chiusi%20al%204-1-22.docx

WG E JWG ATTIVI

https://cigregroups.org/display/ITA3/Mirror+Panel+IT.A3+Home?preview=/51973913/141756648/Lista%20WG%20attivi%20al%204-1-22.docx

PUBBLICAZIONI 2020-2022

https://cigregroups.org/display/ITA3/Mirror+Panel+IT.A3+Home?preview=/51973913/145198896/A3-Ultimi%20documenti%20pubblicati.docx

ESPERTI ITALIANI PARTECIPANTI AI WG

https://cigregroups.org/display/ITA3/Mirror+Panel+IT.A3+Home?preview=/51973913/141756700/Esperti%20italiani%20nei%20WG%20al%204-1-22.docx

TUTORIAL SC A3

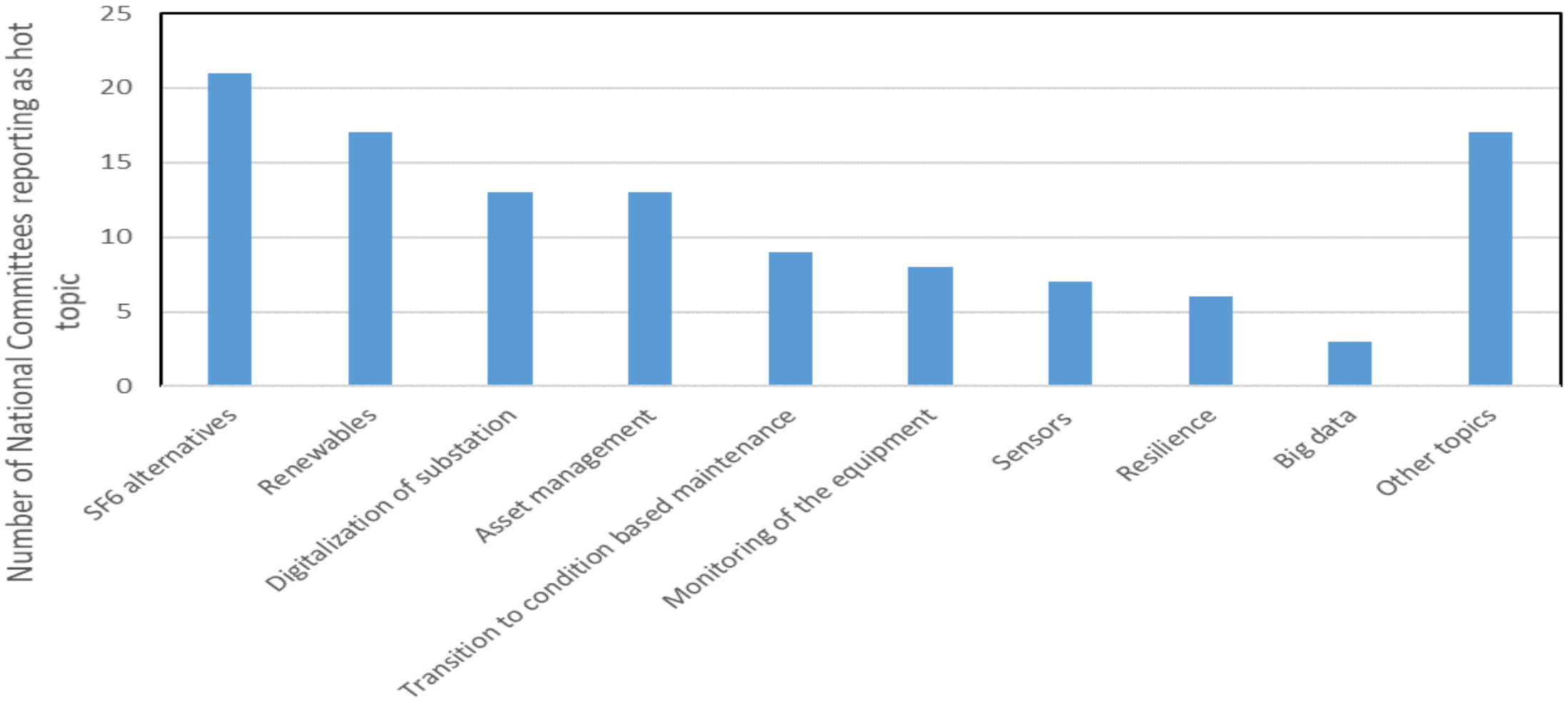
Ultimi tutorial svolti

Tutorial	SC / WG
A3 tutorial innovation	A3
A3 tutorial on vacuum switchgear	A3
A3.40 tutorial	A3, B4
Current Zero Club interruption in SF6 alt gases	A3
HVDC switchgear	A3, B4.34
Innovation in station equipment techologies	A3
Innovations in switching technology	A3
Non-intrusive monitoring techniques	A3.32
Reliability of HV Equipment	A3.06
Shunt reactor switching	A3
Switching phenomena	A3
Trends in switching technology	A3

Attesi nella Sessione di Parigi 2022:

- tutorial su Switching vacuum interrupters – con B4
- workshop su SF6 Alternatives – con B3
- presentazione di Current zero club

SC A3 Meeting 2022: “Hot Topics” (1)



SC A3 Meeting 2022: “Hot Topics” (2)

- Most national committees (23 out of 29) reported hot topics related to the **environment protection** exclusively including topics from the fields SF6 alternatives and renewables. Certain topics include **lower CO2 imprint** and changing the regulation and waiting for the **limitation of SF6**. Topics from the field of renewables mostly include challenges related to **integration of distributed energy sources**, **PV and offshore power generation**.

- Regarding the new technologies, 13 national committees reported **digitalization of substations** (and transmission and distribution equipment) as a hot topic and 8 national committees reported as a hot topic or interest in **HV DC grid**, including **HV DC breakers**. Six national committees reported topics of **resilience of substations** (and transmission and distribution equipment) including the resilience against **natural disasters and climate change** (USA, NLD, CRO) and **cyber resilience** (NLD, SWE).

SC A3 Meeting 2022: “Hot Topics” (3)

- Traditional hot topics are **asset management** (reported by 13 national committees) including the **end-of-life questions** (retrofitting or replacement), **transition from time-based to condition-based maintenance** and **monitoring** of the equipment in general.
- Certain national committees reported specific problems such as: **exploding CT-s in the beginning of life** (GBR), **explosive failure of instrument transformers** < 10 years (AUS), PV with battery storages and problems with harmonics (ZAF), etc.
- Additionally, some emerging topics are identified: **power supply for Data centers** (IRL, SUI), how to **manage store data, cloud data** (SUI, BRA, THA), **AI implementation into grid operation** (USA).

SC A3 Meeting 2022: Increasing CIGRE value and membership (1)

- *"CIGRE is the place to be to gain unbiased information. Its status may be higher than we see, and the need is clearly existing, which more expertise shifting from users to manufacturers"*

- CIGRE structure: Today driven by technologies, future: application driven?, it isn't visible or cannot understand

- *relationship with the standardization bodies, CIGRE does not create standards, no competition: share opinions, trends and visions*
  impact of CIGRE onto standardization is not very visible

- *improve a lot in our communication strategy and style*

- *communication outside of CIGRE to authorities, ministries to deliver unbiased positions or provide second opinion on given statements*

- *CIGRE as Mentor: Study committees are the professional so they are able to provide the good consult and discussion without biased facts. Students are the young engineer who can help us to work or research the new simulation or new solution*

SC A3 Meeting 2022: increasing CIGRE value and membership (2)

- *more involved in regional conferences*
- increase quality and acceptance of the publications: a) peer-reviewed and b) reports of members
- working groups with a more narrow scope and shorter time from startup to delivery (result not called as TB, something else)
- most difficult issue with finding new participating members, participation by younger engineers and professionals who do not feel they are an “expert” in their field yet
- WGs need to promote dual/hybrid access (physical and on-line) to encourage participation
  - *(CIGRE doesn’t fit in the life balance of young families)*
- *New approaches like:* like moderated open-source platforms
- *Platform to create knowledge (New forms of finance the work)*

See also in the following slides the presentation of the Italian Panel:

CIGRE Paris Session 2022

Italian Panel SC A3

Study Committee Meeting 30th August 2022

For power system expertise

Paolo Mazza

Roberto Nicolini

ITALIAN NATIONAL COMMITTEE AT A GLANCE

Establishement date	1957
Collective Members	18
Universities	8
Individual Experts	277
Equivalent Members	342

MIRROR PANEL SC A3 - ITALY

(new) Establishement date	24th November, 2021
Launched KMS website	1st February, 2022
Registered experts	47
- Regular members	44
- Observers	3
- Vendor	7
- Utility	3
- Consultant	15
- Academic	22
Experts participation to WG	8
Last panel meeting	8th July, 2022

MIRROR PANEL SC A3 - ITALY

- Involvement of Experts within the professional network:
  - CIGRE Members
  - Companies
  - Advertising in the framework of National Standardisation Body activities
  - Word of mouth
  - Opening of the National Panel to the “not yet” Memebers: no access to the deliverables but free access to discussion and proposals
- Next Steps:
  - Involvement of professional and academic associations
  - “In person” meeting (Autumn 2022)
  - Involvement of Italian NGN and WIE panels in order to booster the participation

KMS WEBSITE ITALIAN PANEL SC A3

cigregroups.org/display/ITA3/Mirror+Panel+IT.A3+Home

Mirror Panel IT.A3 Home

Creato da Gary Williams, ultima modifica di Roberto NICOLINI il ago 01, 2022

Benvenuti nello Spazio KMS dedicato al Mirror Panel italiano dello SC A3 Cigre "Transmission and Distribution Equipment"

Questo Spazio contiene informazioni sulle attività del Comitato di Studio Cigre A3 e consente di visualizzare le indicazioni dei Gruppi di lavoro, delle pubblicazioni tecniche e dei principali eventi legati al SC A3.

Lo Spazio riporta inoltre le proposte di creazione di nuovi Gruppi di Lavoro e permette di visualizzare i relativi ToR (Terms of Reference) per consentire di valutare e proporsi in qualità di esperto alla partecipazione ai relativi lavori.

Infine, attraverso questo Spazio è possibile accedere alle Technical Brochure in fase finale di revisione per collaborare con gli Officer del Mirror Panel alla loro verifica.

STUDY COMMITTEE A3 – Novità e notizie in evidenza

- 17-lug-2022 **Creati nuovi Blog sul nostro sito!**

  Come discusso nell'incontro del 8 luglio, è stato richiesto ai rappresentanti nazionali del SC A3 di portare propri contributi alla riunione dello Study Committee programmata il 30 agosto a Parigi durante la Cigre Session 2022. Il Segretario del SC Frank Richter ha indicato alcuni argomenti su cui siamo chiamati a rispondere e formulare nostre proposte da discutere opportunamente in sede internazionale.

  Nella sezione Blog di questo sito (in fondo a questa pagina) abbiamo predisposto tre aree con altrettanti argomenti su cui vi chiediamo di esprimervi per fornirci supporto alla preparazione dei contributi del nostro Panel italiano.

  Attendiamo entro il **22 agosto** i vostri preziosi contributi di cui vi ringraziamo fin d'ora!

- 15-lug-2022 **Nuovo WG A3.48 "4th CIGRE Reliability Survey on Transmission and Distribution Equipment"**

  "The scope of the fourth CIGRE reliability survey is expanded to cover generator circuit breakers, vacuum circuit breakers and MO surge arresters to provide field experience to related WGs. Dworking group will deliver a technical brochure on lifetime management of indoor medium voltage switchgear. The WG will mainly summarize and update the results and publish the reliability data on transmission and distribution equipment showing these differences in the reliability dependence on specification, design, service-year, maintenance and replacement policy, country by country (but anonymously without showing the utilities name), by comparing the new results with the previous results".

  Gli Esperti interessati a partecipare alle attività del WG sono invitati a inviare la loro candidatura al rappresentante italiano nello Study Committee e al Segretario del Panel italiano utilizzando il template scaricabile **qui.** Si ricorda che, in base alle regole CIGRE, la partecipazione alle attività di ogni WG è aperta a un numero limitato di Membri, in rappresentanza del Comitato e del Panel Nazionali.

- 13-lug-2022 **Meeting on-line Panel italiano "SC A3 CIGRE - T&D Equipment 8 luglio 2022"**

Link utili

- CIGRE website
- e-CIGRE
- ELECTRA
- CIGRE SC A3
- CIGRE Italia
- KMS SC A3 Home
- CIGRE active Working Groups - Call for Experts
- Contatti membri Mirror Panel IT.A3

Contatti Mirror Panel A3 italiano

Membro delegato

Paolo Mazza *paolo.mazza@rse-web.it*

Segretario

Roberto Nicolini *roberto.nicolini@cesi.it*

Contenuto dello Spazio

Cerca

Espandi tutto Comprimi tutto

- 0 IT.A3 General Instructions and Policies
- 1 IT.A3 Contact Details and Access Permissions
- 2 IT.A3 Proposte di attivazione di nuovi WG
- 3 IT.A3 Pubblicazioni recenti e documenti in corso di verifica
- 4 IT.A3 Proposte per la creazione di nuovi WG (template)
- 5 IT.A3 Eventi internazionali
- 6 IT.A3 Eventi nazionali
- 7 IT.A3 Archivio notizie
- Italy A3 engagement
- zzz-Pagine non utilizzate

KMS WEBSITE ITALIAN PANEL SC A3

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STUDY COMMITTEE A3 – Informazioni generali

- Scope of Work
- Struttura e Officers
- Piano strategico
- Annual Report 2020
- Lista Working Group - attivi / chiusi
- Technical Brochure pubblicate - ultime / storico
- Study Committee meeting
- Eventi

MIRROR PANEL ITALIANO – Informazioni dallo Study Committee

- Proposte di attivazione nuovi WG (ToR)
- Technical Brochure in corso di verifica

MIRROR PANEL ITALIANO – Informazioni per lo Study Committee e comunicazioni interne

- Esperti italiani partecipanti ai WG
- Proposte di nuove attività per lo Study Committee
- Eventi nazionali
- Archivio notizie

Blog/Notizie/Avvisi

Utilizzare i tre punti vicino al pulsante <Create> per creare un nuovo Blog/Notizie

Visualizzare tutti i Blog/Notizie per questo Spazio

Visualizzare tutti i Blog/Notizie globali (General Resources Space)

Post nel Blog

Contributi per nuove tematiche da portare a SC A3 nella prossima sessione di Parigi creato da Roberto NICOLINI	Mirror Panel IT.A3	lug 08, 2022
Le apparecchiature T&D e la transizione energetica creato da Roberto NICOLINI	Mirror Panel IT.A3	lug 17, 2022
Contribuisci all'evoluzione del CIGRE! creato da Roberto NICOLINI	Mirror Panel IT.A3	lug 17, 2022
Sono aperte le iscrizioni alla sessione 2022! creato da Roberto NICOLINI	Mirror Panel IT.A3	mar 30, 2022

Attività recenti

Chiara GANDOLFI

Le apparecchiature T&D e la transizione energetica ha commentato ieri alle 12:57 PM

Le apparecchiature T&D e la transizione energetica ha commentato ieri alle 12:51 PM

Roberto NICOLINI

Mirror Panel IT.A3 Home aggiornato ago 01, 2022 • Visualizza la modifica

Paolo MAZZA

Contributi per nuove tematiche da portare a SC A3 nella prossima sessione di Parigi ha com

Contribuisci all'evoluzione del CIGRE! ha commentato lug 19, 2022

Mostra di più

KMS WEBSITE ITALIAN PANEL SC A3

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Dashboard / Mirror Panel IT.A3 Home / 3 IT.A3 Pubblicazioni recenti e documenti in corso di verifica

(M)odifica Salva f o dopo Seguendo (C)ondividi

3 IT.A3 Technical Brochure WG A3.41 "Current Interruption in SF6-free Switchgear"

Creato da Roberto NICOLINI, ultima modifica il lug 03, 2022

È stata pubblicata la Technical Brochure n. 871 del WG A3.41 "**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.

- Fare click sulla miniatura per visualizzare l'Executive Summary e l'indice del documento.
- La TB 871 può essere scaricata da "e-Cigre" per chi possiede un account. Il link da utilizzare è questo.

GOALS ACHIEVED AND WORK IN PROGRESS

- Goals achieved:
  - Participation of about 50 Experts through the KMS
  - Effective promotion and participation for the new A3 WGs
  - Good participation and answer for the 1st meeting (up to 30 participants)
- Work in progress:
  - More active participation and proactiveness needed
  - Use of KMS blog and spaces still limited (training and examples to be implemented to win the “blank page” Syndrome)!
  - Catalysers needed in order to foster the transition from passive participation to an active one: in-presence events, NGN, WIE, KMS, LinkedIn (strong coordination with CIGRE NC)
  - Support from Companies in order to promote non only individual but collective participation.

Thank you for the attention!!!

Further suggestions, proposals and exchanges are welcome!!!

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roberto.nicolini@kema.com

For power system expertise

TOR in discussione (1)

- Ageing of instrument transformers - > Approvato (A3.49)
- Requirements for HV Equipment operating under Abnormal Weather Conditions (Fase finale discussione Birmingham)
- Testing requirements for MV equipment
- Partial discharge properties of non-SF6 insulating gases and gas mixtures
- On-site tests for instrument transformers (Fase finale discussione Birmingham)

See the details in the following slides!

TOR in discussione (2)

- Requirements for HV Equipment operating under Abnormal Weather Conditions (Fas discussione Birmingham)

The new WG shall investigate levels and frequency of non-standard environmental requirements that might affect HV equipment performance with emphasis, but not restricted, to:

- earthquake above 8 in Richter scale,
- atmospheric discharges above normally expected values,
- extreme ambient temperatures, snow and ice (above and below standard values),
- heavy rains,
- wind above standard values including tornado,
- tsunami,
- flood,
- sandstorm, etc.

- Wide bibliography review on non-standardized, or values above standard are affecting HV equipment performance.
- Enquiry among utilities all over the world shall be carried out to identify actual problems.
- Environmental stresses levels not yet covered by standards, the severity level of these stresses and the expected frequency to improve existing Standards or to propose new ones.

TOR in discussione (3)

- Testing requirements for MV equipment

- Analyse of on-site testing requirements on MV equipment of different technologies with different insulating mediums in different countries
- Data collection on reliability on MV equipment – use existing surveys and extend the survey if necessary
- Return of experiences with the reliability of MV equipment
- Analyse of customer specifications for testing of MV equipment before putting into service and evaluate best practice
- Comparison IEC requirements vs. best practice
- Develop a proposal of testing requirements for MV equipment to increase reliability in service

- Experiences with MV switchgear outages showed that a major part of all defects are caused by secondary equipment like voltage transformers ,connectors or missing components during the assembly.
- Also transport and assembly can cause defects in a GIS
- the on-site test of a GIS is practically always carried out with a combination of withstand AC voltage test with partial discharge measurement. Operating and testing experience also leads to the conclusion that it is advisable to include not only the busbars but also the feeders including all voltage transformers in the test.

TOR in discussione (4)

- Partial discharge properties of non-SF6 insulating gases and gas mixtures

The Working Group will collect and summarize the current knowledge on the partial discharge properties of major non-SF6 insulating gases which are currently proposed by the manufacturers of MV and HV equipment. Wherever required and feasible, further studies shall be conducted within the Working Group (e.g. by testing).

- Physical background of PD
- Current PD measurement techniques
- Definition of appropriate test setups
- Tests and test results, esp. PD inception and breakdown voltage
- PD impulse waveforms and spectra
- Applicability of current PD measurement techniques for non-SF6 insulating gases
- Sensitivity verification
- Estimation of criticality of imperfections
- Gas decomposition by PD and its measurement

TOR in discussione (4)

- Partial discharge properties of non-SF6 insulating gases and gas mixtures

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- Applicability of current PD measurement techniques for non-SF6 insulating gases
- Sensitivity verification
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- Gas decomposition by PD and its measurement

TOR in discussione (5)

On-site tests for the verification of the accuracy and for the calibration of instrument tr

1. To present the technical background and the new applications that recommend the performance of on-site calibration.
2. To present the applicable international and regional/local technical Standards.
3. To present the accuracy requirements needed for each specific application.
4. To investigate the state of art of international regulation and/or network codes about this subject.
5. To present the technical state-of-art about the on-site assessment of the accuracy of instrument transformers (both calibration and verification of the accuracy, with instrument transformers in service or disconnected) and the international experience about this subject: methods by comparison and based on models will be considered.
6. To present the ongoing activities aimed at the on-site verification of the accuracy and calibration.
7. To analyse the benefits and limits of the available methodologies and technologies, (e.g. the impact of needing an outage versus verifying without an outage, at the voltage and current level(s) where the system naturally is);
8. To indicate the technical benefits and the opportunities for the evolution of power systems, in terms of management and observability, made possible by on-site calibration.
9. To evaluate the economical impact and benefit of the on-site calibration of instrument transformers.

SC A3 General Discussion Meeting – GDM 2022 (1)

- The 2022 group discussion meeting of Study Committee A3 was held on 02nd of September 2022 in room Bordeaux at the Palais des Congrès, Paris, France in a morning and afternoon session.
- The Discussion Group Meeting was chaired by the Study Committee Chairman, Nenad Uzelac (US), with Rene Smeets (NL), Nicola Gariboldi (CH), Tadao Minagawa (JP), Wayne Pepper (AU), Erik Sperling (CH) as Special Reporters and Frank Richter (DE) as SC A3 Secretary. Martin Kriegel (CH) act as the interactivity manager. Rene Smeets who coordinated the work led the team of special reporters.
- As already described in the Special Report, the papers received for the 3 preferential subjects were categorized into four groups with 20 questions in total. The discussion was also clustered into these groups, which were named as follows:
  - 1. Miscellaneous T&D equipment and systems (16 papers) moderated by Tadao Minagawa and Wayne Pepper
  - 2. SF6 alternatives (18 papers) moderated by Rene Smeets
  - 3. Asset management, monitoring and diagnostics (9 papers) moderated by Nicola Gariboldi
  - 4. Instrument transformers and digitalization (9 papers) moderated by Eric Sperling
- The advantage of dividing into topics instead of ordering them into Preferential Subjects is that the experts can be addressed better and more specifically due to the large variety of the scope handled in SCA3. This resulted in a very good average participation rate.
- The special reporters explain the procedure of the group discussion. Each topic is presented by an introductory lecture. Hereby, invited experts presented topic 2 and 4:
- Topic 2 – SF6 Alternatives, by Nina Stoa-Aanensen and
- Topic 4 - Instrument transformers and digitalisation, by Paolo Mazza.
- The beginning was made by the Next Generation Network talk. Abigail Zafris gave an excellent contribution about “Monitor Data Management for Asset Failure Prevention”.

SC A3 GDM 2022 (2)

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SC A3 GDM 2022 (3)

TOPIC 1: MISCELLANEOUS T&D EQUIPMENT AND SYSTEMS (Special Reporters: Tadao Minagawa/ Wayne Pepper)

- 16 reports were categorized into this topic and six questions were raised in the special report.
- Generator circuit breaker (GCB) was dealt with in two reports and two prepared contributions about delayed current zero in the doubly-fed induction generator were presented. The convenor of WG A3.46 put words about present situation of the study on the issue as a spontaneous contribution.
- Two reports describe HVDC switchgear and relevant technical challenges in relation to standardization, and they were discussed by five prepared contributions.
- To the question in association with three reports on “metal vapor deposition in vacuum interrupter”, “controlled switching with high-resolution/high-bandwidth measurement” and “high-temperature superconducting fault current limiter”, improvements of technologies for new generations of T&D equipment were discussed by four prepared contributions.
- The experiences related to “Safety with use of digitalization”, which was described in three reports, were introduced by two prepared contributions. A question about “Overstress”, Commissioning” and “Service life” in terms of equipment management was asked in the special report, and experiences on the issue were introduced by four prepared contributions. Two reports describe technical challenges for data management in monitoring, and the considerations on monitoring and diagnosis of disconnector associated to a pollution severity were presented in a prepared contribution.

SC A3 GDM 2022 (4)

TOPIC 2: SF6 ALTERNATIVES (Special Reporter: Rene Smeets)

- Eighteen (18) reviewed reports were falling in this topic. In the GDM, seven questions from the Special Report were discussed by 20 prepared contributors from six countries. Prior to this, an overview on the urgency and the actual status of the technology in this topic was given by Nina Støa-Aanensen from Norway, being a key member from WG A3.41 on current interruption in SF6-free switchgear.
- The questions were on the following subjects:
  - 1. The possible impact of increased filling pressure (four prepared contributions in the GDM)
  - 2. Retro-fill issues and the role of sealings/gaskets (one contribution)
  - 3. The impact of the “new gases” on temperature rise performance (three contributions)
  - 4. Multi-break circuit breaker applications (two contributions)
  - 5. Size, weight and footprint of HV SF6-free switchgear (three contributions)
  - 6. Alternative gas management (two contributions)
  - 7. Harmonisation of the variety of new mixtures into one-fits-all solution? (five contributions)
- Two contributions were on MV switchgear, all others covered HV equipment, including LPIT. Seventeen (17) contributions were from manufacturers and were mainly oriented to remove possible concerns. One was from a TSO and two were on behalf of a national manufacturer’s organization.
- Spontaneous contributions (around 15 short ones) was mainly directly from the audience, SparkUp was not used very much to transfer question to the contribution authors or the auditorium.

SC A3 GDM 2022 (5)

TOPIC 3: ASSET MANAGEMENT, MONITORING AND DIAGNOSTICS (Special Reporter: Nicola Gariboldi)

- Nine (9) reports were grouped into this category from six countries. Three questions were proposed in the special report, two of which were discussed in six (6) contributions.
- Controlled switching was quite a treated topic addressing different aspects like detailed quantitative evaluation of the Rate of Decrease of Dielectric Strength (RDDS), limitation of overvoltage at shunt reactor switching, capacitor bank insertion, limitation inrush currents while energizing power transformers.
- The outlook seemed to be the integration into IEC 61850 as a configurable software module in a control and protection device. Question 14 given in the special report about controlled switching technology and the possibility to be integrated in IEC 61850 digital substations were answered by three contributions from France, Sweden and Australia. Integration through IEC 61850 and the use of type “Point On Wave” relay for various CB brands was confirmed to be the outlook. The increasing demand for this technology is due to the fact that it is becoming more and more trusted and has proven to be the most efficient solution for limiting overvoltages for various applications. Some concerns exist regarding commissioning and appropriate training.

SC A3 GDM 2022 (5)

TOPIC 3: ASSET MANAGEMENT, MONITORING AND DIAGNOSTICS (Special Reporter: Nicola Gariboldi)

- Specifically on Asset management, monitoring and diagnostics five reports focused on different aspects like health indexing and reliability assessment methods for SF6 circuit breakers based on commonly available parameters, applications of Artificial Intelligence (AI), new wireless sensors, Internet of Things (IoT) and pattern recognition. For all the aim is to enhance the asset reliability by means of more the efficient use of resources and controlling the costs. There is also a proposal for the more traditional off-line test for high voltage circuit breakers. It is shown that, in contrast to current practice, the high voltage circuit breaker can remain grounded on both sides to improve the hazard and safety of the test personnel.
- Continuous monitoring with online access to data enables faster response and data transmission for post-processing and analysis. Wireless communication allows for easier installation, but requires special adaptation to ensure that all components in the substation are reached.
- Regardless of the strategy or technology used, it was confirmed that improving maintenance efficiency and reducing costs were the driving motivations. One contribution was an increase of more than 70% in the labour efficiency of circuit breaker inspections. Another case study example showed that the inspection interval could be extended from 6 to 24 years.

SC A3 GDM 2022 (6)

TOPIC 4: Instrument transformers and digitalisation (Special Reporter: Eric Sperling)

- Prior the discussion started, Paolo Mazza (Italy) introduced the topic with an impulse lecture and showed the challenges in the application and standardization of instrument transformers of different types.
- Nine reports were summarized in the topic four. Six reports on conventional or low-power instrument transformers were transmitted. Three reports focus on monitoring aspects, machine learning and digital twins, as well as risk-based replacement of ITs.
- In the Special Report four questions were formulated which were answered by seven contributions.
- Finally, the chair closed the session, thanked all participants for the discussions and gave the hint to continue the discussions at the next two planned events in Birmingham (UK) and Cairns (AUS).

SC A3 General Discussion Meeting 2022 (7): Conclusions

- 51 prepared contributions were shown.
- Several spontaneous contribution were given during the group discussion meeting.
- A discussion followed most of the contributions.
- The Sparkup tool for interactive participation of the auditorium was an enrichment.
- Spontaneous contributions and suggestions provided many interesting ideas.
- The session was of interest to all participants from a technical viewpoint. The number of participants was over 130 (during the morning session), averaged more than 70.

SC A3 General Discussion Meeting (8): Contributo italiano

- **1 Invited speech (Paolo Mazza, Lorenzo Peretto)**
- **Many spontaneous contributions (Eros Stella, Alberto Pigini)**
- **2 Articoli:**

Sizing and testing of HVDC disconnectors from the dielectric point of view

Eros STELLA[1], Marco NOSILATI[1], Francisco CHACON[2], Alberto PIGINI[3]
[1]GE Italy; [2]GE UK; [3]Consultant

Instrument Transformers and bushings using alternative and eco-friendly high voltage insulation systems

Lorenzo GIOVANELLI[1], Udo PRUCKER[2], Esseddik FERDJALLAH KHERKHACHI[3]
[1]TRENCH Italia Srl; [2]TRENCH Germany Gmbh; [3]TRENCH France SAS

PREFERENTIAL SUBJECTS SESSION 2024

PS1: Energy transition involving T&D equipment

- Innovative technologies to reduce total cost of ownership and to foster the energy transition.
- Novel applications especially DC and increased duties on equipment due to DER.
- Improvement of grid resilience due to climate change: the impact on equipment requirements.

PS2: Lowering the carbon footprint of T&d equipment

- Performance & maturity of Sf6 alternatives – report on industry experience.
- Life cycle assessment of T&D Equipment.
- Life cycle management and life extension of existing equipment.

PS3: maintaining and management T&d assets

- Smart sensors, low power instrument transformers, monitoring, condition assessment and application of IoT.
- Digital twin and equipment reliability modelling also covering new / higher load profiles.
- Big data management and data ownership, with respect to equipment condition assessment

PROSSIMI EVENTI COMITATO STUDIO A3

- Colloquium A3 & B3, Maggio 2023, Birmingham - UK
- Symposium A3, B1, B3, B5, C1, C2, C4, C5, C6, D1, D2, Settembre 2023, Cairns, Australia
- Session 2024, Settembre 2023, Parigi, Francia
- Colloquium A3, Proposta India 2025

Grazie per l’attenzione

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