

Take away Paris 2024, B3 substations and electrical installations

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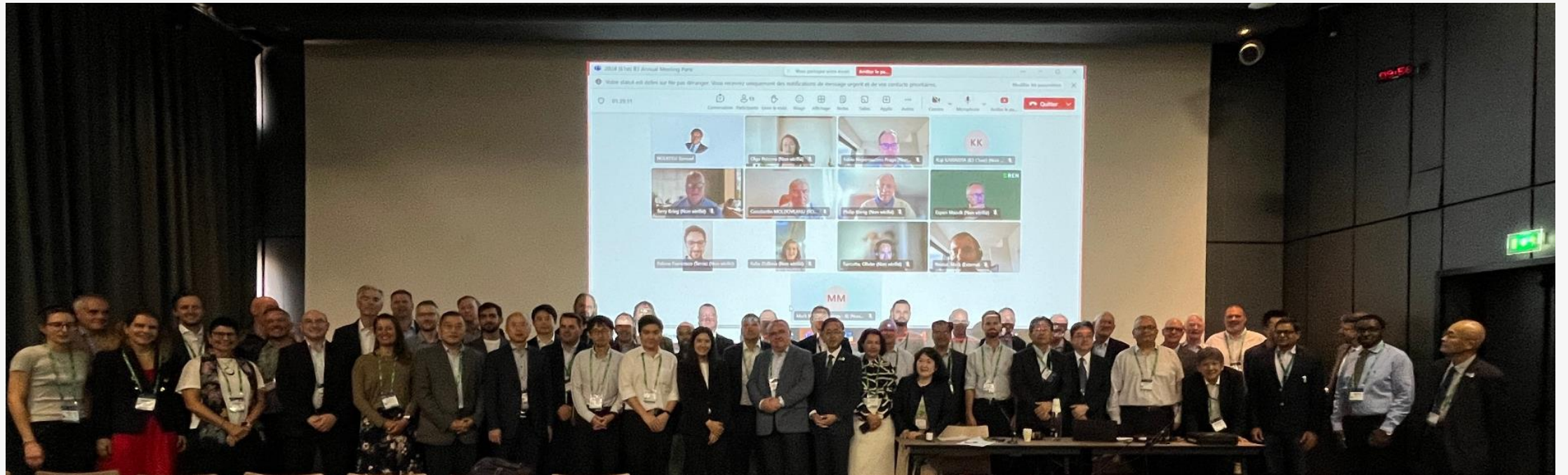
For power system expertise



inhoud

1. Study Committee Meeting
 - Technical brochures
 - 2026
2. Paris session
 - PS1
 - PS2
3. Workshops
 - Driving T&D substations and equipment towards ZERO emissions
 - Guidelines for SF6 end-of-life treatment of T&D equipment (>1kV) in substations
 - Poster sessions

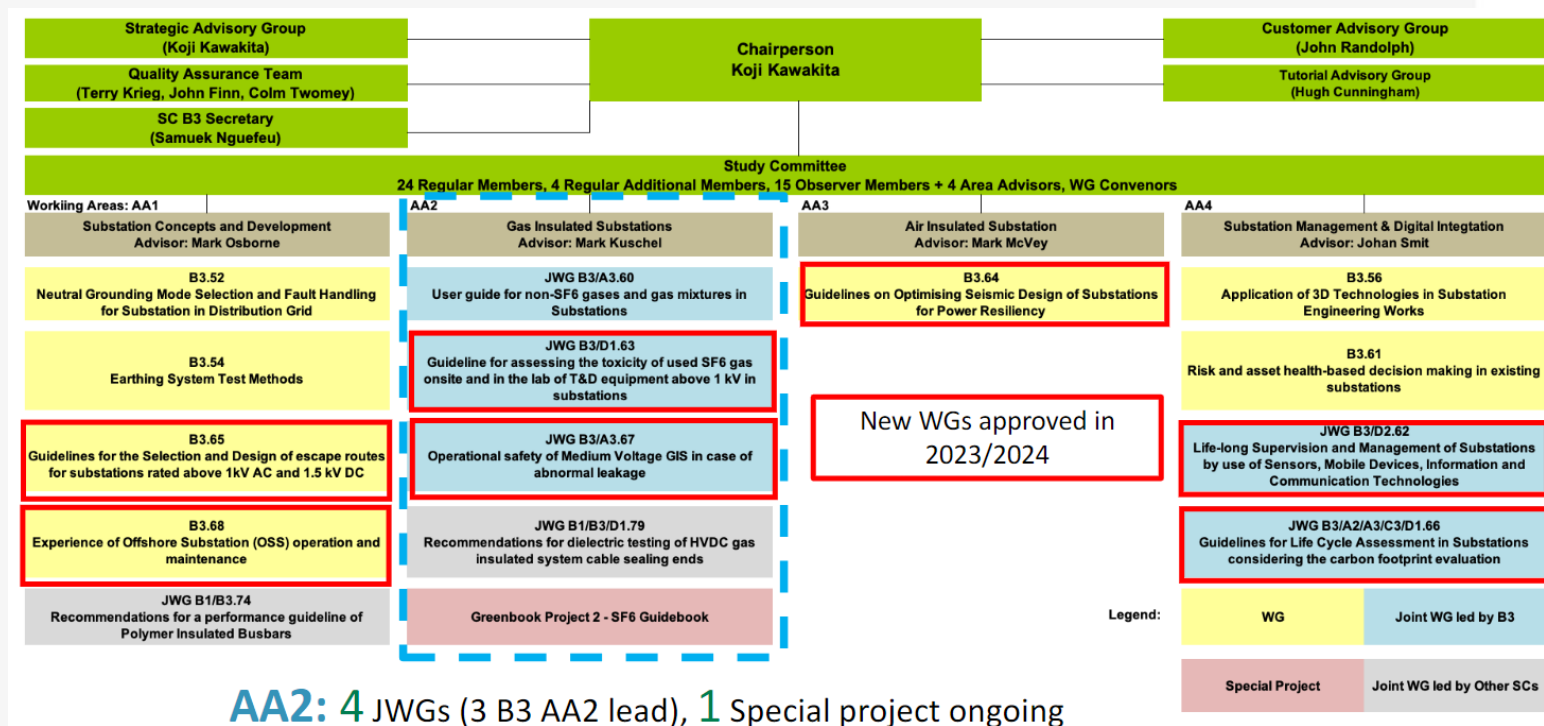
Parijs, de stuurgroep B3



B3: Sub categories. Daar waar de brochures tot stand komen






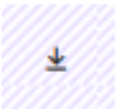
Is iedereen bekend met de brochures?
Wie heeft er onlangs eentje ingezien?

- AA1: Substation Concepts and Developments, presented by [Mark OSBORNE](#)
- AA2: Gas Insulated Substations (incl. SF6 Green book) presented by [Mark KUSCHEL](#).
- AA3: Air Insulated Substations presented by [Mark MCVEY](#).
- AA4: Substation Management presented by [Johan SMIT](#).
- New WG topic discussion | ALL



— Publications

6 Technical Brochures (TBs) were published in 2023 for Study Committee B3 including

 <u>TB 895 - Impact on Engineering and Lifetime Management of Outdoor HV GIS - WG B3.57</u>	 <u>TB 898 - Knowledge transfer of substation engineering and experiences - WG B3.58</u>
 <u>TB 907 - Mobile Substations Incorporating HV GIS - WG B3.41</u>	 <u>TB 914 - Guidelines for SF6 end-of-life treatment of T&D equipment (>1 kV) in substations - JWG B3/A3.59</u>
 <u>TB 920 - Concepts for on-site HV testing of GIS after installation, extension, retrofit or repair - WG B3.50</u>	 <u>TB 930 - Review of substation busbar component reliability - WG B3.49</u>

The following working group brochures are expected to be completed in 2024:

- **B3.52** - Neutral grounding mode selection and fault handling for substation in distribution grids
- **B3.54** - Earthing system testing methods
- **B3.56** - Application of 3D technologies in substation engineering works
- **B3/A3.60** - User guide for non-SF₆ gases and gas mixtures in Substations
- **Green Book: SF₆ Guidebook** - a Springer publication

Parijs



B3 Discussion Meeting – 2024 PS1 Paper topics

Special Reporter:
Mark OSBORNE (UK)

PS 1 - Challenges & new solutions in T&D substation design and construction for energy transition:

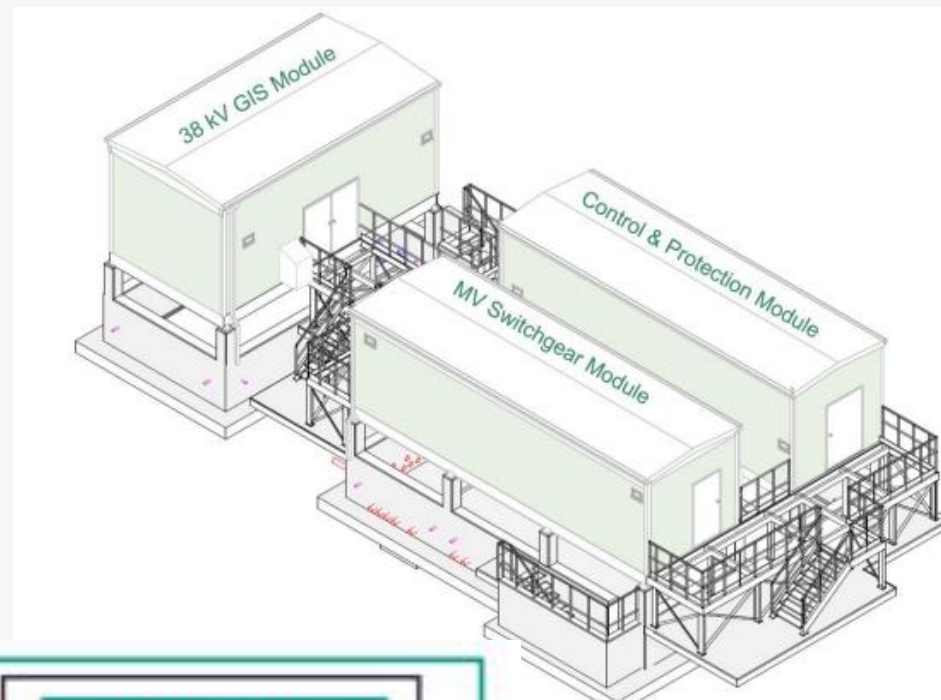
- Design impacts on substations from on-offshore wind, PV, hydrogen, small modular reactors, EV charging infrastructure, etc.
- New functions in substations (energy storage, synchronous compensators, etc.).
- HV-MV DC substation and GIS/GIL application for a DC network.

18 papers overall

- New substation concepts
- Evolution in modular and containerised substations
- Developments in GIS technology
- The role for Digitalisation in the substation development

PS1: compact, modulair en pre-fab bouwen

1. Om kleine modulaire kerncentraletjes (6-pack van elke 50-70 MW) te combineren met electrolyzers, vermogen blijft in SS
2. Gestandaardiseerde modulaire AIS, 38 kV, ook voor PV (wind al snel te veel MW)
3. Nieuwe trend: het integreren van primair met P&C, inclusief LPIT



Customer Switchgear installation



LPIT cable

3

LPIT Merging Unit

IEC 61850
9-2 / 8-1
IEEE1588

Protection

Power Quality

Revenue meter

⋮

Ethernet Switch

B3 Discussion Meeting – 2024 PS2 Paper topics

Special Reporter:
Mark McVEY (USA)

PS 2 - 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.

47 papers overall, including an NGN showcase paper from xx focused on asset management experiences.

- Safety through Design
- Digitalisation in Substations
- Substation Asset Health Metrics
- Service Continuity
- Introduction of SF6 alternatives
- Substation Resilience
- Implementing Sustainability

PS2:

1. Uitmaken van netten. Goed stuk van Liander. Hoever/lang kun je (over)belasten?
2. Alternatieven voor SF6, vooral in A3. Eerlijk stuk van EdF en Rte. Die hebben AIS 110 kV van (de) 3 leveranciers
3. Inspectie met robots. Vergelijking van diverse types (Nodig? Want....)

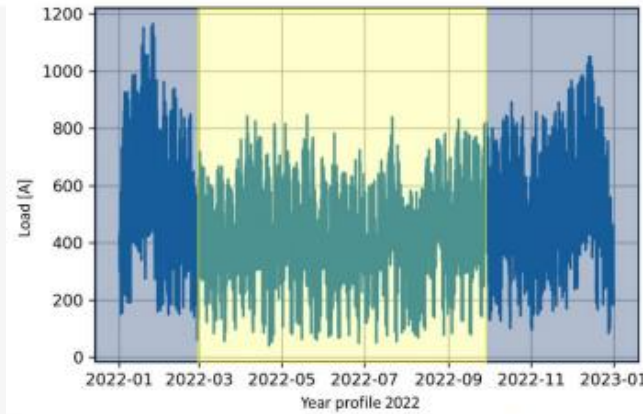


Figure 3. Typical load profile substation for one year. The blue shaded part shows the winter period, and the yellow shaded part shows the summer period.

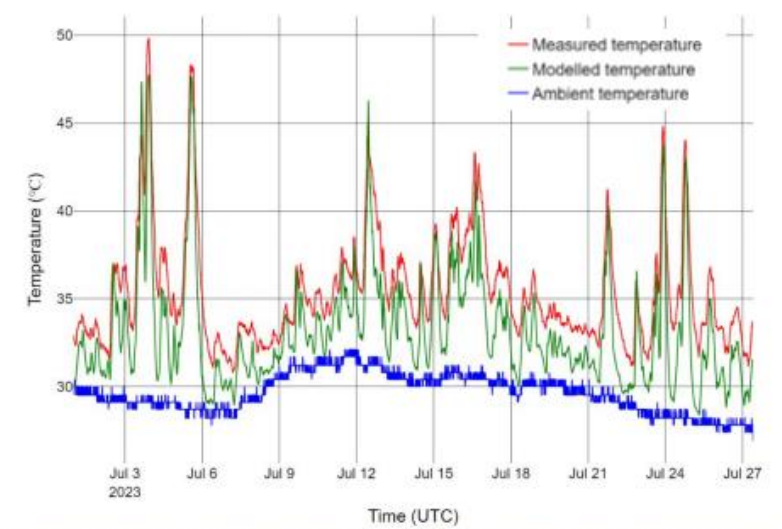


Figure 4. Graph showing the measured temperature on installation 4 and the modelled temperature based on the actual current and the ambient temperature in the switchgear room.



Figure 7: On-site assembly of the interrupter unit (left), CB inside a standard substation (middle) and CB inside an indoor substation (right)

LPIT in GIS, directly integrated in protection & control

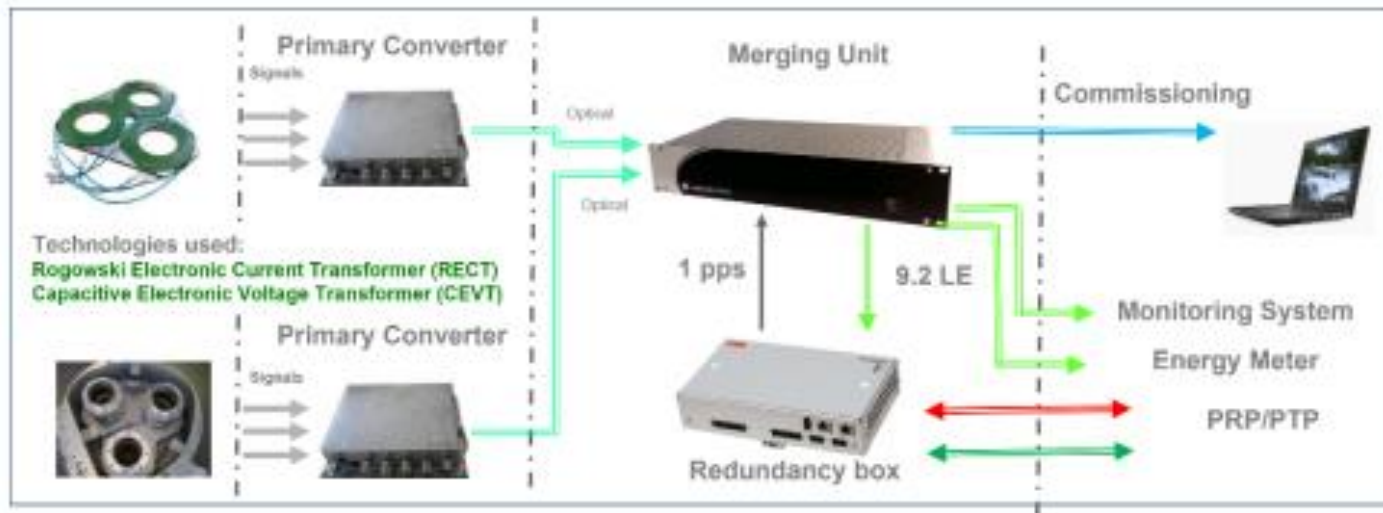


Figure 2: LPIT full acquisition chain, from the LPIT sensor (Rogowski coil and capacitive voltage divider) to the sampled values output and process bus network.



digitale transformatie, trending

De trend is gezet, o.a. Japan, Brazilië, USA en fabrikanten

- Digital transformation, BIM, VR, AR, IOT, 3d scanning and photogrammetry, sensor integrating, AI
- Daarmee “real-time performance equipment monitoring” en daarmee de echt voorspellende “condition based maintenance” mogelijk
- Direct data uit P&C, gebaseerd op IEC 61850 en indirect mbv on-line sensoren

Vraag die steeds terug kwam: “why is the utility sector slow in adopting and implementing new techniques on substation projects?” want:

- Industry is ready, kennis en producten leverbaar
- Een aantal TSO/DSOs zijn al gestart met deze manier van “health indexing”

Digital transformation USA (#10343) VR, HI



Figure 3: BIM integration with VR (left) and AR (right) technologies for a substation project.



Figure 4: BIM integration with Internet of Things (IoT) for asset monitoring and predictive analytics.

Digital twin, Brasil (#10771) real time monitoring of c.b. for HI

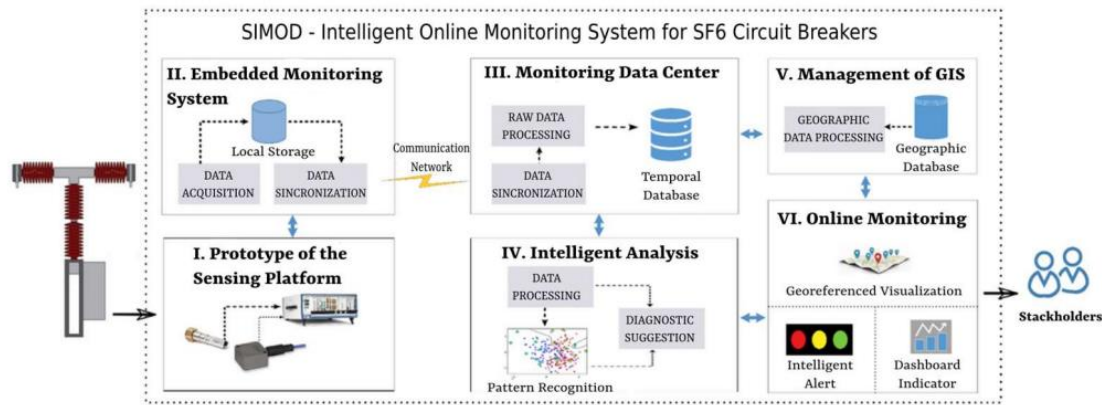


Figure 4 - SIMOD overview structured into 6 functional modules.

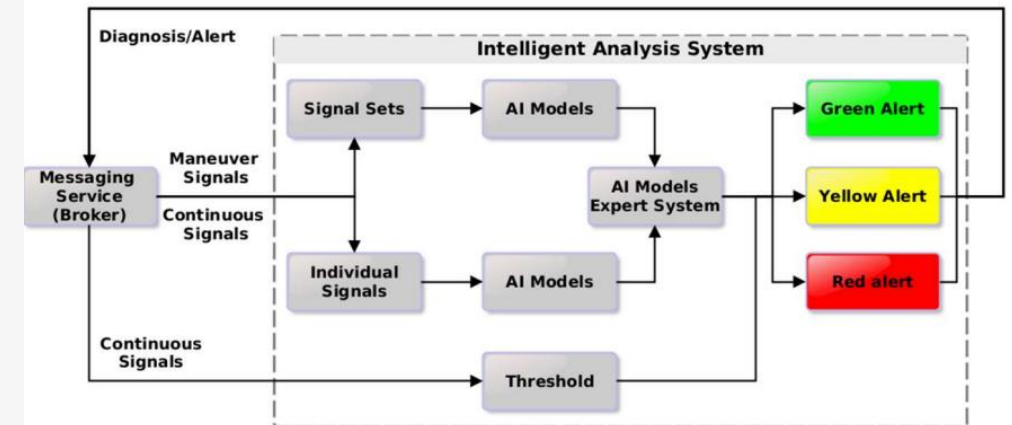


Figure 6 - Structure of the Intelligent Analysis System (module IV).

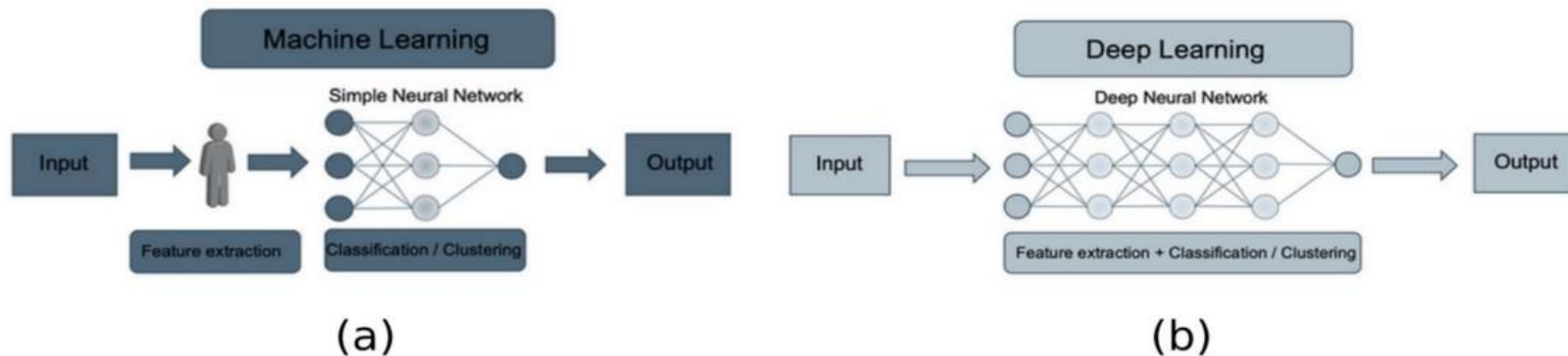


Figure 5 - Intelligent Modeling using Classic (a) x Modern (b) approach.

Condition monitoring Japan met IoT (#11088) voor voorspelbaar onderhoud

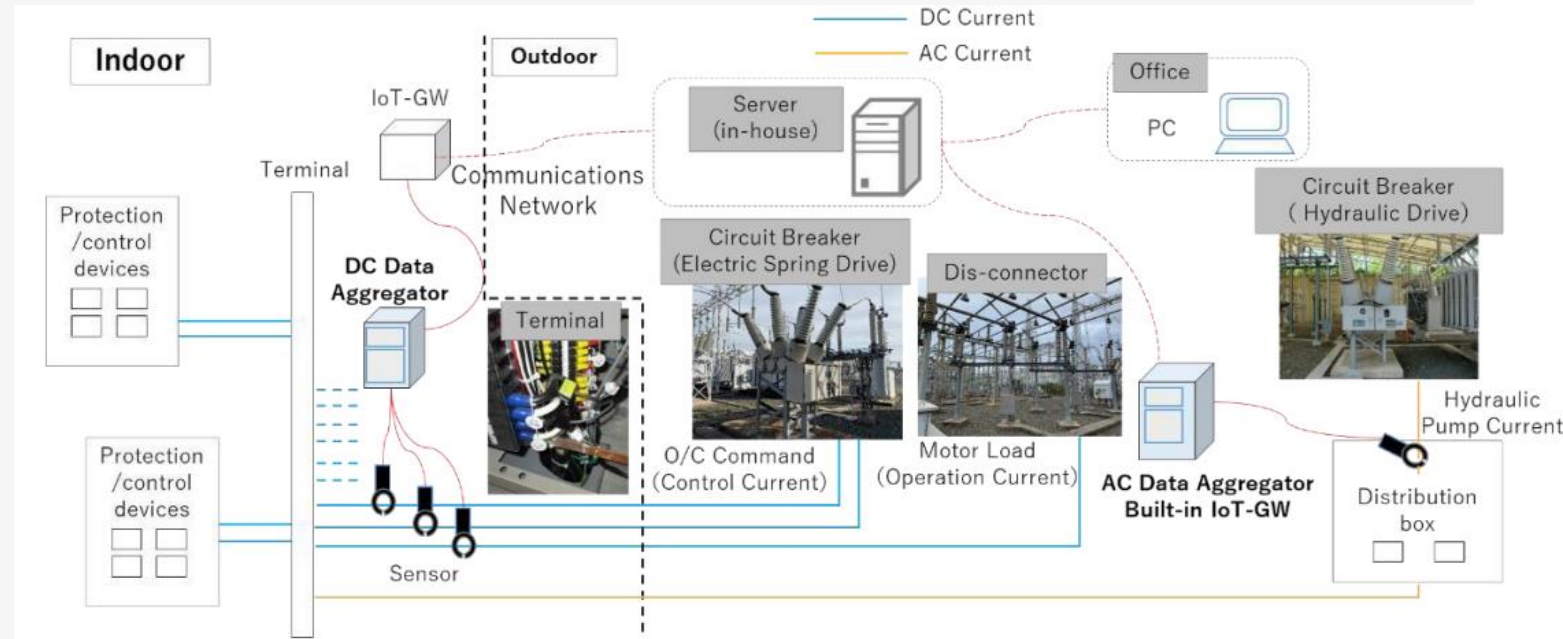
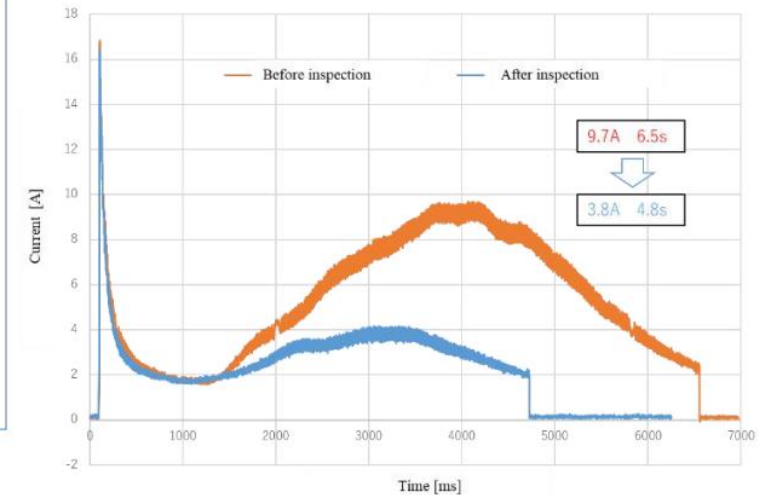
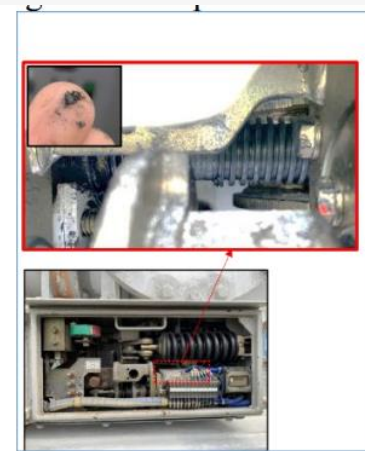
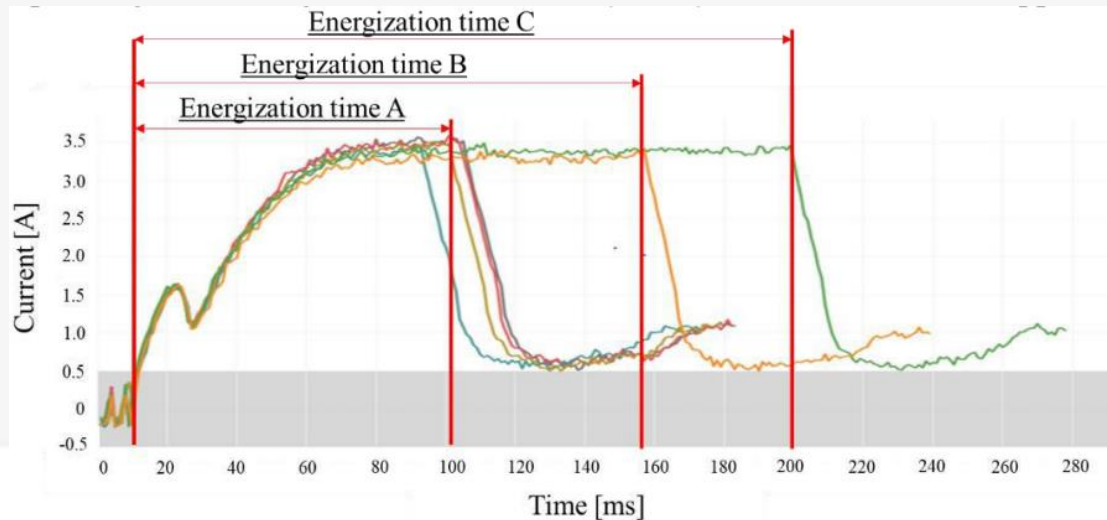
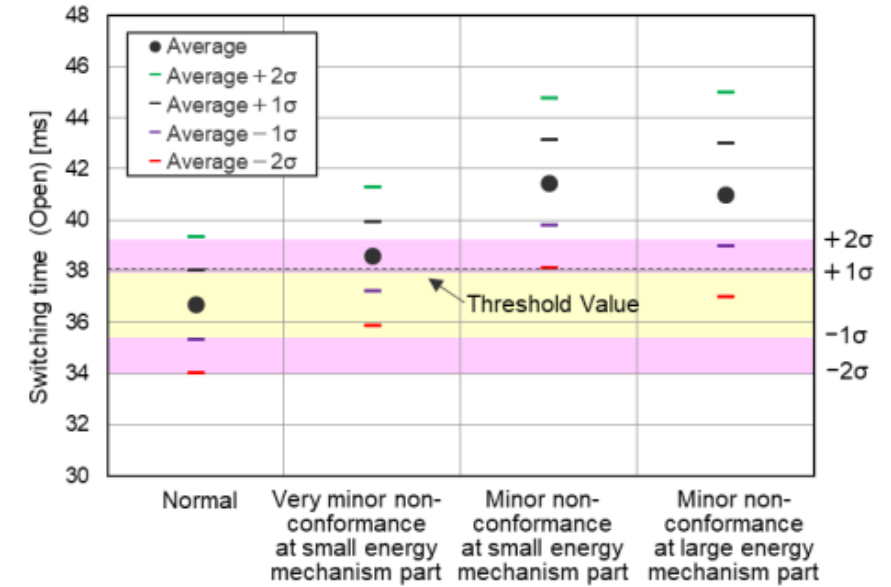
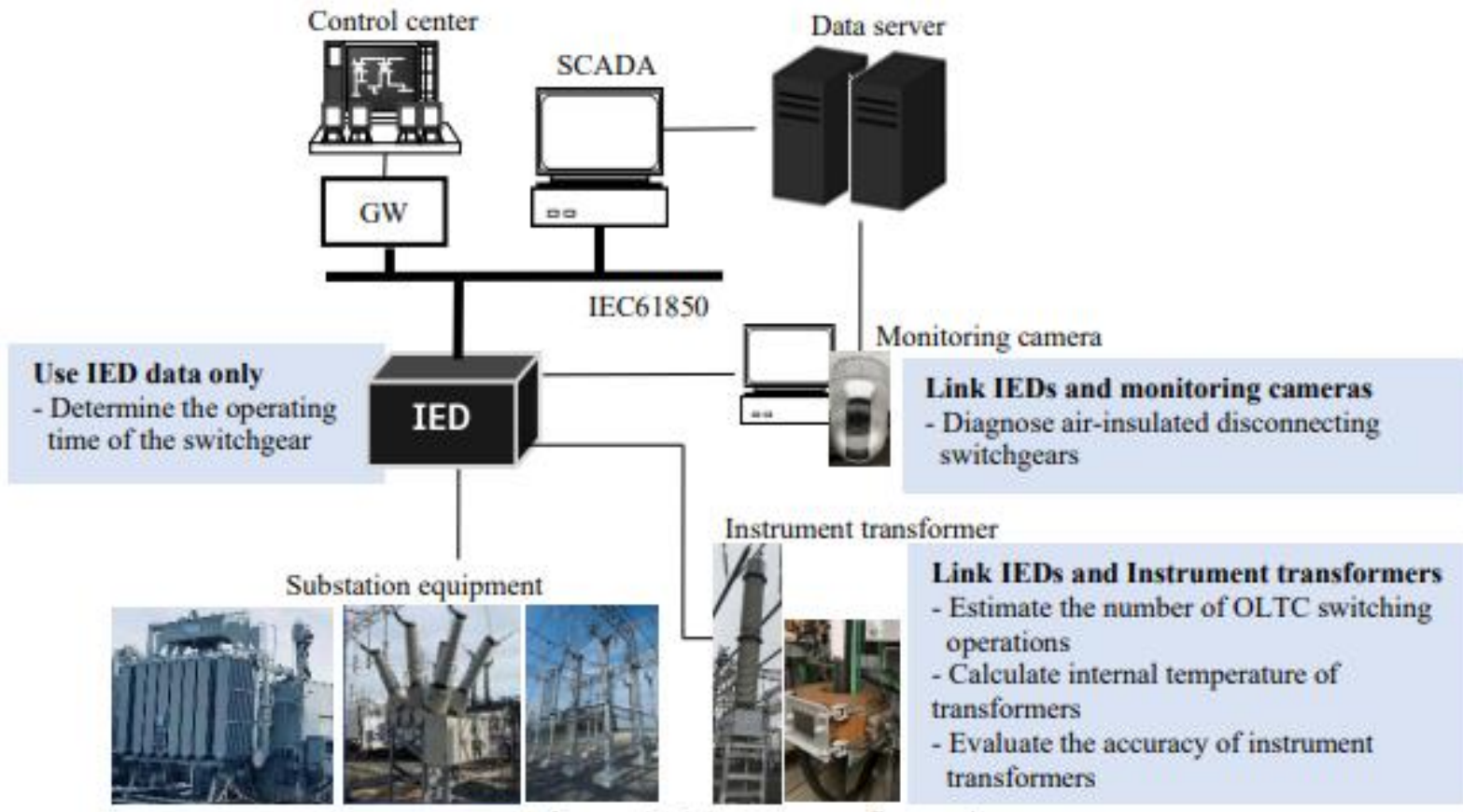


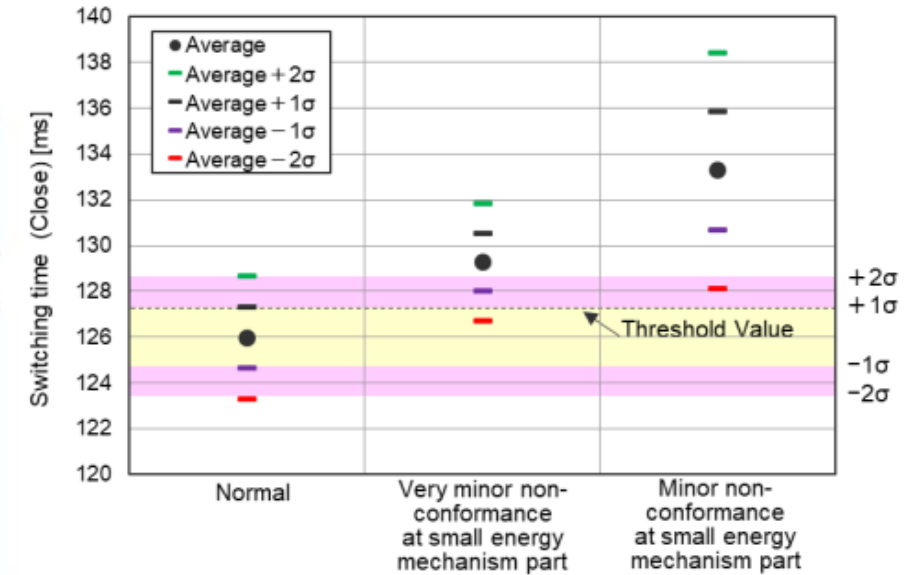
Figure 1 Overview of AC/DC Monitoring System



Alles uit IEC 61850, Japan (#11093)



(a) In "open" operation



(b) In "Close" operation

Figure 3 Circuit breaker operating time calculation results

2026 preferential subjects

STUDY COMMITTEE SC B3



PS1 : New Substation designs and Concepts to Support Installation of Renewables and Energy storage

- 3D Design Concepts and digital twin support
- New Insulating materials and methods
- Modular and prefabricated substation designs
- UHV and HVDC experience and designs

PS 2: Life Cycle & Asset Management:

- Monitoring, diagnostics and testing equipment to improved energy efficiency and reduce CO2 through equipment life extension. Prevent equipment failure and forced outages.
- Substation up-rating, upgrading and extension approaches and experience
- Optimised Maintenance, life assessment concept to retirement including extension methodologies and experiences

PS3 : New Energy and Grid Transformation

- Physical and Cyber Security designs and experience
- New station designs or Upgrades for severe weather sustainability
- Experience developing projects for Data Centers, Bit Coin or Energy Storage



Workshops

1. Driving T&D substations and equipment towards ZERO emissions
2. Guidelines for SF6 end-of-life treatment of T&D equipment (>1kV) in substations
3. Poster sessions, well visited, divided in 2 parts