

# CIGRE A3

## High Voltage Equipment

Chair: Dr. Hiroki Ito (JP)

October 2014

Mietek Glinkowski – USNC representative to A3

# CIGRE A3- High Voltage Equipment

- CIGRE Study Committee A3 covers High Voltage Equipment:
  - Switchgear (HV, MV)
  - Capacitors
  - Surge Arresters
  - Instrument Transformers
- 24 Countries have memberships
- Work based on WG meetings (separate)
- Most recent WG Terms of Reference (TOR) and contacts are available here: **<http://cigre-usnc.tamu.edu/workinggroups/>**

# Working Group A3.27

- **A3.27 – The impact of the application of vacuum switchgear at transmission voltages, chair: Rene Smeets, NL, TOR available upon request**
- US members:
  - Kirk Smith, Eaton
  - Mietek Glinkowski, Schneider Electric
  - Pete Meyer, S&C
  - Dave Johnson, consultant
- UGT group participated in the global survey with 22 responses (largest group!)
- Last meeting – Galveston, TX- April, 2013

# Working Group A3.28

- **Switching phenomena and testing requirements for UHV & EHV equipment, chair (new): Denis Dufournet (FR) TOR available**
- Field experience and switching behavior during and after commission
- Benchmark study of interrupting requirements of GCB based on model UHV/EHV networks
- Benchmark study of switching requirements of DS, HSGS and ES based on model UHV/EHV substations

# Working Group A3.29

- **DETERIORATION OF AGEING SUBSTATION EQUIPMENT AND POSSIBLE MITIGATION TECHNIQUES**
- Convenor: Ankur MAHESHWARI (AU)
- **Scope:**
  - Material and equipment deterioration/degradation
  - Lifetime (residual life) assessment techniques
  - Life extension:
  - Life management for new equipment
- **TOR** posted on Webpage
- **US members:** Jason MacLeod (corresponding), Eric McGrail (ABB)

# Working Group A3.30

## IMPACT OF OVERSTRESSING OF SUBSTATION EQUIPMENT

Convenor: Antonio Carvalho (BR)

- Review key network parameters and anticipated stresses affecting equipment capabilities
- Review of methods already in use to assess the risk of operating beyond the performance limits
- Identification of potential failure modes of overstressed equipment and their impacts (safety, reliability, availability)
- Determination of the capabilities of the equipment involved (Standards, Test Protocols, manufacturer's information, re-testing)
- Mitigation techniques
- Impact of overstressing on residual life (where immediate failure is avoided)
- Usefulness of information supplied at type and endurance testing & proposals for enhancements
- Interaction with age and/or condition information

**TOR** posted on Webpage

US member: Ken Edwards (BPA)

# Working Group A3.31

## Instrument Transformers with digital output

Convenor: Farnoosh Rahmatian, CA

- Proposal & analysis of procedures for calibration of the entire measuring chain, both in the factory and on site, for digital output of NCITs or for a SAMU connected to classical ITs and/or EITs.
- Description of the practical applications of using flexible EITs for on-site calibration without disconnection or de-energisation.
- Consideration and description of the migration of the digitalisation process from low voltage equipments (protective relays, meters, ...) to the high voltage equipments. Overall accuracy of the measurement chain, including transient responses for both protective and measuring classes, and taking into account the work of B5.24, will be proposed for consideration by IEC standardisation committees.
- Investigation & proposals for DC accuracy classes and calibration method for HVDC applications.
- Proposal & analysis of EMC test methods considering various earthing and shielding techniques for specific application of EITs and SAMU up to 1100 kV. A test procedure will be developed & proposed taking into account the requirements of the IEC 60044-8.
- Analysis & discussion of redundancy requirements for EITs and SAMU in the context of protection schemes.
- Proposal and analysis of solutions where control functions using digital signals, e.g. for disconnectors or circuit breakers, are integrated into the NCIT or SAMU hardware.

- US members: None

The group will maintain a close dialogue with the relevant IEC committees via shared membership & mutual reporting.

## **Non-intrusive methods for condition assessment of distribution and transmission switchgears**

**Convenor : Nenad Uzelac (United States)**

**Scope :** 1. To review existing state of the art of non-intrusive methods and their field experience applied in HV and MV CB/R/FI to assist in the evaluation of transmission & distribution equipment conditions using the different parameters such as:

- a. Insulation: gas characteristics (decomposition product, pressure, etc.) and partial discharges
  - b. Switching: operation time, pole discrepancy, re-strike, dielectric stress assessment, arcing time and contact wear
  - c. Current carrying: contact resistance, temperature and position
  - d. Mechanical drive: number of operations, energy, vibrations and damping
  - e. Control and accessories: supply voltage, coil current, auxiliary switch and heat
2. To provide users experiences, case studies and application feed-back
  3. To analyse technical vs economical benefit for applying non-intrusive methods on CB/R/FI
  4. To identify future trends in the technology and switchgear user requirements
- Nominated US members: Jack Arnold (National Instruments), Kip Benson (S&C), Jason MacLeod (corresponding young engineer), Robert J. Sicker (First Energy Utilities)
  - <http://cigre-usnc.tamu.edu/workinggroups/>



## **Experience with equipment for Series / Shunt Compensation**

Convenor: **Guofu Li (China)**

Scope:

A. Investigation of developments and service experience with equipment for new series /shunt compensation.  
Investigation of the impacts of system transients on the new equipment / components

Investigation of the impact of the new equipment / components on system transients and HV equipment requirements.

B. Addressing requirements for equipment / components applied to series / shunt compensation, for example

- UHV / EHV bypass switch
- (Fast acting) bypass gap
- UHV / EHV bypass isolating disconnecter
- (Thyristor controlled) capacitor bank
- MO Varistor
- Equipment connected to transformer's tertiary windings.

C. Addressing requirements for HV equipment which is influenced by the new developments in series / shunt compensation: shunt reactors, HSES, circuit-breakers, MOSA

D. Special capacitor-bank applications for tertiary winding connected shunt compensation (which is not covered by WG A3.26)

- Nominated US members: Bharat Bhargava (Electric Power Group), Jason MacLeod (corresponding young engineer)
- <http://cigre-usnc.tamu.edu/workinggroups/>

## **JWG A3/B4.34 - Technical Requirements and Specification of DC switchgear**

- Convenor – C. Franck (CH)
- US member: Himanshu Bahirat (MSU)

## **WG A3.35 – Best practices for commissioning of controlled switching**

- Convenor– A. Mercier ([mercier.andre@ireq.ca](mailto:mercier.andre@ireq.ca))
- US Corresponding member – Vincent Marec – G&W
- US member- Bjorn C Lofgren – Siemens (to be replaced by Casey Weeks, Siemens)
- US member – Jon Rogers – Siemens – Richland, MS ?

**For more information:**

<http://cigre-usnc.tamu.edu/workinggroups/>

## **WG A3.36 – Application and Benchmark of Multi Physics Simulations and Engineering Tools for Temperature Rise Calculation**

- Convenor – Martin Kriegel (CH)
- US member(s): Amit Patel (GE)

## **WG A3/B5/C4.37 – System conditions for and probability of Out-of-Phase**

- Convenor– Anton Janssen (NL)
- US member(s): Amit Patel (GE)- corresponding, Kevin Jones (Xcel Energy)- corresponding, Zhenhua Wang (AEP)- corresponding member.

**For more information:**

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# CIGRE/IEEE activities related to A3

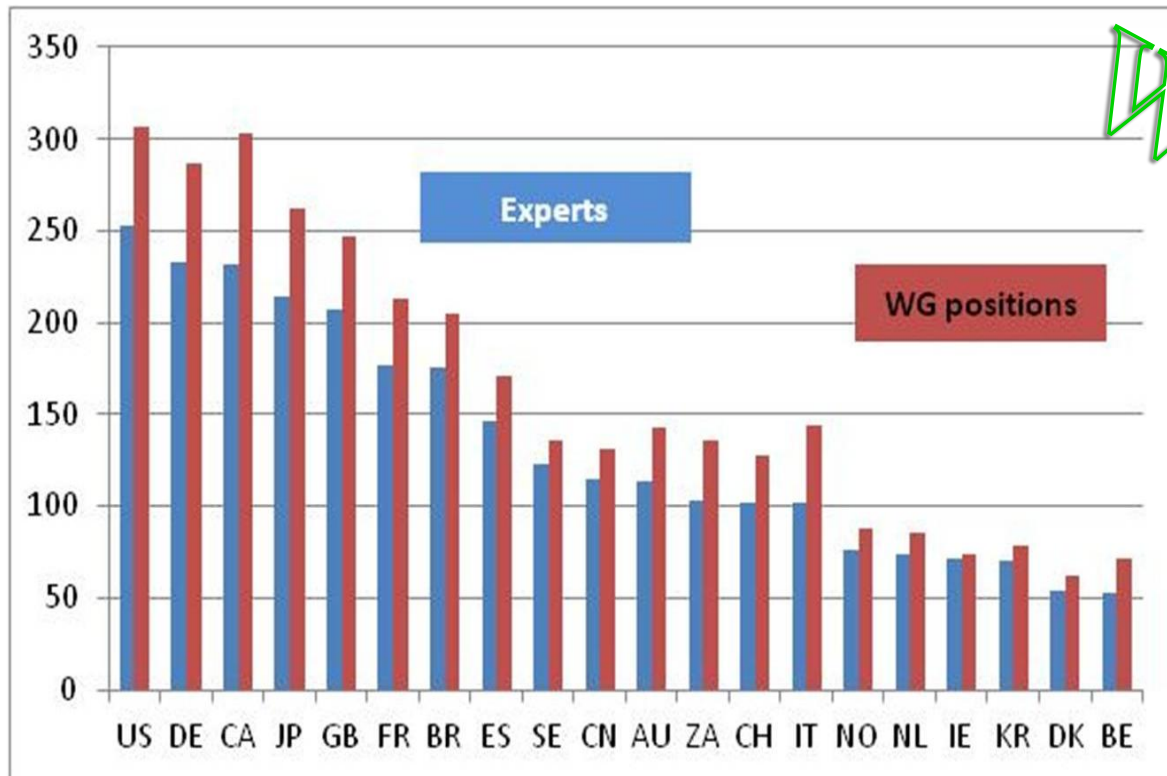
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- **Roy Alexander** received 2014 Attwood Associate Award and Distinguished Member Awards from US NC, July 2014 , Washington DC at IEEE PES GM
- Plenary meeting of CIGRE August 25-29, 2014, Paris, France
- A3 Study Committee meeting – August 26, 2014

- 4 US paper synopses submitted to A3 under three preferential subjects:
  - **PS1 > Equipment to cater for changing network conditions ·**
  - **PS2 > Lifetime management and ageing of T&D equipment ·**
  - **PS3 > Impact of extreme operating conditions on T&D equipment ·**
- **Total 26 US NC papers accepted out of 30 submitted (87%)**

# US Membership for CIGRE

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012*</u>
<b>Individual</b>	380	319	332	394	459



*We are #1!*

## SC A3 Upcoming events

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- Upcoming colloquia
  - A2-A3-B3 Shanghai colloquium, 20-25 September 2015, A3 is requested to provide 3 Tutorials
  - A3 & B3 joint Nagoya colloquium -09/26 -10/02 2015, A3 is requested 2 Tutorials
  - A3 received an invitation from Indian NC for 2017
- Next A3.01 (Strategy) meeting: March 4, 2015, Berlin, Germany

## SC A3 – Other news

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- More emphasis on tutorials and “outside” visibility
- Continue strong bonds with IEEE: Tutorials at Switchgear Committee: A3.06 HV Equipment Reliability – Fall 2011, A3.22-28 UHV Equipment, - Fall 2012, A3.27 – HV Vacuum – Spring 2013,
- [http://ewh.ieee.org/soc/pes/switchgear/CIGRE\\_A3.htm](http://ewh.ieee.org/soc/pes/switchgear/CIGRE_A3.htm)
- Slightly reorganized the SC structure (Advisory groups- last meeting: Delft, NL, March 2014)
- Will be implementing the Tutorial Review process to enhance quality and collect feedback from audience
- Discussed the Green Book initiative and appointed contact persons for the project (A3.03)



# U.S. Representatives to all CIGRÉ Study Committees & Appointment Dates

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- A1-Sam Salem (GE Energy) – 2006
- A2-Raj Ahuja (Waukesha Electric Systems) – 2012
- A3-Mietek Glinkowski (Schneider Electric) – 2008
- B1-David Lindsay (EPRI) – 2008
- B2-Dale A. Douglass (Power Delivery) – 2006
- B3-John Randolph (PG&E) – 2012
- B4-Hamid Elahi (GE Energy) – 2010
- B5-Mark Adamiak (GE Energy) – 2008

# U.S. Representatives to CIGRÉ Study Committees & Appointment Dates

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- C1-Richard Wakefield (DNV KEMA) – 2007
- C2-Anjan Bose (Washington State Univ.) – 2006
- C3-John Oglevie (Power Engineers) – 2006
- C4-Ian S. Grant (TVA) – 2006
- C5-Andrew L. Ott (PJM Interconnection) – 2006
- C6-Roger Dugan (EPRI) – 2008
- D1-Andrew Phillips (EPRI) – 2012
- D2-Thomas E. Kropp (Nexant) – 2006