

## Dear NGN Member,

In March four of our NGN members attended a two and half day course on "Fundamentals of High Voltage Circuit-Breakers". The course was organized by AREVA T&D Technical Institute. The Institute offered four places free of charge to our NGN members. Bellow is summary of the course and feedback from the attendees.

### Course Summary:

"Fundamentals of High Voltage Circuit-Breakers" was a relax but comprehensive course which empowering engineers with the essential knowledge in high voltage circuit breakers. Although the course only last for 2.5 days, it covered most aspect of high voltage circuit breakers fundamentals. Not only theories for fault current analysis and arc extinguishment etc. were covered in the course, the practical aspect for high voltage circuit breakers like contact mechanism, breaking capacity, circuit breakers testing and standards, as well as test document interpretation etc. were also discussed. This course is highly recommended to any engineer who interested in or work with high voltage circuit breakers.

### Day 1 Feedback

The course started with an overview of the types of disturbances which can occur in power systems by Dr Pinches. This was followed by lectures on short circuit theory by Prof. Al Tai. He covered some basic per unit calculations and three-phase balanced and unbalanced faults. A number of worked examples were included. The lunch break provided an opportunity to network with the other attendees and also to ask any specific questions to the course leaders. The afternoon was spent covering the characteristics of the electric arc. This included studying the alternating current arc, DC time constant, arcing window and arcing energy.

“Rosemary King, Cardiff University”

### Day 2 Feedback

The session on second day morning of the course start with a brief introduction on different type of high voltage circuit breaker interrupter, such as air, oil, vacuum and SF6. Following the introduction, different type of interruption medium and interrupter design for arc quenching ability were discussed. In the mechanical aspect, this course covered the design of interrupter contacts and operating mechanisms. Some common issues on contact design, such as contact resistance and temperature rise, contact repelling and attraction force, contact opening and closing velocities etc were discussed in the session. In term of circuit breaker operating mechanisms, some low cost operating mechanisms with high reliability, reduced maintenance, and able to switch under all switching duties were suggested in the course. Besides the internal design of circuit breaker, different types of HV circuit breaker housing and insulation technologies were taught, such as dead tank, live tank, GIS and AIS etc. Finally, the morning session was closed with the topic in the use of HV circuit breaker in terms of capacitor and reactor



switching. This topic covered the essential knowledge in the phenomena which have to be taken into account for capacitor and reactor switching, such as arc re-ignition, multiple re-ignitions, current chopping and re-ignition over-voltages.

“Hong Soo GOH, University of Newcastle”

Dr Derek has covered different elements of type tests and routine tests that will be conducted for a newly design circuit breakers according to the two main IEC test standards (“IEC 60694 Common specifications for HV switch gear and control gear standards” and “IEC 62271-100 HV AC Circuit Breakers”). He emphasized the importance of testing low level symmetrical fault current rather than only the high asymmetrical fault current. He also talked about the evolution of switchgear short-circuit testing where the switchgear rating exceeding the power available for testing stations. He then talked about the synthetic tests (IEC 60427) practice by HV testing stations nowadays to overcome limitation of the stations' rating. He introduced Short Line Fault where extremely steep Transient Recovery Voltage could cause the breaker to fail.

“Daniel Ting, ERA Technology”

#### Day 3 Feedback

The course ended with an overview of SF<sub>6</sub> type circuit breakers and brief description of history of transmission switchgear and its future by Dr Pinches. SF<sub>6</sub> Regulations, development of transmission system in UK associated with various types of circuit breakers were few points discussed during the last session of the course. The course concluded with looking into various development work-on-progress for future circuit breakers.

“Aruna Gunatilake, AREVA T&D”

#### **First Core Technical Event**

The first NGN Technical Core Event on “Offshore Windfarm Development” was held on April 29th 2010 at Siemens T&D, Monkton, Newcastle upon Tyne. A brief summary of the event will be in our May newsletter.

#### **NGN Annual General Meeting & Upcoming Election**

This year's Annual General Meeting will be held in Nov/Dec. Details of the AGM & election will be in our upcoming newsletters. This year the following positions will be available for nomination.

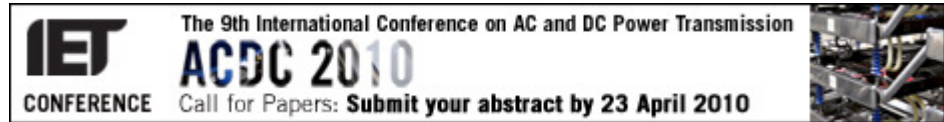
#### **Vice chairman/Information Coordinator**

The Vice Chairman / Information Coordinator shall have responsibilities of aiding the Chairman with day-to-day operations, chairing meetings in the absence of the Chairman, and ensuring that information of the NGN is gathered and distributed accordingly.

#### **The Treasurer /Secretariat**

The Treasurer / Secretariat shall be responsible for the coordination of the NGN budget and finances, recording minutes of meetings, and ensuring NGN membership details are recorded and reported to the CIGRÉ-UK Secretary as required.

- NGN would like to remind you following upcoming conferences



The 9th International Conference on AC and DC Power Transmission will be held on 20 - 21 October 2010, IET, Savoy Place, London.

**Recent important projects** including HVDC interconnectors, FACTS and HVDC and VSC transmission technologies

**Looking ahead: developments over the next five years** including multi terminal DC grids, renewable power and AC/DC connections and offshore wind farms

**Future innovation and international projects** including the DC offshore grid system, energy storage at a large scale transmission level and solar energy transmission

- **7<sup>th</sup> Mediterranean Conference and Exhibition on Power Generation, Transmission, Distribution and Energy Conversion**

**7 - 10 November 2010, Agia Napa, Cyprus**

For more details please follow the link below

<http://cyprusconferences.org/medpower2010>