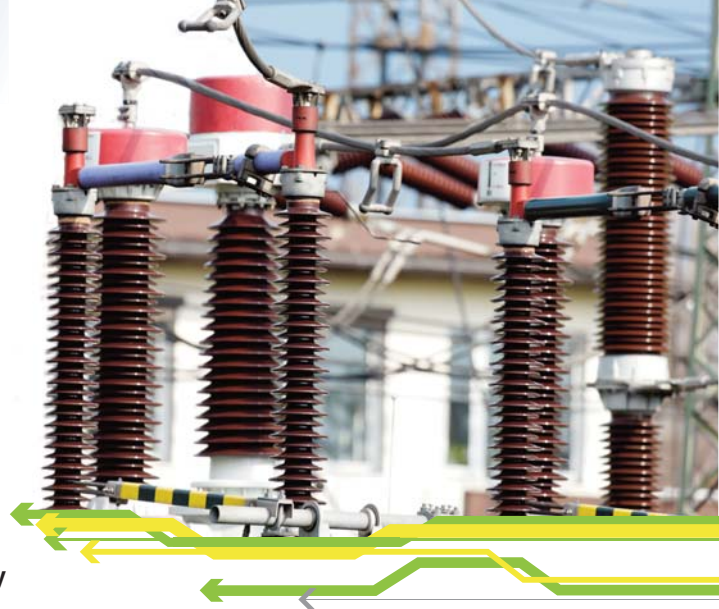


High Voltage Engineering



3-Days | Sydney | 25-27 August 2010
\$1,600 API Members | \$1,900 Non-Members

Transmission and distribution equipment operate at high voltages and an understanding of why and how their insulation can fail, and how failure can be avoided or minimised, is increasingly important because of the huge costs, directly and indirectly, of equipment failure.

This **3-day** course will introduce the failure mechanisms in insulation systems, the importance of good design, appropriate testing of prototypes and at commissioning, and methods of monitoring of the health of insulation systems.

Target Audience This course is suitable for a range of experiences in high voltage engineering from new graduates through to experienced professionals and senior managers who need or wish to understand: Why electrical failures occur in high-voltage equipment; How the health of such equipment may be monitored; and The methods of design and testing of such equipment.

Course Outline

The initial 2-days of the course will cover the causes and mechanisms of insulation failure and the consequent design approaches and condition monitoring of high-voltage equipment.

Breakdown Mechanisms in Gases: the streamer breakdown mechanism particularly in respect of air and SF₆, defect-initiated failures in compressed gases, breakdown in non uniform fields, corona; breakdown mechanisms in very low pressures and vacua.

Breakdown Mechanisms in Liquids and Solids: the 'treeing' mechanism, effect of inclusions (water droplets, gas/vapour bubbles and solid particles), 'weak-link' effects.

Breakdown Across Surfaces: flashover and tracking mechanisms.

Design of cables: bushings, circuit breakers, overhead line insulators to avoid partial breakdown and complete failure

Generation of High Voltages for Testing: cascade and series resonant AC generators, doubler and multistage rectifiers and electrostatic generators for DC, single-stage and Marx generators for impulse voltages.

Partial Discharge Detection: types of partial discharges (pd's), damage to the dielectric due to pd's, detection and measurement of pd's in power system apparatus.

Condition Monitoring in Oil-Filled Transformers: the purpose and theory of dissolved-gas and furfural analysis.

The final day will give an insight into the methods used in testing to establish conformity to the relevant design standards. This will be conducted at Australia's premier High Voltage Laboratory, The National Measurements Institute at Lindfield.

Course Objectives

At the end of the course, participants will be able to:

- Understand the mechanisms of electrical breakdown in gases, liquids and solids
- Understand mechanisms of electrical breakdown across surfaces by tracking and flashover
- Understand the principles employed in the design of equipment operating at high voltage so that they do not fail: equipment such as cables, bushings, circuit breakers and overhead line insulators
- Be aware of the principles of design and operation of high-voltage testing equipment including AC, DC and impulse generators
- Understand the testing methods using such equipment and of the relevant international standards
- Understand some of the methods available for monitoring the health of insulation systems, such as partial discharge testing, daylight UV observations on outdoor insulation, and dissolved-gas and furfural analysis for oil-filled transformers

Facilitators

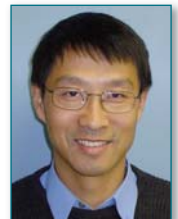
Professor Mark MacAlpine

BA, MA, PhD, MHKIE, MIEE



After 5 years with the UK's Central Electricity Generating Board and 30 years at the Hong Kong Polytechnic University, he is now an Honorary Consultant in the Industrial Centre of the HK PolyU, a Guest Professor at Shanghai Jiao Tong University, part-time Professor both at Tsinghua University and Harbin Technical University, and a Visiting Scholar at Sydney University. He is also an Associate Editor of the IEEE Transactions on Dielectrics and Electrical Insulation. His research interests continue to be in electrical corona, statistics and prediction of spark and lightning paths, and the condition monitoring of electrical plant.

Dr Yi Li



Is a Principal Scientist and the Leader of the High-Voltage Laboratory at the National Measurement Institute, formerly the CSIRO National Measurement Laboratory. He joined the organization as a post-doctoral fellow in 1993 and has since worked in the areas of high-voltage insulation diagnostics and high-voltage measurement techniques. He is a senior member of IEEE, a member of IEEE High Voltage Testing Techniques sub-committee and a member of IEC Technical Committee 42, High-Voltage Testing Techniques.

Recognised for Continuing Professional Development (CPD) by Engineers Australia [refer to EA CPD Guidelines]

Registration Form

Please complete and mail, fax or scan email this form to EEA for each registration.

This registration form is also available at www.ee aust.com.au.

Please print clearly in black pen and in block letters.

EEA Short Courses details

Course title

City Course dates

Participant's details

Title Mr Mrs Ms Dr

First name

Family name

Position

Engineering Discipline (if applicable; eg Civil, Electrical, Mechanical)

Organisation

Postal Address

Suburb/Town

State Postcode Country

Please indicate Home address Business address

Telephone

Mobile

Fax

Email

Are you a member of Engineers Australia?

Yes
Engineering Australia Member Number (if possible)

Please indicate course fee \$AUS

(Refer to EEA Website for course fees)

Payment details

(Payment is required prior to course attendance)

EFT Details Bank: CBA BSB: 062 203 Account: 001 757 58

Cheque (payable to EEA Pty Ltd)

Credit Card

Visa Mastercard Bankcard Diners American Express

Card number

Expiry date

Cardholders's name

Cardholder's signature

Tax Invoice

A tax invoice will be sent approximately two weeks prior to the course

Address for invoice if different from the participant's address

Postal Address

Suburb/Town

State Postcode Country

How did you find out about us?

EEA website Engineers Australia HR/Training Manager

EEA email Manager Colleague

Other

Cancellation and Transfer Conditions

An acknowledgement email is sent following your registration. A confirmation email is then sent closer to the course date. **A confirmation email must be received and payment made before attending a course.** Following registration, a substitute participant is welcome at anytime, **otherwise the following conditions apply:**

5 or less working days before a course

- cancellation - no refund of course fee
- transfer to another EEA course - admin fee of \$198 (inc GST) is payable

6 or more working days before a course

- cancellation - refund of course fee less admin fee of \$198 (inc GST)
- transfer to another EEA course - admin fee of \$198 (inc GST) is payable

Personal extenuating circumstances such as illness or accidents will be sympathetically considered, but admin fee of \$198 (inc GST) would still be payable. Cancellations or transfer must be in a writing by email, fax or letter. **Only one transfer is allowed per participant per course.** If EEA cancels a course due to insufficient registrations or other circumstances beyond its control, a full refund would be provided.

We invite you to contact us at:

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 **telephone** +61 3 9274 9600  **fax** +61 3 9326 9888



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