

# Current Interruption Transients Analysis

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Register at: <https://meetings.vtools.ieee.org/m/34736>

IEEE Calgary Chapter of the PES/IAS will be presenting an in depth seminar by Dr. David Peelo on Transient Recovery Voltages. The three day seminar will held from October 6th to 8th, 2015 at the McEwan Center Escalus Room on the University of Calgary campus. Cost for the seminar is \$1,200 for IEEE member and \$1,800 for non-IEEE members plus GST.

The seminar materials include Dr. Peelo's book <http://eu.wiley.com/WileyCDA/WileyTitle/productCd-1118600479.htm> and class notes on a jump drive.

**Please note the seminar is limited to 25 attendees. No exceptions will be made.**

The seminar will be held from 0830 to 1630 with 15-minute breaks morning and afternoon. Lunch will be provided and the lunch break will be 45-minutes. On campus parking at your expense is available.

## Overview

This advanced course covers the origin and derivation of the transient recovery voltage (TRV) requirements for circuit breakers applied for fault clearing and the switching of inductive and capacitive loads. The course first develops the fundamental concepts involved in current making and breaking including oscillatory circuits, pole factors and travelling waves. The developed concepts are then applied to the individual current interruption case TRVs and associated re-ignitions or restrikes and to making and breaking capacitive and inductive circuits. All cases are well illustrated by real examples. At the end of the course, attendees will have an in-depth knowledge and understanding of the TRV requirements in IEC and IEEE standards and also know how to deal with exceptional cases.

## What You Will Learn

- Fundamental basis for TRVs and re-ignition and re-striking transients.
- Generic approach to the calculation of TRVs and re-ignition and re-striking
- Derivation of pole factors and amplitude factors associated with TRVs as specified in IEC 62271-100 and IEEE C37 Series.
- Calculation of the effects of adding surge capacitors to control TRVs; effect of shunt capacitor banks, load sharing reactors and opening resistors.
- Calculation of TRVs and re-ignition and re-striking transients associated with inductive and capacitive loads, respectively.
- ***Bring a calculator and a laptop loaded with Excel for the classwork!***

## Prerequisites

To derive maximum benefit from the course, attendees should have a basic prior knowledge of the following:

- Electric circuit theory.
- Differential equations
- Trigonometric and exponential functions.

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- Symmetrical components.
- IEC Standards 62271-100 and 62271 110 or IEEE C37 Series.
- Use of Excel for equation based calculations.

## When

Start time: 06-Oct-2015 08:30AM

End time: 08-Oct-2015 04:30PM

All times are: Canada/Mountain

## Where

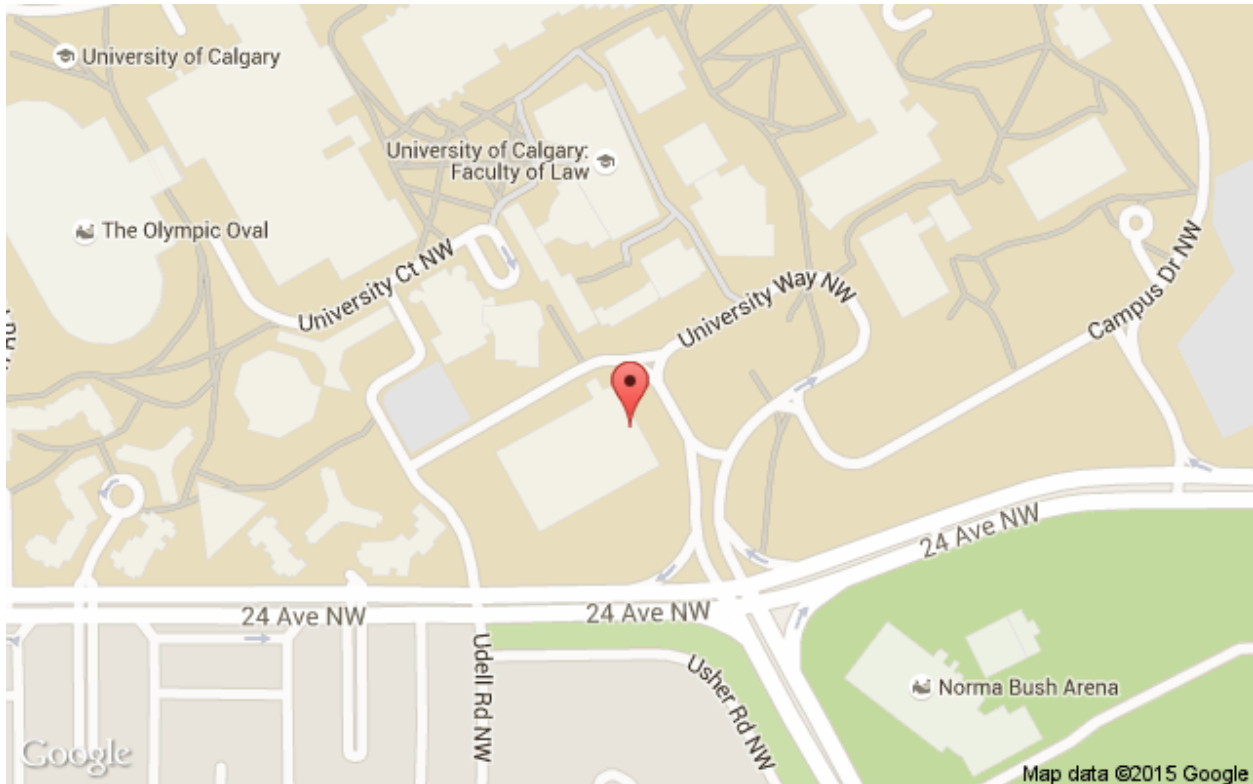
Building: McEwan Center, University of Calgary

Room Number: Escalus Room

2500 University Drive NW

Calgary, Alberta

Canada T2N 1N4



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## Speaker



**Dr. David Peelo**

Topic:

**Current Interruption transient Analysis**

Biography:

Dr. David Peelo is a consultant and former switching specialist at BC Hydro. He is an active IEEE and Cigre member and is a past Convenor of IEC MT32 (Inductive load switching), the Convenor of IEC PT42 (Current interrupting capability of air-break disconnectors) and a member of IEC MT57 (Application guide for IEC 62271-100 and other circuit breaker related standards). He is an IEC 1906 Award recipient and a Distinguished Member of Cigre. He has authored or co-authored over 60 papers on circuit breakers and surge arrester application, is author of a textbook on current interruption transients calculation and a coauthor of a textbook on switching in transmission and distribution networks.

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## Agenda

### Scope

1. Introduction
  - Overview and definitions.
  - Basic principles of current interruption in circuit breakers.
2. Oscillatory Circuits
  - General approach to series and parallel RLC oscillatory circuits.
  - Underdamping, critical damping and overdamping.
  - Damping factors.
  - Amplitude factors.
3. Pole Factor Calculation
  - Basic theory and general approach to using symmetrical components.
  - Balanced and unbalanced fault calculations.
  - AC recovery voltage calculations.
  - First, second and third pole factors.
4. Travelling Waves
  - Basic concepts.
  - Open circuit and short circuit termination cases.
  - Circuit breaker rating basis.
  - Four parameter and two parameter TRVs.
  - “Standard” circuit for TRV derivation.
5. Terminal Faults
  - 100% and 60% terminal faults.
  - 30% and 10% terminal faults.
  - Effect of shunt capacitors, load sharing reactors and opening resistors.
  - Double earth faults.
  - Asymmetrical fault currents.
6. Short Line Faults
  - Line side travelling waves.
  - TRV calculation.
7. Out-of-Phase Switching
  - TRV considerations.
8. Inductive Load Switching

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- Shunt reactor switching.
- Unloaded transformer switching.

## 9. Capacitive Load Switching

- Shunt capacitor bank switching.
- Unloaded transmission line switching.
- Unloaded cable switching.

## 10. Wrap up and Questions

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