

Applications of PSCAD in Power Systems Including Switching & Lightning Induced Transients for Insulation Coordination



Learn to apply industry leading technology for insulation coordination easily through the use of PSCAD™/EMTDC™, practical case studies, and interactive hands-on workshops.

Course Description

This two day course will cover the electromagnetic transient studies that are required to determine the insulation levels and ratings of substation equipment. Specific topics include the following: selection of surge arrester (ratings and position) to protect substation equipment from lightning and switching surges; development of the system model for switching frequency overvoltage studies and estimation of 'failure rates'; lightning overvoltage studies - representation of station equipment, line segments and towers for a lightning overvoltage study; circuit breaker TRV; and capacitor switching transients.

Course participants will be able to experiment with the case studies in an interactive hands-on workshop environment using the PSCAD simulation software.

Who should attend?

This course is intended for practicing engineers, graduate students, and researchers in power systems and power electronics, who are interested in developing an in depth understanding of the modern tools available for station design.

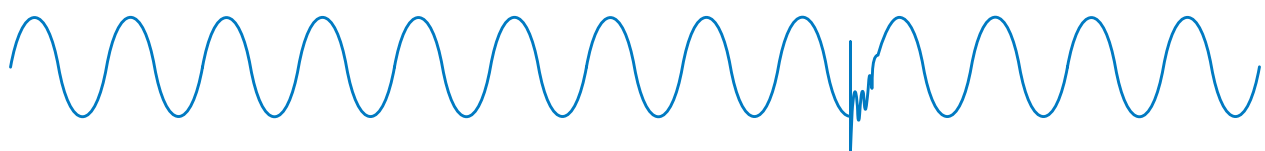
It is recommended that class participants have at least a basic or intermediate working knowledge of PSCAD.

Course Methodology

The training will be conducted using a presentation format by the instructor with interactions (questions and answers) with course attendees. The presentations will be followed by hands-on tutorials where the participants will develop practical cases to further reinforce the concepts presented. The detailed course materials and the example cases used in the tutorials portion will be provided for future follow-up and study.



A variety of power systems, PSCAD, and custom training courses are offered by MHI. This course gives attendees the opportunity to expand their knowledge about insulation rating levels of power generation facilities, requirements, ratings of surge arresters, and how PSCAD can help to achieve these goals.



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Course Topics

1. Introduction to electromagnetic transients in power systems and simulations:

- Local oscillation of lumped L-C elements
- Travelling waves in lines, cables and bus bars
- Damping of transients due to system resistance
- Building the power system model

2. Introduction to PSCAD:

- Important component models and features
- Creating a small simulation case using PSCAD

3. Development of an AC system model suitable for:

- Temporary overvoltage studies
- Switching overvoltage studies
- Network resonance
- Representation of power system elements such as lines and cables, transformers, and shunt devices
- Representation of surge arresters
- Network equivalences
- Model validation
- Discussion of prior outage and contingency conditions
- Multiple run feature of PSCAD parametric studies

4. Network frequency scan studies

5. Temporary overvoltage studies including network resonance:

- Ferranti effect
- Transformer energizing
- Faults

6. Switching frequency over voltage studies:

- Parametric studies to identify worst case
- Determination of surge arrester ratings from a switching surge perspective

7. Breaker TRV studies:

- Transient recovery voltage across breakers
- Determination of station stray capacitance values and representation in the study overvoltages:
- IEEE breaker capability curves and applicable international standards

- Fault level, type, and duration
- Mitigation methods

8. Stranded conductors

9. Capacitor bank switching considerations:

- Arrester energy rating
- Overvoltages
- Resonance issues
- Mitigation methods

10. Development of a simulation model to study lightning induced overvoltages, the following will be represented:

- Transmission lines, towers, and insulators
- Lightning surges
- Surge arresters
- Substation bus bars and equipment (including transformers)
- Bushing and stray capacitances
- Flash over mechanism based on insulator striking distance

11. Lightning induced overvoltage studies:

- Direct lightning strikes

Course Particulars

Instructor

Course instruction will be provided by one of our many simulation and application experts from the team of PSCAD Support Engineers. CV's available upon request.

Classroom Size

By striving to keep classroom sizes small, there is ample opportunity for questions and discussions among the students and the instructor.

Training Location

Courses can be provided at MHI's Winnipeg location, or an instructor can provide training at clients' desired location.

A minimum enrolment is required. Students will be notified two weeks prior to commencement if the course is cancelled

Manitoba Hydro International Ltd. is a world leader in power system simulation innovation and applied engineering solutions. As the developers of the world-renowned PSCAD™/EMTDC™ software, we recognize the importance of collaborative partnerships and technologies in the global power industry.