

# Configuring Transmission Lines with PSCAD

*The Manitoba HVDC Research Centre (MHRC) is committed to providing comprehensive training programs to help clients better understand how to easily utilize PSCAD™ to achieve results.*

## Course Description

This one day course outlines how to model overhead lines and underground cables. The transmission line models in PSCAD are discussed in detail and are compared in terms of accuracy, application, limitation and simulation speed. Other key discussion topics include: the correct modeling of overhead lines and cables using data mined from manufacturer datasheets, such as stranded conductor, semi-conducting layers, segmented conductors, and cross-bonding.

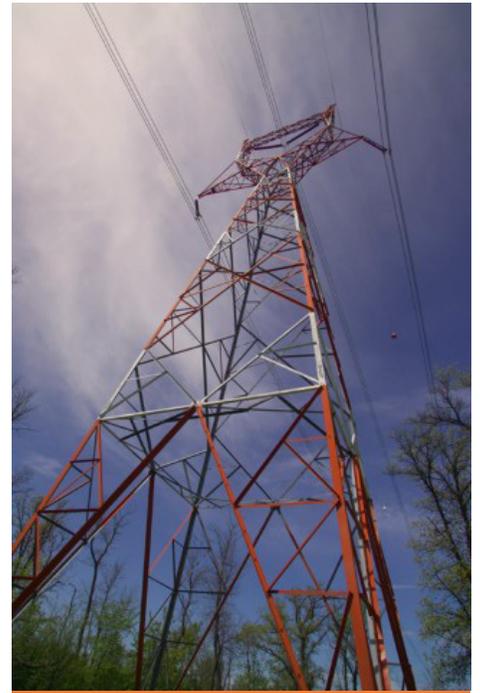
Special considerations, such as obtaining a correct DC response for an HVDC transmission line, as well as methods to improve the stability of the simulations due to passivity violations, are also discussed. When applicable, the concepts presented are reinforced with several PSCAD simulation workshops. Case studies will be applied in detail to highlight practical situations encountered by engineers in the field. Previous experience and knowledge of PSCAD is not required, but class participants should have a working knowledge of transmission lines.

### Who should attend?

This course is intended for practicing engineers, graduate students, and researchers in power systems, who are interested in understanding the concepts, nuances, and potential pitfalls of accurately simulating overhead lines and underground cables in 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 perform tests further reinforcing 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.



*Course attendees will cover a variety of topics. Attendees will be able to enhance their learning and understanding by experimenting in the workshop.*



**PSCAD**

## Course Topics

1. Available transmission line models
  - Advantages and disadvantages of  $\pi$ -Sections, Bergeron Model, and Frequency-Dependent Models
  - Comparison of the above models to one another
2. Representing transmission line and cable models in PSCAD
  - Construction of a transition line
  - Construction of a cable
3. HVDC transmission line modeling
4. Troubleshooting unstable simulations
5. Conductor elimination
6. Treatment of sag
7. Stranded conductors
8. Creation of a  $\pi$ -Section equivalent
  - PSCAD coupled a  $\pi$ -section model
  - Long-line correction
9. Frequency-dependent ground conductivity
10. Multiple coupling
11. Ideal cross-binding, DC correction, semi-conducting layers, and aerial cables
  - Practical cable cross-bonding of underground cables
  - Ideal cross-bonding of cables
  - DC correction by functional form method
  - DC correction by adding a pole/residue
  - Semiconducting layers
12. Aerial cables and mutual coupling between overhead lines and cables

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

## Course Particulars

### Instructor

Course instruction will be provided by transmission line experts. CVs 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 MHRC's Winnipeg location, or an instructor can provide training at client's desired location.

For courses at a client's location:

- A workbook with tutorial examples, PSCAD software and a temporary license(s) for use during the course will be provided.
- We require that the client arranges for use of a training room, computers for the students, a VCD (LCD) projector, and a large whiteboard.

For courses at MHRC's Winnipeg office:

- A computer, workbook with tutorial examples, PSCAD software and a temporary license for use during the course will be provided.
- Lunches are provided on site during training days.
- Hotel accommodations and local travel are the responsibility of the student. Contact us for a list of local accommodations.



*As leading experts in the field of HVDC, we offer comprehensive training courses as well as global services for HVDC transmission.*

For more information about our training courses, please contact us.

The Manitoba HVDC Research Centre is the world leader in power system simulation innovation and applied services. Our expertise provides a comprehensive array of engineering products and solutions. We foster new ideas and technologies through collaborative partnerships globally.

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