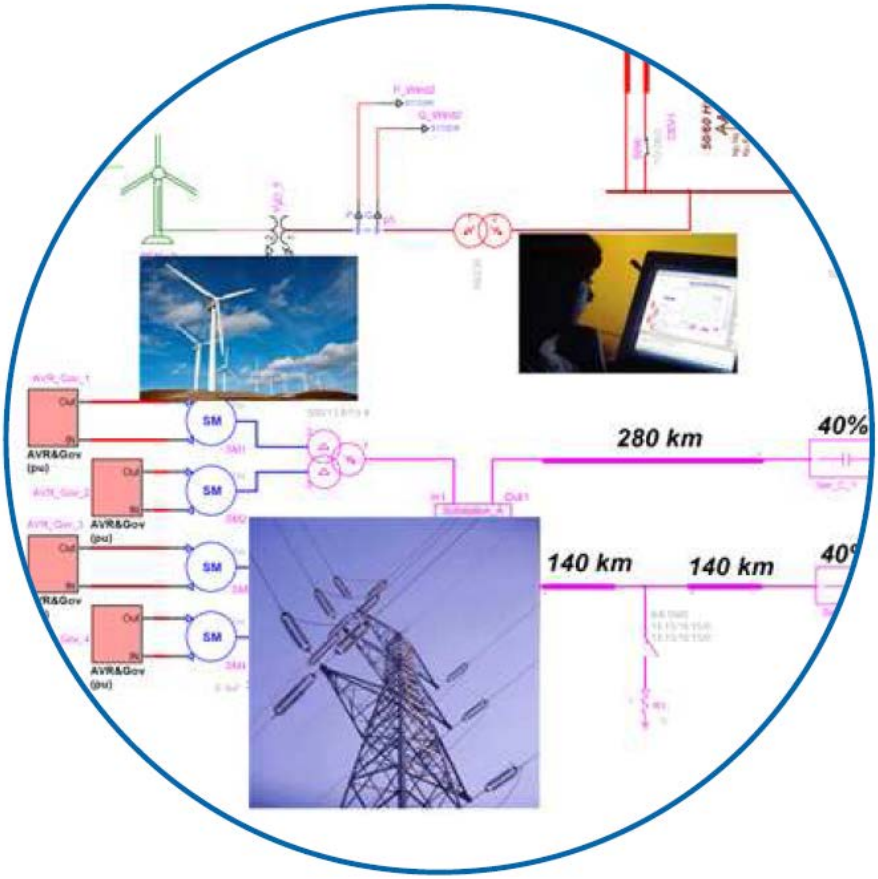
EMTP-RV

The reference for power systems transients

5-Day course
Montréal - CANADA
October 1-5, 2012

Simulation and Analysis of Power System Transients using EMTP-RV



This course is organized by POWERSYS.

Place:
DELTA MONTREAL
http://www.deltahotels.com/en/hotels/quebec/delta-montreal/
475 President-Kennedy Avenue
Montréal,QC,H3A 1J7
CANADA

Course Objectives

The objective of this course is to give to beginner and intermediate participants a good hands-on experience on the simulation and analysis of power systems transients in general. The course is based on the usage of EMTP-RV for demonstrating concepts and teaching through practical problem cases. EMTP-RV contributes greatly to the simplification of complex power system studies and to the visualisation and accurate simulation of large systems.

Who Should Attend

EMTP-RV users that want to increase their level of knowledge on the software usage and applications.

Engineering personnel familiar with the basics of electric power system analysis that need to get more in-depth practical knowledge of power system transients simulation and analysis in areas such as:

- Insulation coordination of HV substations and transmission lines;
- Electromagnetic and electromechanical transients;
- Practical system studies

Course Structure

The duration of the course is 5 days.

Each participant will have access to a personal computer or will have to bring his personal computer to learn about presented topics and to analyze available practical examples.

The course starts at 8:30 a.m. and ends at 5:00 p.m. every day.

Lunch breaks are from noon to 1:00 p.m.

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Speakers

Luc Gérin-Lajoie
Power system studies
TransÉnergie, Hydro-Québec
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Dr. Ilhan Kocar
Professor
École Polytechnique de Montréal
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Director, IT Infrastructure and Enterprise Services
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IREQ, Hydro-Québec,
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Course Outline

Day 1 – Monday, October 1rst, 2012 08:30 - 17:00

Program

1. Introduction to the program
   a. Welcoming remarks
   b. What you can expect to learn
2. Theoretical backgrounds on Power Systems and Transients
   a. Theoretical analysis methods
   b. The range of problems and frequencies: lightning, switching and temporary overvoltages; electromechanical transients
   c. Typical study cases
3. Numerical methods for the simulation of transients
   a. Load-flow
   b. Steady-state
   c. Frequency scan
   d. Initialization
   e. Time-domain
4. Introduction to EMTP-RV and EMTPWorks using examples
   a. Overview: devices, pins and signals
   b. Power and Control devices
   c. Device attributes
   d. Basic scripting techniques
   e. MPLOT and ScopeView
5. EMTP-RV Simulation options
   a. Steady-state analysis and initialization
   b. Numerical methods in time-domain computations
   c. Solution of nonlinear devices
6. Creation and maintenance of subnetworks
   a. Subnetwork uniqueness
   b. Masking
   c. Hierarchical designs: from small systems to large scale problems
   d. Symbol editor
   e. Password protection
7. Creation and maintenance of libraries
8. Other options
   a. Available Libraries
   b. Searching for devices
   c. Error checking
   d. Page setup, multipage designs
9. Basic models: switches, RLC branches, ideal sources

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Day 2 – Tuesday, October 2nd, 2012 08:30 - 17:00

Program

1. The library of control devices
   a. Measuring devices: power, voltage, current
   b. Periodic meters, transformation functions
   c. User-defined modeling
2. Simulation of control systems
   a. Initialization methods
   b. Examples: mean-value model, measuring power with variable frequency, variable inductance model
3. Switching device models
   a. Application examples
   b. Simulation of power electronics devices
4. Input impedance computation
5. Transmission/Distribution line and cable models
   a. Theory and available models
   b. PI-section, Constant Parameter model, Frequency dependent models
   c. Corona model
   d. Application examples
6. Three-phase power-flow
   a. Methodology and setup options
   b. Initialization
7. Nonlinear devices
   a. Modeling in steady-state and time-domain
   b. Application examples
8. Transformer models
9. Synchronous and asynchronous machine models and related controls
   a. Available models
   b. Case setup, controls and initialization
   c. Startup from 0 Hz
10. Statistical analysis methods
11. The study of complete systems
    a. From load-flow to steady-state to time-domain
    b. Initialization of machine controls
    c. Switching transients
    d. Temporary overvoltages
    e. IEEE-34 bus distribution test case study
    f. 500 kV system study

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Day 3 – Wednesday, October 3rd, 2012 08:30 - 17:00

Program

1. Steady State and Transient Analysis of Unbalanced Distribution Networks
   a. Neutral shift computations in unbalanced distribution systems: Analysis of a real comprehensive distribution feeder
   b. Calculation of voltage on the neutral conductor in 4 wire distribution systems
   c. Multiphase load flow solution from sub-transmission level to meshed secondary levels
   d. Capacitor Switching transients

2. Power system stability studies: electromechanical oscillations, frequency control, voltage stability
   a. Exciter, governor and stabilizer models. IEEE standards and related models.
   b. Importance of load models. Load model designs and applications.
   c. Transmission case study.
   d. Distributed generation case study.

3. Protection systems
   a. Instantaneous relays, inverse-time and rms current relays
   b. Distance protection
   c. Undervoltage protection
   d. Overvoltage protection
   e. Frequency protection

4. Insulation Coordination principles
   a. Voltage stresses within the system
   b. Power Frequency Insulation and pollution
   c. Lightning, switching and temporary overvoltages
   d. Lightning arrester selection
   e. Insulation coordination methodologies

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Day 4 – Thursday, October 4th, 2012 08:30 - 17:00

Program

1. Insulation Coordination of a 230 kV Transmission System
   a. System setup
   b. Power-flow and steady-state stability of the system
   c. Statistical switching studies and line insulation
   d. Temporary overvoltages, usage of line arresters and reclosing resistors
   e. Ferroresonance and harmonic resonance
   f. Lightning protection of substations

2. Practical Power System Studies
   a. Insulation coordination of a 230-kV GIS
   b. Transformer and capacitor bank switching
   c. Temporary overvoltage cases - load rejection, self excitation, etc
   d. TRV studies
   e. Breakers and switches
   f. Breaker failure analysis with detailed arc model

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Day 5 – Friday, October 5th, 2012 08:30 - 17:00

Program

Wind generation and HVDC

1. Introduction to wind generator studies
   a. Model setup
   b. Collector network
   c. Grid code requirements
   d. Detailed and Average value models
2. HVDC converter and systems
   a. LCC and MMC
   b. Detailed models

Advanced usage of EMTP-RV

1. Quick introduction to JavaScript
2. EMTPWorks extensions to JavaScript
   a. Main objects
   b. Methods for grabbing object data
   c. Relations between objects
   d. Devices, signals and pins
   e. Available services
3. Device search methods, looking into subnetworks
4. Device attributes: Data ad Methods
5. How devices are setup and how data is entered
6. Changing data without opening a device
7. Scripting device data
8. Programming masks from top-down, application examples.
9. Complete parametric study case:
   a. Step-by-step analysis
   b. Changing data
   c. Rerunning
   d. Scripting with MPLOT
10. DLL programming
    a. Advanced model development
    b. Using Fortran
    c. Using C++
    d. Examples

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Contacts:

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EMTP-RV Software
POWERSYS is the worldwide commercializer of EMTP-RV
For additional information about EMTP-RV:
www.emtp.com

Corporate website:
www.powersys-solutions.com