Electro Magnetic Transient (EMT) Studies

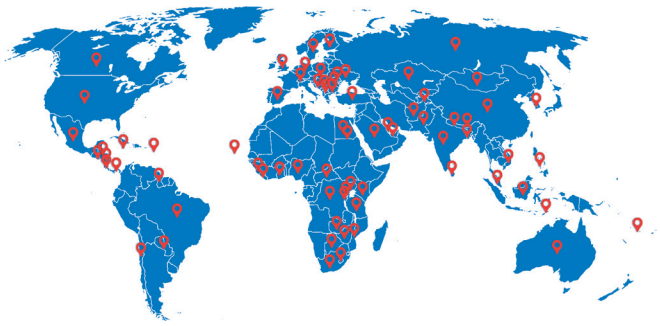
Manitoba HYDRO INTERNATIONAL

Manitoba Hydro International (MHI) is the world leader in power system simulation. As the developers of the PSCAD™/EMTDC™ simulation software, our technical team has provided consulting services, expert advice, and EMT studies to over 500 clients.

We are the industry leader in EMT based studies and our capabilities include:

- Insulation coordination studies
  - Switching over-voltage studies
  - Lightning over-voltage studies
  - Temporary over-voltage studies
- Breaker transient recovery voltage (TRV) studies
- Very Fast Transients (VFT) studies
- Custom model development, simulations and validation
- Power quality studies, including harmonics and voltage flicker
- Capacitor bank design and switching studies at all voltage levels
- Wind farm integration / interconnection and feasibility studies
- Sub-synchronous resonance and control interaction studies
- HVDC, SVC, and FACTS studies
- Detailed fault analysis
- Power system protection and relay settings
- Black start restoration (BSR) studies
- Fast bus transfer and motor starting studies
- PSCAD training on a wide range of technical topics

We have conducted switching, insulation coordination, and other EMT studies for hundreds of sub-stations over the past 5 years and are highly experienced in performing such studies and identifying mitigation techniques. MHI works closely with clients during every stage of the project to provide valuable technology, tools and knowledge transfer.



MHI has provided training on EMT studies to hundreds of people around the world. We offer introductory, advanced and customized PSCAD courses and see personalized training as an important way to connect with the power system community.

Stage 1		Stage 2		Stage 3	
Bid/Tender Evaluation	Data Preparation	Model Testing/ Validation	Run Study & Analyze Results	Provide Recommendations	Implementation Plans

MHI can provide the training, tools, and assistance at any stage of your project.

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Past Projects

TRV and Insulation Coordination Studies

MHI provided insulation coordination studies aimed at identifying the severity of over-voltages that can appear at the transformer terminals and other electrical equipment in the station due to system events. The studies also verified the adequacy of protection devices to protect critical equipment.

Harmonic Resonance Study in a 100 MW Solar Power Plant

MHI performed harmonic resonance studies on a 100 MW solar power plant connected to the national electric grid in Texas, USA. This project focused on detection and analysis of potential harmonic resonance concerns at the solar farm due to interactions of solar inverter controls with resonance conditions in the electrical grid and solar collector network.

System Restart Ancillary Service (SRAS) Power System Black Start Studies

MHI teamed up with an Operator to validate the feasibility of the Black Start Restoration (BSR) procedures by performing the required EMT simulation studies. The PSCAD- based study investigated phenomena, such as transients, dynamic performance, network resonance conditions and appropriateness of various relay settings under weak system conditions that prevail during a BSR process. The studies covered the entire Australian National Electricity Market (NEM).

As a result of the analysis, the client has been able to justify a significant reduction in the overall number of black start services required.

Sub-Synchronous Control Interaction Study in a 160 MW Solar Power Plan

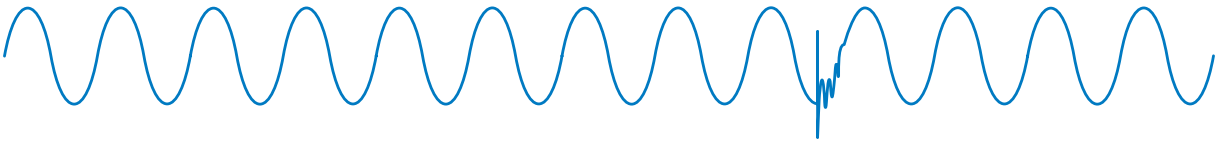
MHI performed a SSCI study on a 160 MW solar power plant connected to the national electrical grid in Texas, USA. This project investigated the potential sub-synchronous control interaction (SSCI) at the solar farm due to interactions of solar inverter controls with resonance conditions in the electrical grid. The study employed an advanced screening method, developed in-house, to determine the region of negative dynamic damping of the solar farm inverters for sub- synchronous frequencies.

Wind Interconnection Studies for 400 MW Wind Integration Project

MHI performed PSCAD-based studies to support the interconnection of wind generation to the transmission system.

The study identified modifications to the wind farm protection and control settings that are necessary to meet the required overall performance.

The main focus of the study was to verify the acceptable operation of the wind farm under steady state operation, as well as during recovery from faults and other system events. Based on study observations, MHI proposed changes to the protection and control settings of the wind turbines that enabled the wind farm to ride through transmission system faults and meet grid code requirements.



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.

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Accessible formats available upon request.

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