

Providing expertise in the field of clean, renewable energy



There is a growing demand worldwide to incorporate more renewable energy to meet an ever increasing global power need.

Manitoba Hydro, one of Canada's leading utilities, recognizes the importance of integrating renewable energy sources and currently produces 95 percent of its energy from clean, renewable sources.

As a subsidiary of Manitoba Hydro, Manitoba Hydro International has spent years developing knowledge in the implementation and operation of renewables and have created specialized tools, models, and techniques to better understand and simulate the system integration. The techniques developed by the engineers at MHI are recognized as the industry standard for Sub-Synchronous Resonance (SSR) and Sub-Synchronous Control Interaction (SSCI) screening.

Electromagnetic Transient (EMT) type simulation studies are a cornerstone of wind power integration. PSCAD™, developed and supported by MHI team, is the software tool of choice for all major wind system vendors worldwide. PSCAD is essential for examining wind interconnection into weak grids and other challenging integration issues. EMT tools are required for:

- Vendor level design of control and protection schemes
- System operating/short term planning studies
- Vendor level design of power electronic topology and wind turbine electrical equipment ratings
- Vendor level testing and model certification to satisfy utility and system operator requirements

System level wind integration studies:

- Fault ride through and dynamic response
- Power quality
- SSR and control interaction issues
- Power and reactive power control and response
- Frequency scans, harmonic studies and filters
- Temporary over voltage and TRV

In addition to EMT studies, MHI offers traditional planning and operational studies that are essential to generation integration.

MHI works closely with clients through the renewable lifecycle - from researchers and manufacturers to owners, operators, regulators, and the end clients including wind industry leaders such as ABB, Vestas, Gamesa, Siemens, and Alstom Grid.



MHI offers a comprehensive range of training courses to the power industry, including wind power technology and system integration. Over the past five years, our experts have conducted numerous training sessions in the field of renewable energy.

Capabilities

MHI offers a comprehensive array of studies including EMT, load flow, fault analysis, PQ and PV analysis, dynamic stability analysis, transient/voltage stability, and small signal stability. These studies include:

- Wind interconnection/planning studies
- System operating/short term planning studies
- FACTS and synchronous condenser based solutions for performance improvement
- Detailed EMT studies for equipment specifications, verify dynamic performance and mitigate control interaction and resonance issues
- Collector system design, over voltage, and harmonic analysis

Renewable Training Programs

To assist building competencies within your organization, MHI provides comprehensive standard or customized education and training programs.

For example, offered is a Wind Technology Theory and Simulations Course that has been taught for over five years and is popular among vendors, utilities, and academic institutions. The workshop topics include:

- Nature of wind that impacts wind turbine performance
- Turbine aerodynamic characteristics
- Generation technology
- Voltage and reactive power control
- Fault ride through
- SSR issues
- Voltage and harmonic issues

Past Projects Include:

Wind Energy Offshore Power System Analysis

MHI was contracted to determine the feasibility of

connecting 1200 MW offshore platforms by means of 220 kV export cables for RWE in the UK. A variety of studies were undertaken to determine the feasibility of connecting the proposed wind generation to the 400 kV National Grid. The overall project included: load flow study, losses study, short circuit study, and transient studies.

ETI Wind and Renewable Integration Study

This project was carried out for the Energy Technologies Institute (The ETI) in the UK. One of the goals of this study was to examine issues in 400 kV AC grid reinforcement for the UK for the integration of renewable resources using multi-terminal HVDC, VSCs, and FACTS, as well as series compensation technologies.

Sub-Synchronous Resonance Studies & Expertise

Awarded a joint contract with PwrSolutions Inc., MHI provided a leading U.S. system operator training and technical assistance in detection and analysis of SSR and SSCI risk in the operator's bulk electric system. This project included the following:

- Review and assess the technical analysis provided regarding SSR and SSCI risks to particular units and grid locations
- Provide quality assurance and quality control on issues related to modeling and analysis of SSCI
- Deliver a set of guidelines associated with modeling requirements and SSCI screening methodology
- Provide technical support and training courses

Wind Turbine Model Development

In close collaboration with the R&D Grid Integration Dept. at Alstom Renewables Espana, S.L., in Barcelona, during 2013, MHI worked on the development of a PSCAD model of the ECO110 60Hz DFIG wind turbine including all its capabilities. This model can be easily adapted to the other ECO100 platform wind turbines to perform grid integration studies.

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.