

# Tutorial SESSION

## Tutorial Session on Renewable Energy Integration to Weak Grids – System impact studies with PSCAD

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### ORGANIZED by

Manitoba Hydro International Ltd.

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### TUTORIAL SESSION DESCRIPTION

The renewable energy penetration levels in the power systems have increased significantly in many parts of the world. The converter based generation show vastly different dynamic characteristics compared to the traditional synchronous machine based generation. Since the generator dynamic characteristic is a dominant factor in the overall system dynamic response and dynamic stability, large-scale renewable integration will present new technical challenges from a power system stability point of view.

The use of appropriate modelling tools can facilitate insights into the performance of weak (low fault levels and inertia) AC systems with high levels of renewable technologies connected in close proximity. Phenomena's such as control interactions and sub-synchronous



oscillations are a real challenge and a threat to power system stability and security. Phasor-based RMS simulation programs have key limitations to study weak grids with large penetration of renewables and cannot accurately capture the transient interactions and events that could potentially lead to plant tripping as recently experienced in Australia and Great Britain.

This tutorial session specifically concentrates on studies related to integration of renewable generation (Wind and Solar PV related studies).

### WHAT IS COVERED

- Inverter basics
- Power system modelling
- Demonstration of examples
- Analyzing simulation results

### SHORT BIO OF PRESENTER

Dharshana Muthumuni, Ph.D., P.Eng., is the Managing Director of the Power Systems Technology

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(PTC) Centre, a division of Manitoba Hydro International. He oversees the overall operation and development of the Industry Standard PSCAD simulation software. He has over 20 years of experience in engineering studies using a variety of simulation products, including PSCAD™/EMTDC™ and PSS/E. His expertise is regularly sought out by clients around the world for his strong and wide ranging technical knowledge on power system behavior, model development, and simulation studies. He has lead the technical team to solve challenging problems, including HVDC and generation interconnections, wind integration into weak grids, FACTS-based solutions, SSR screening techniques, and power quality and harmonics.

Dharshana has worked extensively and closely with equipment vendors to develop simulation models and techniques to address difficult interconnection problems. He has developed many custom models and simulations techniques for specific studies, including working closely with equipment vendors to address their simulation study requirements.

In addition to his engineering study experience, Dharshana has been a key contributor to the development of the PSCAD simulation tool and has conducted training workshops on a variety of power system topics globally.

### Technical Co-sponsors:



### Supporting Universities:

