

July 11, 2005

ORTECH Power Points™

Wind Energy Simulation and Mapping System (EnSimWE) is in Beta Testing

By: Dr. Trevor Scholtz and Hong Liu

On June 21, 2005, Environment Canada released the first-ever beta version of its Wind Energy Simulation and Mapping system (EnSimWE). The system is a new and invaluable tool for site development. It can be used to prospect in North America and globally for the best potential sources of wind energy and then to statistically estimate the likely electrical power production from these sites based on meteorological observations over the period 1958 to 2000. ORTECH has considerable expertise in wind climate/energy assessment and field measurement and we were invited by Environment Canada to be a beta tester for EnSimWE.

EnSimWE is a unique system combining both the mesoscale and microscale dynamic downscaling. This method of wind resource assessment is entirely different than assessments based on site specific measurement. This makes EnSimWE an invaluable tool for independent verification of projected capacity factors. It is also possible to benchmark the wind resource of a proposed development site against virtually any other site in Canada. Due to the length of record of the input data it has complementary value to most site specific measurements which are based on short periods of record (eg. 1 year). The immediate applications of EnSimWE are:

- to provide a tool for an initial screening assessment for a site of interest through enhancing the 5-km resolution Canadian Wind Energy Atlas for sites in Canada; and
- to create a long-term average wind climate based on a 43 year data record, which can be compared with the long-term wind climate developed using Measure-Relate-Predict (MRP) methods. The statistical integrity of the long-term average wind climate is critical for financial modelling.

ORTECH has begun to compare the projected average wind speeds of various site specific measurement data with the predicted average wind speeds of EnSimWE, and the

early results look very promising. ORTECH invites its clients to work with us on the beta testing with real-life applications.

With future enhancements, EnSimWE will be capable of:

- carrying out wind energy forecasts over 24-48 hours time frame;
- carrying out wind energy prediction for the next decades by considering the impact of climate change on the wind energy production; and
- providing solar energy mapping.

For more information, please contact:

Dr. Don McKay

General Manager

Tel: 905-822-4120 ext. 499

Fax: 905-855-0406

Email: dmckay@ortech.ca

Web: www.ortech.ca

Technical Background of EnSimWE

Environment Canada initially developed a small-scale wind climate mapping system – the Wind Energy Simulation Toolkit (WEST) in 2000. In late 2004, a 5-km resolution Canadian Wind Energy Atlas was created using WEST. WEST uses a statistical-dynamic downscaling method involving mesoscale and microscale models. A primary data input to the system is a 43-year record (1958-2000) of three-dimensional meteorological data with global coverage assembled from surface observation stations, radiosondes, ships, airplanes, radars and satellites. These data have been quality controlled and objectively analyzed at a resolution of 2.5 degrees latitude-longitude (~ 500 km at Canadian latitudes) to provide a basic database with a total of 432 representative classes of meteorology. These representative classes of meteorology at about 500-km resolution are then downscaled to a few kilometers using the Mesoscale Compressible Community (MC2) model, a state-of-the-art dynamic mesoscale atmospheric model that is widely used in Canada and worldwide. The MC2 step produces classes of wind climate at a few kilometers resolution which are then further downscaled to tens of meters using MS-Micro, which is a microscale numerical model that computes the steady-state wind flow over complex terrain and land use. Finally, the representative classes of wind climate at both mesoscale and microscale resolution are transformed to wind energy indicators that are used to identify preferred sites for further detailed assessment using onsite wind measurements and other more detailed wind flow models.

The WEST was initially developed in UNIX and Linux environments. With the demand from the wind energy sector, work began in 2004 to develop a more user-friendly version

of WEST for Windows-based PCs, which resulted in EnSimWE, a marriage between the WEST and EnSim, the latter being a modelling engine interface developed by the Canadian Hydraulics Centre at the National Research Council.

As with any complex system, there are limitations in EnSimWE that should be noted. For example:

- EnSimWE produces only annual average wind climate statistics without any seasonal or diurnal information;
- MC2 is run with a simplified physics scheme that excludes radiation, condensation and the diurnal cycle. These simplifications preclude the simulation of day/night effects, the sea/lake breeze and mountain valley circulations;
- MS-Micro is only capable of modeling the steady state and neutrally stratified boundary layer over gentle mountainous terrain without flow separation; for more rugged terrain and non-neutral atmospheric stratification, other microscale models must be used.

* * * * *

ORTECH Power provides technical and management consulting services to developers and financiers of energy projects in Canada. ORTECH Power Points™ are compiled based on independent in-house analysis of current events in the power sector. The information provided is not intended to predict financial performance for companies discussed, and is not to be used for investment decisions of any kind. If you wish to be deleted from the distribution list, please contact info@ortech.ca or call Pat Ross-Smith at 1-877-774-6560. Copyrighted, all rights reserved. www.ortech.ca