

Advanced DG Modeling with CYMDIST - Product Highlight

A recent survey* of Studies and Analysis Tools Used for Assessment of Distributed Generation Integration in Canadian Distribution Systems published by Natural Resources Canada's CANMET Energy Technology Centre - Varennes has shown that distribution companies are only beginning to integrate Distributed Generation (DG) and that this remains a relatively new and insufficiently understood topic. It concludes that knowledge regarding the impact on the operation and planning of the distribution system, and new technologies to facilitate its integration, would be welcomed to aid in this process.

Recognizing the fact that Distributed Generation (DG) is propagating rapidly on the distribution networks and that engineers must be equipped with better tools to assess the impact of DG on their electrical network, CYME has recently enhanced the functionality of its distribution analysis software CYMDIST in a significant way. The new release of CYMDIST features several improvements and functions including new DG models to investigate and simulate the impact of various types of DG on the distribution network.

The latest version of CYMDIST allows to study quickly and clearly the impact of DG. Namely, it provides the ability to model all types of DG including all electronically coupled DG such as wind turbines (synchronous or induction), gas turbine (high speed), energy storage, photovoltaic, etc. It also features tools for islanded systems simulation (islanding capability) and the ability to reduce the network (network reduction) to better see the impact of DG.

Enhanced DG Models

In CYMDIST the DG models are divided in three categories depending on how they are coupled with the electrical network:

- **Synchronous generators** that can be operated in three different modes: voltage control, fixed generation or swing.
- **Induction generators** that provide constant generation.
- **Electronic converters.** Electronic converters are used with wind turbines (synchronous or induction), gas turbine (high speed), energy storage, photovoltaic source and fuel cells.

DG Impedances Estimation

An **Impedances Estimation function** has been developed and introduced in the DG properties dialog box. This function provides typical values of the generator impedances if the data is not available to the user. The estimation function is based on standards for short-circuit calculations that provide a series of tables for different generator sizes and types. The estimation function implemented in CYMDIST provides the data that enables different "what-if" cases and that provides accurate results on the impact of DG.

* The final survey report can be downloaded from:
http://cetc-varenes.nrcan.gc.ca/2006-070_e.html

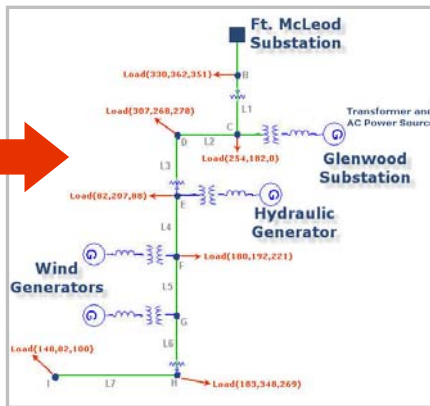
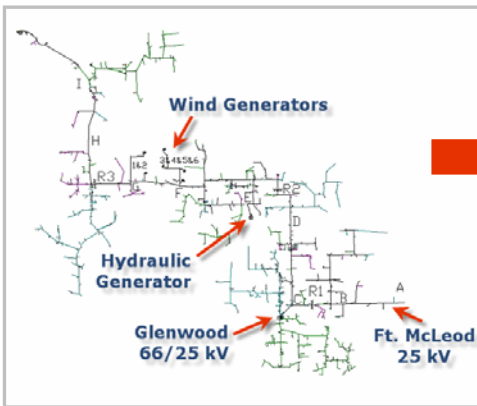


Islanding Capability

Integration of DG technology creates networks that are fed by multiple sources. CYMDIST has been modified to allow modeling of islanding (network fed by DG's only or both) and to provide the capability to set any DG as a swing for the network. Simulation algorithms and reports have been enhanced to view the new configuration and to report overloading of any DGs for any operating conditions.

Network Reduction

When performing studies on a large distribution network that includes a number of DG sources, a reduced network is beneficial since it lessens the computational effort and simplifies the study, focusing only on the area of interest. The **Network Reduction function** implemented in CYMDIST allows reducing a large network into a much smaller equivalent network by keeping the area and equipments of interest. More importantly, this sophisticated equivalent model allows matching exactly the power flow and short-circuit results of the non-reduced network.

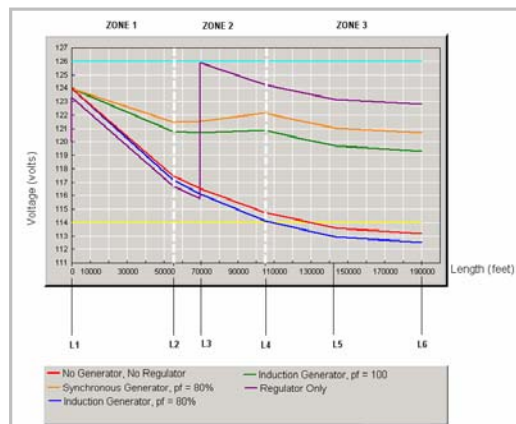
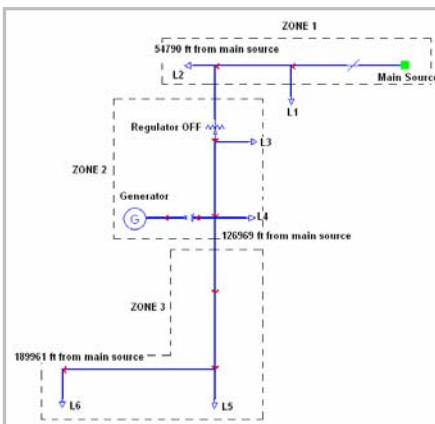


Network Reduction – Left side is the original 3200 nodes and on the right is a 50 nodes equivalent model

Validation and Case Studies

These enhancements were implemented in CYMDIST with the help of Natural Resources Canada's CANMET Energy Technology Centre - Varennes that funded part of the development of the new models and functions, as well as the production of case studies presenting the impact of implementing distributed generation sources of different technologies, in a typical distribution circuit. The complete report for these case studies can be found on the Natural Resources Canada web site:

http://cetc-varennes.nrcan.gc.ca/en/er_re/inter_red/p_p.html



Voltage Profile for various generators types and regulator for the peak load condition



Canada & International
 1485 Roberval, Suite 104
 St-Bruno, QC Canada J3V 3P8
 Tel. (450) 461-3655
 Fax (450) 461-0966

U.S.A.
 67, South Bedford St, Suite 201 East
 Burlington, MA 01803-5177 USA
 Tel (781) 229-0269
 Fax (781) 229-2336

U.S.A. & Canada
 1-800-361-3627
 www.cyme.com
 info@cyme.com