Long-Term Dynamics Analysis

High penetration of variable output distributed energy resources (DER) units, such as solar farms and wind farms, imposes new challenges to distribution engineers. To prepare for increased penetration levels and to plan the deployment of distributed generation, new simulation tools are needed. The CYME Long-Term Dynamics Analysis module offers a new time-series simulation to study the impact of insolation variations, wind fluctuations and load variations on network controls such as regulators, load tap changers and switched capacitors.

Long-Term Dynamics – Analysis for Distributed Energy Resources

The advance in nowadays technologies has increased significantly the presence of wind and solar power supplies in power generation portfolios, and utilities have to face the challenge of managing such interconnection into the grid.

The intermittency of wind and cloud-over periods affect the output of wind energy systems and photovoltaic (PV) generation. By analyzing the impact of such variations on regulators, load tap changers and capacitor switching, the Long-Term Dynamics Analysis allows power engineers to properly assess the impact of DER integration and to better understand related technical issues such as var control and voltage regulation.

Sun Radiation, Wind Speed and Load Profile

To allow the modeling of DER system output profile, different curve libraries have been implemented to carefully model the variants which affect ultimately the output of the various DERs:

- Insolation curves
- Wind speed curves
- Load curves

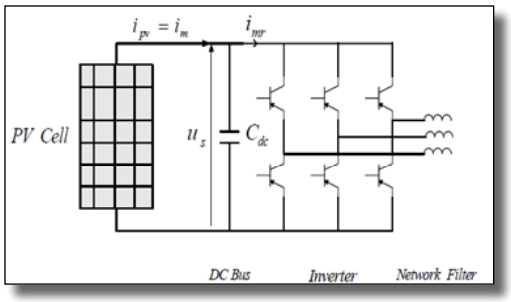
COOPER Power Systems

Long-Term Dynamics

Study the impact of insolation variations, wind fluctuations and load variations on network controls.

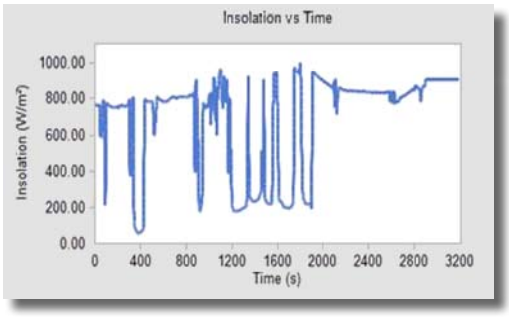
Accurate Equipment Modeling

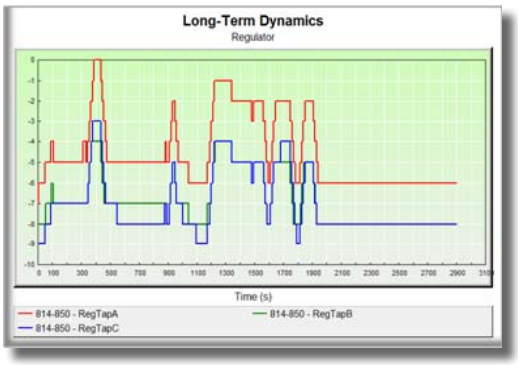
CYME has refined its PV system model such that the output function is represented by manufacturer data such as:



- Insolation curve model
- Current at maximum power point
- Voltage at maximum power point

Other detailed distributed generator models, such as wind energy conversion systems, are available.





Evaluating System Impact

With Long-Term Dynamics analysis, time-series simulations can be performed to assess how the DER output profile affects:

- Voltage regulators
- Load tap changers
- Capacitors

The user can specify the activation time delay, tap changer delay and mechanism delay data of the regulators and LTCs tap changing algorithm in order to prevent unnecessary switching due to voltage fluctuations. Time delays are also available for shunt capacitors and switchable shunt banks to specify closing and tripping delays.

Voltage regulators now have four reset modes: fast, induction disc, delay and delay freeze reset.

Simulation results are illustrated in comprehensive graphs. Power engineers can easily evaluate the performance of the system with or without DER, determine the impact of different DER locations and evaluate the effect of different variant profiles.

Long Term Dynamics Analysis is a powerful tool for the understanding of how solar arrays and wind farms impact the system, so that the network can be better prepared for higher DER generations of tomorrow.

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