Distribution State Estimator

Process various measurements in order to estimate the power flow and voltages of the system

As distribution systems are becoming more interconnected and complex, their efficient planning and operation require an accurate and trustworthy power flow solution obtained from a detailed electrical model with its inherent share of imprecision.

The CYME Distribution State Estimator module features a refined algorithm which takes detailed network modeling to a newer level by being able to process various measurements in order to estimate the power flow and voltages of the system.

The CYME Distribution State Estimator analyzes the unbalanced power flow and the voltages at every level of a distribution power system. The module uses a rigorous mathematical formulation which solves for all distribution system topologies (radial, looped, meshed), including heavily meshed systems such as secondary grid networks.

The details provided by the module help the distribution engineer design the best solution to the problems identified. The module is seamlessly integrated to the CYME framework, making it easy to utilize the results for other CYME simulations and for adjusting settings on the distribution model.

The CYME Distribution State Estimator can:

- Estimate unbalanced load and power flow
- Process various types of by-phase measurements (volts, amps, kW, kVAR) with user-specified precisions
- Handle measurement redundancy
- Estimate voltage regulator and transformer on-load tap changer tap position
- Include distributed generation
- Provide solution quality indices
- Cleanse the data based on user-defined rules to remove bad data prior to the analysis

- Perform load initialization in preparation of distribution system analysis (capacity analysis, volt-VAR optimization, contingency analysis, etc.)
- Assist with identification of potential errors in topology and measurements (switches state, shunt capacitor state, tap position, etc.)

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Distribution State Estimator

Detect potential power flow and voltage problems on your electric distribution system

State estimation for secondary grid networks

The Distribution State Estimator analysis is based on a rigorous mathematical formulation that can handle large interconnected systems. This robust algorithm makes the state estimation of heavily meshed systems such as secondary networks possible. Load values can be estimated while low-voltage cable currents can be calculated for increased grid awareness.
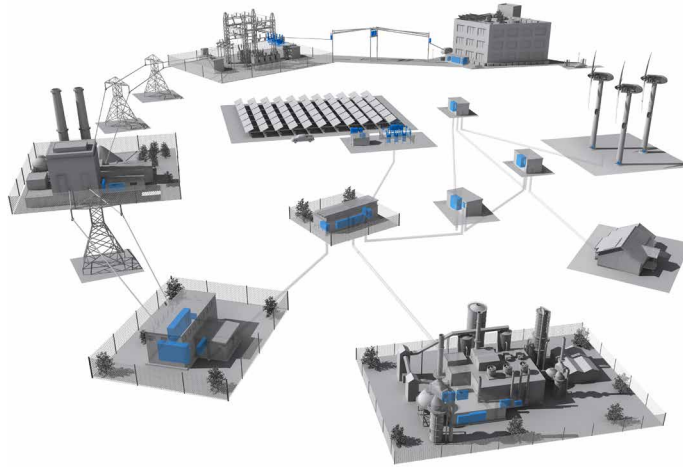
Voltage measurements

Unlike traditional algorithms such as power flow and load allocation, the Distribution State Estimator takes into account by-phase voltage measurements, along with other traditional measurements (Amps, kW, kVAR). A voltage meter can be installed at any node of the distribution system model.

Meaningful results

The Distribution State Estimator analysis module includes several detailed reports that can be further customized by the user. They provide insights on the solution by tabulating meaningful results such as estimated load values, meter measurements and calculated meter values. A series of quality indices is also available to help the engineer assess the accuracy of the solution:

- Normalized residuals
- Weighted residuals
- Normalized Lagrange multipliers
- Solution cost
- Measurement mismatches

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