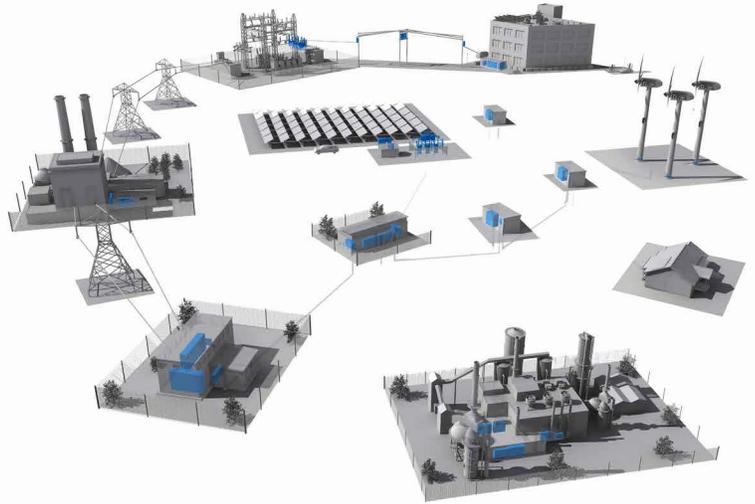


# CYME 8.1 New Features



## Keep ahead with the analysis of your power systems in an era of rapid changes

To maintain safe and reliable power delivery while maximizing assets and efficiency gains is at the heart of the challenges faced by power engineers performing grid planning in an ever-evolving environment.

Keeping abreast of the evolution of the technology, standards and regulations, the CYME algorithms, models, and interface are constantly upgraded to provide the users with the best experience possible. Clear view of the behavior of the network under various circumstances is only a few mouse clicks away.

The CYME team continues to further the development of the CYME Software to offer a flexible framework with advanced analyses for power engineers in utilities and industrial installations. The focus remains on delivering our promise of a powerful yet intuitive software which brings dependable results at the user's fingertips. On top of the new and enhanced algorithms, a countless number of innovative tools introduced in version 8.1 offer an enriched one-line diagram navigation experience and open the way to dynamic integration with external systems for a factual view.

This new version combines user insights with our innovative edge and is in line with the fast changing industry practices, standards and regulations, while improving its renowned user-friendliness.

### Enhancing the as-built network model with field measurements

Highly adaptable plugin environments are introduced with CYME 8.1, which purposes are to enrich the CYME network model with dynamic data from the field and to feed external systems with information from the CYME data and results.

#### Dynamic Data Pull module

The Dynamic Data Pull (DDP) module was designed to refine the as-built planning model with field measurements such as power, current, voltage, load demand, generation, or devices statuses for switches, voltage regulators, shunt capacitor banks, etc. The CYME network model can thus accurately depict the system at specific moments, providing engineers with valuable information when running analyses to support operations.

Once the data access and the mapping are configured, the module allows engineers to fetch field measurements residing in external systems such as SCADA historian, AMI, MDM, and the like, directly from the CYME software user interface.

Long-term planning can also benefit from the DDP as it makes possible the creation of a dynamic link between the CYME software and a load forecasting tool. Data such as annual or seasonal circuit- and bank-level peak and minimum loads can be acquired by the CYME software, enabling the engineer to quickly assess system risks and violations for a horizon of as many years as available from the external forecast database.



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## Data Push Publishing module

The CYME software combines a wealth of information about the power system and its components as built, installed and set, along with results of a variety of analyses.

The Data Push Publishing module is an environment which facilitates the publishing of the CYME data for an audience of traditional or non-traditional CYME users (e.g. field crews, customers, etc.). A custom bridge is built between the CYME software and the external systems desired, based on the extensive CYME keywords library.

The plugin receives the selected CYME values from the network model or simulation results and push them to the external system. Consequently, with the use of the Data Push Publishing module, the CYME software can act as a data repository or a calculation engine in an integrated environment.

## Time-based network update

Now that time-varying data is at the user's fingertips with the use of the Dynamic Data Pull module, the time-based network status can be obtained when loading a network (or at any later time) within a few mouse clicks. Based on the data available, the updates requested and displayed may include device statuses, meter readings and load/generation values at a specific time, a user-defined time range of specific intervals, or at the most recent moment.

## Using dynamic data for time-sensitive analyses

A number of CYME analyses can make full use of the time-varying data automatically updated through the deployment of the Dynamic Data Pull module. After a user-initiated update of the network model at a given point in time, the new system state can be studied using several CYME analyses, including among others, our Distribution State Estimator, Load Flow, Load Allocation and Contingency analyses.

## New analysis modules for greater efficiency gains

### EPRI DRIVE™

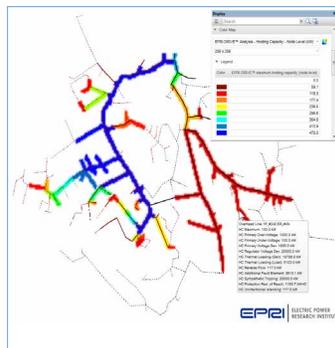
The EPRI DRIVE™ engine has been integrated into the CYME software as a module and offers another hosting capacity analysis method besides the Integration Capacity Analysis module.

The calculation method provides aggregated and granular hosting capacity results for each distribution feeder and considers numerous circuit-specific attributes, such as topology, equipment nameplate data, device settings as well as peak and minimum loading conditions. Its various analysis parameters allow nuancing between different DER technologies, considering the particular impacts of the resource types.

The main highlights of EPRI's hosting capacity method are:

- Streamlined method based on heuristics
- Results available for three-phase large DER hosting capacity scenarios (centralized and distributed) and single-phase small DER scenarios (distributed)
- Thorough analysis based on multiple, diverse criteria covering thermal loading, power quality, protection and reliability

The hosting capacity results are provided under several formats within the CYME software graphical user interface. Typical for this type of analysis, heat maps and one-line diagram color-coding layers are available for each aspect of the method.



## Advanced Fault Locator

Smart fault sensors and indicators are being deployed across the distribution system to remotely monitor the system and gather data about their status. The data is used to assist operation engineers to evaluate the possible locations and determine a sound plan of action for restoration.

The CYME Advanced Fault Locator module has been developed to provide engineers with a rigorous method to calculate and visualize the possible fault locations on the detailed network model.

First, for the user to model monitoring devices on the one-line diagram, fault indicator has been added as a drag and drop instrument from the CYME Explorer Bar's Toolbox tab, which trip threshold can be specified.

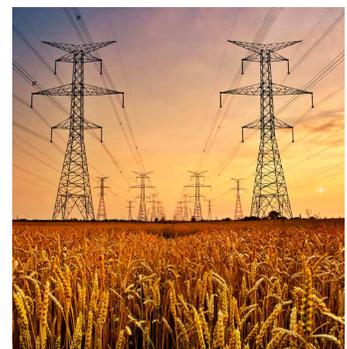
Furthermore, the CYME software can import COMTRADE files generated by Intelligent Electronic Devices (IED). The data can be utilized directly from within the Advanced Fault Locator dialog box as an immediate input of field measurements during fault conditions.

Based on one or multiple fault measurements (current or reactance to fault), entered or obtained, and the tolerance specified, the Advanced Fault Locator calculates the possible fault locations and narrows them down. The user can also specify the measure (ex.: current) for each phase.

A sliding fault feature is included in the module to refine the resolution of the fault location detection on models with long lines. The sliding fault calculates the fault current at an incremental distance along the lines.

Visualization of the measuring device(s) and the fault event(s) critical path(s) on the one-line display is made easy with the configurable markers and measures' colors. A comprehensive report completes the output of the analysis, and shows the fault locations determined, information about them, along with the electrical distance between the fault and the reading device location.

The module's algorithm is based on the IEEE C37.114© and C37.111-2013© standards.



## Sophisticated algorithms reflecting the up to date industry practices, yet easy to use

In line with the needs and trends in the industry, a number of our modules' algorithms and interface have been upgraded to provide the engineer with the precision and ease of use they are looking for. Here are the main upgrades.

### Integration Capacity Analysis

The capabilities of the Integration Capacity Analysis module have been extended to widen the possibilities by which the engineer can address the different needs of hosting capacity analysis. Protection constraints have been improved:

- Protection Reduction of Reach constraint to verify that the minimum fault current seen by the protective device does not be reduced beyond a certain percentage to assure the adequacy of its protection reach.
- Sympathetic Tripping constraint to determine the maximum generation level allowed without the back-feed of its short-circuit contribution causing the tripping of overcurrent protective devices in other protective zones.
- Minimum Fault Clearance to verify that the protection can still clear the minimum fault in its zone.

It is now possible to unlock the controls of the tap changers and switched capacitors, when calculating the maximum integration capacity for the steady-state voltage constraint. Thus, the results take into consideration the voltage changes and better represent the final state of the network.



### Distribution State Estimator

The robust algorithm of the Distribution State Estimator module now allows an improved use of the data utilities have. Also, a new Line Search Approach facilitates the convergence of the analysis for networks with modeling and/or metering issues.

The Distribution State Estimator module takes advantage of the external data that can be obtained from systems such as an AMI. The CYME Dynamic Data Pull module can be utilized to that end.

Solution quality indices have been added along with their associated keywords, so they can be used anywhere relevant in the CYME software. In the output reports, they indicate the level of consistency between the solution computed, the network model and the measures pulled such as the active power and the reactive power of meters, generators, motors and loads; and the current and voltage as measured by the meters.

Additionally, to help the analysis to converge and provide a good solution, a "Bad Data Pre-screening" function validates the values of metering devices available on the network. The filtering can be user-defined. With the CYME Scripting Tool with Python module, scripts can be used to validate the data and modify the values.

### Load Balancing

Applying and removing rephasing suggested by the Load Balancing module is now completely unconstrained and visual as a Load Balancing Control has been added to the Explorer bar as an individual tab that can be accessed at will with capabilities that facilitate decision making.

From that window, the user can apply/remove/ignore any rephasing proposition and see the results immediately refreshed on the one-line display. Hyperlinks are available to facilitate the location of a proposed rephasing on the one-line diagram.

### Protective Device Analysis

Results visualization of the Sequence of Operations simulation has been enhanced with the use of device circling, colors and tags that are applied to better identify tripped and closed devices as well as fault location and operating times. The report now allows identifying the difference in time between two operations.

The Properties Control tab in the Explorer bar includes the possibility to edit the settings of any protective device selected on the display; while a new color-coding layer allows the easy visualization of the amount of upstream protectives to each section. Coloring of curves in TCC Views, when not individually customized, follows the same color coding.

TCC settings management has been greatly improved with the option of creating a dynamic link between the protective devices in the model and the TCC settings stored in the data repository. The user is now allowed to display and edit a group of TCC settings directly from the repository and propagate the modified settings to all protective devices where it is used.

## Smooth deployment of the CYME software within your company

The enhanced configuration features now available allows streamlining the access to the CYME software based on distinct work processes by defining which aspects of the tool each user requires for performing the work. This capability facilitates employees' training around the configured features and thus accelerates the learning curve and promotes a new level of efficiency.

To simplify the creation and management of configuration files, several improvements are introduced in the CYME software and its Configuration Setup tool, the latter now having a counterpart embedded in the software user interface for ease of use.

Based on company's preferences, the creation of configuration templates targets the files and folders that the CYME software uses. The customization of the menus, toolbars, reports, result boxes,

etc., is retained into one of these configuration files. It is easy to normalize the accesses to the CYME software components based on the needs (by types of users, for example) and the reports structure and content based company's procedures.

Moreover, creating, sharing and deploying software configuration templates to a team of engineers based on their individual work needs while maintaining a high level of security is made straightforward within the CYME software. The configuration templates can be shared and deployed in a user/machine setup or when the software is used in a network environment. Moreover, the recent improvements to the configuration files management facilitate the deployment of company- or user-specific templates when the CYME software is executed as a virtual application.



# CYME 8.1

## New Features

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### Upgraded network modeling for more precise results

Bringing power system modeling at a new level of precision for true-to-life results requires precise modeling of equipment and loads along with their settings in the field. Several enhancements have been introduced into the CYME equipment modeling functions in order to emulate the behavior of the devices and loads in the most complete way possible.

- Customer loads definition is expanded to enter more information that can be used in reports, result boxes, filters, etc. The Downstream Customer Load Box is made dynamic, so the data can be monitored while modifications are being made. Customer loads configurations can be exchanged between users.
- De-energized tap changer of a by-phase transformer is now supported with new settings with which the user can fix the primary and secondary taps for each phase.
- A new relay model based on the ETI's MNPR relay has been added for network protector to complement the CYME current network protector relay model which is based on the Eaton MPCV relay.



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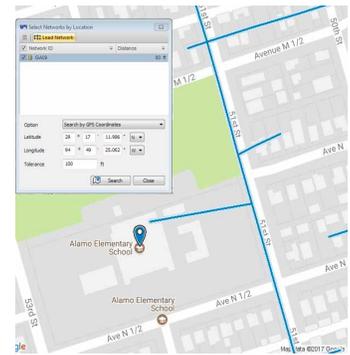
- Single-phase connection has been added to the motor connection settings.
- Ampacity derating factor has been included in the overhead lines settings.
- Harmonic source modeling has been enhanced with the control of the harmonic current injection of inverter-based distributed generation, variable frequency drives, DC chargers and UPS by entering the device parameters in order to limit the distortion levels within specifications.
- Tower configurations have been added for single-circuit and double-circuit transmission tower to support the definition of European transmission towers.
- With the introduction of two short-circuit levels in the source equivalent equipment definition, a source impedance range can be indicated and the impedance level to use can be specified. That level can be overridden in a number of analyses, where a new level can be selected as a simulation parameter.
- Three zero sequence impedance models are now available for the grounding transformer; and an estimate function has been added to calculate the impedance.
- A calculator included in equipment definition and anywhere in the settings for the generator and the two-winding transformer allows the calculation of the grounding impedance.
- The modification to the equipment definition can now be handled in a more intuitive way where the user can keep the changes to values in view while making the adjustments needed. Furthermore, the modifications once applied can be propagated to the equipment instances installed on the network.

### Effortless network navigation

The network editing experience is even smoother with a number of features introduced to allow the user to navigate more easily on the one-line diagram and to adjust ergonomic items for an easier viewing of the components.

### Navigate using GPS coordinates

With the CYME Geographic Overlay module installed, it is now possible to search for and display a network based on a GPS coordinate or by clicking a location on the background map displayed. When the Online Maps Service is available, the user will be able to do the same by address or point of interest.



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