Spectrum Power™ Transmission Network Applications

The Siemens suite of Spectrum Power™ Transmission Network Applications (TNA) provides your organization with the tools needed to manage the operation of the transmission grid. The tools are used to monitor, analyze and optimize transmission system operation. These applications are developed for today’s open computing environment and can be configured as stand-alone systems or integrated with a SCADA/EMS. Spectrum Power TNA consists of field-proven applications suitable for networks of various sizes. TNA provides:

- Advanced, flexible solution to assist in the management and optimization of transmission grid operations for reliability and economic purposes
- Modular, state-of-the-art components based on the latest hardware and software technology designed to meet current and evolving industry standards and satisfy regulatory requirements
- Applications can be configured as stand-alone systems or integrated with a SCADA/EMS system
- Fully CIM-compliant data model, built on the IEC1 CCAPI data standards.

**Benefits**

Spectrum Power TNA provides benefits such as:

- Providing accurate real-time model for better monitoring and control of the transmission grid
- Assessing power system grid stability in near real-time with respect to overloads, static voltage limits and voltage collapse
- Enabling you to evaluate network control actions under a wide variety of hypothesized conditions
- Maintaining historical cases for after-the-fact analysis.

**Key features**

Key features of Spectrum Power TNA include the following.

- All applications available in real-time and/or study modes
- Supports multiple simultaneous study users
- Supports multiple network model versions
- Field-proven, single-pass orthogonal state estimator
- Fast-decoupled and Newton-Raphson power flows with multiple slack options.
- Cascade outage simulation in contingency analysis with flexible interactive definition.
- Full range of equipment models, including SVCs, DC lines and transmission interfaces
- Voltage collapse analysis using the continuation power flow
- Optimization with contingency constraints
- Case comparison tools
- Retention of save cases following network model change
- Short circuit analysis with balanced and unbalanced faults
- Task-oriented, Web-based user interface.

**Package options**

The Spectrum Power TNA suite is comprised of a base package and options within two main functional areas:

- Transmission Grid Analysis applications
- Optimization applications

**Transmission Grid Analysis applications**

The Transmission Grid Analysis base package includes the applications required to build base cases and perform static contingency analysis.

The applications that comprise the base package are:

---

**Control center and energy management solutions**

**Answers for energy.**
State estimator - uses real-time measurements, forecasted load and generation, scheduled voltages, and any operator entries to provide a complete and reliable network solution.

Dispatcher power flow - is user-initiated study function that provides a power flow solution for the transmission network. It is used to examine the steady-state conditions that may exist on the network under a wide variety of hypothesized conditions.

Contingency analysis - determines the reliability of the network under specified contingencies. It simulates the steady-state power flow solution and checks the network for out-of-range conditions. Contingency analysis can also account for planned outages.

Siemens offers the following two Transmission Grid Analysis applications as options:

- **Voltage stability analysis** - enables the operator/engineer to identify voltage stability problems and examine the effects of load transfers or other conditions on voltage stability.

- **Short circuit analysis** - calculates fault currents in the network so that it may be used to monitor potential fault currents that may exceed circuit breaker rating(s) in current operating conditions and network topology. This function can also be used to verify the circuit breaker capacity and protection settings.

**Optimization applications**

The optional Optimization applications are used to maximize system operation. They use cases from the Transmission Grid Analysis package to perform studies of how the transmission grid can be better utilized. The available applications are the following:

- **Optimal power flow** - used to enhance system operations. Recommends adjustments to controls to achieve optimization objectives. There is also an option for a security Constrained OPF\(^1\), which includes the capability to consider contingencies as constraints along with corrective and preventive control strategies.

- **Voltage scheduler** - used to determine the optimum device settings to minimize transmission losses, optimize reactive power, and to eliminate or reduce voltage violations and branch overloads.

- **Contingency Constrained Dispatch** - determines the most effective remedial actions that can be implemented at minimal cost through generation re-dispatch to alleviate violations of active power operating constraints.

**User interface**

Spectrum Power TNA provides a task-oriented Web-based user interface to support various user types: system operators, operations engineers, and support personnel. A Web UI provides flexible access, as users can be added without loading software on each new UI console. Graphic summaries display an overview of system conditions, present color-coding to indicate problem areas, and provide access to more detailed views. Tabular displays and one-line diagrams enable the user to enter data and view results.

**Availability**

Spectrum Power TNA is available in three system configurations:

- Stand-alone
- Integrated with a Siemens Spectrum Power SCADA/EMS system
- Interfaced with third party’s SCADA/EMS system.

\(^1\) U.S. Patent No 6,775,597 B1.

Figure 1. Typical TNA screen

For more information, please contact your Siemens representative.