

A person with short dark hair, wearing a white shirt, is seen from behind, sitting at a desk in a control room. The desk is filled with several computer monitors. The top row has three monitors: the left one shows a colorful map with red lines, the middle one shows a detailed grid or map, and the right one shows a schematic diagram. The bottom row has three monitors: the left one shows a data table, the middle one shows a data table, and the right one shows a line graph with multiple colored lines. The background is a large window with a grid pattern.

SIEMENS

Smart tools for a smarter grid

Take control of network planning with Siemens PTI's power system analysis tools

siemens.com/power-technologies/software

Answers for infrastructure and cities.

Smart grids call for smart software solutions

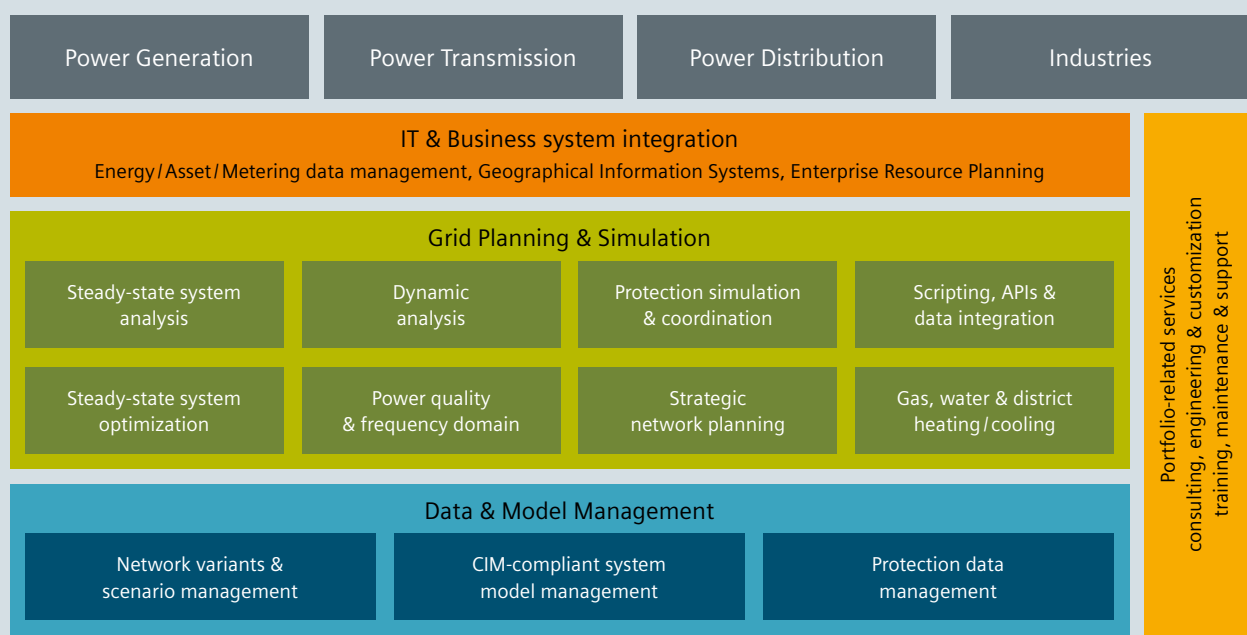
Today's changing power systems infrastructure and the growing pressure for increased reliability and decreased costs demand flexible and comprehensive planning and analysis software solutions. In this environment, system analysis tools must deliver reliable calculation results, provide efficient data management, and have the flexibility to adapt to any IT environment.

Thorough system analyses are key elements for successful system planning and development to ensure the reliability and efficiency of the power supply. While the energy systems are undergoing dramatic changes and the cost pressure on system operators and planners is increasing, powerful and highly efficient system analysis tools are gaining in importance. To adapt to the infrastructural changes, these software tools must undergo improvements to the underlying calculation algorithms and integrate models for emerging technologies, such as FACTS, storage, hybrid networks, or new equipment for wind power, while considering new and existing regulatory requirements. In addition, as the networks are expanding, integrated utilities are looking for software solutions that handle cross-sectoral planning and analyses to make their processes even more efficient. Besides comprehensive

calculation and simulation methods and a modular structure, effective software tools today require an open architecture, which means the availability of a vast number of IT integration options and an efficient data management system. This ensures that the tools can flexibly adapt to existing or changing IT structures and data can easily be exchanged between different applications for fast access and to enable the use of synergies. Especially in smart grids, an effortless handling of complex tasks is fundamental for successful operation.

In today's energy world with its challenges, Siemens PTI's expertise and power system analysis tools provide valuable support to planners and operators in the areas of power generation, transmission, distribution, and industry.





Answers for today's challenging power system planning tasks

For the efficient planning and operation of electrical power supply or multi-utility systems, the availability of suitable software tools is of fundamental importance. In addition to high-quality results, our tools provide efficient model data management. While today's system models become increasingly complex, our comprehensive but intuitive user interfaces ensure user-friendly project handling. The flexible, modular structure and various interfaces allow for a focused, customized application.

High-performance planning and simulation tools

Siemens' power system analysis tools work with highly advanced algorithms and cover any kind of system study, such as steady-state analyses, the evaluation of dynamic behavior, a simulation of the protection system, or power quality issues. Our tools can handle even very large and complex systems and support multi-utility planning. In addition to technical parameters, economical criteria are taken into consideration for an optimized configuration of power systems and pipe networks.

Efficient data management

Our model and data management tools are designed with an eye for CIM-compliant power system modeling. They are used in operational power system simulation as well as for model exchange. The tools enable the coordination of time-based incremental models across entire planning organizations and support a comprehensive set of data management options.

Vast IT integration possibilities

All software tools are built as open systems, which means it is easy to integrate into other systems, such as SCADA, EMS, DMS, GIS, and Metering Data Management systems, without depending on integrators. Interfaces for import and export are available.

Comprehensive portfolio-related services

The development of our software tools is backed by more than 40 years of experience in power system planning. Alongside our broad software portfolio in this field, Siemens PTI also provides professional power system consulting services for any aspect relating to the planning and operation of power supply networks.

Siemens Power Academy hosts product-related training for all of our software tools. Our offering ranges from basic training to courses on special topics or software modules. The courses are adaptable to individual requirements with regard to both content and venue.

Powerful and flexible tools made for professionals

Whether for system analysis or planning, safety and security calculations or power quality evaluations, strategic planning issues or data handling tasks: there is a Siemens software solution that provides you with everything you need while offering excellent operability and a great user experience.

Steady-state system analysis and optimization

- Balanced/unbalanced power flow, PV/PQ analysis
- Contingency analysis, restoration of supply
- Short-circuit calculation, multiple faults
- Steady-state network reduction
- State estimation
- Optimal power flow, Volt / Var optimization
- Compensation placement and optimization
- Load balancing, load assignment
- Generation and load profiles
- Feeder evaluation / optimal branching
- GIC – geomagnetic induced currents

Dynamic analysis

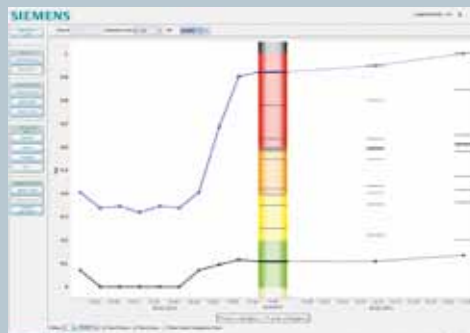
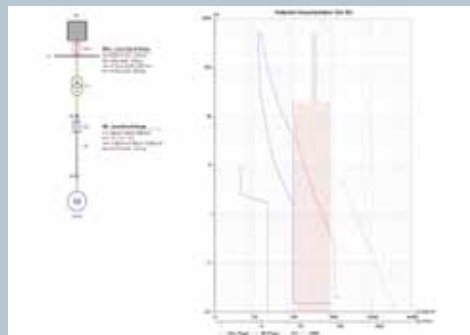
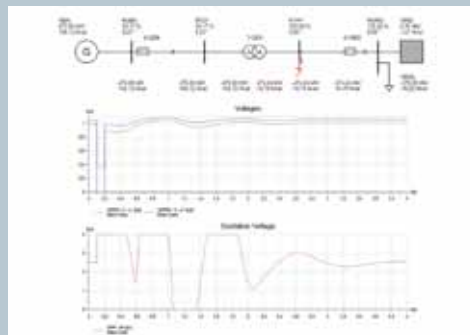
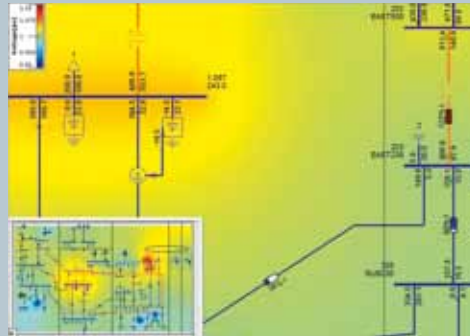
- Motor start
- RMS – stability calculation
- EMT – electromagnetic transient stability
- Eigenvalue / modal analysis
- Dynamic network reduction
- Parameter identification / optimization
- Real-time test of protection / control devices
- Standard libraries and user-defined models
- GMB – Graphical Model Builder

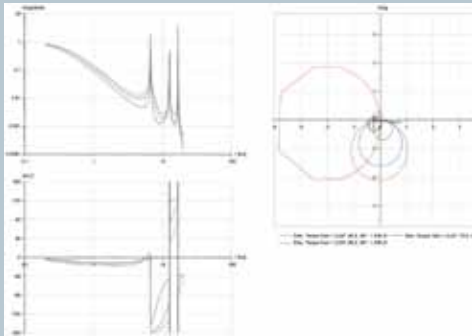
Protection simulation and coordination

- Overcurrent time protection
- Distance protection
- Differential protection
- Protection simulation
- Arc flash hazard
- Dimensioning of low-voltage networks
- Protection data management

System security

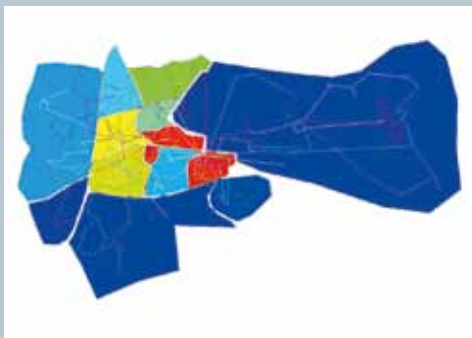
- Dynamic security assessment
- Protection security assessment





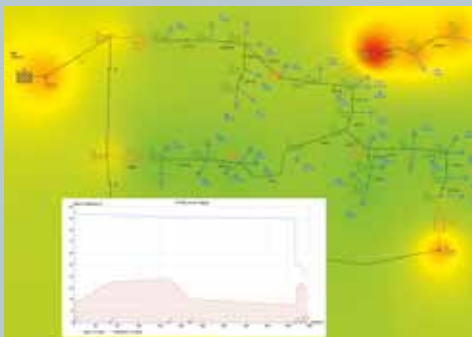
Power quality and frequency domain

- Harmonic response
- Linearized active and passive systems
- Probabilistic / deterministic contingency analysis
- Probabilistic reliability calculation
- Flicker evaluation
- Ripple control



Strategic network planning

- Economic efficiency calculation
- Load development
- Optimal network structures
- Transfer analysis / ATC calculations
- Grid code compliance



Gas, water, and district heating / cooling

- Steady-state flow calculation
- Contingency analysis
- Dynamics
- Fire water simulation
- Water tower filling



Model management and data integration

- Line / cable constants, standard equipment libraries
- Model / diagram management, auto-display builder
- Multiuser project modeling
- IT integration (SCADA, GIS, MDB, ERP), Web UI
- Program automation, public APIs
- Support of modern scripting and programming languages, e.g. Python™, Microsoft® Visual Basic, C#, C++, .NET
- Advanced results analysis and visualization
- Conversion of network model data between various formats

PTI Software Solutions

Siemens' world-leading experience and know-how in power system planning are condensed into Siemens PTI's Software Solutions – powerful system simulation and analysis tools that assist engineers in the performance of their work.

Power system planning and data management

The tools of the Power System Simulator (PSS®) product suite are leading products with respect to technical performance and user-friendliness. Intuitive interfaces enable the interaction of all PSS® tools, and also support the integration with other IT systems.

PSS®E – transmission power system planning

Simulates, analyzes, and optimizes power transmission system performance. As the trusted industry leader for over 40 years, PSS®E provides state-of-the-art tools for steady-state, dynamics, short-circuit, and optimal powerflow, as well as advanced probabilistic contingency analysis and results visualization tools.

PSS®ODMS – CIM-based model management and analysis for operations and planning

Used by transmission planning and operations departments to facilitate the creation, management, exchange, and analysis of CIM-compliant network models for use in long-term planning studies and near-term operational planning. Increases power system security/reliability, and boosts the efficiency of model exchange workflows.

PSS®MOD – web-based project modeling and data management for PSS®E

Efficiently manages large numbers of change cases for PSS®E across multiple concurrent users. Brings efficiency, order, and accuracy to the process of creating, maintaining, and exchanging PSS®E-based network models.

PSS®MUST – transmission transfer capability calculation

Optimized for fast transfer limit analysis, PSS®MUST complements PSS®E by offering powerful tools for quickly assessing the impact of transactions on transmission networks. By using efficient linearization techniques, PSS®MUST can analyze hundreds of transactions at a time, and fine-tune the results with accurate nonlinear analysis.

PSS®SINCAL Platform

• **PSS®SINCAL – system planning for generation, transmission, distribution, and industrial grids**

Simulates, models, and analyzes electrical power systems as well as pipe networks, such as water, gas, and district heating/cooling systems. It provides a full unbalanced network model for high, medium, and low-voltage grids based on an open commercial database.

• **PSS®NETOMAC – dynamic system analysis**

Facilitates access to and manages any kind of information on the dynamic performance of a power system. It aligns the most important methods for the analysis of dynamics of electrical networks in the time and frequency domains.

• **PSS®PDMS – protection device management system**

Manages protection devices and their settings in a central relational database for data exchange with other programs, like DIGSI or PSS®SINCAL. It supports the full workflow of protection settings and also offers document management.

Power system supervision and security applications

SIGUARD® solutions support the decision making process of the power system operator. The basic idea is to increase the observability and the controllability of the system and to perform an automatic, intelligent security assessment.

SIGUARD® DSA – dynamic security assessment

Analyzes possible contingencies and assesses the system stability. It provides the operator with an overview of the current and near-future state of system stability.

SIGUARD® PSA – protection security assessment

Analyzes the selectivity, sensitivity, and speed of the entire protection system. It enables a rigorous protection system performance audit.

Expertise at your fingertips – wherever you are

Siemens Power Technologies International (Siemens PTI) provides network consulting services, network planning software, and professional training on all aspects of power generation, transmission, distribution, and industry, as well as on Smart Grid technology.



▶ PTI General

Siemens PTI's internationally renowned experts provide the knowledge and expertise required to combine individual equipment components into a complete power supply system that meets even the highest technical and economical demands. The comprehensive software and training portfolio, long-standing expertise in advanced power system technologies, and Siemens' financial strength are a sound basis for the development of state-of-the-art solutions that ensure the utmost reliability and efficiency of any supply network.

With regional offices around the globe, Siemens PTI is present on all continents. Wherever you are, Siemens PTI's unique supply network expertise is always in close reach.



▶ Network Consulting

In today's complex and changing power system environment sound advice from power system experts is essential. Siemens has a legacy of world-renowned engineering experience and innovative software and technology. Our consulting services range across technical, economic, and regulatory disciplines – addressing technical concepts, business models, processes, and overall strategy. They include power system analysis and solution development, expert testimony, and industry training.



▶ Power Academy TD

As specialists in training and continuing education, Siemens Power Academy TD offers professional training in the fields of power transmission and distribution, the industrial and commercial use of electrical energy, and Smart Grid technology. In more than 25 state-of-the-art training centers worldwide, Siemens Power Academy TD provides access to Siemens' expert knowledge and capabilities. Employing the latest teaching methods and highest-quality content, Siemens' certified trainers provide a superior-quality educational experience, so participants acquire practical skills with a focus on retaining these skills long term.

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