
POWER SYSTEMS
Powertech
The Power of Trust. The Future of Energy.

POWER SYSTEM PERFORMANCE ASSESSMENT

Software tools for power system analysis and consulting studies to optimize power system performance.

Maintaining grid security is a fundamental requirement for power system operations and the reliable supply of electricity. In today's competitive and rapidly changing environment, electric utilities also constantly seek innovative ways to optimize power system performance.

Powertech meets the need for grid security with a comprehensive suite of power system analysis tools, and with capabilities of examining and optimizing system performance.

Powertech's flagship software package, DSATools™, incorporates leading-edge technologies for the modeling, design, and analysis of power systems. For off-line dynamic security assessment (DSA), the programs may be used to conduct system design, planning, and operation studies involving thermal analyses, stability assessment, reactive power planning, dynamic performance assessment, transfer capacity determination, and NERC compliancy studies.

The more advanced and unique applications of DSATools™, developed exclusively by Powertech, are for on-line DSA. In this mode, the software is connected directly to a power system's energy management system (EMS) and assesses the system security in continuous cycles. Using real-time captured system conditions, an on-line DSA system provides system operators with important information about system security limits, types of criteria violations, critical contingencies, and remedial actions needed to prevent system failures.

Powertech also provides a wide range of technical consulting services, including comprehensive powerflow and stability studies; development of models for system analysis; design and assessment of power system controls; validation of generator models from field-collected data; evaluation of transfer capability and security limits; integration of renewable resources; post-mortem analyses of system disturbances; and many other studies. Our up-to-date and real-world experience in performing power system consulting studies worldwide also aids our software team in constantly improving our software tools to address new technical challenges as they emerge.

Powertech

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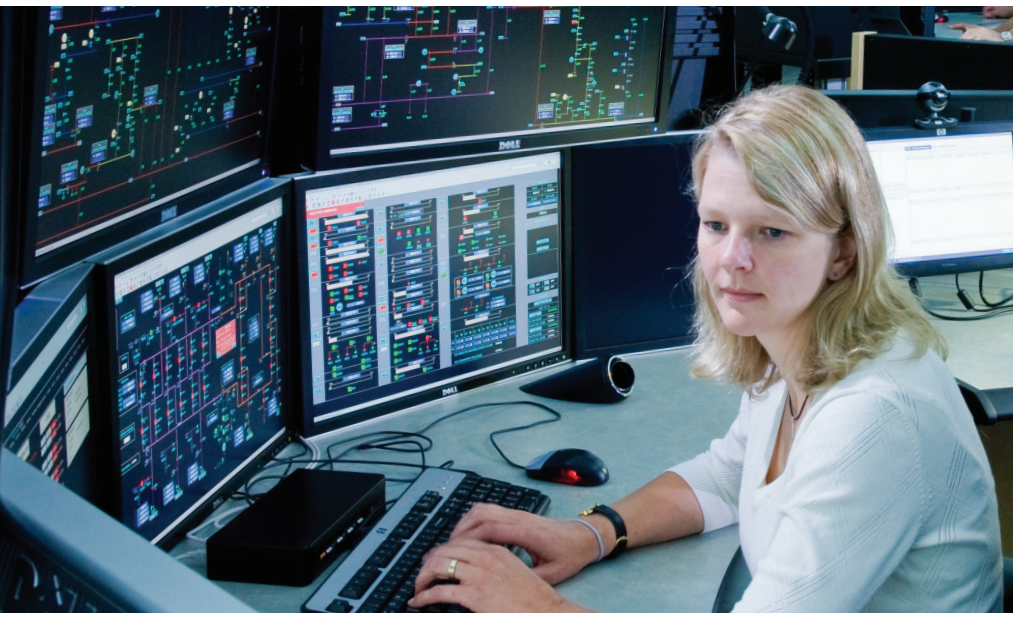
CAPABILITIES AND SERVICES



Powertech's capabilities and services derive from the experience and expertise of its staff.

Our technical team has 25+ years of experience in power system analysis and software development. We have extensive backgrounds in technical consulting, R&D, testing, and training.

Areas of expertise include:

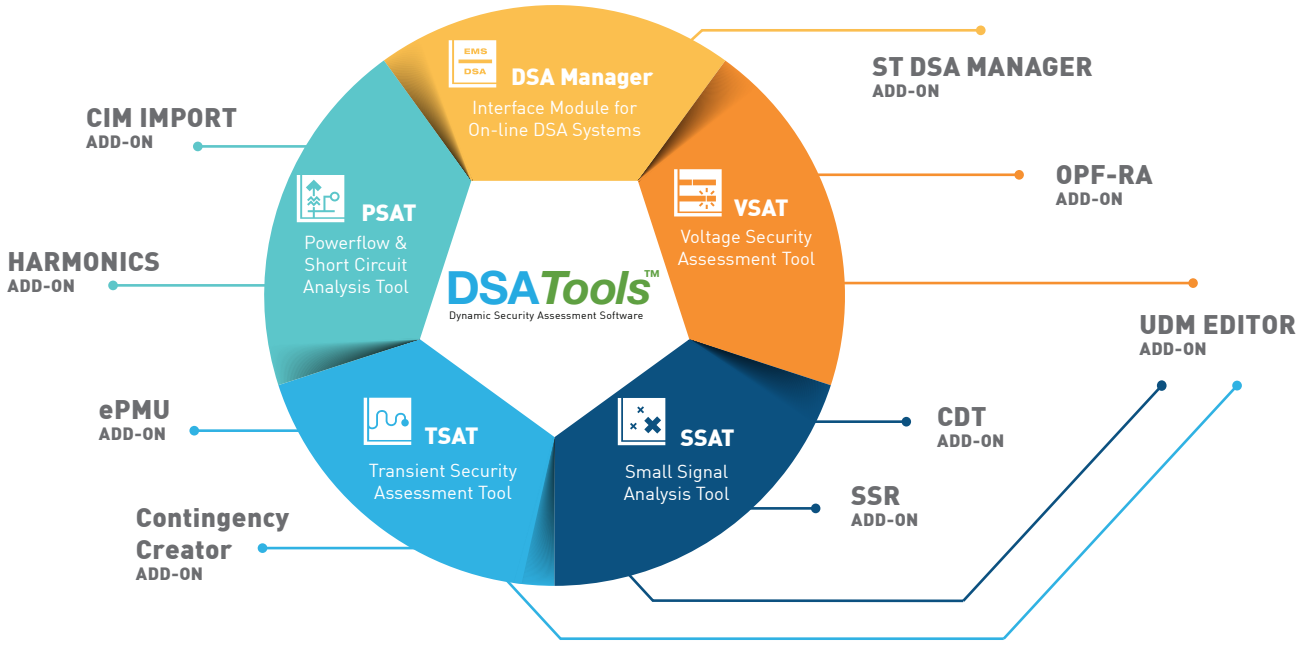
- *Theories and methods for power system analysis.*
- *Development of algorithms for power system computations.*
- *Power system modeling and model development.*
- *Technical consulting on power system design, planning, and operation.*
- *Development of software for power system analysis and other applications.*
- *Technical training.*

Key services include:

- **Power system consulting studies**—system planning and operation studies; comprehensive stability assessments in terms of voltage, transient, small-signal, and frequency performance; evaluation of transfer capability and security limits; IPP integration and load interconnection studies; system control assessments; NERC compliancy studies; electromagnetic transients studies; development and assessment of system design alternatives; post-mortem analysis of system disturbances.
- **Development of power system models**—development of base case models for system studies; derivation and validation of simulation models of generators including renewable resources; optimization of control and protection settings; development of model for application software.
- **Testing and evaluation of hardware devices**—hardware-in-loop real-time simulations using RTDS for control, protection, and communication devices.
- **Implementation of on-line DSA systems**—turn-key services to smoothly integrate DSA*Tools*™ software with EMS for performing on-line DSA.
- **Custom software development**—software developed to meet targeted needs for customers.
- **Software user support**—comprehensive support to software developed by Powertech, such as usage guidance, feature application, model assembly and debug, and result interpretation.
- **Technical training**—power systems fundamentals; equipment modeling; power system stability theory and methods of analysis; software application; model development.

PRODUCTS

DSA*TOOLS*™



DSATools™ is a suite of state-of-the-art power system analysis tools that provides the capabilities for a comprehensive system assessment, including all forms of stability analyses. The programs are designed for off-line studies, as well as for on-line DSA, when integrated with a power system's energy management system (EMS).

The five core modules in DSA*Tools*™ are complemented by a set of add-on modules for specific applications.

DSA*Tools*™ is ideal for use by regulatory authorities, independent system operators (ISOs), electric utilities, power market participants, consultants, OEM, and research and educational institutes.

DSA*Tools*™ is being actively enhanced and maintained. Powertech provides full user support and also schedules regular training courses to help new users to learn the software.

Other products:

Other products offered by Powertech include:

- TRI, a TSAT/RTDS interface, which enables real-time simulations for large power system models. The simulations are performed in hybrid mode—part of the system is simulated in RTDS, and part is done in TSAT.
- Powerflow and system dynamics databases (PFDB and SDDB), which are tools for managing network and dynamic models of power systems.
- ModV for assessing the performance of power plant models using real-time collected data such as PMU.
- DYNRED for reducing large power system models for static and dynamic performance analysis.
- Asset management tool, which consists of a cloud-hosted database, Web-based user interface, and mobile apps, for use by electric utilities to manage assets (such as transmission towers).

COMPLIANCY AND COMPATIBILITY

Products and services offered by Powertech are compliant to the following standards and industry practices.

SOFTWARE MODELING	COMPLIANCY AND COMPATIBILITY[1]
Synchronous generator	IEEE Standard 1110 – 2002
Excitation system and power system stabilizer	IEEE Standard 421.5 – 2016
Governor	IEEE Technical Report PES-TR1 – 2013
Wind turbine	WECC second-generation generic renewable models, IEC 61400-27-1
Solar PV	WECC second-generation generic renewable models
Composite load	WECC composite load model
Relay and special protection systems	NERC PRC-026
Power system network	CIM 14, 15, AND 16+ compliant to IEC 61968, 61970, 62325

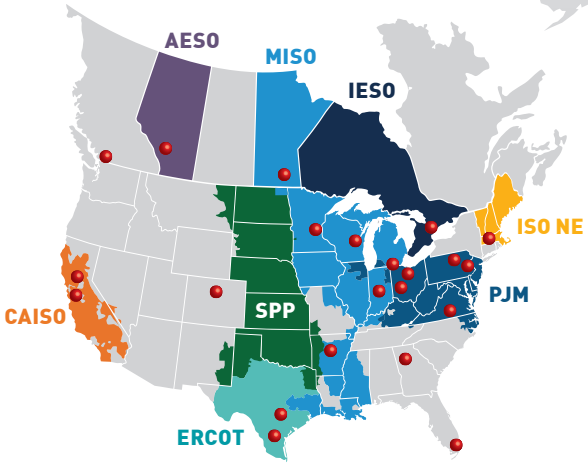
SOFTWARE APPLICATION	COMPLIANCY AND COMPATIBILITY[1]
Input data for powerflow and dynamics	Siemens PTI PSS/E, GE PSLF, BPA
Output results	PI AND SQL databases
System planning	NERC TPL-001-4, CIP-014-1
System operation	NERC TOP-001-3, TOP-002, TOP-003-1, TOP-004-2
Short-circuit calculation	ANSI / IEEE C37
Harmonics	IEEE Standard 519 – 1992
PMU data streaming	IEEE Standard C37.118

SYSTEM STUDIES	COMPLIANCY AND COMPATIBILITY[1]
Validation of generator and associated control models	NERC MOD-025, 026, 027, 029, 030, 032, 033
Automatic under-frequency load shedding	NERC PRC-006, PRC-006-NPCC, PRC-006-SERC
Transmission system planning	NERC TPL-001-4
Coordination of generating units capabilities, controls, and protections	NERC PRC-019
Generator frequency and voltage protective relay settings	NERC PRC-024
Modeling of distributed energy resources	NERC guideline – 2017
Development of base cases for power system analysis	NERC ERAG MMWG Procedure – 2017
Arc flash studies	IEEE Standard 1584 - 2002

[1] Including partial compliancy and compatibility wherever applicable.

DSATOOLS™ USER BASE

DSATools™ has a broad user base, which includes eight of the nine ISOs in North America and spans across six continents, encompassing some of the largest and most technologically advanced utilities and grid operators in the world. Powertech has issued over 220+ commercial licenses with more than 4,700 application seats.



On-line DSA systems in U.S. / Canada

Worldwide DSATools™ users

SELECTED CLIENTS

BC Hydro Power smart
aeso Alberta Electric System Operator
ieso Independent Electricity System Operator
MISO
pjm
ERCOT
California ISO
ISO new england
SPP Southwest Power Pool
NERC North American Electric Reliability Corporation
AEMO
Eskom
中国南方电网 China Southern Power Grid
KPX Korea Power Exchange
TRANSPOWER
EIRGRID
nationalgrid
Power Grid Corporation of India
SERC Reliability Corporation
ATCO
TransAlta
NEXTera Energy
الشركة السعودية للكهرباء Saudi Electricity Company
中国大唐集团公司 China Datang Corporation

Power
Systems

THE POWERTECH ADVANTAGE

Powertech Labs Inc. is one of the largest testing and research laboratories in North America, situated in beautiful British Columbia, Canada. Our 11-acre facility offers 15 different testing labs for a one-stop-shop approach to managing utility generation, transmission and distribution power systems.

Powertech is home to a broad range of scientists, engineers, and technical specialists, with capabilities in electrical testing, cable condition assessment, mechanical and materials engineering, software technologies, power system studies, chemical analysis, gas systems engineering, and smart utility services. These skilled researchers have decades of collective and real-world experience and often work in cross-departmental teams to investigate, diagnose and solve complex problems.

As an independent, third-party testing facility, we adhere to the **highest** laboratory **(ISO 17025)**, quality **(ISO 9001)** and environmental **(ISO 14001)** management standards. Many of our scientists and engineers chair or participate in various standards committees within their fields of expertise. Additionally we have the capabilities to derive and develop **non-standard testing** methods and setups required to test product prototypes and perform forensic analysis.

Outside of the utilities industry, Powertech provides routine **testing** capabilities, product **development**, research and **consulting** services to support an array of industrial-type operations, electrical equipment manufacturers and automotive original equipment manufacturers.

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