

Siemens Power Technologies International

# Dynamic Simulation

PSS®E

## At a glance

PSS®E is a comprehensive time tested tool for performing power flow (including optimal power flow), short circuit, and transient stability simulation (including long term) of power system networks. The program, used by utility engineers and others worldwide for well over three decades, employs the latest numerical algorithms to efficiently solve networks with up to 150,000 buses with no loss of solution accuracy or computer time.

The PSS®E program package has a modern, easy-to-use, Microsoft® Foundation Class (MFC), graphical user interface (GUI) for power flow as well as dynamic simulation. The GUI contains commands for recording capability which can be used to automate repetitive calculations.

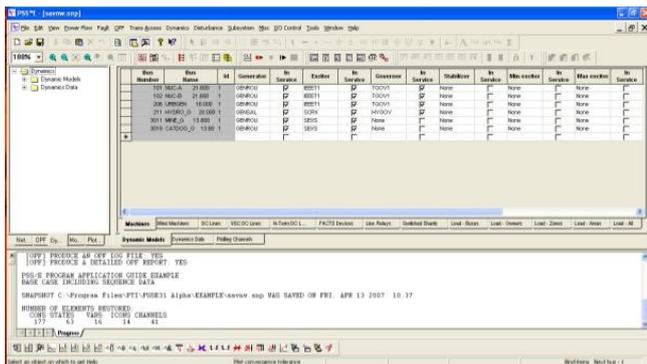


Figure 1 Dynamic Simulation GUI

The PSS®E Dynamic Simulation module of PSS®E is a versatile tool to investigate system response to disturbances that cause large and sudden changes in the power system. The dynamic simulation module employs a vast library of built-in models for modeling different types of equipment, and with capability to create user defined models of any complexity.

A new and integrated dynamic simulation plotting package allows for quick generation of plotting with ability to export to several popular graphic formats.

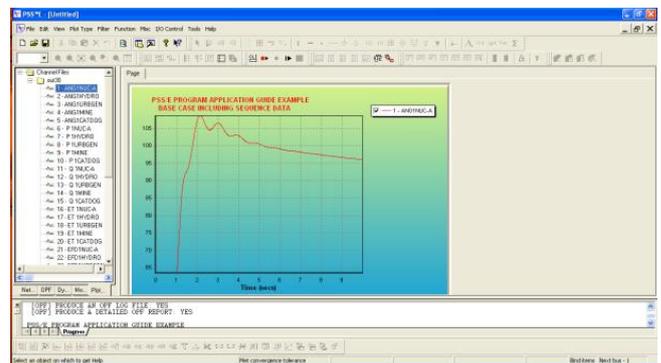


Figure 2 Dynamic Simulation Plotting Package

## The challenge

Design and stable operation of an electric power system requires careful study of the interaction of the different equipment that constitutes the power system. Stretching of electric system performance to its operational limits and deployment of special fast-acting controls has not only made dynamic simulation more common and essential to utility planning and operation, but has made the simulation process more complex. In this context, simulation tools such as PSS®E are critical to the effective investigation of system response to a variety of disturbances in a fast and accurate manner. As power systems and computers continue to evolve, Siemens Power Technologies International (Siemens PTI), has kept pace by developing the most comprehensive, reliable and sophisticated software needed to handle today's power system dynamic simulation problems.

## Our solution

Key features of the PSS®E dynamic simulation tool are:

- Time tested and robust algorithm that has been used by utilities all over the world.
- A comprehensive built-in library of dynamic simulation models to model equipment, such as:
  - Synchronous generators and the controls, such as: excitation systems, turbine-governors, minimum and maximum excitation system limiters, power system stabilizers, turbine load controllers
  - Wind generators: the mechanical system, along with mathematical models of the pitch and electrical controls.
  - Loads and load relays
  - Line relays
  - HVDC systems,
  - FACTS devices
  - Static Var Compensators
  - Onload tap changers and phase shifters
- Ability to model a wide variety of manufacturer specific wind models and their controls.
- Ability to create user defined models of any desired complexity.
- Ability to use the Graphical Model Builder (GMB) module to easily construct the user defined models.
- An intuitive, easy-to-use, Microsoft® Foundation Class (MFC) based graphical user interface (GUI) that allows for performing dynamic model data edits and simulation. Model data edits can be performed either via spread sheet or one-line diagram of the network.
- Ability to plot any system quantity
- A new and integrated plotting package that allows for quick and easy plot generation, plot annotations, and with facility to export to several popular graphic formats.
- Ability to record PSS®E commands in response files and python automation scripts for future use.
- Ability to automate dynamic simulation activities using simple English language commands. Commands use keywords in English and have a structure that results in a readable file that clearly defines the simulation being performed.
- Facility for checking of dynamics data.
- Ability to create any disturbance such as, faults, generator tripping, motor starting, loss of field etc.
- Computation of response ratio and open circuit transient response of excitation systems (this and similar tests on turbine governors are used to check or estimate data).
- Ability to interrupt and restart the simulation at any time.
- Ability to carry out extended term simulation. This feature allows users to study long term effects such as frequency deviation as affected by prime mover response and voltage changes caused by protective equipment; and yet minimize computer time by providing a variable step integration technique.

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