SIEMENS

Optimal Power Flow

PSS®E

At a glance

PSS®E Optimal Power Flow (OPF) from Siemens Power Technologies International (Siemens PTI) is a powerful and easy-to-use electric network analysis tool. It goes beyond traditional load flow analysis to provide the engineer with the ability to fully optimize and refine the transmission system. This task is made even easier with the complete integration of the OPF into the PSS®E Power Flow program.

PSS®E OPF improves the efficiency and through put of power system performance studies by adding intelligence to the load flow solution process. Whereas the conventional load flow relies on the engineer to systematically investigate a variety of solutions before arriving at a satisfactory "good" solution, PSS®E OPF automatically adjusts controls to determine the "best" solution. From virtually any reasonable starting point, you are assured that a unique global optimal solution is attained, a solution that simultaneously satisfies system constraints given a pre-determined objective.

The challenge

In addition to being able to perform traditional analysis such as minimizing operating costs, PSS®E OPF is ideally suited to solving many problems more attuned to the challenges of today's less-regulated power system environment:

- Reactive power scheduling
- Voltage collapse analysis
- Transfer capability investigation
- Location based marginal cost assessment
- Ancillary service opportunity cost assessment
- Impact assessment
- Base case development

- Congestion analysis

Our solution

PSS®E OPF provides an easy-to-use interface that has been specifically designed to assist in quickly defining and building even the most complex power system optimization problems. By being fully integrated into the PSS®E Power Flow program, PSS®E OPF obtains all of the necessary load flow data models directly from PSS®E and automatically updates them each time an optimal power flow solution process is completed. Spreadsheets provide a convenient way to introduce, modify and view all optimal power flow constraints and control variables. A complete set of windows offers a modern graphical user interface in which to operate the entire program. Every function is directly accessible through pull-down menus.
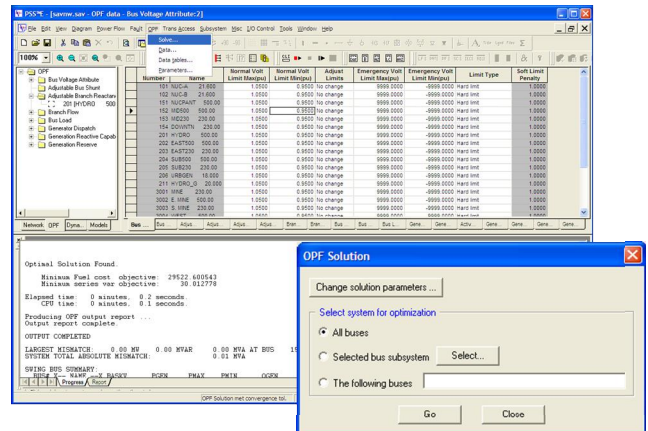

Figure 1: PSS®E OPF Solution Dialog

Application example

PSS®E OPF provides the most commonly desired objective functions, and more:

- Minimize fuel costs
- Minimize active power slack generation
- Minimize reactive power slack generation
- Minimize active power losses
- Minimize reactive power losses
- Minimize adjustable branch reactance
- Minimize adjustable bus shunts
- Minimize or maximize interface flows
- Minimize or maximize active power transfers
- Minimize or maximize reactive generation reserve
- Minimize load adjustments

PSS®E OPF allows the user to easily combine any of these objective functions at the push of a button.

The optimal power flow problem statement is completed by combining the objective with any number of constraints and controls, selectable from the following:

- Bus voltage magnitude limits
- Branch flow limits (MW, Mvar, MVA, Ampere)
- Interface flow limits (MW, Mvar)
- Generator reactive power capability limits
- Generation period reserve limits
- Generator active power limits
- Adjustable bus shunt limits
- Adjustable branch reactance limits
- Adjustable load limits

The speed and robustness of the program makes it suitable not only for network planning and analysis problems, but also for operational planning environments.
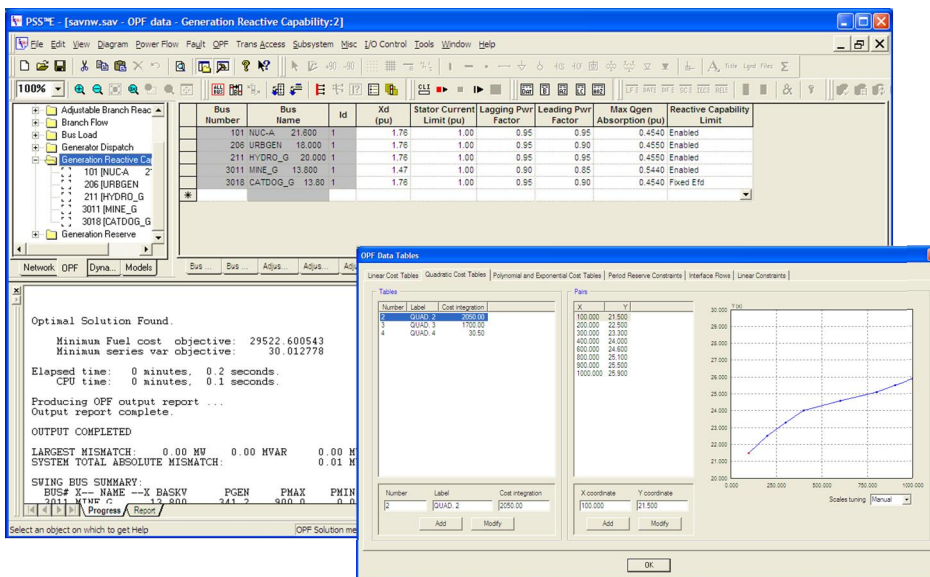

Figure 2: PSS®E OPF data tables dialog

siemens.com/power-technologies