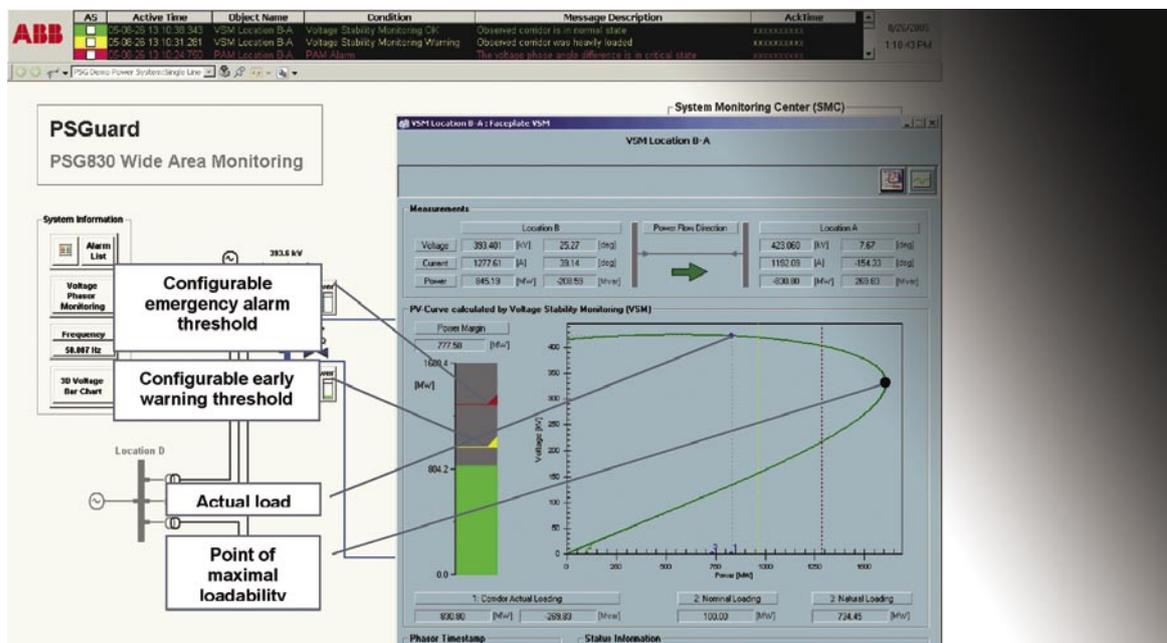


Voltage Stability Monitoring

A PSGuard Wide Area Monitoring System application



Application

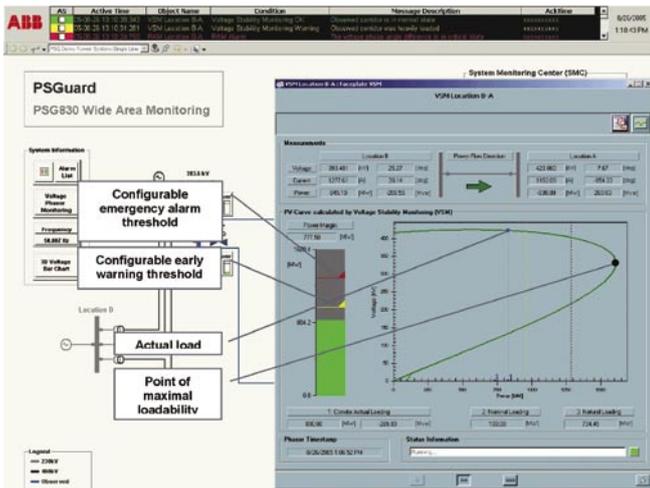
The Voltage Stability Monitoring (VSM) application provides power system operators with valuable online information to assess the present power margin with respect to voltage stability. A power margin is the amount of additional active power that can be transported on a transmission corridor without jeopardizing voltage stability. This monitoring functionality, and its outputs are intended as decision support for operators. Actions the operator may take to improve voltage stability may range from generation rescheduling or actions on the reactive compensation, blocking of tap changers in the load area or in extreme cases load shedding. The VSM application is designed to monitor transmission corridors and it therefore delivers the dynamic current and voltage phasors and resulting calculations in real time.

Function

Firstly the VSM-function monitors the PV-Curve, with the actual loading point, the point of maximum loadability and the power margin. All these results are displayed graphically to give the operator a fast overview of the current situation.

The phasor measurements are taken by two GPS synchronised Phasor Measurement Units (PMUs) at both ends of the line, which deliver precise measurement values in real-time. No other measuring equipment is required for VSM, it is thus the most cost-effective solution for monitoring the voltage stability of a transmission corridor.

In addition to the PV-Curve, VSM provides operators with information about voltage and current phasors at both ends of the line, with



calculated values such as active and reactive power as well as the power flow direction, so that operators are always informed with exact real-time data on the current voltage stability situation, as a base for further steps.

The algorithm is designed for general transmission corridors that may comprise several physical lines and it can easily be adapted to the individual needs of each utility. The results of the VSM application are visualized using the PSGuard Basic Monitoring module and can additionally be integrated in SCADA EMS / Network control systems with RTU-live interfaces.

To analyse and reinterpret past scenarios or events, historical data can easily be accessed in the PSG Database, where phasor data is stored with a time resolution of 100 milliseconds. With the export module included, the user can export historical data as CSV files offline, which can then be quickly imported into business applications such as Excel.

Online output provided

- Display of PV-Curve with indication of the actual loading point
- Calculation and display of actual power margin
- Display of the voltage and current phasors at both ends of the transmission corridor
- Display of natural loading point and nominal loading point
- Display of the actual active and reactive power flow
- Display of the direction of the active power transmitted through the corridor
- Display of the equivalent impedance of the load area
- Data logging and trend display
- Online warning and emergency alerting

Offline output provided

- Access to historical data
- Data export to business applications such as Excel

Benefits

- Monitors the most relevant values for the control of a transmission corridor at first sight
- High accuracy by using dynamic PMU data
- Fast corrective actions through the utilization of real-time data
- Safer operation of power transmission assets close to their limits
- Optimized utilization of dynamic transmission capacities
- VSM improves your system stability, security and reliability
- VSM helps to reduce cost and to achieve greater functionality of your individual Protection & Control systems



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