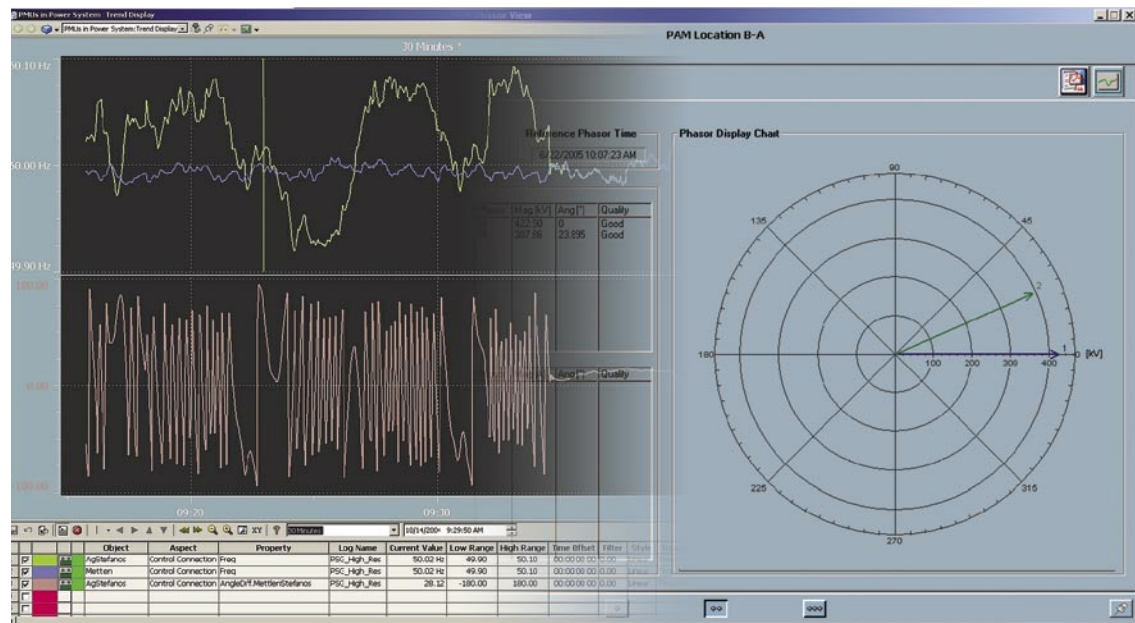


Phase Angle Monitoring

A PSGuard Wide Area Monitoring System application



Application

The phase angle monitoring application facilitates the monitoring of network stresses caused by heavily loaded lines. It provides operators with real-time information about voltage phase angle deviations between two locations. This is a decisive factor e.g. for the successful reclosing of transmission lines. PAM helps utilities to improve the voltage control of their power system. This application makes it possible for utilities to safely operate power-carrying components closer to their design limits, without jeopardizing stability, security or reliability.

Function

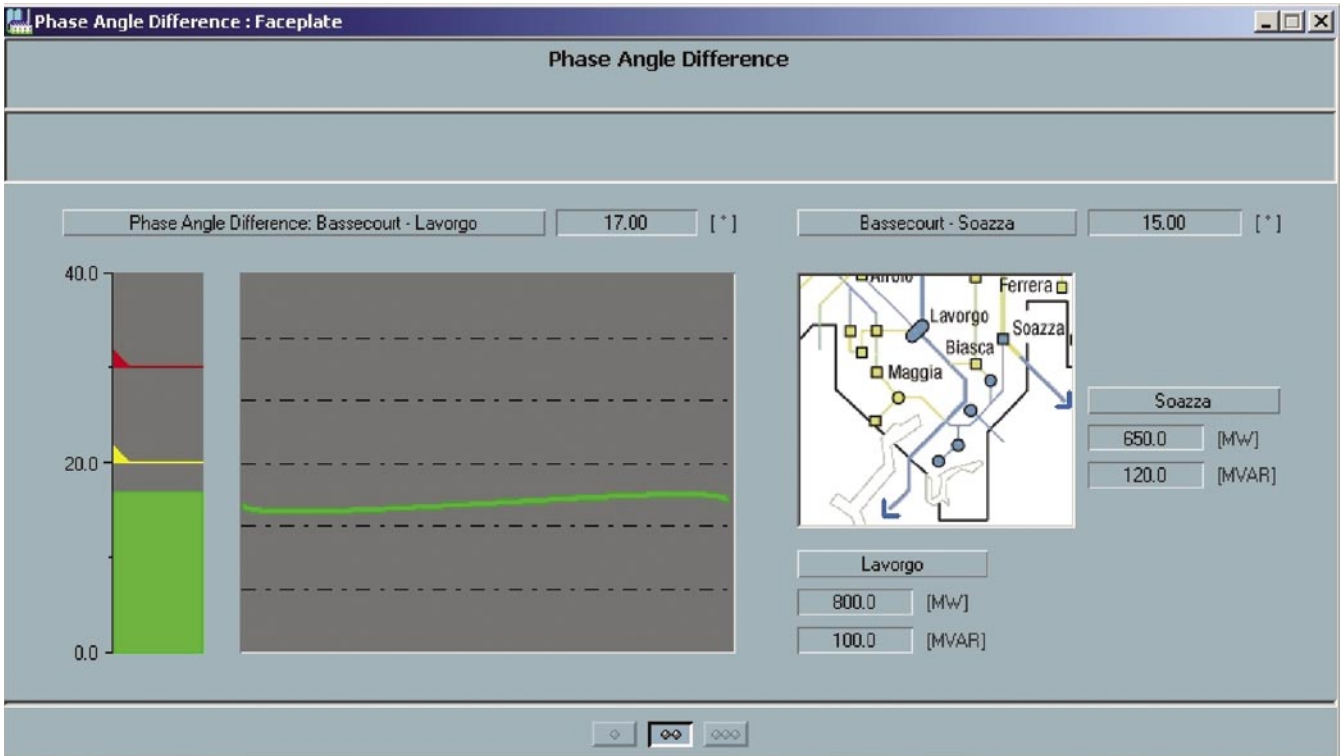
The main function of PAM is to supply sufficient information to the power system operator to evaluate the present angle difference between two selected locations.

The PAM application is based on data storage, which provides the synchronized phasor measurements for the application. The results of the

PAM application are visualized with the PSGuard Basic Monitoring module and in addition as an option, they can be integrated in SCADA EMS / Network control systems.

On the detection of an abnormal status, PSGuard alerts the operator by giving an early warning or, in critical cases, an emergency alarm. The alarm levels are user defined, so they can be completely adapted to the individual needs of each line section.

The monitoring function of PAM is a reliable aid for decisions taken by the operators and provides an improved power system visibility. The actions that an operator can initiate to improve the stability of the network based on the PAM output, range from rescheduling generation or compensation of reactive power,



blocking the tap changers in the load area, or in extreme cases load shedding.

To analyse and reinterpret past scenarios or events, historical data can easily be accessed in the PSG Database, where phase angle 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 easily be imported into business applications such as Excel.

Online output provided

- Display of phase angle difference between selected locations in real time
- Display of the phase angle curve at selected locations as a trend
- Display of the maximum acceptable phase angle between two selected locations
- Online warning and emergency alerting

Offline output provided

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

Benefits

- Improved system stability, security and reliability
- Safe operation of power carrying components closer to their limits
- Optimized utilization of transmission capacities
- Provides crucial information for the successful reclosing of transmission lines
- Enhanced operational and planning safety.
- Provides an indication of a possible evolving electrical separation of parts of the network
- Provides a basis for checking State Estimator accuracy



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