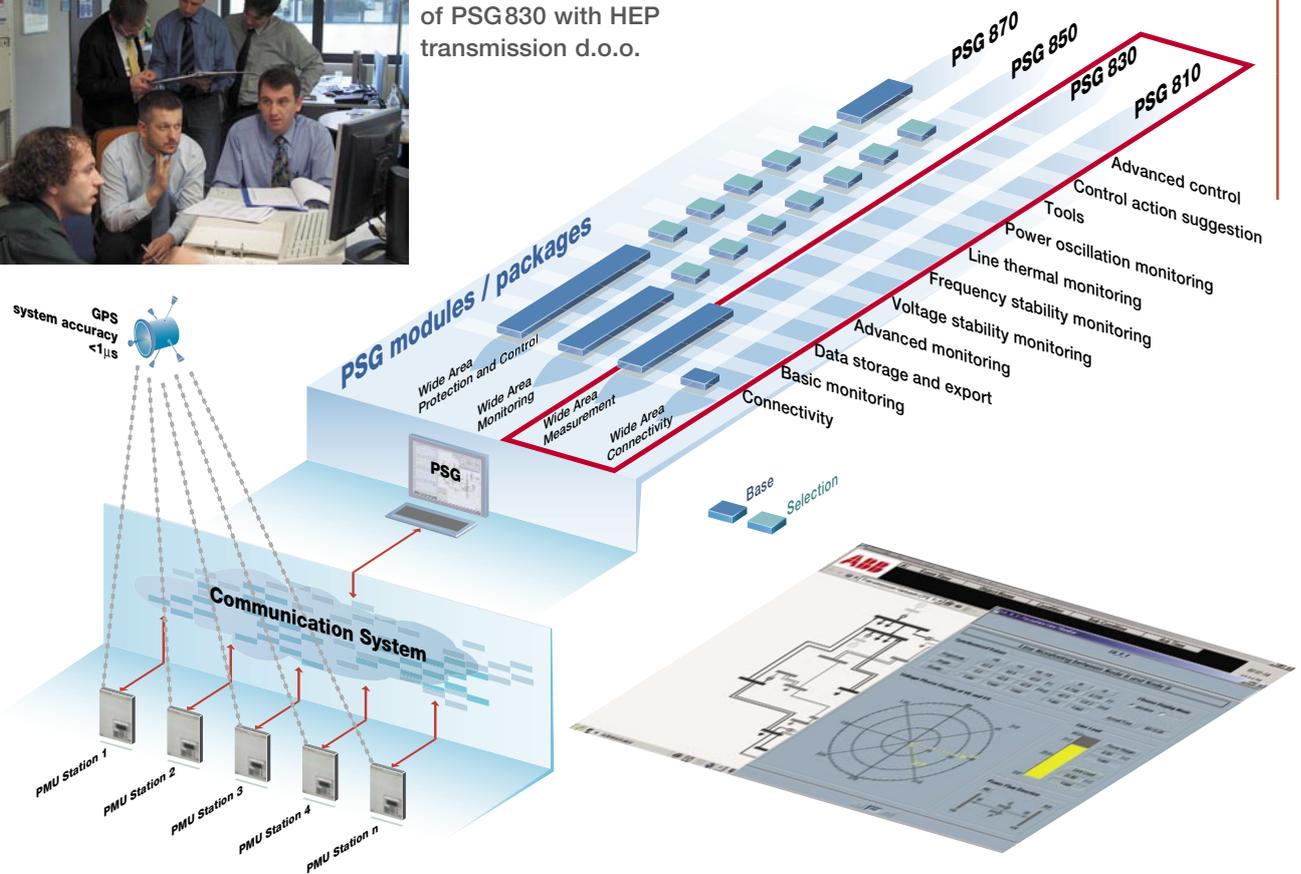


The Wide Area Monitoring System PSGuard 830 is being introduced in Croatia

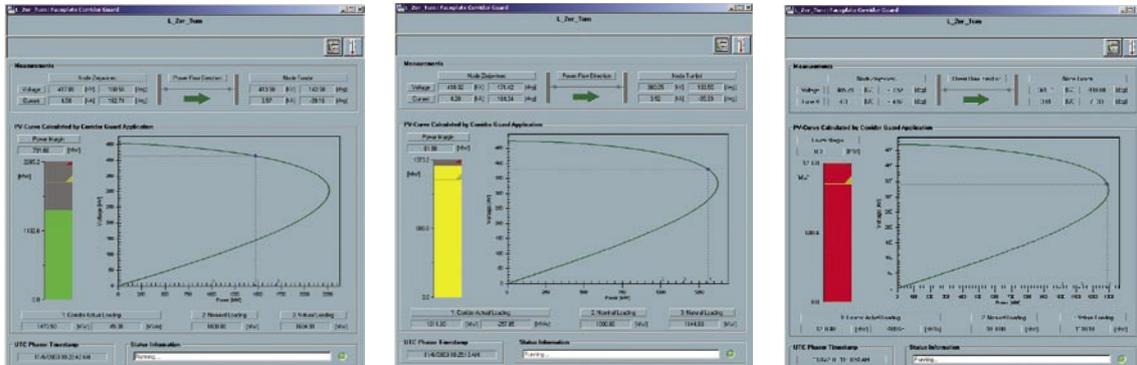


Factory acceptance test of PSGuard 830 with HEP transmission d.o.o.



- ▲ Innovative solution for the on-line voltage stability and line thermal monitoring
- ▲ State-of-the-art phasor measurement technology and advanced applications
- ▲ Optimal utilization of the transmission capacity
- ▲ Early warning system against system instability
- ▲ Improved availability of power utility networks

HEP TRANSMISSION D.O.O. is a subsidiary company of the Croatian utility **Hrvatska Elektroprivreda D.D. (HEP)** and operates the country's 400/220/110kV grid. As part of a comprehensive rebuilding and construction program, it decided to install the Wide Area Monitoring System PSG830 for the on-line monitoring of a transmission corridor between two important nodes in its 400kV network. In addition to the voltage stability, the average temperature of the line is being monitored. This allows the customer to optimize the availability of the system as well as to safely increase the transmission capacity during peak demand.



Voltage stability monitoring: Power/voltage (nose) curve. Yellow = early warning, red = alarm.

With the emphasis on higher utilization of power systems due to continuous load growth and the quest for higher profitability, monitoring the dynamics and maintaining the stability of these systems is becoming increasingly important. State-of-the-art technology and specialized software applications for on-line [wide area measurement, monitoring and control](#) of voltage and frequency stability of power systems provide utilities with the means to safely make the maximum use of the available transmission capacity in a dynamic environment.

Dynamic system stability monitoring

The [voltage stability monitoring](#)* provides the operator with sufficient information to evaluate the present active power margin with respect to voltage stability of a transmission line or corridor. The operator can act to correct the shortage of reactive power with generation rescheduling, reactive load compensation, tap changer blocking in the load area or incremental or complete load shedding in extreme cases.

The [frequency stability monitoring](#) detects unbalances between generated and consumed power and estimates their impacts by modeling load responses and generator inertias. Suitable measures are computed and proposed to reach the desired frequency.

Monitoring of transmission corridors—congestion management

Loading of lines is generally constrained by thermal limits rather than voltage stability concerns. [Line thermal monitoring](#)* allows full use of the transmission capacity dependent of actual ambient temperature and wind. It thus overcomes the constraints often imposed due to stability concerns originating from uncertainties about the system state.

The [power oscillation monitoring](#) detects power swings. It identifies the frequency and the least damped swing modes, which lead to angular instability causing major power system disturbances (blackout). The algorithm employs adaptive Kalman filtering techniques.

Future functionality:

[Evaluated measures and control actions for the prevention of large area disturbances and optimization of power flow](#) are

- suggested for operator guidance or
- automatically initiated by PSGuard. The commands are sent to the appropriate control equipment (SVC, FACTS, etc.) or systems (SCADA/EMS, SA, etc.) or directly to PMUs.

Benefits: The PSGuard system...

- increases the efficiency of power system operation
- maintains security at the desired level whilst optimizing power flow
- lowers the risks of power system instabilities and blackouts
- provides valuable information for efficient disturbance analysis and system expansion/reinforcement planning
- offers scalability for implementation or extension

Conclusion

The newly built line is of utmost importance in the inter-connection between the UTCE network and the Balkan region. On-line condition monitoring of the line gives valuable information and provides the means to optimize availability and to safely increase the power flow of the transmission corridor during peak demand.

** These functions are implemented in HEP's PSG830 system*

For more information please refer to the responsible ABB sales engineer for your country or our dedicated e-mail address: wide.area@ch.abb.com

