

PMU Application in Power System Dynamic Monitoring and Control

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Outline

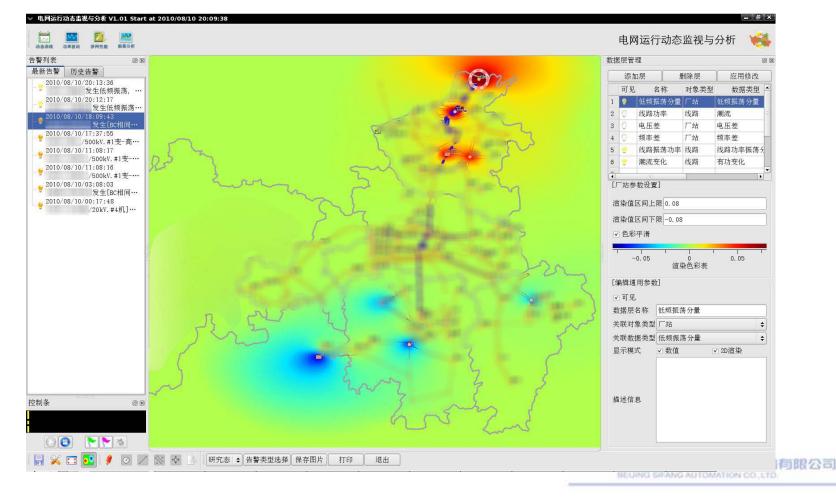
PMU Application in Dynamic Monitoring

- Low frequency oscillation monitoring
- Fast fault positioning
- Generator primary frequency regulation assessment
- PMU Application in Dynamic Control
 - Wide area low frequency damping control

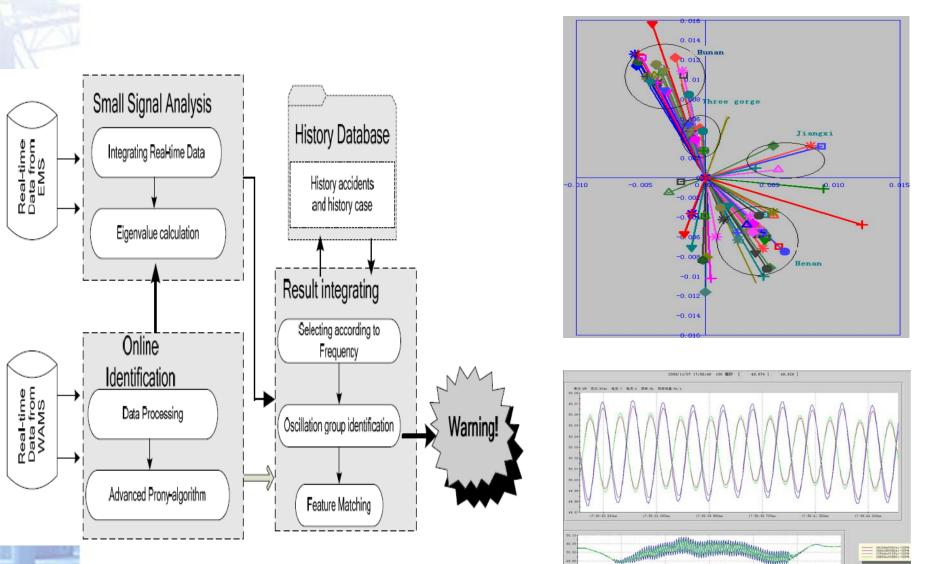


Low frequency oscillation monitoring

Visualizing the different swing groupsLocating the first starting oscillation area



Combined use of SSA result and Identification result

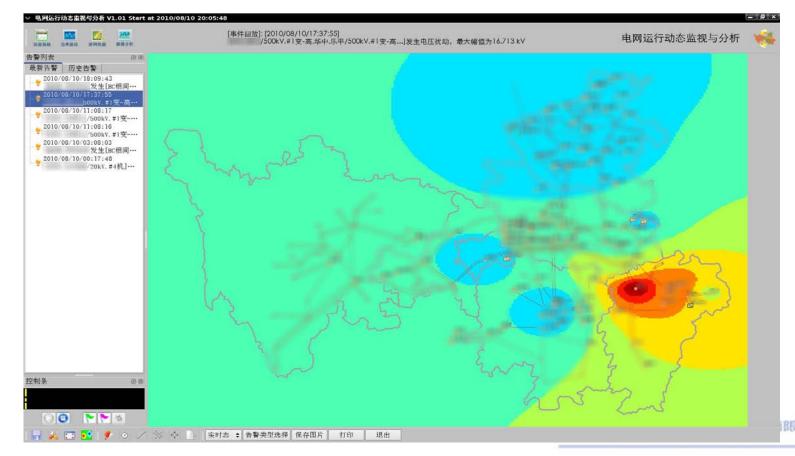


北京四方继保自动化股份有限公司 Incung Strang Automation Co.Ltd

Fast fault positioning

Some fault information, such as short circuit fault on 220 kV or lower level can be obtained quickly for system monitoring;

By employing the visualization techniques, some diagnosis can help dispatchers quickly locate the fault area.



Generator Primary Frequency Regulation Assessment

Analyzing unit power output and frequency curve measured by PMU to assess the effect of primary frequency regulation.

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Trend of PMU data application

Architecture for PMU application

- Final goal is to accomplish closed-loop control

Online Analyzing/Identification

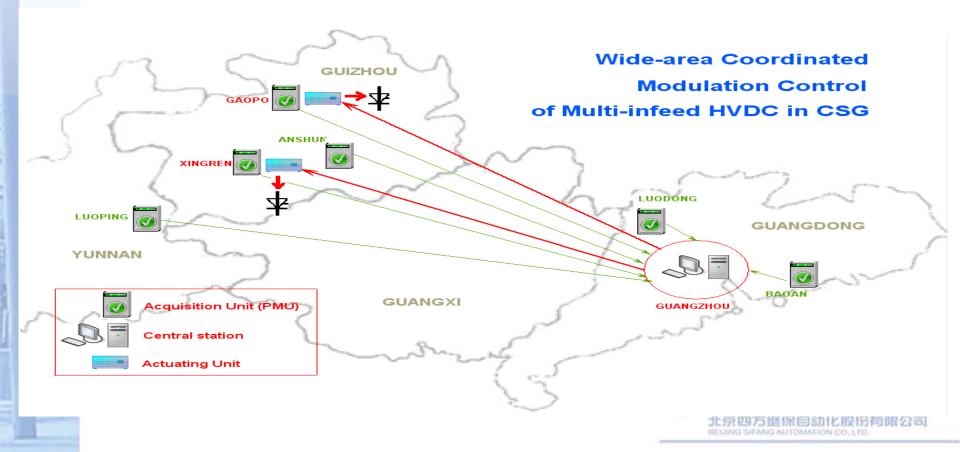
Wide Area Measurement

Wide Area Control

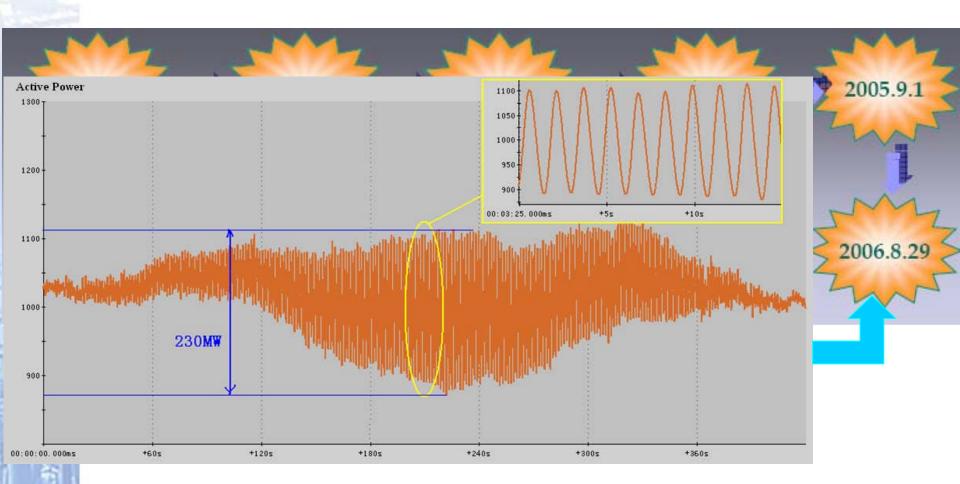
Electrical Power System

China Southern Power Grid

- 8 AC lines and 4 DC lines parallel transmission system
- The transmission distance spans over 1000km
- The total power transmitted from the west to the east over 18,000 MW



Project Background



四方

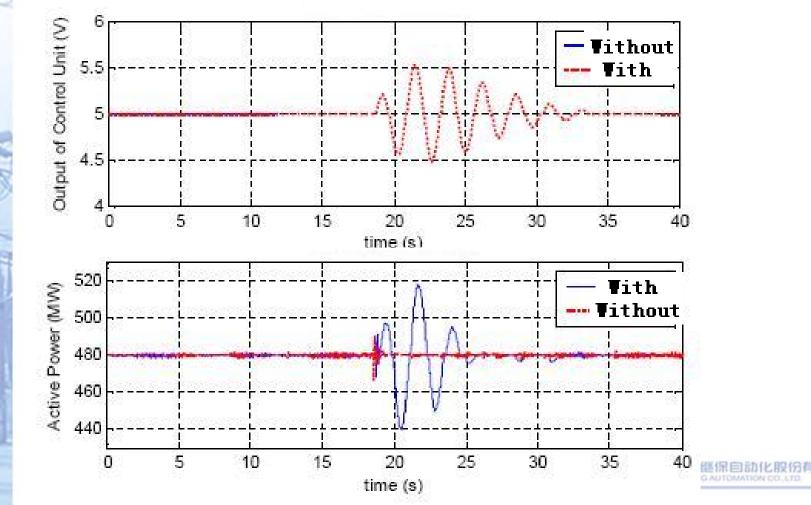
*保自动化

- Oscillation continues more than 6 minutes
- Oscillation amplitude larger than 230 MW
- Oscillation frequency is about 0.64 Hz

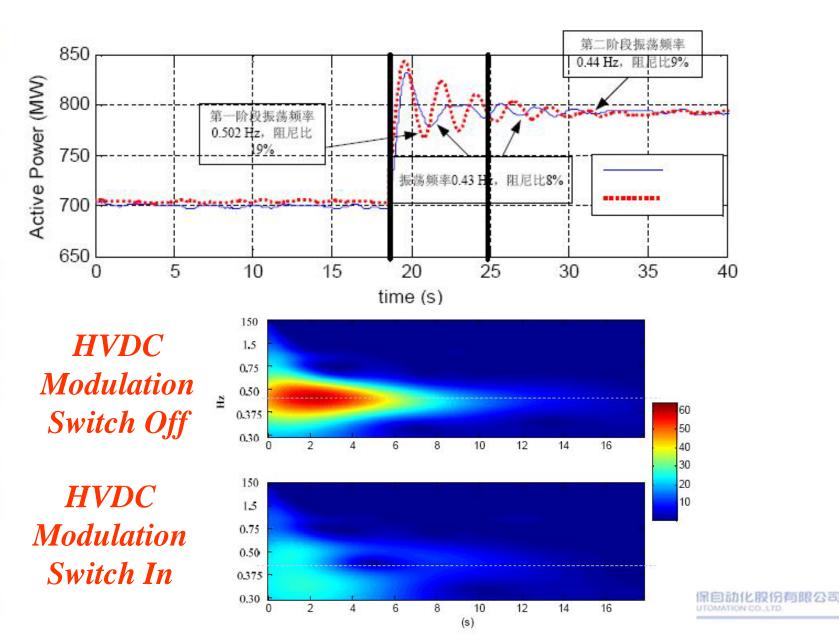
Control Output Test Under Large Disturbance

Test 1: Without HVDC modulation

Test 2: With HVDC modulation



Power Oscillation on Tie Line I







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