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 groups
- Locating the first starting oscillation area
Combined use of SSA result and Identification result
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.
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

- 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

HVDC Modulation Switch Off

HVDC Modulation Switch In
Any Question?

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