N-1-1 Contingency Analysis & Relay Protection
4th BTA Presentation

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Manager Transmission Planning
June 6, 2006
Contingency Planning (N-1-1)

Westwing Transformer #4 Out of Service Oct 31, 2005 - May 1st, 2006
West Phoenix – Lincoln St. 230kV Out Of Service March 6 – April 15, 2006

MW

- APS/SRP Valley Load
- Maximum Load Serving Capability

Oct | Nov | Dec | Jan | Feb | Mar | Apr | May
---|---|---|---|---|---|---|---
8000 | 6000 | 6000 | 8000 | 6000 | 6000 | 8000 | 10000

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APS performs relay coordination checks on all relaying schemes both internal to our substations and between substations in our system.

Working with Protective Relay Depts in connecting utilities, APS performs relay coordination checks on all intertie points.

All additions and changes made on the APS system are checked to make sure that relay coordination exists throughout the APS system and with connecting utilities.
Relay Protection

- APS’ transmission line relaying schemes are designed in a way that enables
  - faults internal to a line to be tripped instantaneously.
  - relaying schemes on adjacent lines will trip for that same fault with a time delay which provides the needed coordination to trip only those breakers that need to be tripped to isolate the fault.
- APS is fully compliant with all applicable WECC, FERC, & NERC standards that apply to relay protection and coordination.
- There has been an increased emphasis on these standards since the recent East Coast Blackout.
Relay Protection

- Since the recent WW events, APS has been adding totally redundant relaying schemes on all 230kV and above substations and lines.
- This will eliminate all known single point of failure to keep cascading events from happening in the future.
- So far, we have added redundant schemes at our WW, PP, NG, NV, MK, YV, FC, CH, DV, & RC.