Operations Report

Kent Saathoff
System Operations
ERCOT

December 2006 Events

Three EECP Step 1 Events in December

- **December 13, 22 and 23**
- **Triggered by dropping below 2300 MW Adjusted Responsive Reserve under new EECP Protocol**
- **None of the events required shedding firm load**
- **Interruptible load shed on December 22 due to potential NERC Disturbance Control Standard event, not EECP Step 2**

December 13 and 23 Events

- **Occurred during typical winter peak periods (morning and evening)**
- **December 13 event lasted 6:52 to 7:16**
  - Three units totaling 786 MW tripped between 4:20 and 6:14
  - Reserves dipped to 2178 MW during morning load pick-up
  - Event quickly resolved in 24 minutes by market in response to EECP Step 1 notice
- **December 23 event lasted 18:15 to 20:45**
  - Evening load (Christmas lights) pick-up exceeded forecast by about 1000 MW (34,000 actual vs 33,000 forecast)
  - Reserves dipped to 2206 MW
  - Event resolved in 2½ hours by increasing RMR unit output and OOMing on off-line gas turbines in addition to market response to EECP Step 1 notice

December 22 Event

- **Both a potential NERC Disturbance Control Standard (DCS) event and an EECP Step 1 event**
- **Between 2:53 and 3:00 five generating units either tripped or ran-back, totaling a loss of 1900 MW**
- **System frequency reached low point of 59.691 Hz at 2:55. All LaaRs not automatically deployed were deployed manually by ERCOT at 2:59 according to DCS procedure.**
- **Frequency recovered to 60 HZ at 3:03**
- **EECP Step 1 declared at 3:03 since Reserves were below 2300 MW**
- **LaaRs restored at 3:48 after frequency stabilized**
- **EECP Step 1 ended at 4:07 as Reserves restored**

Responsive Reserve Adequacy

History of 2300 MW Responsive Reserve Requirement

- **Original requirement was the two largest units in ERCOT**
- **Until nuclear units came on line the requirement was 1600 to 1800 MW**
- **When first nuclear unit came on line in late 1980s it increased to 2300 MW**
- **Before second nuclear unit came on line in 1988 a comprehensive stability study was made to determine what level of reserves might be required to prevent automatic under-frequency firm load shedding at 59.3 Hz if two nuclear units tripped simultaneously**
- **Result was 4000 - 8000 MW, depending on system conditions**
- **Policy decision was made that the constant cost of the increased reserves did not justify the low probability of simultaneous loss of two largest units in ERCOT**
- **Requirement left at 2300 MW**

Is 2300 MW Still Appropriate?

- **On May 15, 2003 both Comanche Peak nuclear units tripped simultaneously**
- **As predicted by the 1988 study, frequency dipped to 59.3 Hz and firm load on under-frequency relays was shed for the only time in current memory**
- **There have been other occurrences of near simultaneous trip of two nuclear units that did not cause frequency to dip to firm load shed levels**
- **In 2004 another stability study was done in order to analyze how much of the Responsive Reserve could be provided by LaaRs without causing stability problems**
- **Results very similar to the 1988 study and also determined LaaRs could be increased from 25% to 50%**

Conclusion

- **While a higher reserve level might have helped on 4/17/06 EECP event**
  - Events of that day were multiple contingency
    - Load exceeded day ahead forecast by ~10%
    - Multiple units tripped within 10 minutes during peak
    - Annual maintenance greatly reduced amount of other available capacity

- **ERCOT Staff believes the 2300 MW requirement is still reasonable based on historical operation and the 2004 confirmation of the 1988 study and that it is not prudent to increase reserves at all times to protect against low probability multiple events**