

Texas Reliability Entity Event Analysis

Event:
May 19, 2011 DCS Event
Category 3 Event

Texas Reliability Entity
July 1, 2011

Table of Contents

Executive Summary.....	3
I. Event Overview	3
II. Forecasts and Initial System Conditions Prior to Event.....	4
III. Sequence of Events on 05/19/2011	5
IV. Analysis of Initial Unit Trips.....	6
V. Response Analysis	6
VI. Conclusions.....	10

Executive Summary

On May 19, 2011, a mechanical failure tripped Unit B at the Generation Station A, removing 1163 MW of generation from the ERCOT Region. Reliability Coordinator (RC) and Balancing Authority (BA) personnel and systems operated effectively to restore system frequency by deploying reserves, and then afterwards restored those reserves. This report provides: (1) an overview of the event; (2) background on system conditions just prior to the event; (3) the detailed sequence of events; (4) an analysis of the causal and contributing factors for concerns that arose in this event; and (5) recommendations for follow-up action.

I. Event Overview

At 14:08:05 on May 19, 2011, Unit B at Generation Station A tripped dropping 1163 MW of generation in the ERCOT Region. The unit was manually tripped by the plant operator due to high sodium levels in all four steam generators exceeding acceptable limits. The high sodium levels were caused by a main condenser tube leak.

System frequency dropped from 59.999 Hz to 59.720 Hz as a consequence of the loss of generation. The drop was arrested by governor action of ERCOT Region generators, aided by automatic deployment of generation responsive reserve as well as automatic deployment of 113.5 MW of Load Resources (LR) by underfrequency relay action. These actions led to system frequency recovery within 5 minutes and 45 seconds to the pre-disturbance value of 60 Hz (at 14:13:50).

The RC responded to the first event as a NERC Disturbance Control Standard (DCS) event due to the loss of generation above 1100 MW in the ERCOT Region. The event also met the definition of a Category 3a event (loss of load or generation of 1,000 MW or more in the ERCOT region) under NERC's Event Analysis Working Group (EAWG) procedure.

II. Forecasts and Initial System Conditions Prior to Event

05/19/2011 Current Day Report forecast reflecting 18:00 Peak (Pk):

Forecasted Pk HR Demand:	46,178 MW
Actual Demand:	42,918 MW
Wind Generation Actual:	3401 MW
Generation for Pk HR Demand	48,926 MW
System Frequency:	59.999 Hz
Schedule Control Error (Total):	~ -150 MW
Net Spin Reserves:	5718 MW
Physical Responsive Capability:	~4481 MW

III. Sequence of Events on 05/19/2011

- 14:08:00 ERCOT Region frequency prior to disturbance was 59.950 Hz.
- 14:08:05 Unit B tripped causing the loss of 1,163 MW of generation.
- 14:08:05 ERCOT Region frequency dropped to approximately 59.720 Hz (59.709 Hz High-Speed Frequency Recorder Data) immediately after the trip.
- 14:08 113.5 MW of Load Resources (LR) tripped offline on Under Frequency Relay (UFR) action.
- 14:13:50 ERCOT Region frequency recovered to 60 Hz.
- 14:17 Hot-line calls were made to the Qualified Scheduling Entities (QSE's) to notify them of the low frequency event, and instructed to all QSE's to restore the Load Resources that tripped during the event.

IV. Analysis of Initial Unit Trips

A. Generation Station A unit B

The Generator Operator reported that at 13:57 CDT on May 19, 2011, the output of Generation Station A Unit B was reduced by 50 MW due to deteriorating sodium levels. At approximately 14:07 CDT, while operating at 1163 Net MW, the unit was manually tripped by the operator because sodium levels in all four steam generators exceeded acceptable limits. The high sodium levels were caused by a main condenser tube leak.

Plant personnel repaired the condenser tube leak and returned the unit online at 02:48 CDT, May 23, 2011. The unit was released to full output at 11:17 CDT on May 26, 2011.

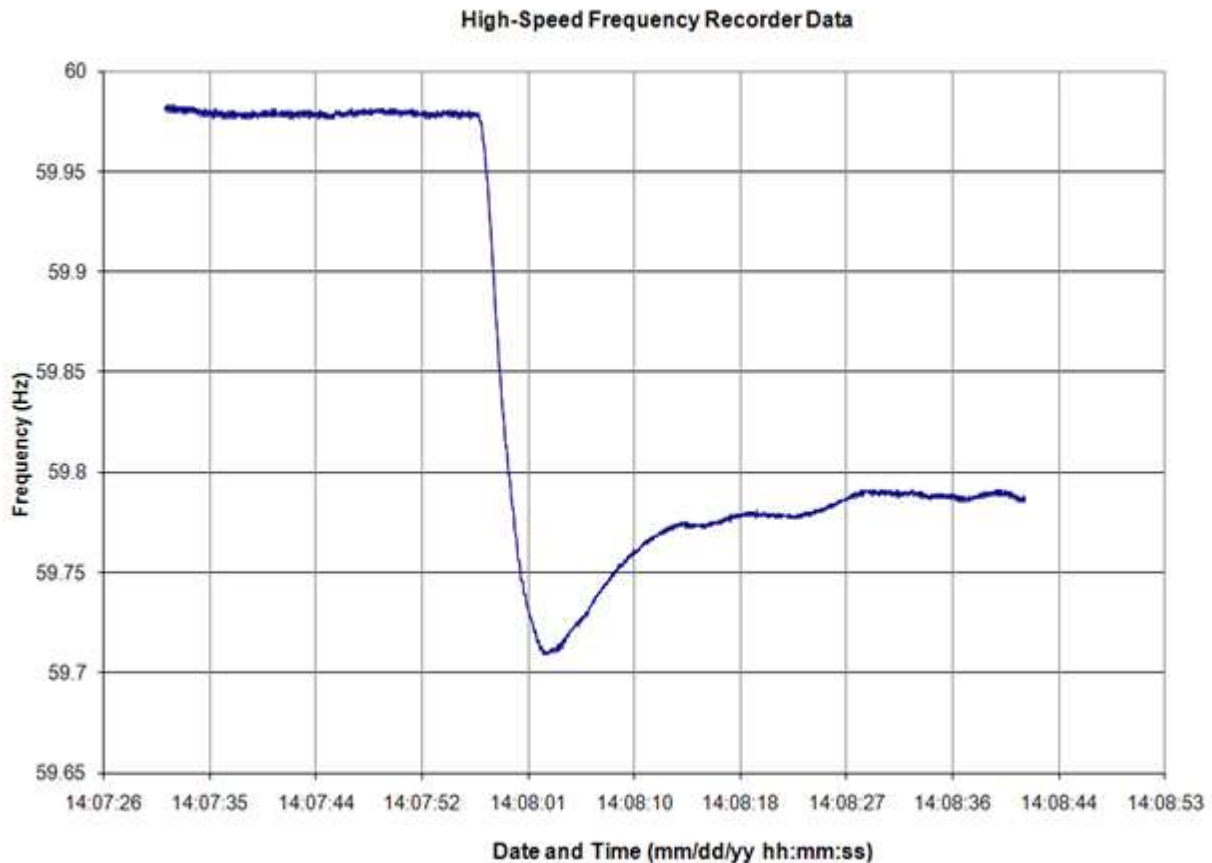
The breakers and protection system operated properly as designed. There were no personnel injuries. The breakers and protection system operated properly as designed.

V. Response Analysis

A. Initial Response

The loss of 1163 MW of generation in the ERCOT Region during the afternoon of May 19, 2011 constituted a significant disturbance to grid. The Balancing Authority (BA) used the Region's resources and reserves to balance resources and demand and return system frequency to pre-disturbance frequency.

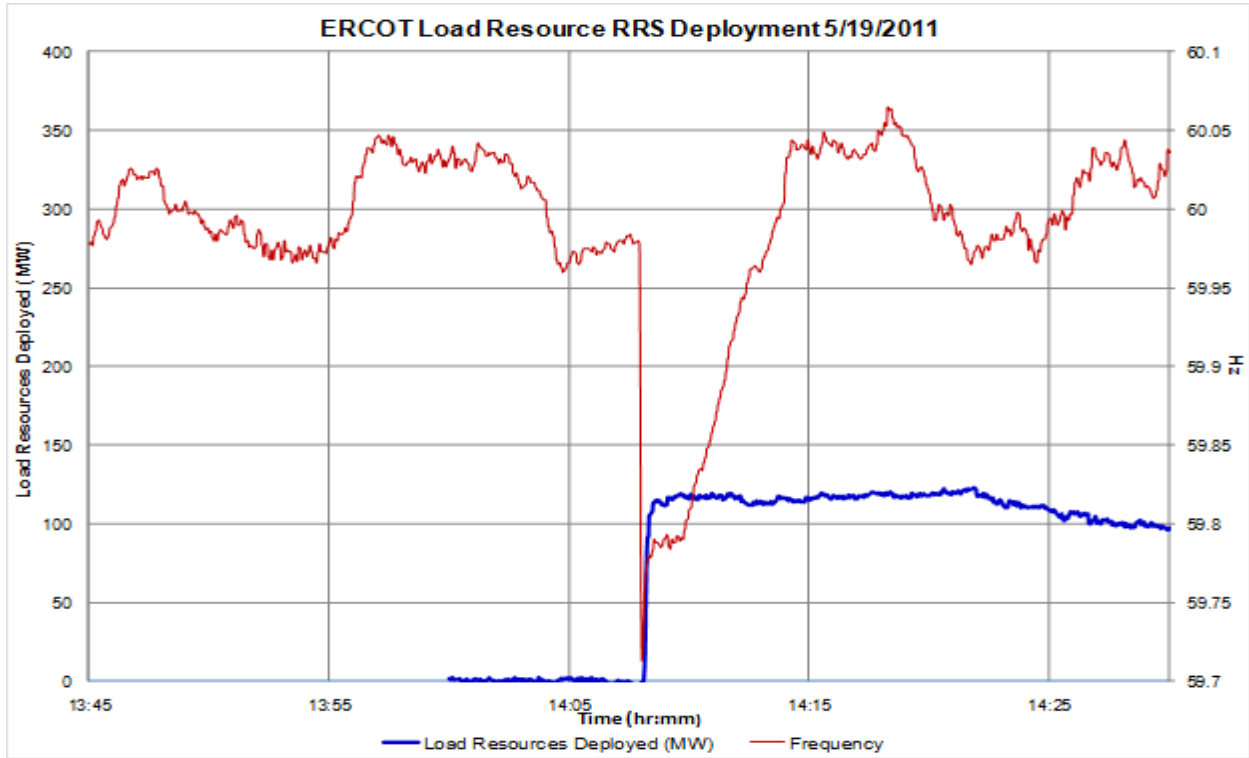
ERCOT Region frequency (measured at the RC control center) was at 59.999 Hz immediately prior to the disturbance. Immediately after the disturbance, system frequency dropped to 59.720 Hz. The following are among the actions that registered entities initially took to stabilize the system:

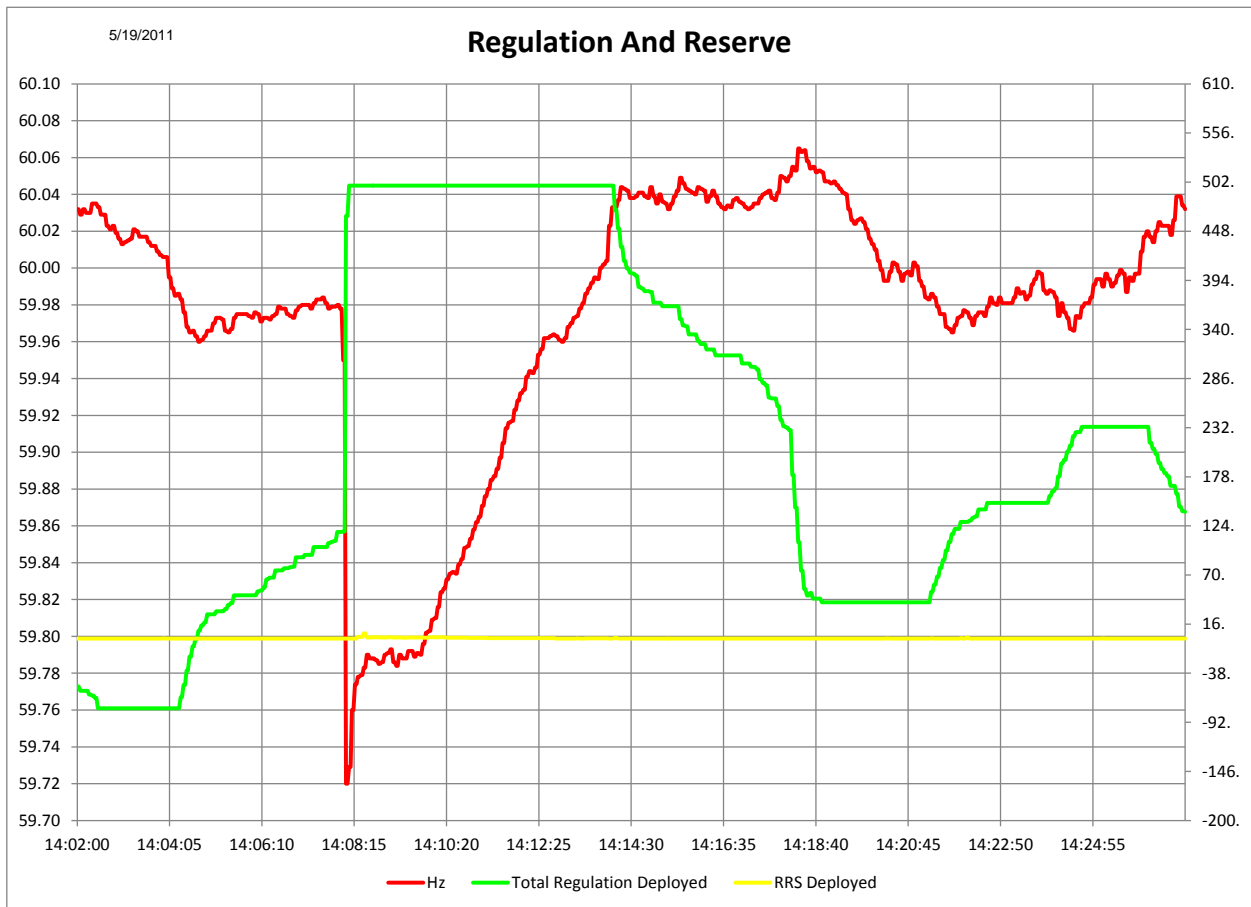


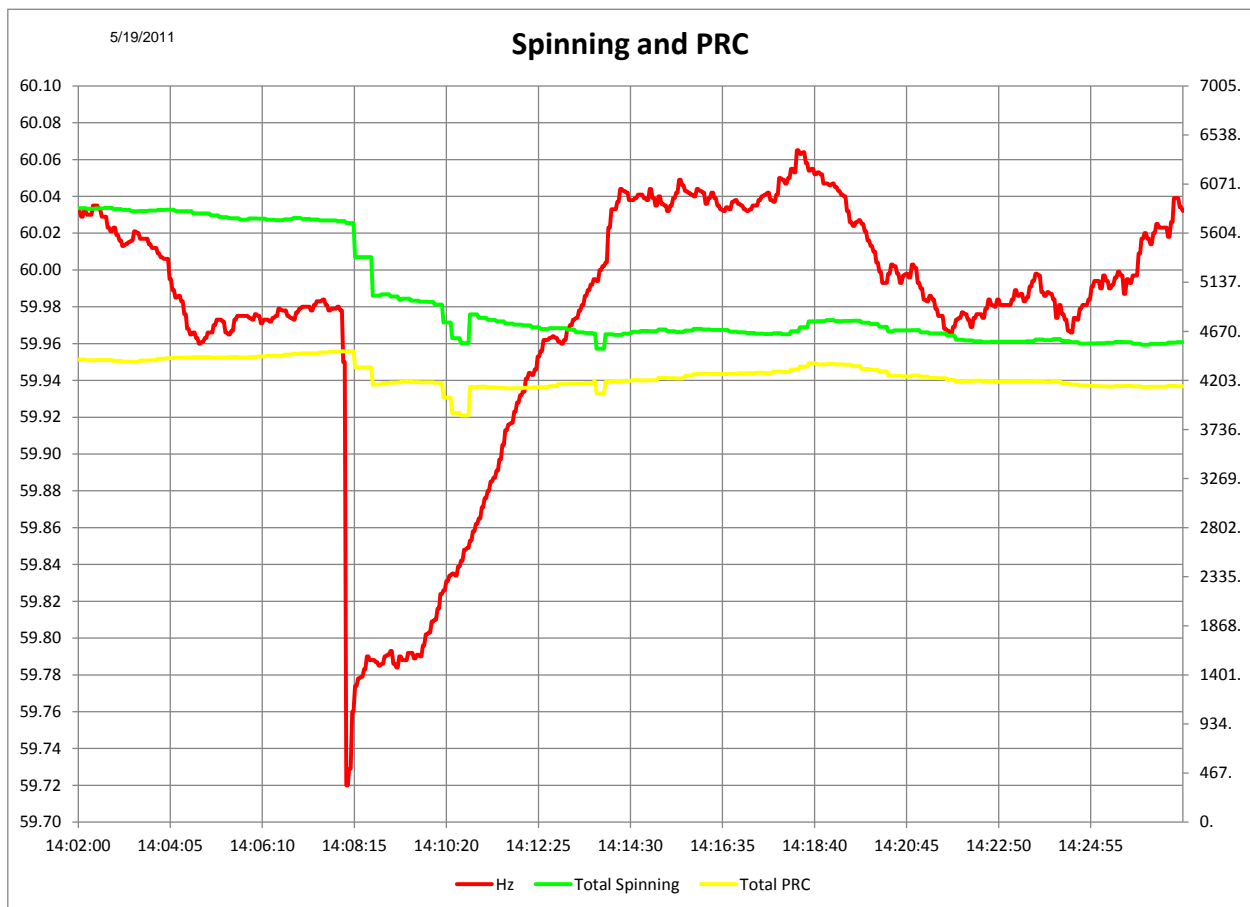
High-Speed Frequency Recorder Data on May 19, 2011.

- Generator governor response arrested the frequency decline, as analyzed by the Performance, Disturbance, Compliance Working Group (PDCWG) in its draft report. The initial calculated system frequency response, termed the “B” point, was 421.2 MW/0.1 Hz, which met the target of 420 established in ERCOT Protocols 5.9.2. The second calculated response point, termed “B+30” to denote that it measures how well response is sustained 30 seconds after the event, increased to 489.14 MW/0.1 Hz, which also met to meet the minimum response level. The PDCWG also noted the following concerns:
 - 127 out of 177 units (units running that were not excluded) (71.8%) sustained governor response for this event.
- The BA control center computer made a step deployment of 381 MW of generation regulation, within 10 seconds of the frequency bottom, modifying the setpoint sent to QSEs to accomplish this deployment. Texas RE did not identify any problems with this automatic deployment by the BA or the response from QSEs to ramp their generators output up within 10 minutes as required.
- Automatic deployment of 113.5 MW of LR by underfrequency relay action aided the frequency recovery.

The result of these actions was that system frequency returned to its pre-disturbance value of 60 Hz within 5 minutes and 45 seconds.







B. Reserves

The Physical Responsive Capability remained above 3800 MW for the duration of the event. The Load Resources that deployed by UFR action were recalled by the BA Operator at 14:17.

VI. Conclusions

In general, the steps taken in the recovery from this event achieved the desired results. RC and BA operators handled the situation effectively.

In conclusion, frequency response from generators and LR performed to effectively address the initial frequency response, the ERCOT Region met the minimum levels on the “B” and “B+30” calculation of system frequency response. 127 out of 177 units (running that were not excluded) provided the ‘sustained’ governor response for this event.