

1. INTRODUCTION

The objective of this report is to provide a summary of historical load-generation resource adequacy and control performance for the three NERC interconnections known as the Eastern, Western, and ERCOT. For each interconnection the report presents:

- Section 2.1 - the number of hours within a 24-hour period that each interconnection was operating in the three reliability states¹ (Normal, Alert, and Emergency) equivalent to the three states defined and in trial by NERC Reliability Coordinators.
- Section 2.2 - load-generation resource adequacy represented by the performance of CPS1-2, BAAL and DCS reliability metrics compared to recommended limits and considering each interconnection as a single Balancing Authority.
- Section 2.3 - the interconnections reliability performance during alert state compared to ACE-frequency standards.
- Section 3 - 24-Hour circular and statistical process control (SPC) plots showing the load-generation adequacy represented by key reliability performance metrics all aligned by hour, and the frequency deviation RMS (Epsilon).
- Section 4 - for the largest load-generation event for each interconnection, the estimated frequency response, and the 1-second frequency-time graph.

2. SUMMARY SECTION

2.1 Interconnections Reliability State Condition

The Eastern interconnection operated in a normal state. The Western interconnection operated in a normal state. The ERCOT interconnection operated in a normal state.

Interconnections Hours of Operation in Each Reliability State				
Interconnection	NORMAL	ALERT	EMERGENCY ²	Observation
Eastern	24	0	0	-
Western	24	0	0	-
ERCOT	24	0	0	-

2.2 Interconnections Normal State Performance

The Eastern interconnection exceeded its CPS2 performance metrics thresholds. The Western interconnection exceeded its CPS2 performance metrics thresholds. The ERCOT interconnection did not exceed any of the performance metrics thresholds.

Interconnections 24- Hours Performance Metrics - Actual vs Recommended									
Interconnection	CPS2 - % Daily		CPS1 - % Daily		BAAL Exceeds Daily		DCS Minutes to Return to Normal		Observations
	Rec Min	Actual	Rec Min	Actual	Rec Max	Actual	Std. Max	Actual	
Eastern	90	73	100	141	0	0	15	-	CPS2 Exceeded
Western	90	53	100	146	0	0	15	-	CPS2 Exceeded
ERCOT	90	99	100	168	0	0	15	-	-

2.3 Interconnections Alert State Performance

No interconnection operated in alert state.

Interconnections Alert State Performance Metrics							
Interconnection	Frequency Trigger Limit Minutes		Frequency Alert Limit Minutes		Frequency Relay Limit Daily		Observations
	Std. Max	Actual	Rec Min	Actual	Rec Max	Actual	
Eastern	30	-	1	-	1	-	No Violations
Western	30	-	1	-	1	-	No Violations
ERCOT	30	-	1	-	1	-	No Violations

3. LOAD-GENERATION ADEQUACY AND CONTROL PERFORMANCE FOR EACH INTERCONNECTION

3.1 Eastern Interconnection

The circular plot shows deviation of control performance metrics from the threshold for the last 24 hours. CPS 2 performance was below the 90% threshold for 14 hours onpeak and 5 hours offpeak. CPS 1 Performance was below the 100% threshold for 2 hours onpeak and 0 hour offpeak. Epsilon exceeded the interconnection threshold of 18MHz for 2 hours onpeak and 2 hours offpeak. The interconnection NetACE limit (BAAL) was not exceeded.

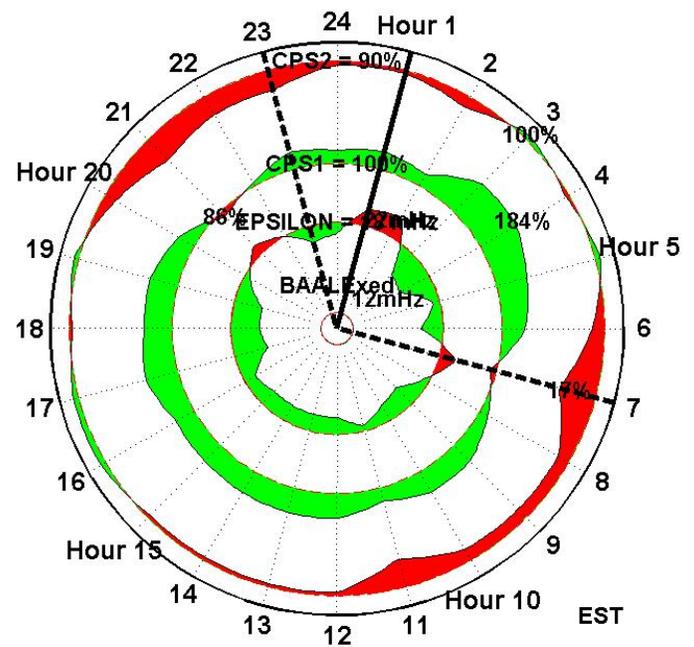


Fig 1 - Eastern Load-Generation Adequacy Performance Metrics

The first statistical process control (SPC) chart shows the frequency deviation mean. The second statistical process control (SPC) chart shows the frequency deviation variability.

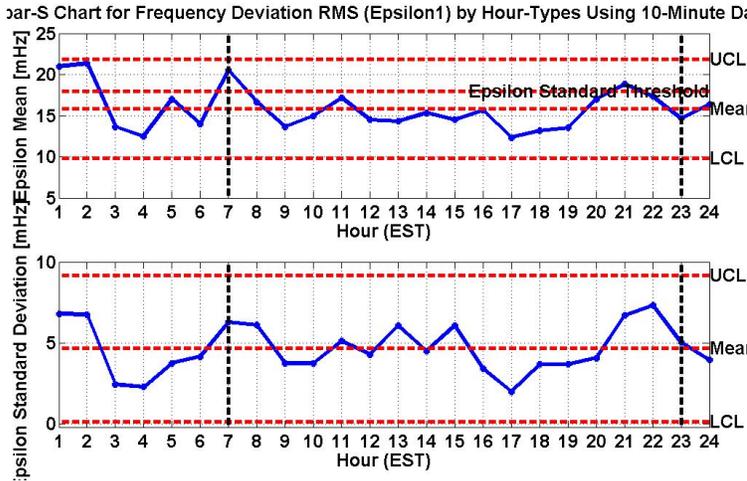


Fig 2 - Eastern Frequency Deviation (Epsilon) Performance

3.2 Western Interconnection

The circular plot shows deviation of control performance metrics from the threshold for the last 24 hours. CPS 2 performance was below the 90% threshold for 16 hours onpeak and 7 hours offpeak. CPS 1 Performance was below the 100% threshold for 1 hour onpeak and 1 hour offpeak. Epsilon exceeded the interconnection threshold of 22.8mHz for 4 hours onpeak and 2 hours offpeak. The interconnection NetACE limit (BAAL) was not exceeded.

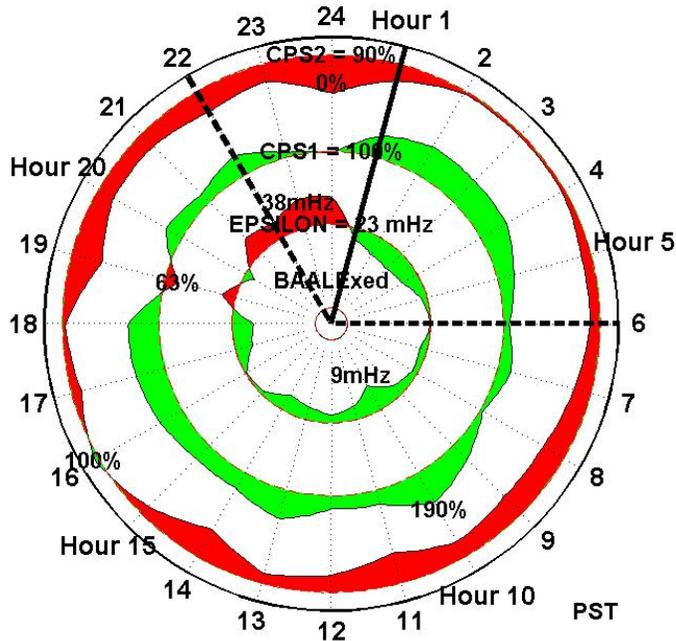


Fig 3- Western Load-Generation Adequacy Performance Metrics

The first statistical process control (SPC) chart shows the frequency deviation mean. The upper control limit for mean was reached or exceeded on hour 19, 21, 22, 23, 24. The lower control limit for mean was reached or exceeded on hour 10. The second statistical process control (SPC) chart shows the frequency deviation variability. The upper control limit for variability was reached or exceeded on hour 6, 7.

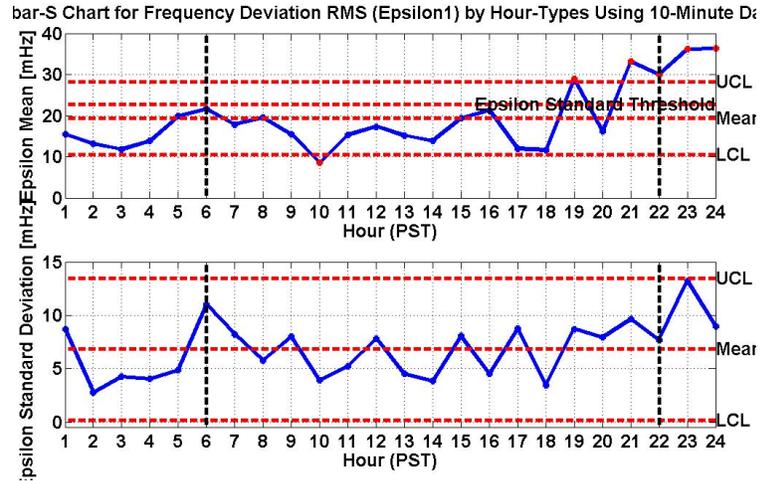


Fig 4- Western Frequency Deviation (Epsilon) Performance

3.3 ERCOT Interconnection

The circular plot shows deviation of control performance metrics from the threshold for the last 24 hours. CPS 2 performance was below the 90% threshold for 1 hour onpeak and 0 hour offpeak. CPS 1 performance did not exceed the 100% threshold. Epsilon performance did not exceed the interconnection threshold of 30mHz. The interconnection NetACE limit (BAAL) was not exceeded.

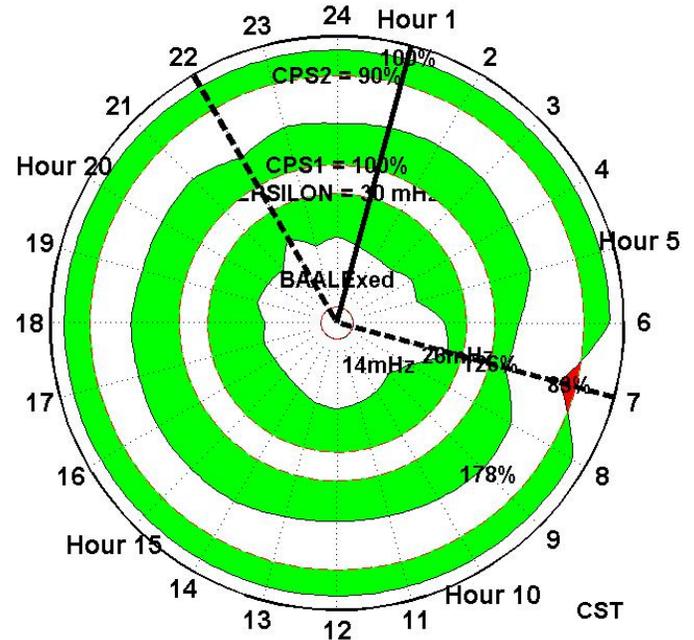


Fig 5 - ERCOT Load-Generation Adequacy Performance Metrics

The first statistical process control (SPC) chart shows the frequency deviation mean. The second statistical process control (SPC) chart shows the frequency deviation variability. The upper control limit for variability was reached or exceeded on hour 6, 7.

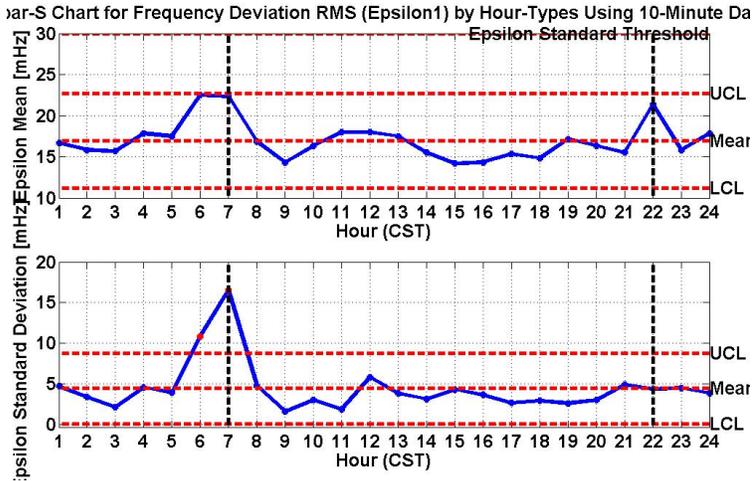


Fig 6 - ERCOT Frequency Deviation (Epsilon) Performance

4. LARGEST LOAD-GENERATION EVENT DATA FOR EACH INTERCONNECTION

4.1 Eastern Event Data - Estimated Frequency Response

NOTE: This is not a significant event.

The event reached a highest frequency of 60.025 (Point C) Hz and started returning to normal in about 21 seconds.

DISCLAIMER- The event Frequency Response is an approximate estimate value using the best available 1-second phasor frequency data, ACE 1-minute SCADA data, and equations shown below whose definition is being developed by NERC Subcommittees and Frequency Response Standard Drafting team. Provided solely for informational purposes.

FR = MWLoss/10*DeltaFreq	MWLoss = Max(DeltaACE(BA))-Const*10*FreqBias*DeltaFreq
DeltaFreq = FreqA - FreqB	EI Const = 0.6, WI Const = 0.6, ERCOT = 0.3
FreqA=Avg of t-2Sec to t-16Sec	
FreqB=Avg of t+19Sec to t+52Sec	
Event Summary : Date/Time	9/30/2013 5:55:08 AM
Frequency at Point A [Hz]	59.999
Frequency at Point B [Hz]	60.029
Delta Frequency	0.03
BA with Highest Delta ACE	MISO
Highest Delta ACE [MW]	343
FreqBias of the BA [MW/0.1Hz]	-951
MW Loss [MW]	-514
Estimated Event FreqResp [MW/0.1Hz]	-1713

The interconnection responded to the largest event with an estimated frequency response of about -1713 MW/0.1Hz under performing the yearly committed value of -2601 MW/0.1 Hz.

4.2 Eastern Event Data- 1-Second Frequency Time Graph

Event Frequency at points A, B, and C are shown in the frequency response table. The frequency for this event dropped 0.027Hz (point-A - point-C) and stabilized (point-B) in 21 seconds.

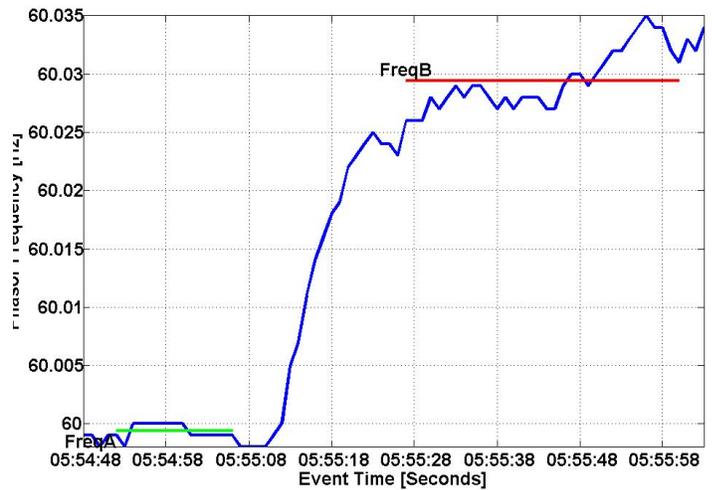


Fig 7 - Eastern Event 1-Second Frequency-Time Graph

4.3 Western Event Analysis - Frequency Response

NOTE: This is not a significant event.

The event reached a highest frequency of 60.025 (Point C) Hz and started returning to normal in about 21 seconds.

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FR = MWLoss/10*DeltaFreq	MWLoss = Max(DeltaACE(BA))-Const*10*FreqBias*DeltaFreq
DeltaFreq = FreqA - FreqB	EI Const = 0.6, WI Const = 0.6, ERCOT = 0.3
FreqA=Avg of t-2Sec to t-16Sec	
FreqB=Avg of t+19Sec to t+52Sec	
Event Summary : Date/Time	9/30/2013 7:14:59 AM
Frequency at Point A [Hz]	59.976
Frequency at Point B [Hz]	60.019
Delta Frequency	0.043
BA with Highest Delta ACE	CISO
Highest Delta ACE [MW]	252
FreqBias of the BA [MW/0.1Hz]	-489
MW Loss [MW]	-379
Estimated Event FreqResp [MW/0.1Hz]	-875

The interconnection responded to the largest event with an estimated frequency response of about -875 MW/0.1Hz over performing the yearly committed value of -833 MW/0.1 Hz.

4.4 Western Event Analysis - 1-Second Frequency Time Graph

Event Frequency at points A, B, and C are shown in the frequency response table. The frequency for this event dropped 0.052Hz (point-A - point-C) and stabilized (point-B) in 21 seconds.

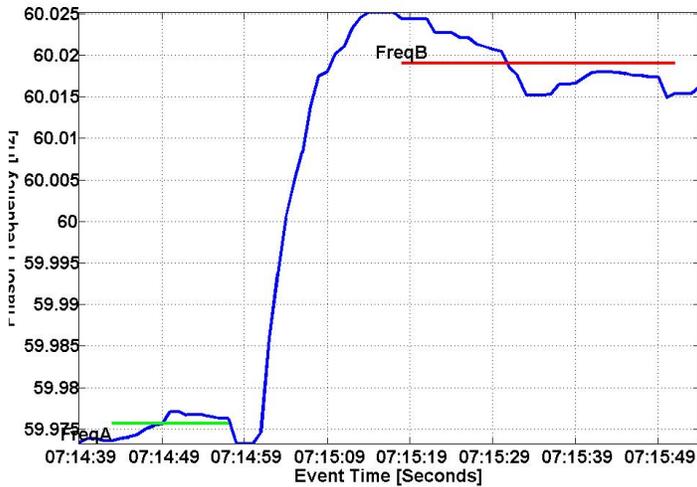


Fig 8 - Western Event 1-Second Frequency-Time Graph

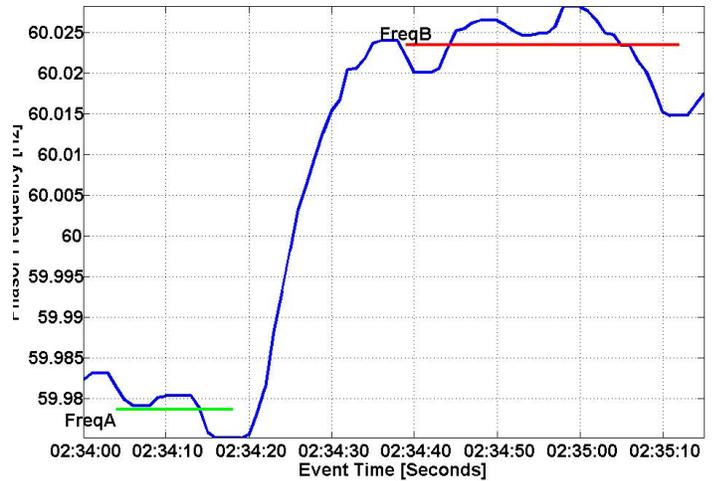


Fig 9 - ERCOT Event 1-Second Frequency-Time Graph

4.5 ERCOT Event Analysis - Frequency Response

NOTE: This is not a significant event.

The event reached a highest frequency of 60.024 (Point C) Hz and started returning to normal in about 21 seconds.

DISCLAIMER- The event Frequency Response is an approximate estimate value using the best available 1-second phasor frequency data, ACE 1-minute SCADA data, and equations shown below whose definition is being developed by NERC Subcommittees and Frequency Response Standard Drafting team. Provided solely for informational purposes.

FR = MWLoss/10*DeltaFreq	MWLoss = Max(DeltaACE(BA))-Const*10*FreqBias*DeltaFreq
DeltaFreq = FreqA - FreqB	EI Const = 0.6, WI Const = 0.6, ERCOT = 0.3
FreqA=Avg of t-2Sec to t-16Sec	
FreqB=Avg of t+19Sec to t+52Sec	
Event Summary : Date/Time	9/30/2013 2:34:20 AM
Frequency at Point A [Hz]	59.979
Frequency at Point B [Hz]	60.023
Delta Frequency	0.045
BA with Highest Delta ACE	ERCO
Highest Delta ACE [MW]	43
FreqBias of the BA [MW/0.1Hz]	-672
MW Loss [MW]	-73
Estimated Event FreqResp [MW/0.1Hz]	-162

4.6 ERCOT Event Analysis - 1-Second Frequency Time Graph

Event Frequency at points A, B, and C are shown in the frequency response table. The frequency for this event dropped 0.048Hz (point-A - point-C) and stabilized (point-B) in 21 seconds.

-----Footnotes-----

1. NERC Reliability Coordinators Working Group, "Guideline for Operating State Alert Levels," Response to August 2003 Blackout Recommendation, May 22, 2007.
2. Please note that an emergency state results when load is dropped, and hence no performance metrics data is presented.