



CCET Discovery Across Texas Synchrophasor Team Meeting
October 15, 2013

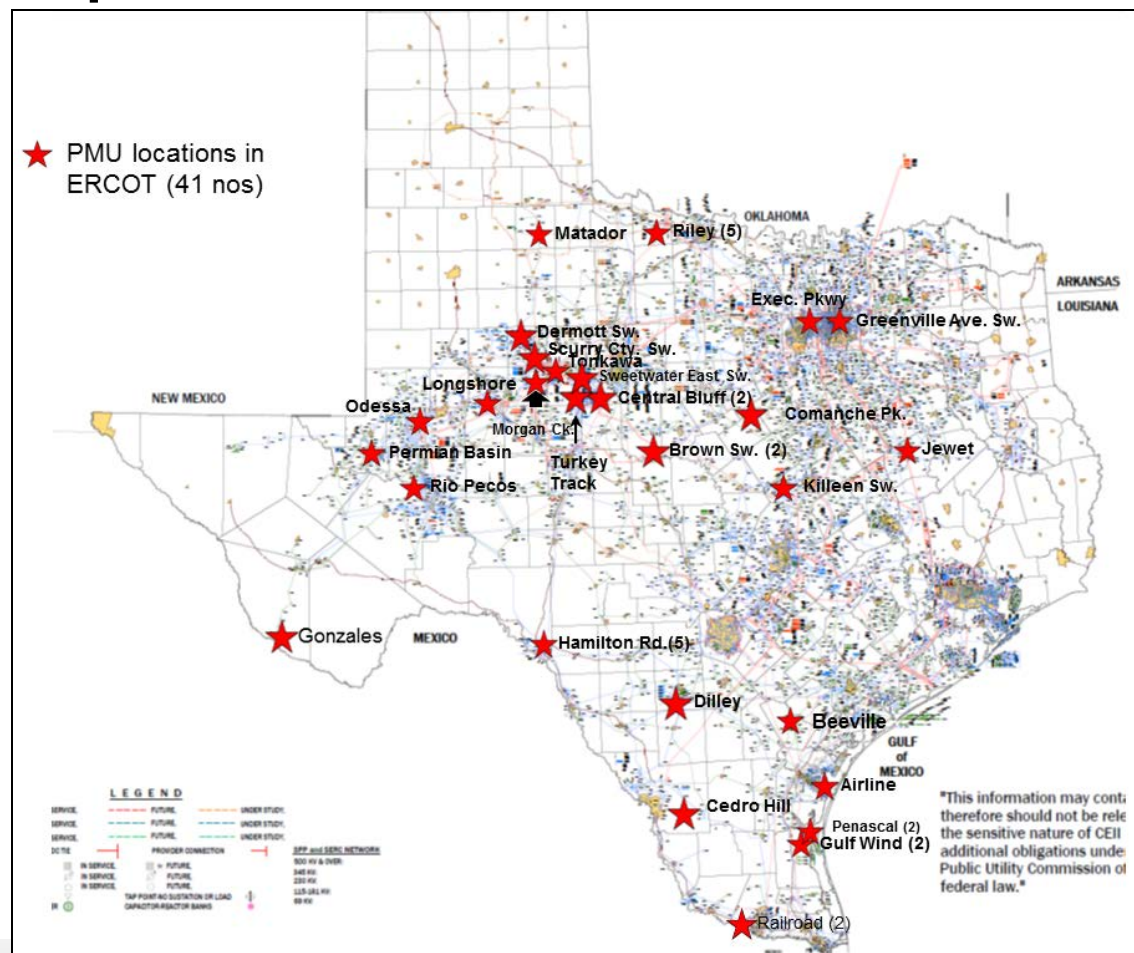
ERCOT UPDATE

Bill Blevins
Manager, Operations Support

PMU Deployment Status – all

- New release of RTDMS installed (Sept 2013)
- Helps to handle data dropouts and other issues
- Total 41 PMUs
 - AEP: 22 (+14 new* ?)
 - ONCOR: 17
 - Sharyland: 2

* Note: Need to finalize on AEP new PMUs



DEPLOYMENT STATUS REPORTS

- AEP – 22 PMUs**

#	Company	PMU Name	Name of the SubStation where PMU is located	Enabled	Base kV
1	AEP	Bowman 1421@ Riley	Riley	Yes	345
2	AEP	Bowman 2421@ Riley	Riley	Yes	345
3	AEP	BwmnFshr@Riley	Riley	Yes	345
4	AEP	Escnodd@Hmltn	Hamilton Road	Yes	138
5	AEP	IL4@HmtnRd	Hamilton Road	Yes	138
6	AEP	PicochoN@HnRd	Hamilton Road	Yes	138
7	AEP	PicochoS@HnRd	Hamilton Road	Yes	138
8	AEP	Odlaw@HamiltonRd	Hamilton Road	Yes	138
9	AEP	Gulf Wind TR1-345	Gulf Wind	Yes	345
10	AEP	Gulf Wind TR2-345	Gulf Wind	Yes	345
11	AEP	Penascal TR1-345	Penascal	Yes	345
12	AEP	Penascal TR2-345	Penascal	Yes	345
13	AEP	Westside@Airline	Airline	Yes	138
14	AEP	WhitBkr@RioPecos	Rio Pecos	Yes	138
15	AEP	MTDR-SPUR	Matador	Yes	69
16	AEP	Sys20ku1@Riley	Riley	Yes	345
17	AEP	Sys10ku2@Riley	Riley	Yes	345
18	AEP	Bvii11/1690/8530	Beeville	Yes	69
19	AEP	21ALCK@Gonzales	Gonzales	Yes	69
20	AEP	TR1@CedroHill	Cedro Hill	Yes	138
21	AEP	SVC@Dilley	Dilley Switch	Yes	69
22	AEP	TR1@TurkeyTrack	Turkey Track	Yes	138

New PMUS:

ECik1L901 @Tesla
 ECik1L902 @Riley
 ECik2L901 @Tesla
 ECik2L902 @Riley
 Gray1L90 @Tesla
 Gray2L90 @Tesla
 Riley1L901 @Tesla
 Riley2L901 @Tesla
 TCanyn1L90 @Tesla
 TCanyn2L90 @Tesla
 Tesla1L901 @Riley
 Tesla2L901 @Riley
 WKRUM1421 @RILEY
 WKRUM2421 @RILEY

Note: Need to finalize on AEP new PMUs

DEPLOYMENT STATUS REPORTS

- ONCOR – 17 PMUs**

#	Company	PMU Name	Name of the SubStation where PMU is located	Enabled
1	ONCOR	EXPKY 9145	Executive Parkway	Yes
2	ONCOR	GAVSW 022	Greenville Avenue	Yes
3	ONCOR	JEWET 1834	Jewet SW.	Yes
4	ONCOR	KLNSW 5020	Killeen SW.	Yes
5	ONCOR	LNGSW 9400/9405	Longshore SW.	Yes
6	ONCOR	MGCSW 6520	Morgan Creek SW.	Yes
7	ONCOR	ODEHV11425/11420	Odessa EHV	Yes
8	ONCOR	PMBSW 2580/2590	Permian Basin	Yes
9	ONCOR	TKWSW 9205/9210	Tonkawa SW.	Yes
10	ONCOR	CPSSW 8070	Comanche Peak SW.	Yes
11	ONCOR	DMTSW10945/10940	Dermott SW.	Yes
12	ONCOR	SCOSW10715/10710	Scurry County South SW.	Yes
13	ONCOR	SWESW10510/10515	Sweetwater East SW.	Yes
14	ONCOR	CBFSW11130/11135	Central Bluff SW.	Yes
15	ONCOR	CBFSW11140/11135	Central Bluff SW.	Yes
16	ONCOR	BWNSW10840/10835	Brown SW.	Yes
17	ONCOR	BWNSW10845/10850	Brown SW.	Yes

- SHARYLAND – 2 PMUs**

#	Company	PMU Name	Name of the SubStation where PMU is located	Enabled
1	SHARYLAND	CFE@Railroad	Railroad	Yes
2	SHARYLAND	Bentsen@Railroad	Railroad	Yes

LCRA PMU ADDITIONAL PMU OUTSIDE OF CCET PROJECT

- At the following six substations install synchrophasor measurement equipment including satellite-synchronized clocks and telecom hardware necessary to enable Phasor Measurement Unit (PMU) functionality:

Substation	# of PMUs	Line(s)
Austrop	4	T-181, T-182, T-185, T-229
Clear Springs	3	T-250, T-419, T-511
Fayetteville	1	T-210
Kendall	2	T-389, T-459
Marion	2	T-248, T-419
Zorn	5	T-185, T-246, T-248, T-250, T-510
Total		17

Locations were chosen based primarily on: SEL-421 relay availability, telecom bandwidth, 345kV system coverage, proximity to generation, and line pairs

RTDMS/PMU DAILY PERFORMANCE REPORT

- **RTDMS 2012 Daily Report – status**

- With new version and new server, issue of automatic generation of report resolved

9th October, 2013 Report

ERCOT RTDMS[®] DAILY PERFORMANCE REPORT

Wednesday, October 09, 2013 (Central Daylight Time)

The data of this report consists of 23.98 hours

ALARM SUMMARY

Interconnection Alarms

High Interconnection Frequency: 0
 Low Interconnection Frequency: 0
 Interconnection Frequency Transient: 0

DISCLAIMER and DATA CONFIDENTIALITY - The report is prepared for ERCOT internal use and authorized users as determined by ERCOT. Report utilizes data from ERCOT's ePDC. Data is confidential and covered under NERC Operating Data Confidentiality Agreement. The report is generated by RTDMS - Built upon Grid-3P® platform, U.S. Patent 7,233,843. Electric Power Group. All rights reserved.

Regional Alarms

	Total	Angle Alarms			Frequency Alarms		Other Alarms		Voltage Alarms	
			Angle Difference	Angle Difference Transient		Frequency Transient		Other Alarm Types		Voltage Transient
AEP	0	0	0	0	0	0	0	0	0	0
ERCOT	50	50	50	0	0	0	0	0	0	0
ONCOR	0	0	0	0	0	0	0	0	0	0
Sharyland	0	0	0	0	0	0	0	0	0	0
System	0	0	0	0	0	0	0	0	0	0
Grand Total	50	50	50	0	0	0	0	0	0	0

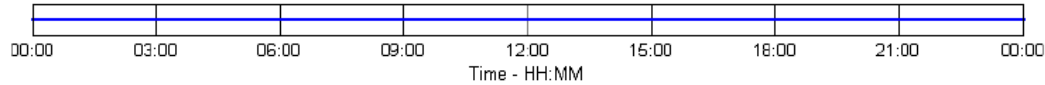
RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

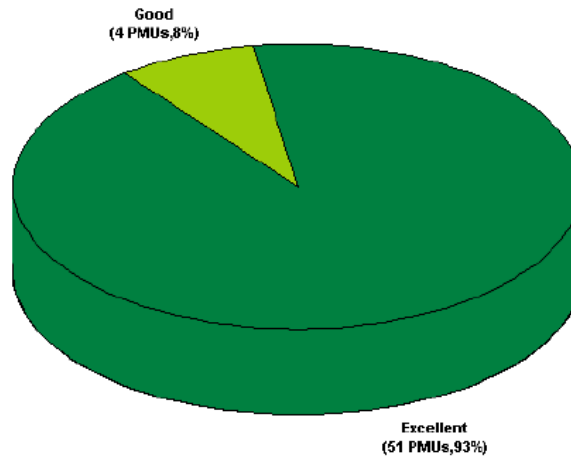
DATA QUALITY

Wednesday, October 09, 2013 (Central Daylight Time)

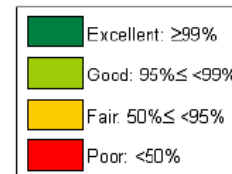
Data Availability (23.98 hours)



PMU Performance*



PMU Performance Category of Valid Data



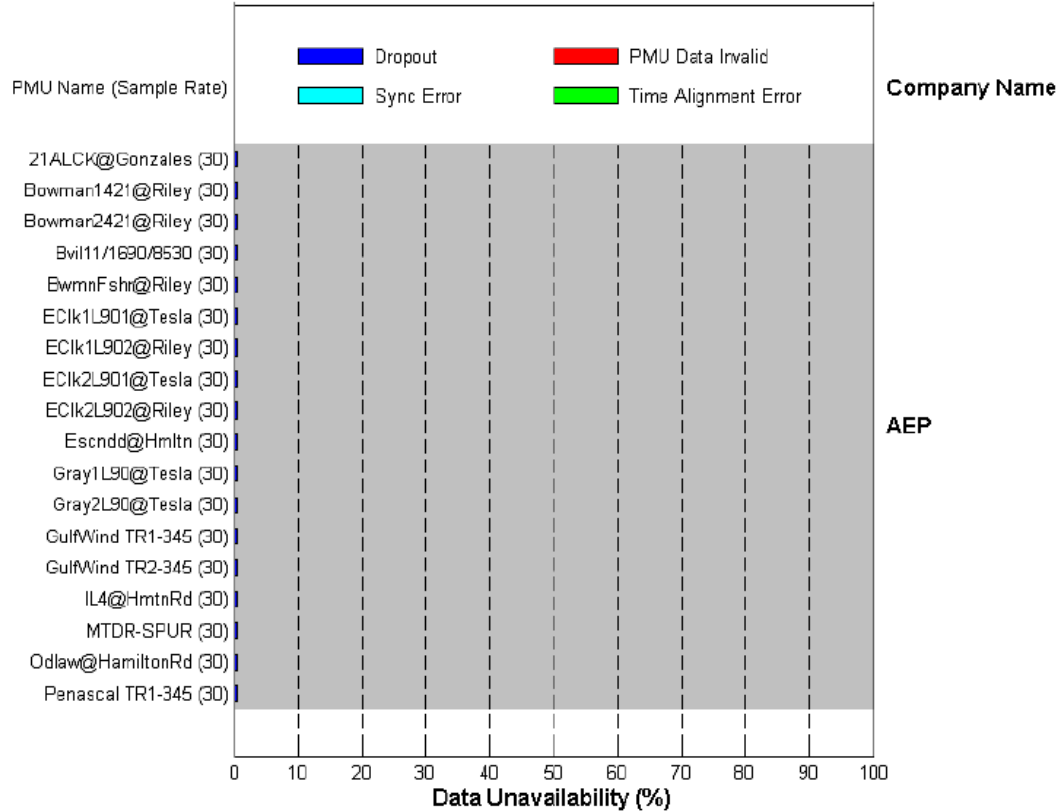
*PMU Performance is based on Archived Data only. (PMU Performance(%) = Valid Data / Total Archived Data * 100%)

RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

INDIVIDUAL PMU PERFORMANCE

Wednesday, October 09, 2013 (Central Daylight Time)

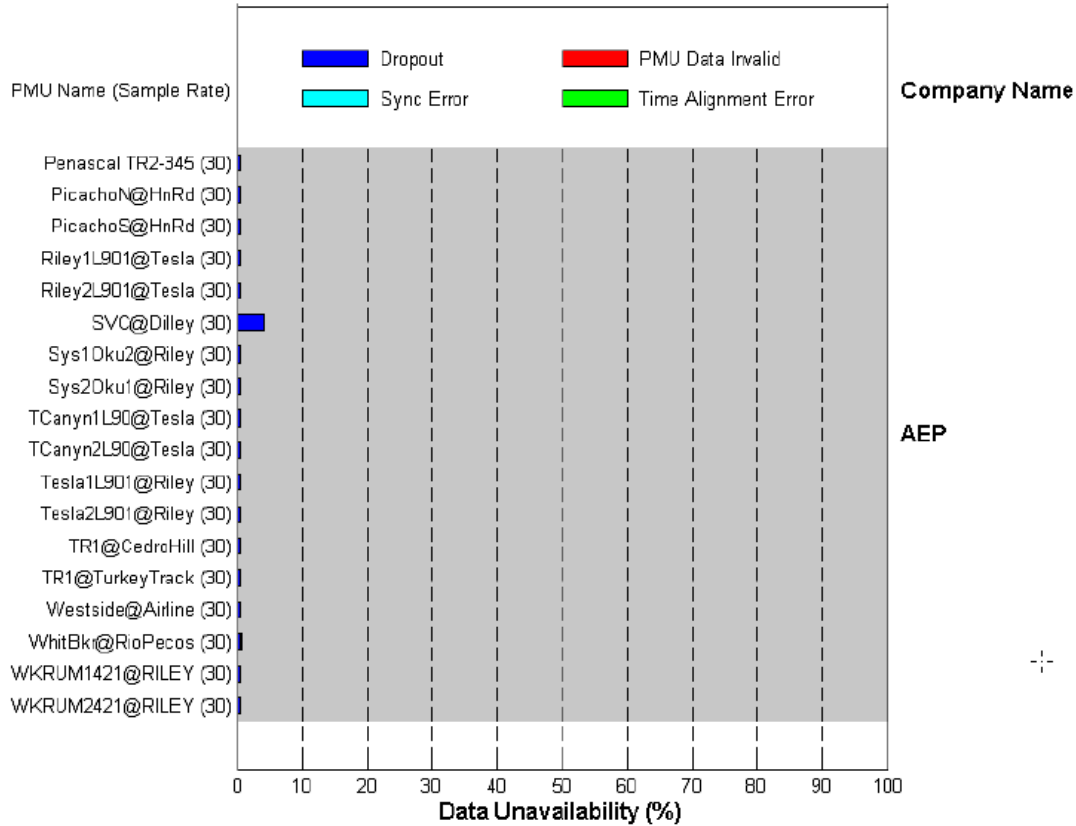


RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

INDIVIDUAL PMU PERFORMANCE

Wednesday, October 09, 2013 (Central Daylight Time)

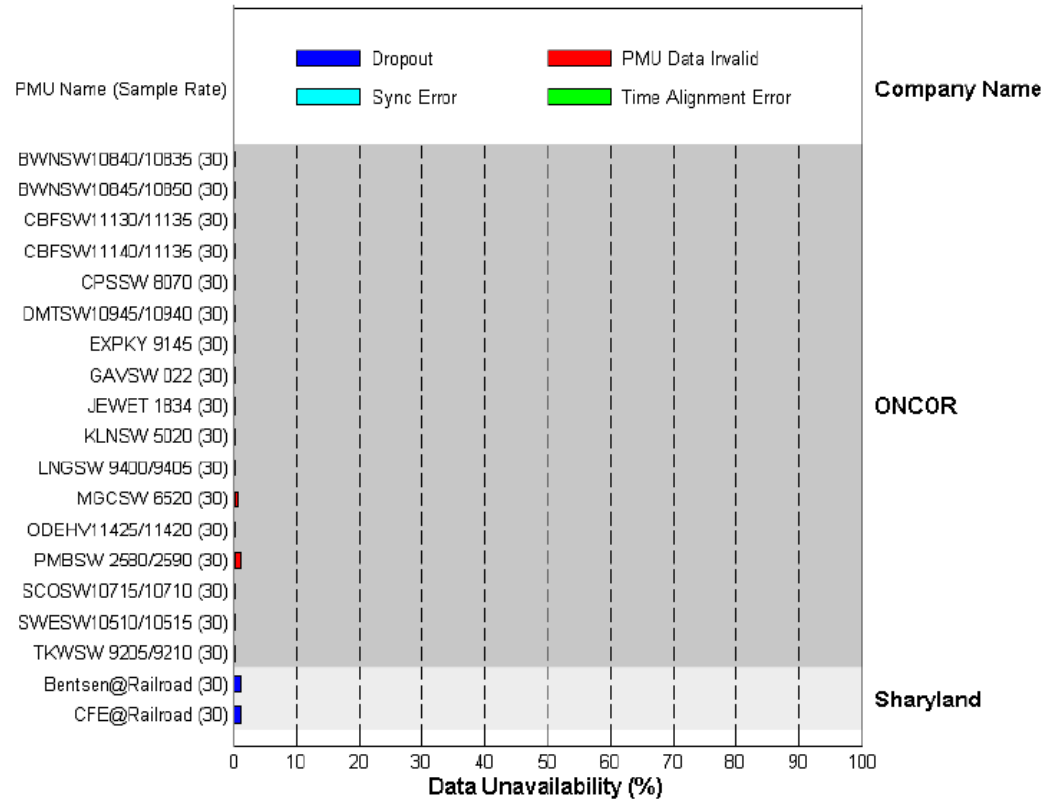


RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

INDIVIDUAL PMU PERFORMANCE

Wednesday, October 09, 2013 (Central Daylight Time)



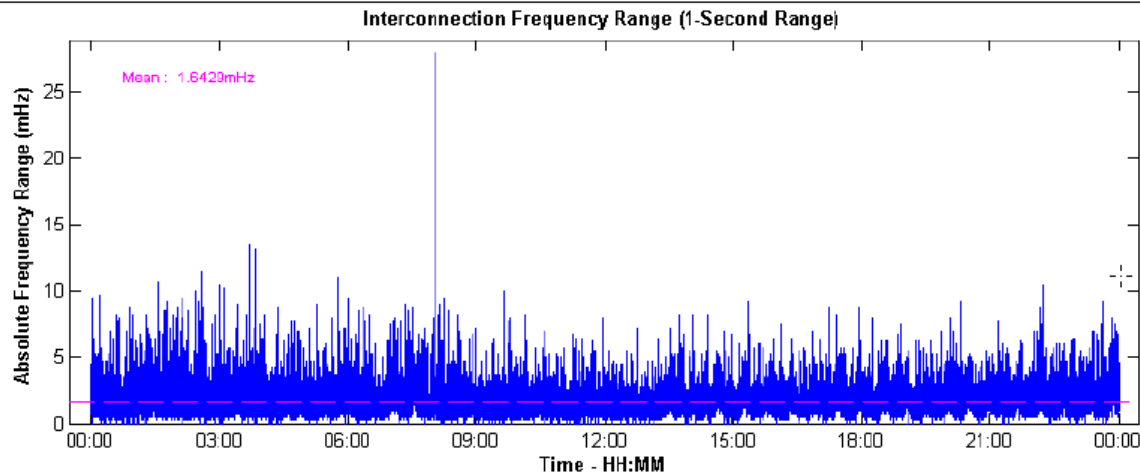
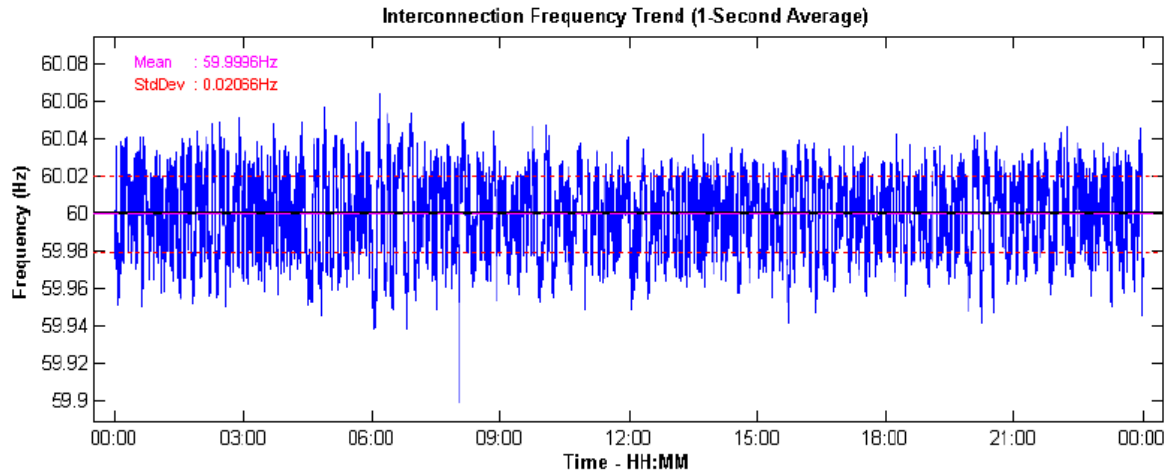
RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

TRENDS & STATISTICS

Wednesday, October 09, 2013 (Central Daylight Time)

Interconnection Frequency Trends & Statistics



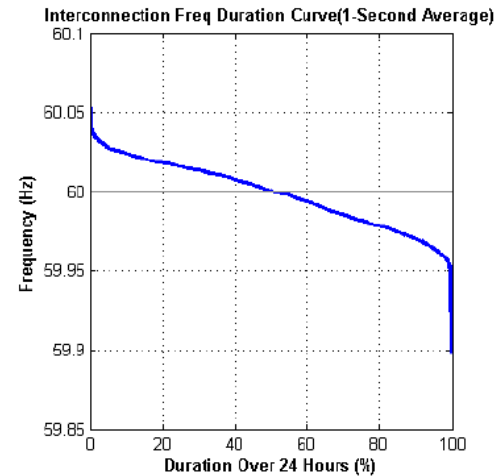
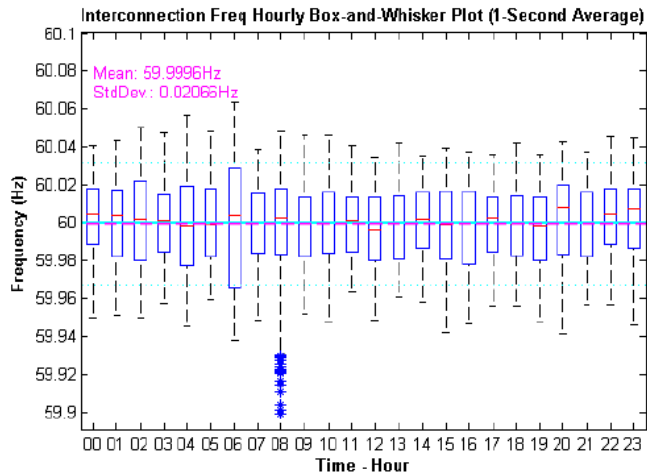
6

RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

Interconnection Frequency Trends & Statistics

Wednesday, October 09, 2013 (Central Daylight Time)



RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

Interconnection Frequency Performance (based on 1-second average data)

Wednesday, October 09, 2013 (Central Daylight Time)

Daily Average: 59.9996
 Standard Deviation: 0.0207
 Maximum Frequency: 60.0648
 Minimum Frequency: 59.8977

Minutes > 60.08: 0.00
 Minutes > 60.05: 1.22
 Minutes < 59.95: 4.83
 Minutes < 59.92: 0.10

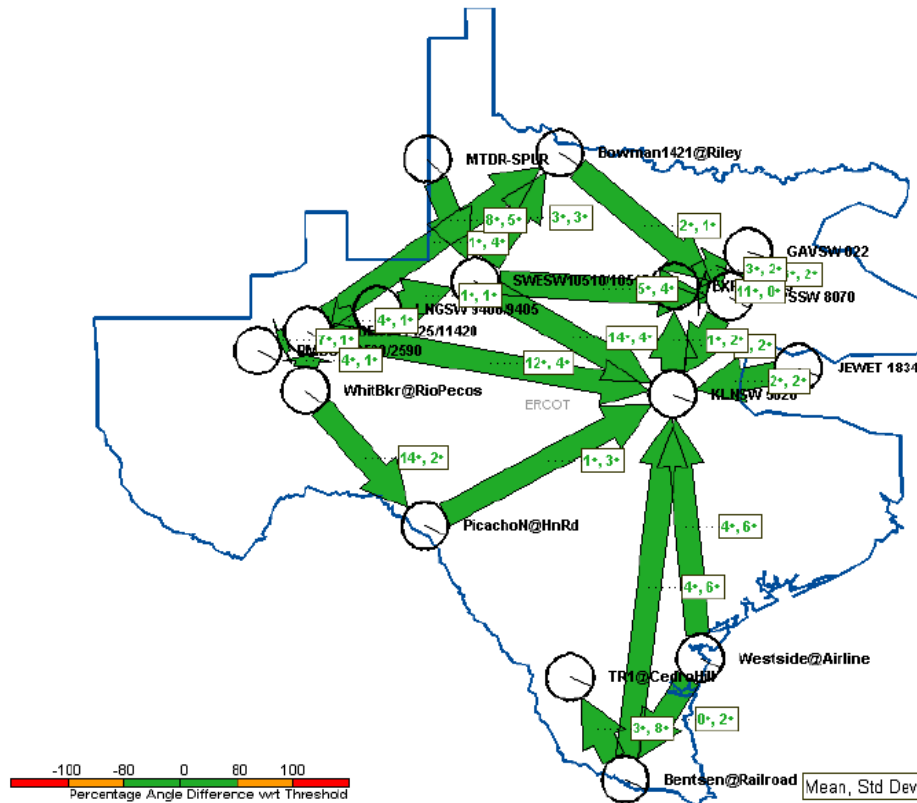
Hour Ending	Hourly Average	1-10 min	11-20 min	21-30 min	31-40 min	41-50 min	51-60 min
1	60.0027	59.9931	60.0128	60.0011	60.0008	60.0041	60.0046
2	60.0004	59.9961	60.0078	59.9947	60.0012	59.9977	60.0049
3	60.0009	60.0081	60.0033	59.9942	59.9987	59.9999	60.0010
4	60.0002	60.0005	60.0041	59.9966	59.9983	59.9986	60.0033
5	59.9974	59.9953	59.9993	60.0023	59.9875	59.9946	60.0055
6	59.9996	60.0005	60.0032	59.9922	59.9994	60.0006	60.0017
7	59.9993	59.9824	59.9950	60.0043	60.0113	59.9910	60.0116
8	59.9994	59.9906	60.0039	59.9996	60.0035	60.0067	59.9923
9	60.0003	60.0014	60.0012	59.9928	60.0051	60.0010	60.0004
10	59.9979	60.0005	59.9903	59.9982	60.0069	60.0122	59.9793
11	59.9999	60.0129	59.9841	60.0065	59.9946	59.9992	60.0020
12	59.9993	59.9966	60.0014	59.9928	60.0007	59.9913	60.0127
13	59.9953	59.9783	60.0022	59.9935	59.9973	60.0020	59.9986
14	59.9984	59.9965	59.9955	59.9961	59.9987	60.0020	60.0019
15	60.0006	60.0066	59.9905	60.0041	59.9944	59.9997	60.0082
16	59.9979	59.9919	59.9949	59.9997	60.0068	59.9863	60.0080
17	59.9978	60.0020	60.0025	59.9912	59.9915	59.9972	60.0027
18	60.0000	59.9996	60.0021	60.0001	59.9962	59.9966	60.0052
19	59.9984	60.0004	59.9971	59.9926	59.9968	60.0057	59.9979
20	59.9971	59.9987	60.0004	59.9943	60.0002	60.0087	59.9809
21	60.0019	60.0148	59.9904	60.0011	60.0106	60.0054	59.9890
22	59.9992	60.0017	59.9957	60.0032	60.0000	60.0127	59.9817
23	60.0037	60.0184	59.9946	60.0030	60.0112	59.9946	60.0002
24	60.0019	60.0071	59.9950	60.0078	59.9965	59.9963	60.0086

RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

Angle Difference Statistics - On-Peak(7:00-22:00)

Wednesday, October 09, 2013 (Central Daylight Time)



RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

Angle Difference Statistics - On-Peak(7:00-22:00)

Wednesday, October 09, 2013 (Central Daylight Time)

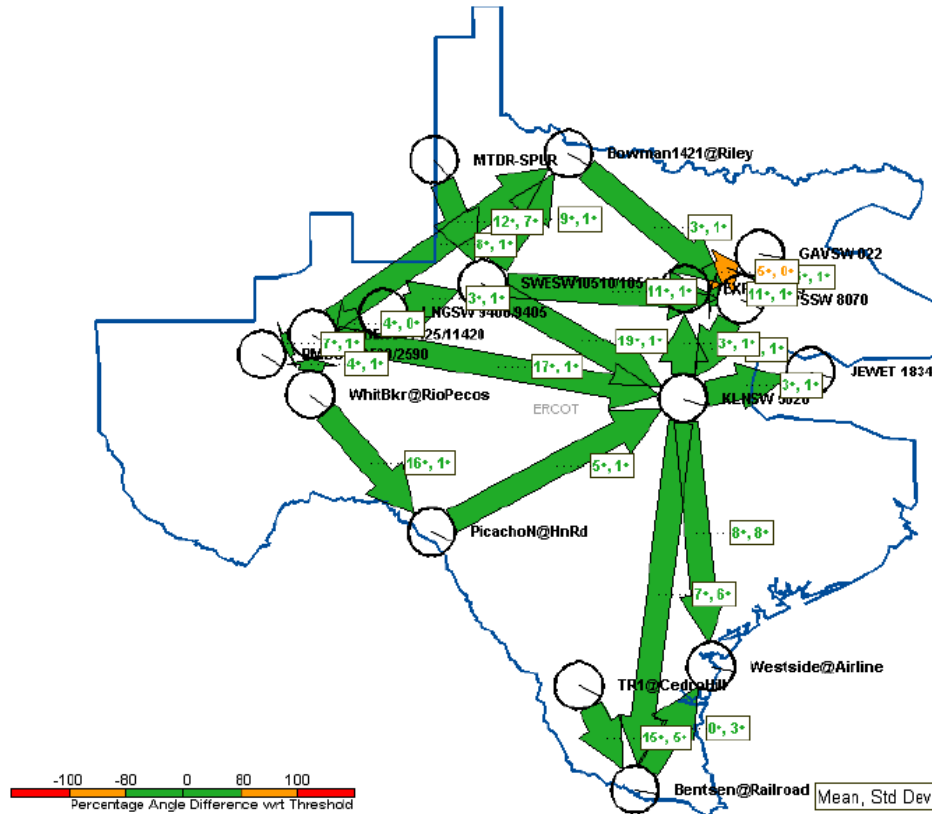
Angle Difference Pair		Min(°)	Max(°)	Mean(°)	Threshold(°)		Std Dev(°)	Mean/Threshold Percentage(%)
From	To				Min	Max		
Westside@Airline	Bentsen@Railroad	-4.72	6.57	0.12	-14	25	2.07	0.46
Westside@Airline	KLNSW 5020	-7.05	14.01	3.64	-25	42	5.54	8.56
Bentsen@Railroad	TR1@CedroHill	-16.14	14.88	2.62	-20	20	8.47	13.11
Bentsen@Railroad	KLNSW 5020	-9.15	14.55	3.53	-10	10	6.45	35.31
CPSSW 8070	GAVSW 022	11.42	17.13	13.34	-5	20	1.68	67.90
CPSSW 8070	EXPKY 9145	9.99	11.45	10.55	2	14	0.26	77.44
CPSSW 8070	KLNSW 5020	4.05	13.35	9.40	-13	31	1.74	29.86
EXPKY 9145	GAVSW 022	0.96	6.18	2.79	-2	6	1.52	46.32
EXPKY 9145	KLNSW 5020	-6.89	2.78	-1.15	-20	21	1.87	-5.75
PicachoN@HnRd	KLNSW 5020	-2.37	9.50	1.27	-32	22	2.84	5.83
KLNSW 5020	JEWET 1834	-4.66	3.31	-1.60	-20	5	1.82	-7.89
ODEHV11425/11420	KLNSW 5020	6.06	21.31	11.90	-37	53	3.96	22.61
ODEHV11425/11420	LNGSW 9400/9405	-4.67	-2.11	-3.50	-16	4	0.77	-21.42
ODEHV11425/11420	PMBSW 2580/2590	4.75	8.52	6.65	2	13	0.86	50.96
ODEHV11425/11420	Bowman1421@Riley	-3.58	8.34	0.97	-25	25	3.70	3.95
ODEHV11425/11420	WhitBkr@RioPecos	-6.41	-1.85	-3.81	-23	24	1.09	-16.61
Bowman1421@Riley	CPSSW 8070	-0.67	4.19	1.54	-16	16	1.27	9.65
Bowman1421@Riley	SWESW10510/10515	-9.42	0.76	-3.35	-20	16	3.23	-16.86
WhitBkr@RioPecos	PicachoN@HnRd	9.05	20.01	14.45	-34	84	2.43	17.17
SWESW10510/10515	MTDR-SPUR	-16.57	-0.12	-7.66	-48	61	5.15	-15.88
SWESW10510/10515	CPSSW 8070	-0.66	13.41	4.88	-25	28	4.37	17.45
SWESW10510/10515	KLNSW 5020	9.13	22.49	14.27	-28	52	3.65	27.24
SWESW10510/10515	LNGSW 9400/9405	-3.32	0.49	-1.13	-8	9	1.12	-14.99

RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

Angle Difference Statistics - Off-Peak(0:00-7:00, 22:00-24:00)

Wednesday, October 09, 2013 (Central Daylight Time)



RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

Angle Difference Statistics - Off-Peak(0:00-7:00, 22:00-24:00)

Wednesday, October 09, 2013 (Central Daylight Time)

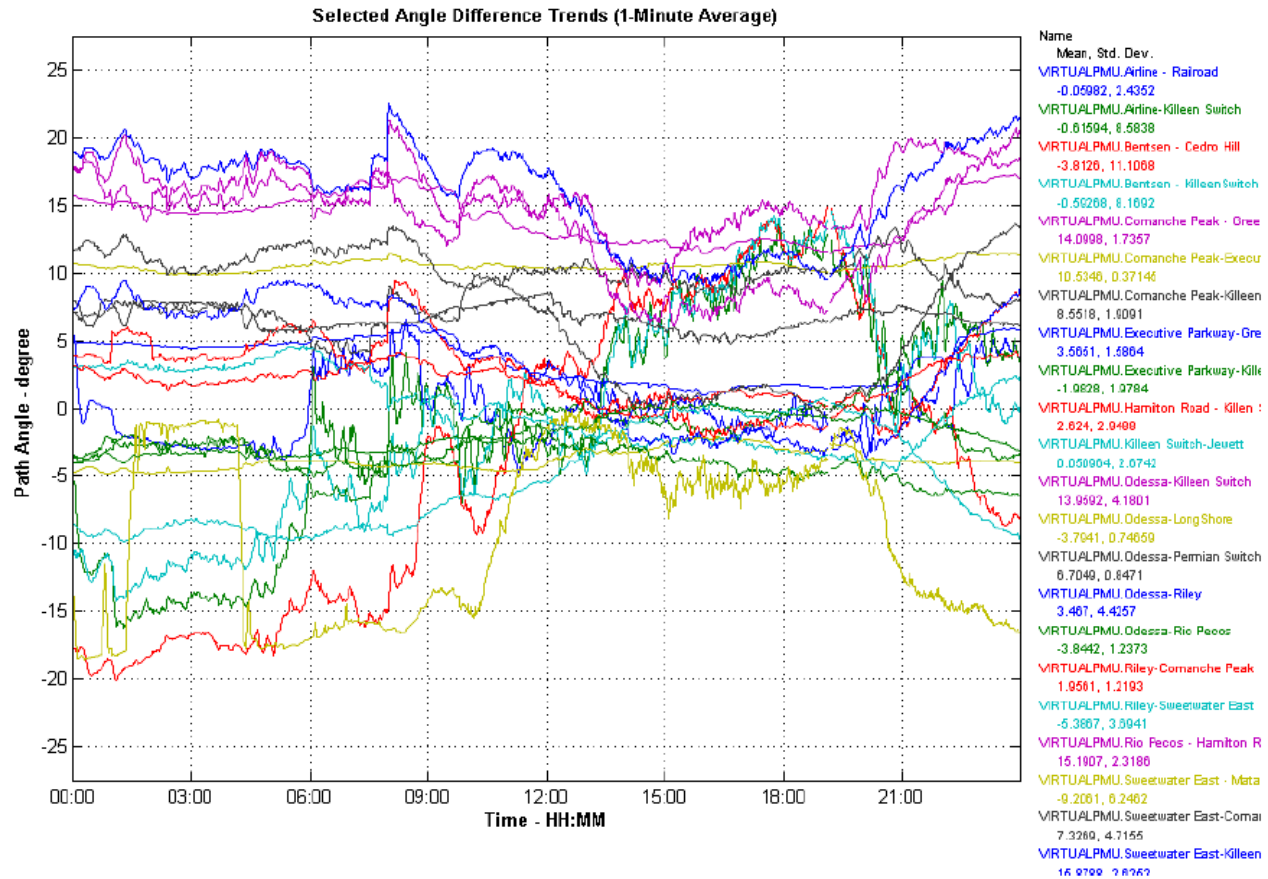
Angle Difference Pair		Min(°)	Max(°)	Mean(°)	Threshold(°)		Std Dev(°)	Mean/Threshold Percentage(%)
From	To				Min	Max		
Westside@Airline	Bentsen@Railroad	-3.78	6.56	-0.35	-14	25	2.92	-2.40
Westside@Airline	KLNSW 5020	-16.16	9.51	-7.65	-25	42	8.08	-30.44
Bentsen@Railroad	TR1@CedroHill	-20.11	0.17	-14.56	-20	20	5.00	-72.78
Bentsen@Railroad	KLNSW 5020	-14.26	7.88	-7.49	-10	10	5.71	-74.89
CPSSW 8070	GAVSW 022	14.34	17.30	15.37	-5	20	0.86	78.26
CPSSW 8070	EXPKY 9145	9.85	11.50	10.51	2	14	0.51	77.20
CPSSW 8070	KLNSW 5020	4.09	10.65	7.14	-13	31	1.22	22.68
EXPKY 9145	GAVSW 022	3.43	5.87	4.86	-2	6	0.43	80.88
EXPKY 9145	KLNSW 5020	-6.62	-0.26	-3.37	-20	21	1.24	-16.91
PicachoN@HnRd	KLNSW 5020	2.81	8.68	4.86	-32	22	1.29	22.27
KLNSW 5020	JEWET 1834	-1.37	4.63	2.80	-20	5	1.18	61.26
ODEHV11425/11420	KLNSW 5020	14.93	20.70	17.38	-37	53	1.31	33.01
ODEHV11425/11420	LNGSW 9400/9405	-4.85	-3.80	-4.28	-16	4	0.37	-26.16
ODEHV11425/11420	PMBSW 2580/2590	5.53	8.00	6.79	2	13	0.81	52.06
ODEHV11425/11420	Bowman1421@Riley	2.42	9.49	7.60	-25	25	1.41	30.92
ODEHV11425/11420	WhitBkr@RioPecos	-6.47	-1.91	-3.90	-23	24	1.44	-16.98
Bowman1421@Riley	CPSSW 8070	1.40	4.23	2.64	-16	16	0.72	16.48
Bowman1421@Riley	SWESW10510/10515	-9.87	-5.26	-8.76	-20	16	0.86	-44.11
WhitBkr@RioPecos	PicachoN@HnRd	13.74	19.64	16.42	-34	84	1.45	19.50
SWESW10510/10515	MTDR-SPUR	-18.51	-0.81	-11.78	-48	61	7.01	-24.43
SWESW10510/10515	CPSSW 8070	8.59	13.63	11.40	-25	28	0.96	40.80
SWESW10510/10515	KLNSW 5020	15.75	21.66	18.54	-28	52	1.30	35.37
SWESW10510/10515	LNGSW 9400/9405	-4.04	-1.22	-3.12	-8	9	0.63	-41.43

RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

Voltage Angle Difference Trends

Wednesday, October 09, 2013 (Central Daylight Time)



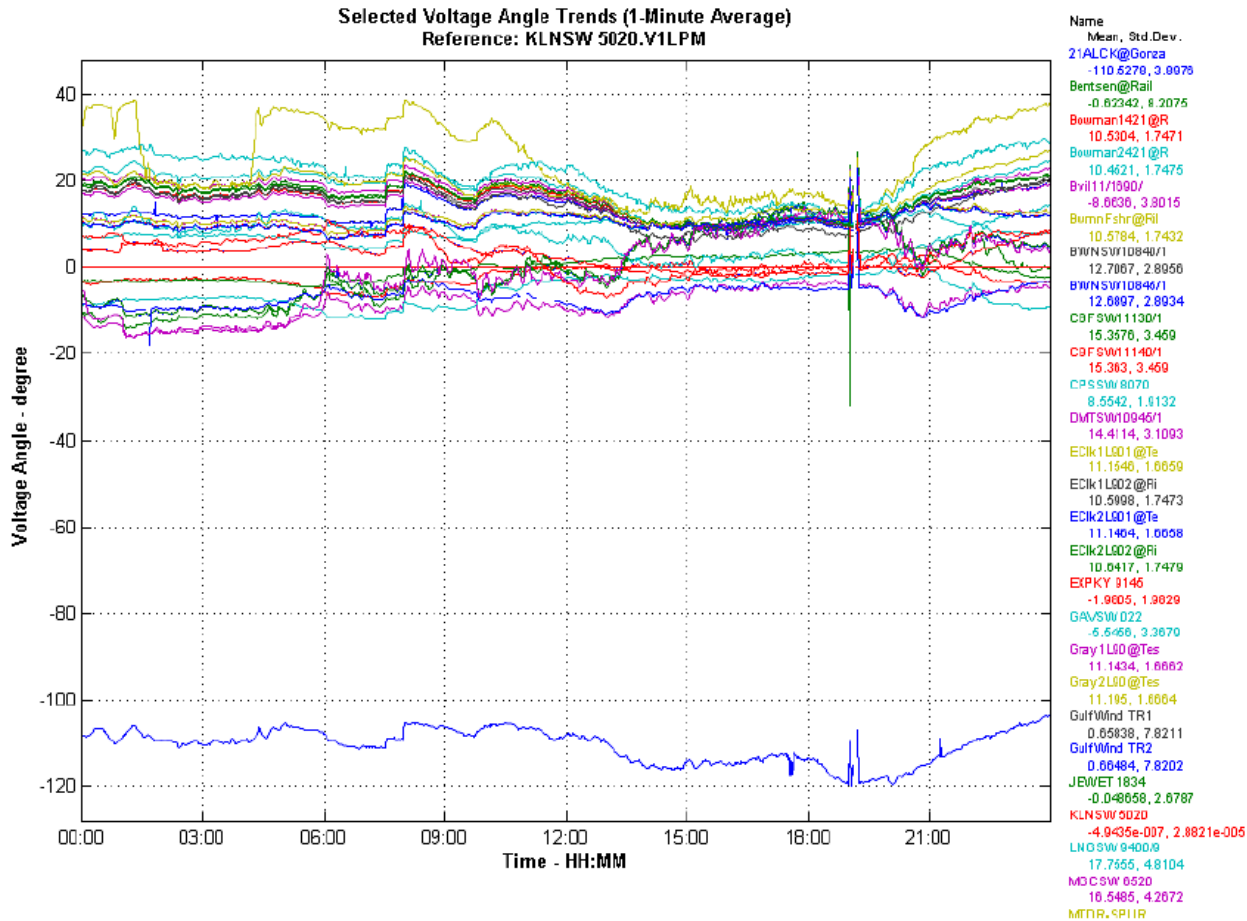
13

RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

Voltage Angle Trends

Wednesday, October 09, 2013 (Central Daylight Time)

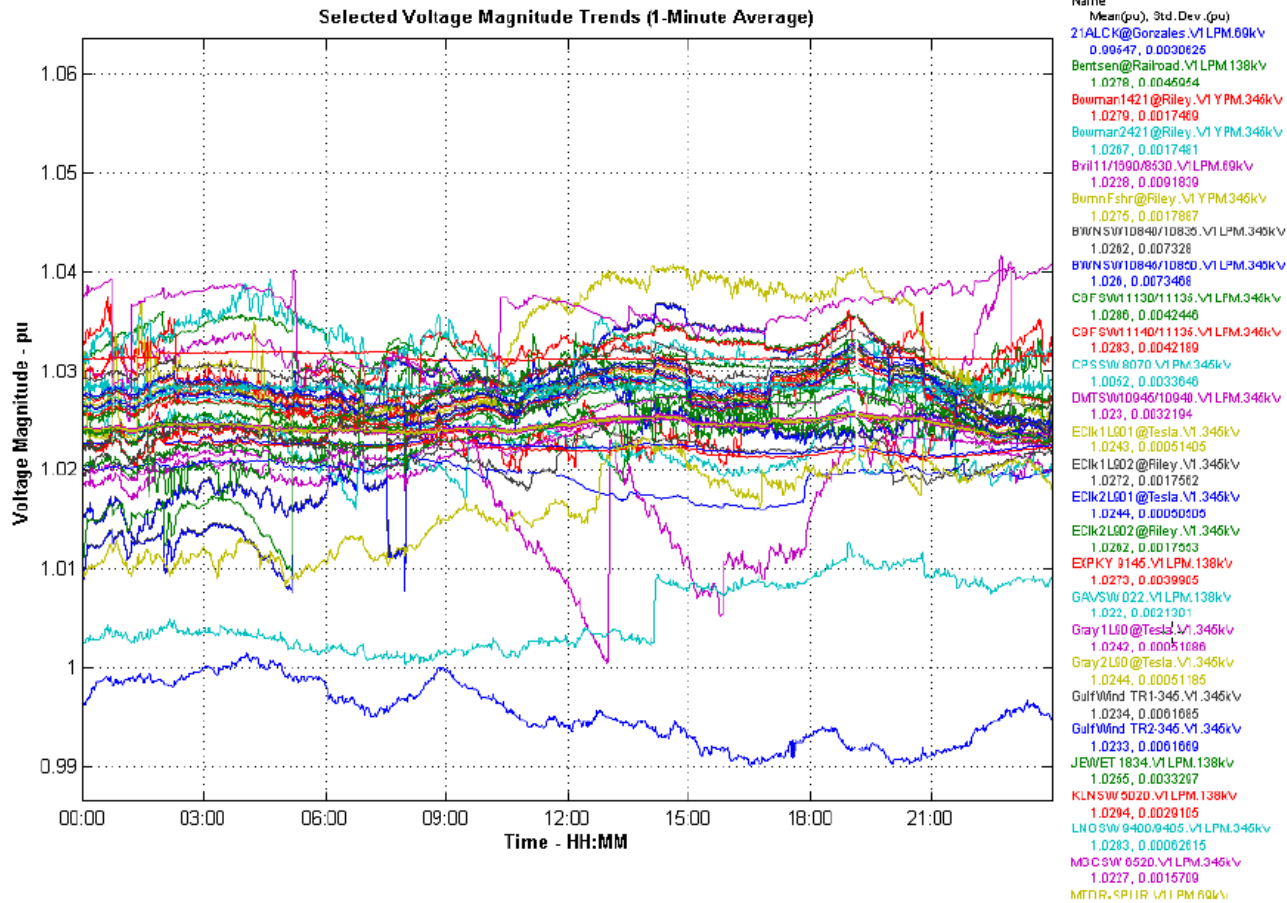


RTDMS/PMU DAILY PERFORMANCE REPORT

9th October, 2013 Report (Contd)

Voltage Magnitude Trends

Wednesday, October 09, 2013 (Central Daylight Time)



RTDMS 2012 DEPLOYMENT STATUS

- **Project Started**
- **New server configuration – ERCOT**
 - Server installation Completed.
- **RTDMS 2012 implementation status – ERCOT**
 - Installation complete
 - ERCOT Testing completed.
 - Client (TO) Testing in progress
 - Initial issues with ONCOR Client side
 - Working with AEP Client for testing
 - Working on porting new profiles/config from EPG
- **RTDMS 2012 Client Access to ERCOT display**
 - Working on providing same displays that ERCOT operators would see since this provides wide area visualization of the system
(This should be feasible since there is NDA agreement)

- **Training on RTDMS and PGDA by EPG completed at ERCOT (25-27 Sept, 2013)**
 - Total of 41 (21 from TOs and 20 from ERCOT) participants
 - Hands-on exercises based on ERCOT use cases was very much appreciated

EVENT REPORTING – EVENTS SINCE JULY 2013

- **Working on new format for the Event Analysis Reports**
 - Currently under review

- **Events in July 2013**

-  Phasor Dynamics Event Summary July-18-2013 0355 HRS
-  Phasor Dynamics Event Summary July-21-2013 1800 HRS
-  Phasor Dynamics Event Summary July-25-2013 0115 HRS

- **Events in August 2013**

-  Phasor Dynamics Event Summary August-02-2013 1534 HRS
-  Phasor Dynamics Event Summary August-11-2013 0543 HRS
-  Phasor Dynamics Event Summary August-12-2013 0258 HRS
-  Phasor Dynamics Event Summary August-18-2013 1645 HRS
-  Phasor Dynamics Event Summary August-20-2013 1419 HRS
-  Phasor Dynamics Event Summary August-24-2013 1846 HRS
-  Phasor Dynamics Event Summary August-29-2013 1855 HRS

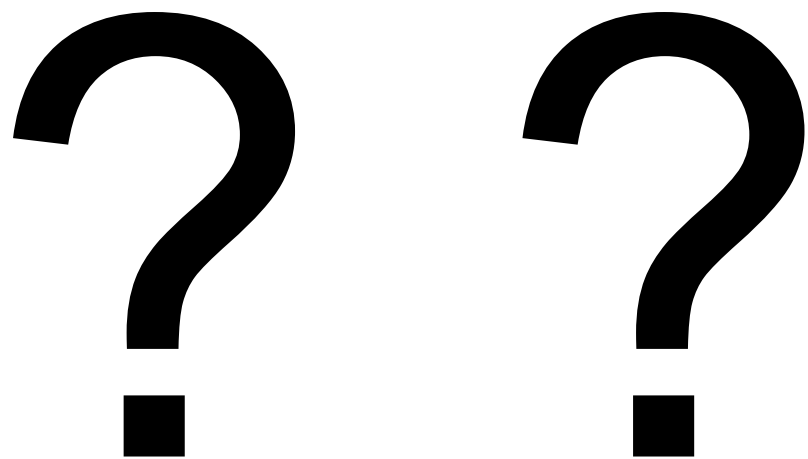
- **Events in Sept 2013**

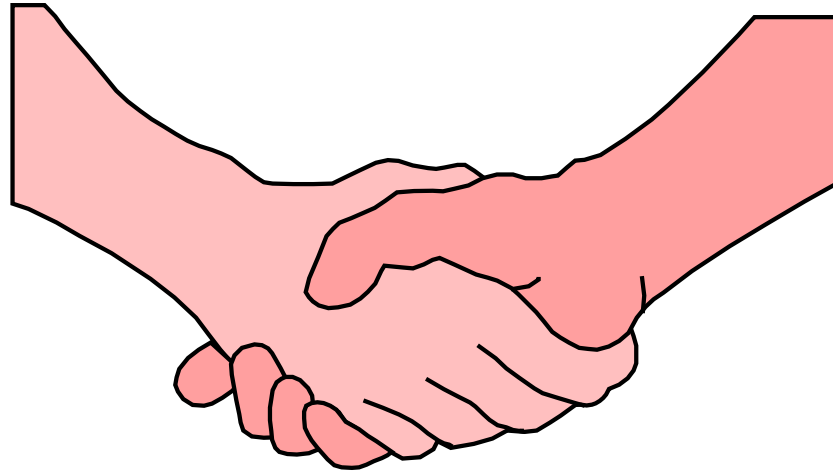
-  Phasor Dynamics Event Summary September-03-2013 1525 HRS
-  Phasor Dynamics Event Summary September-20-2013 1429 HRS
-  Phasor Dynamics Event Summary September-25-2013 0917 HRS

PRESENTATIONS AT ERCOT STAKEHOLDER MEETINGS

- **Made preliminary presentations at ERCOT stakeholder meeting**
 - PDCWG Meeting
 - DWG Meeting
- **Made presentation at ERCOT ROS meeting**
 - Task Force will be formed

- **When/where will event reports be posted ?**
 - Discussions with ERCOT legal in progress
 - Modifications to NDA between CCET and ERCOT may be needed ?





Thank U !!