# PDCWG
# Report to ROS

David Kee

CPS Energy

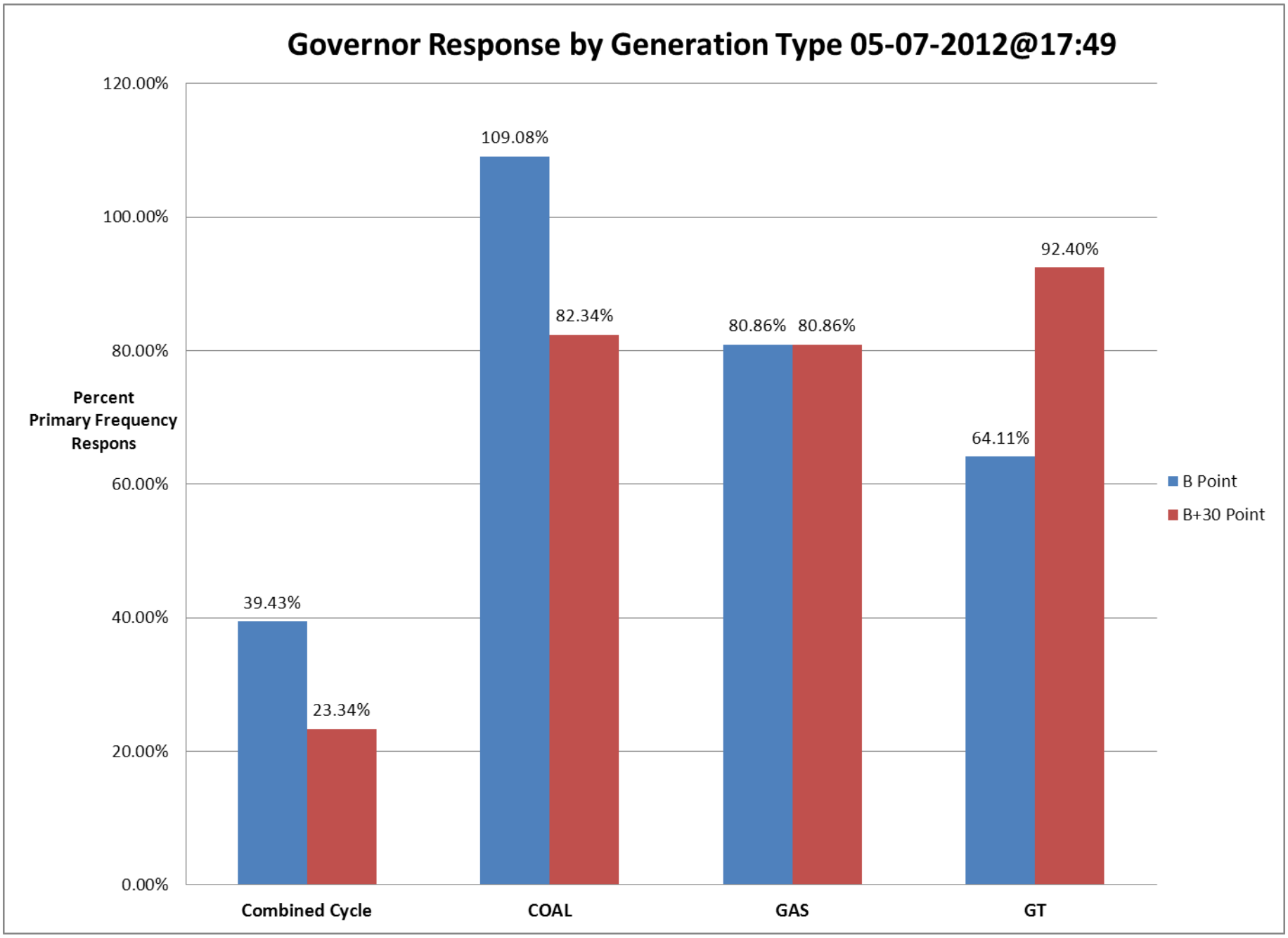
# June 6th meeting

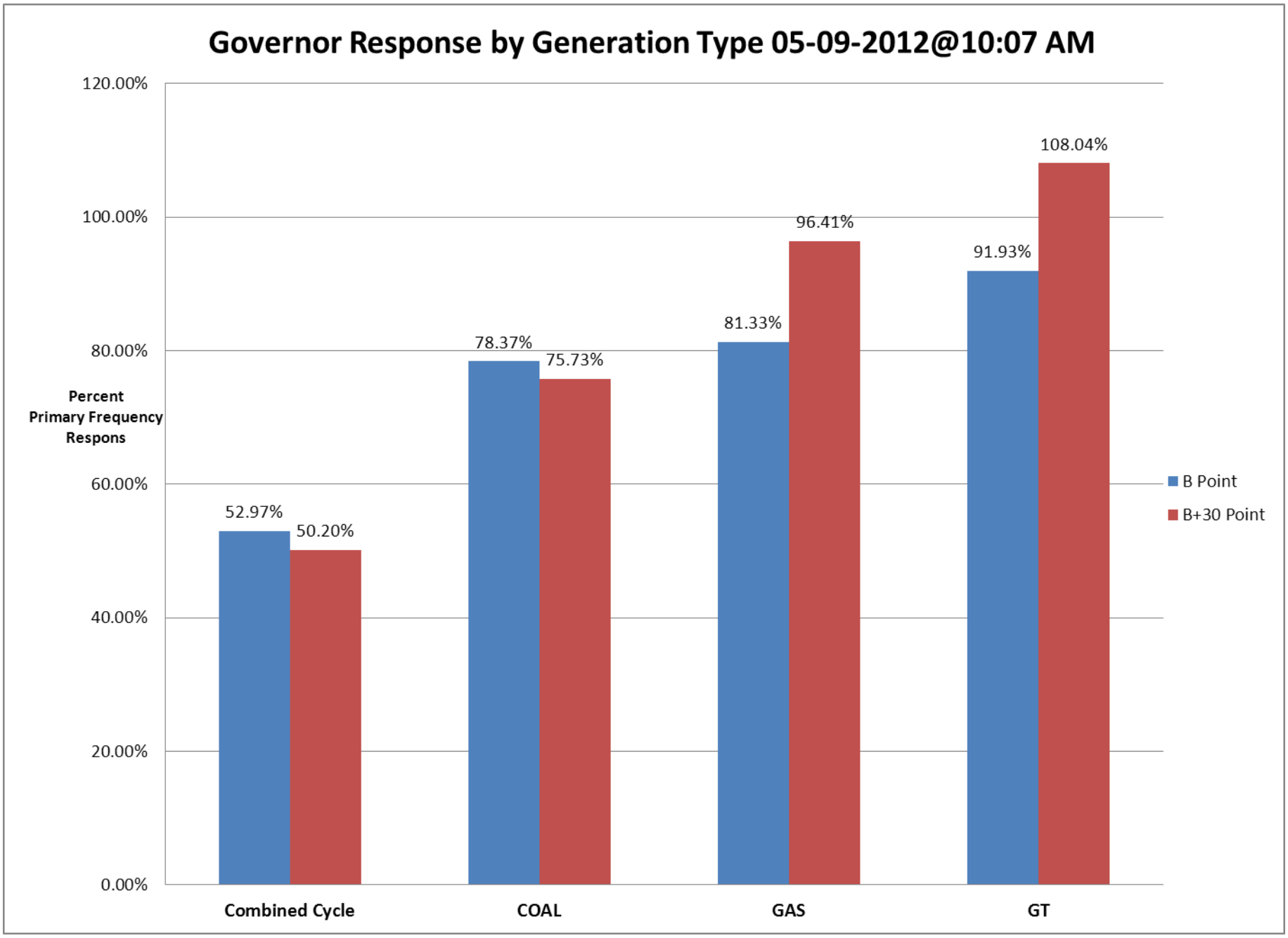
- 16 members attended representing 10 companies, ERCOT, TRE.
- Discussion of challenges when calculating and communicating HSL for Combustion Turbines
  - Shared successes
    - Recommend weather telemetry to be provided from generation resources to QSE's to allow correction of HSLs using real data.
  - Proposal of additional telemetry points
    - **Duct burner status, available capacity, output power**

# June 6th meeting

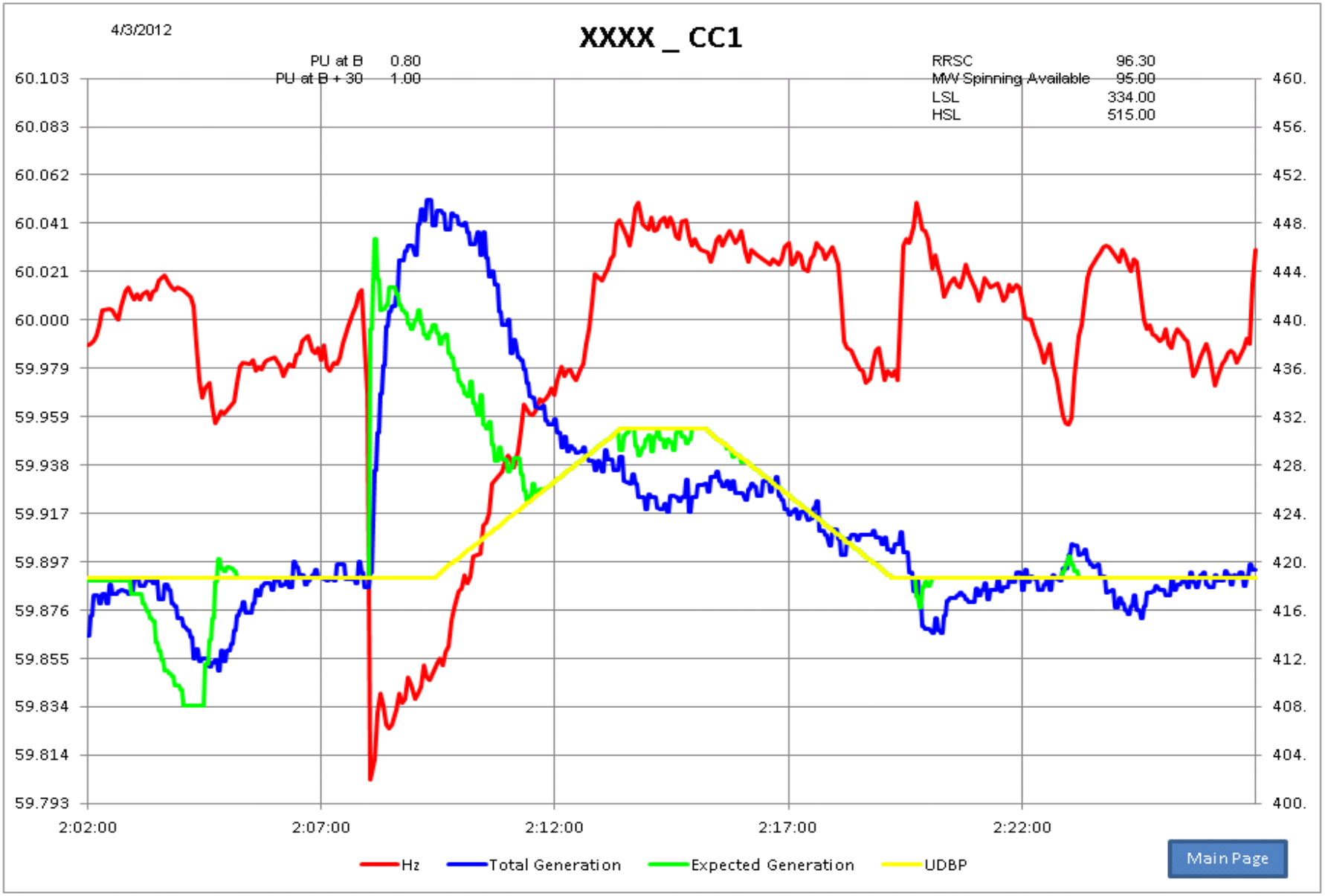
- Reviewed Primary Frequency Response data of Combined Cycle Steam Turbines
  - Preview of results (slides 4-20)
  - Received feedback
  - Will update data and methodology

# Performance of ST of a CCY during Frequency Disturbance Events

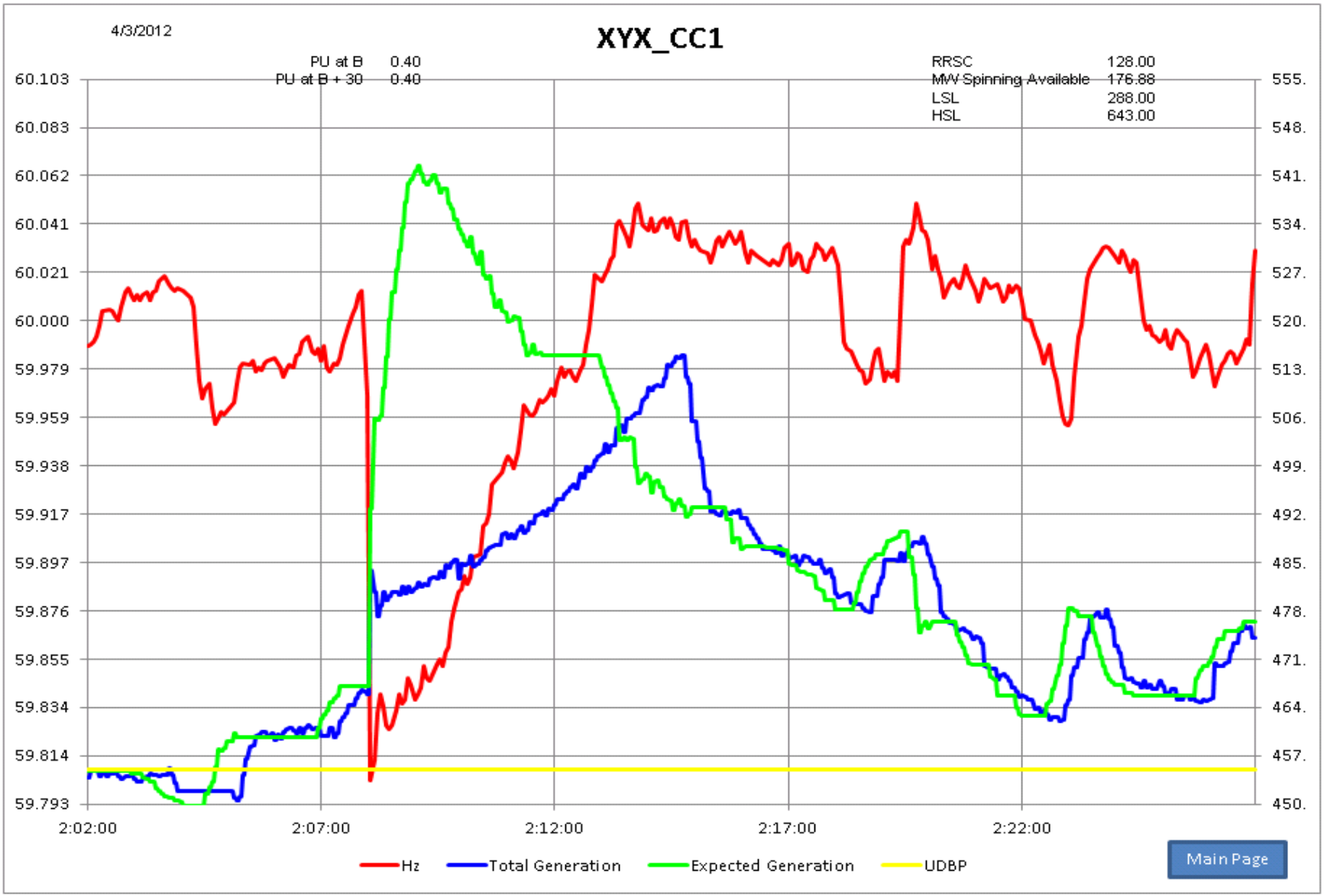

Governor Response by Generation Type 05-07-2012@17:49
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
Percent Primary Frequency Respons
109.08%
82.34%
80.86%
80.86%
92.40%
64.11%
39.43%
23.34%
Combined Cycle
COAL
GAS
GT
B Point
B+30 Point


Governor Response by Generation Type 05-09-2012@10:07 AM
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
Percent Primary Frequency Respons
52.97%
50.20%
78.37%
75.73%
81.33%
96.41%
91.93%
108.04%
Combined Cycle
COAL
GAS
GT
B Point
B+30 Point

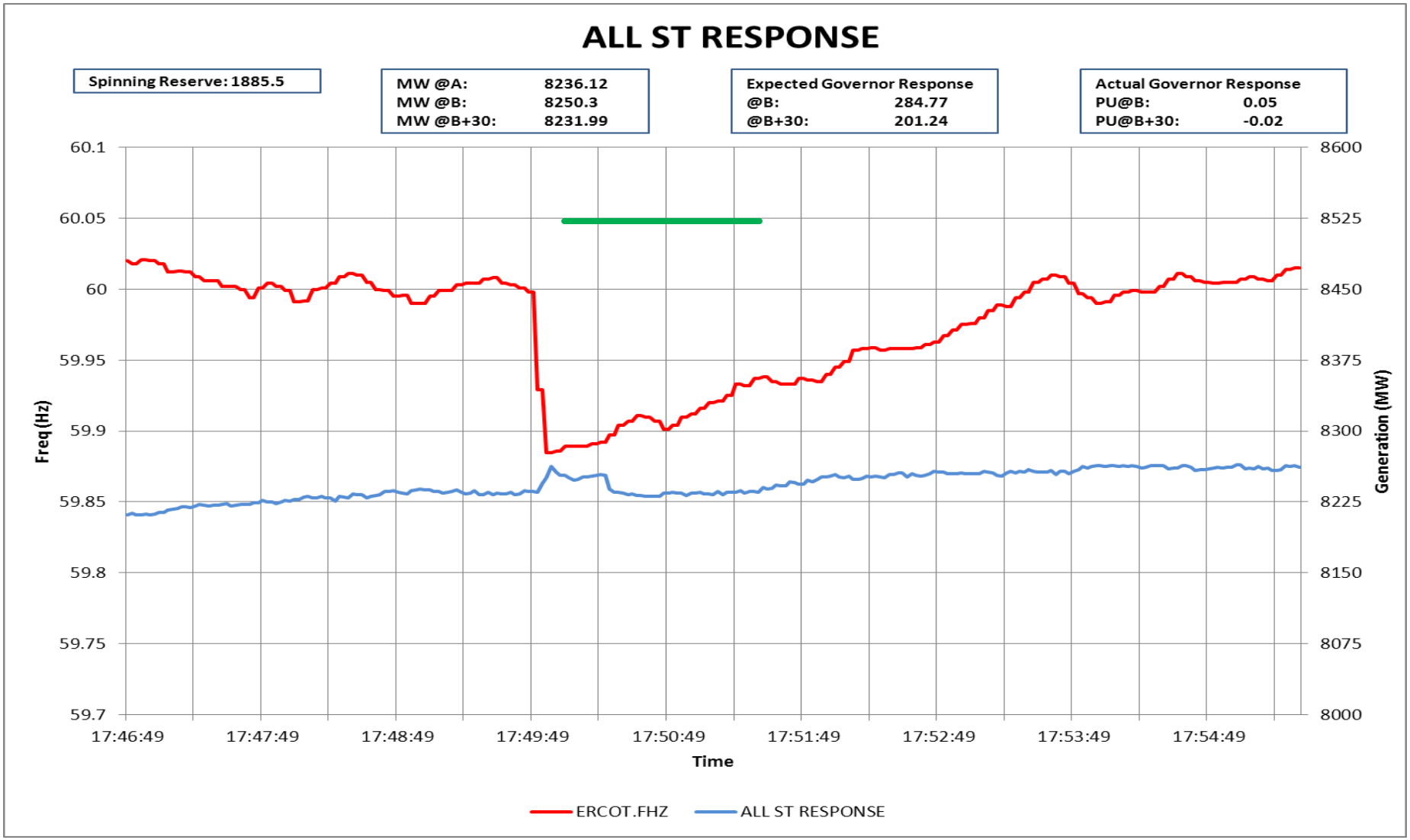
# CCY Performance when RRS is carried by CTs



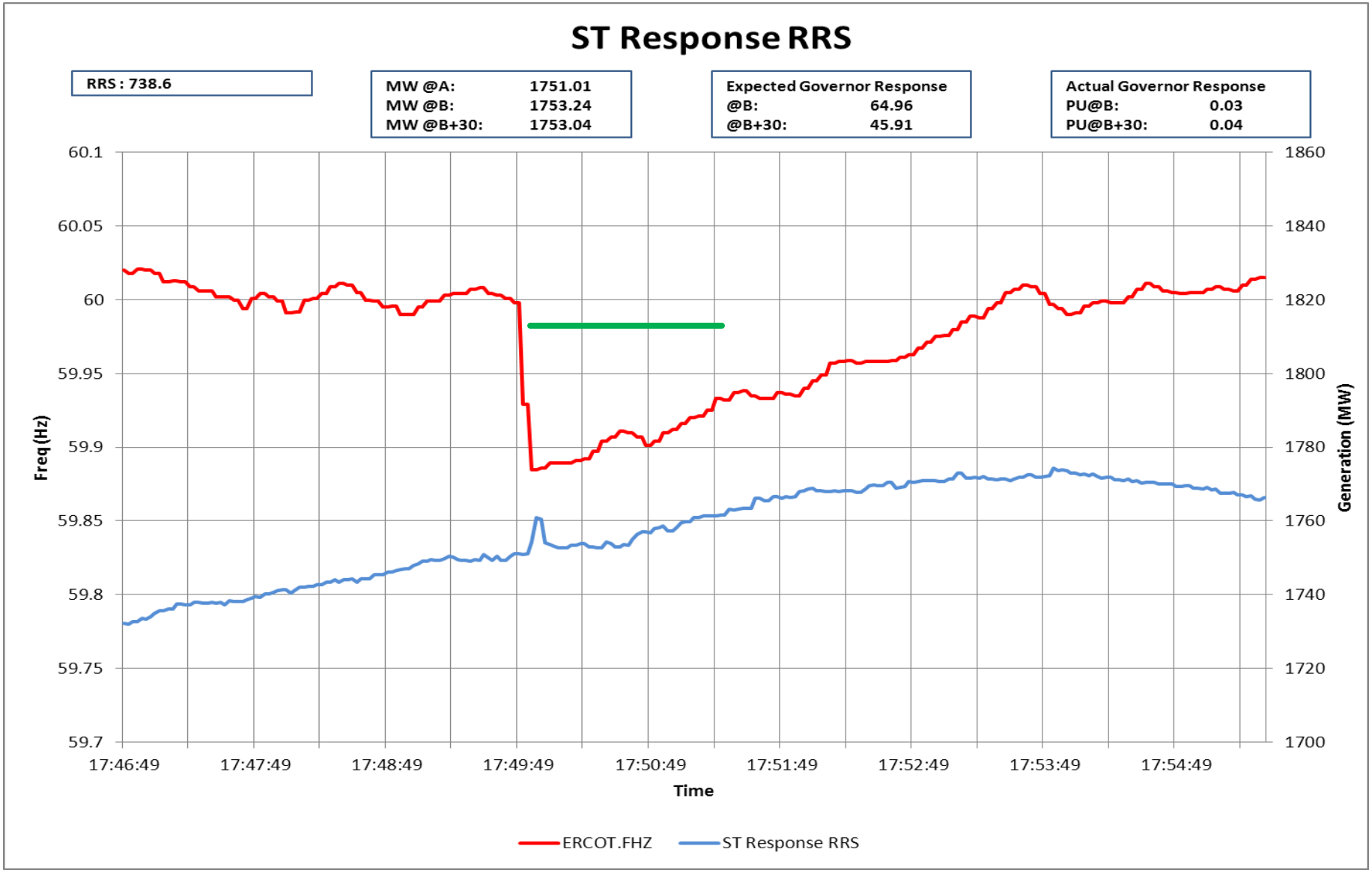
# CCY Performance when most of the RRS is carried by ST and Power Augmentation



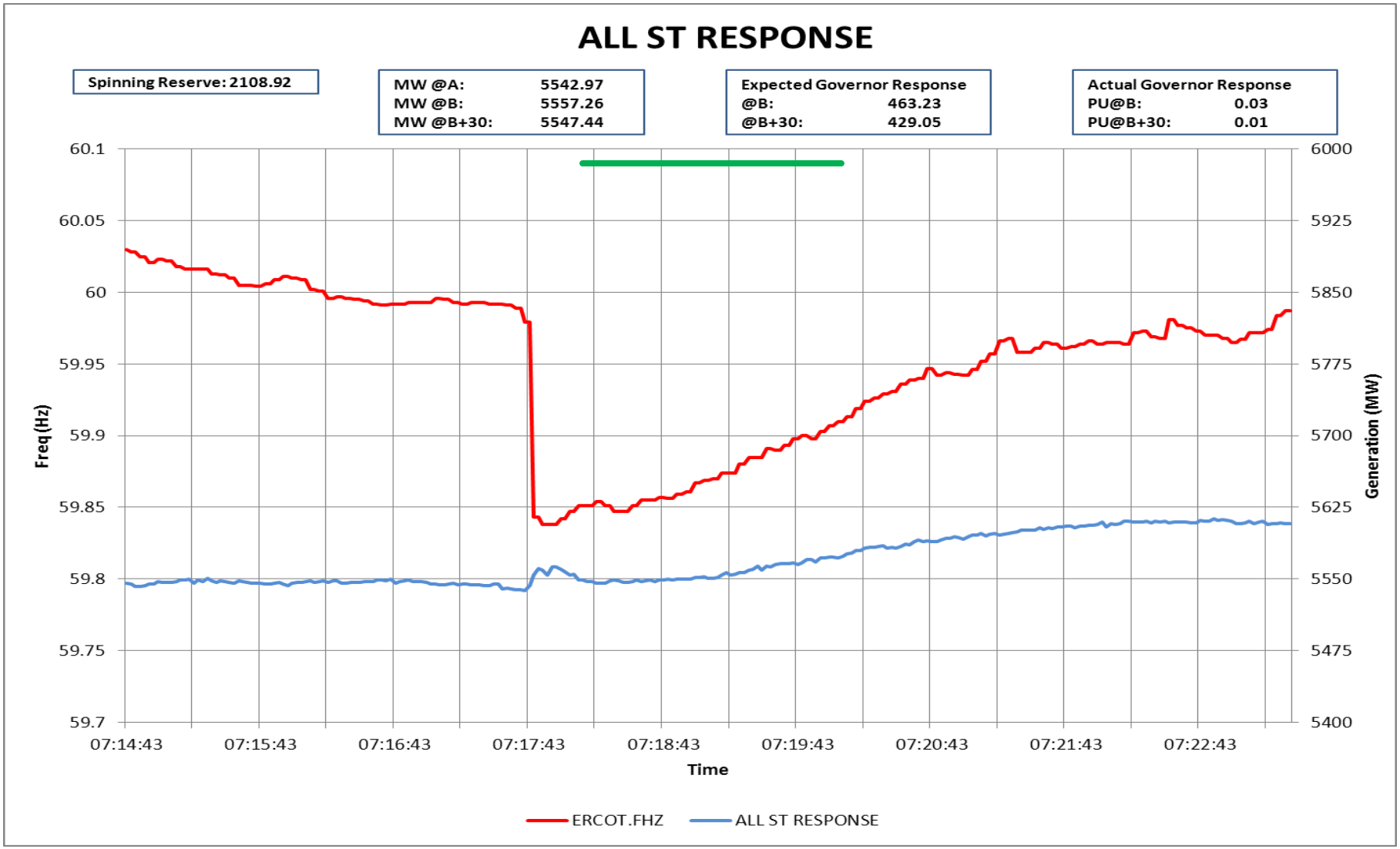
# 5/07/2012@17:49 PM – All ST



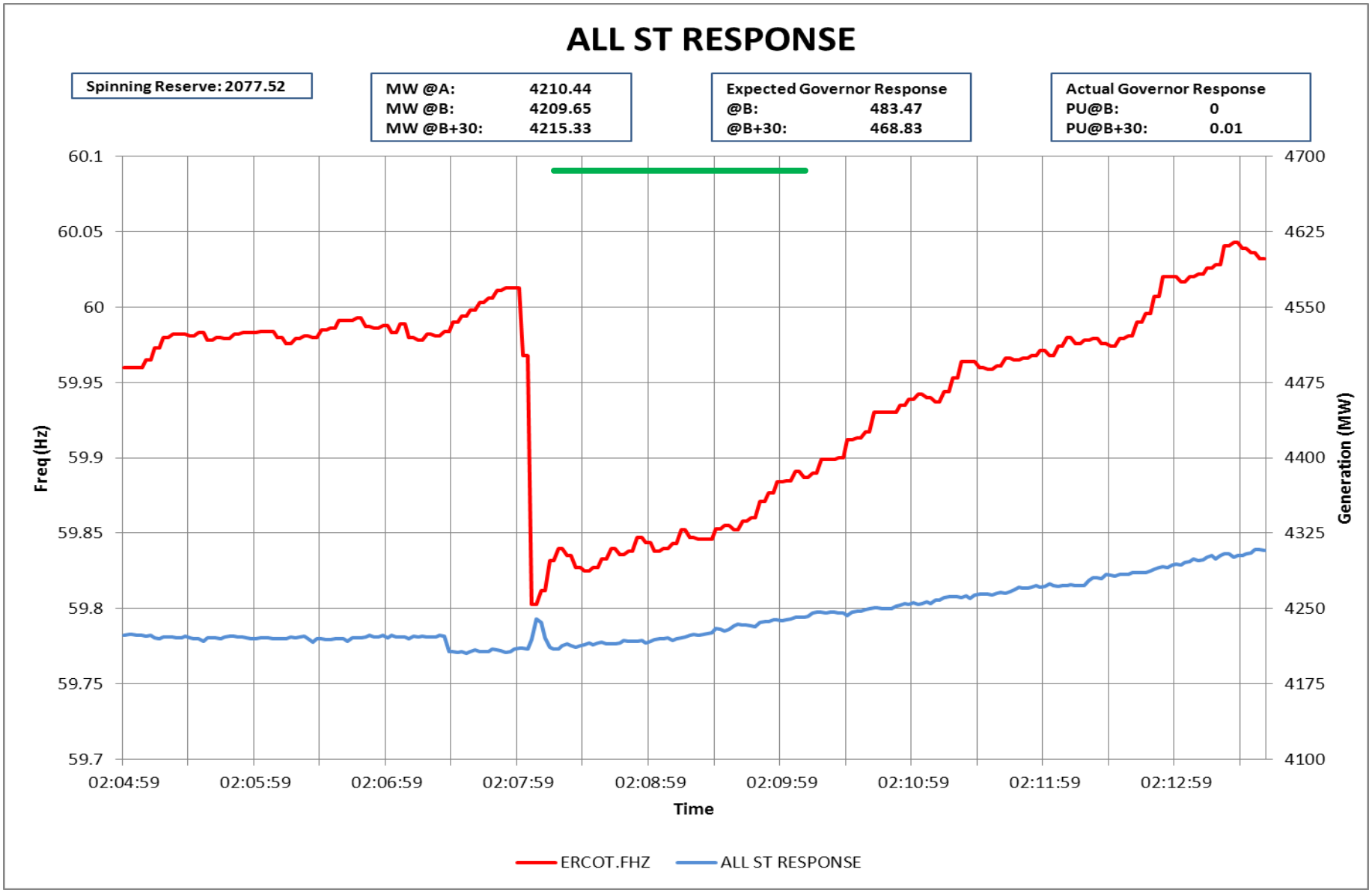
# 5/07/2012@17:49 PM – All ST



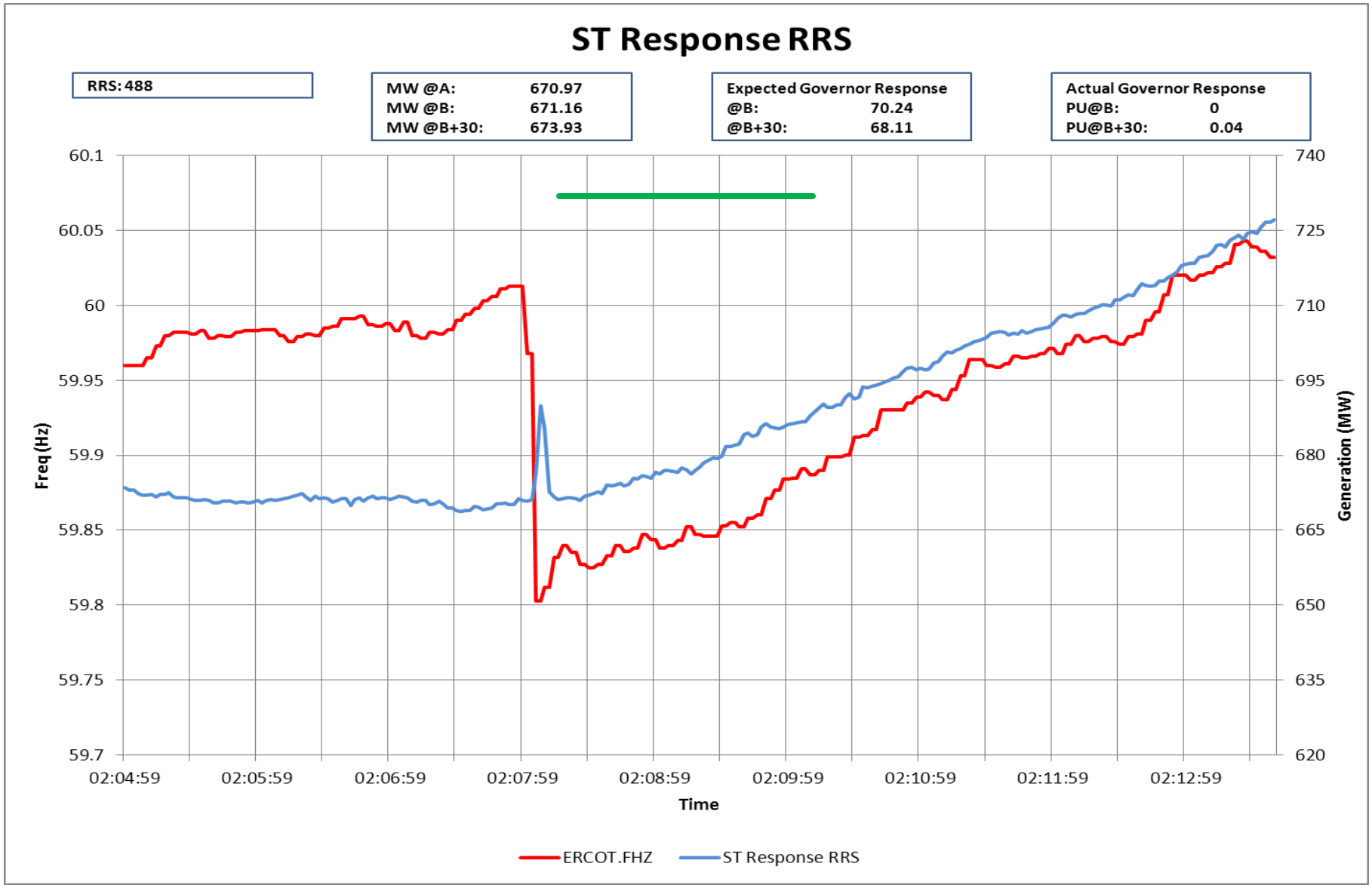
# 4/4/2012@07:17 AM – All ST



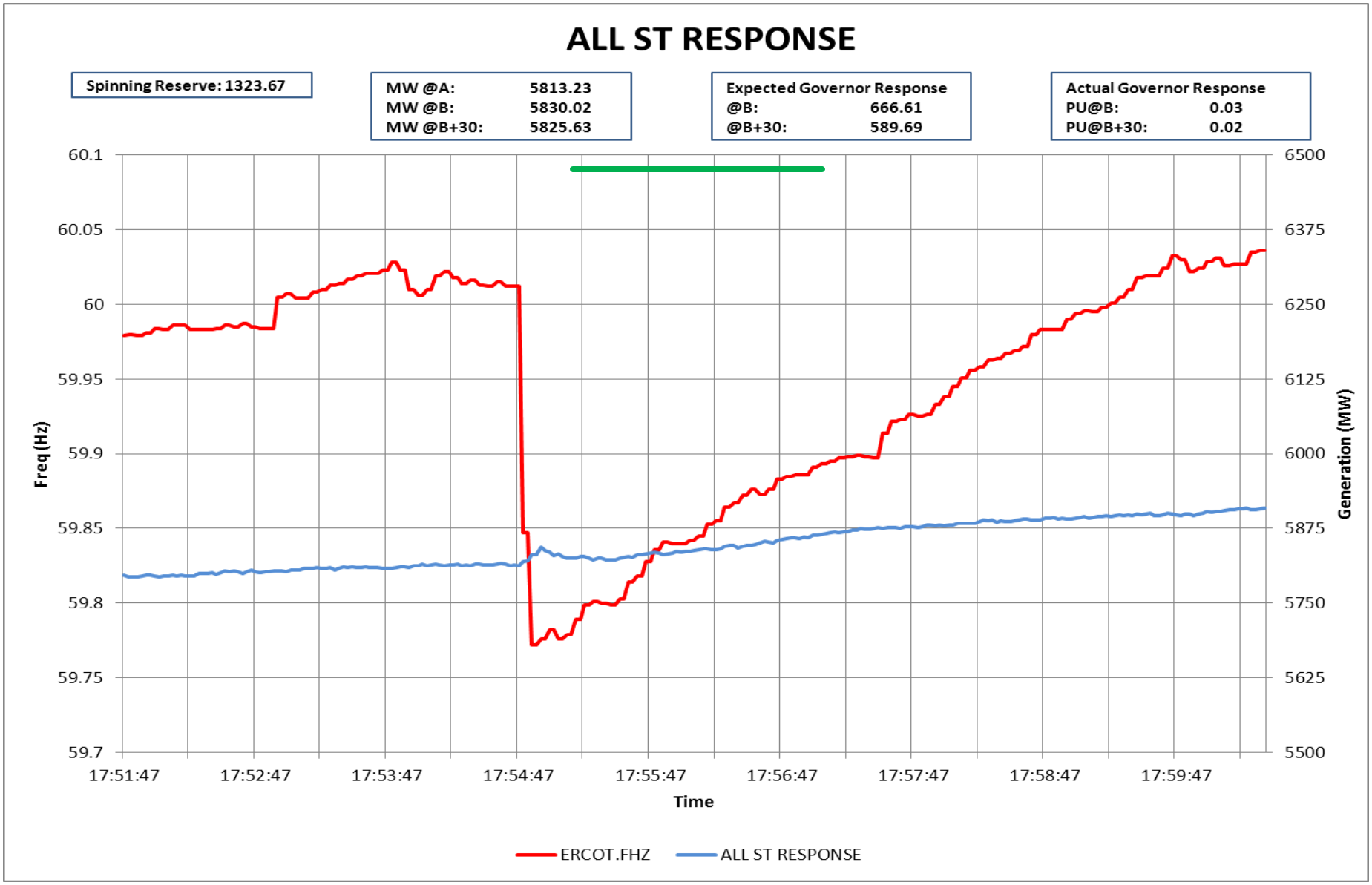
# 4/03/2012@02:07 AM-All ST



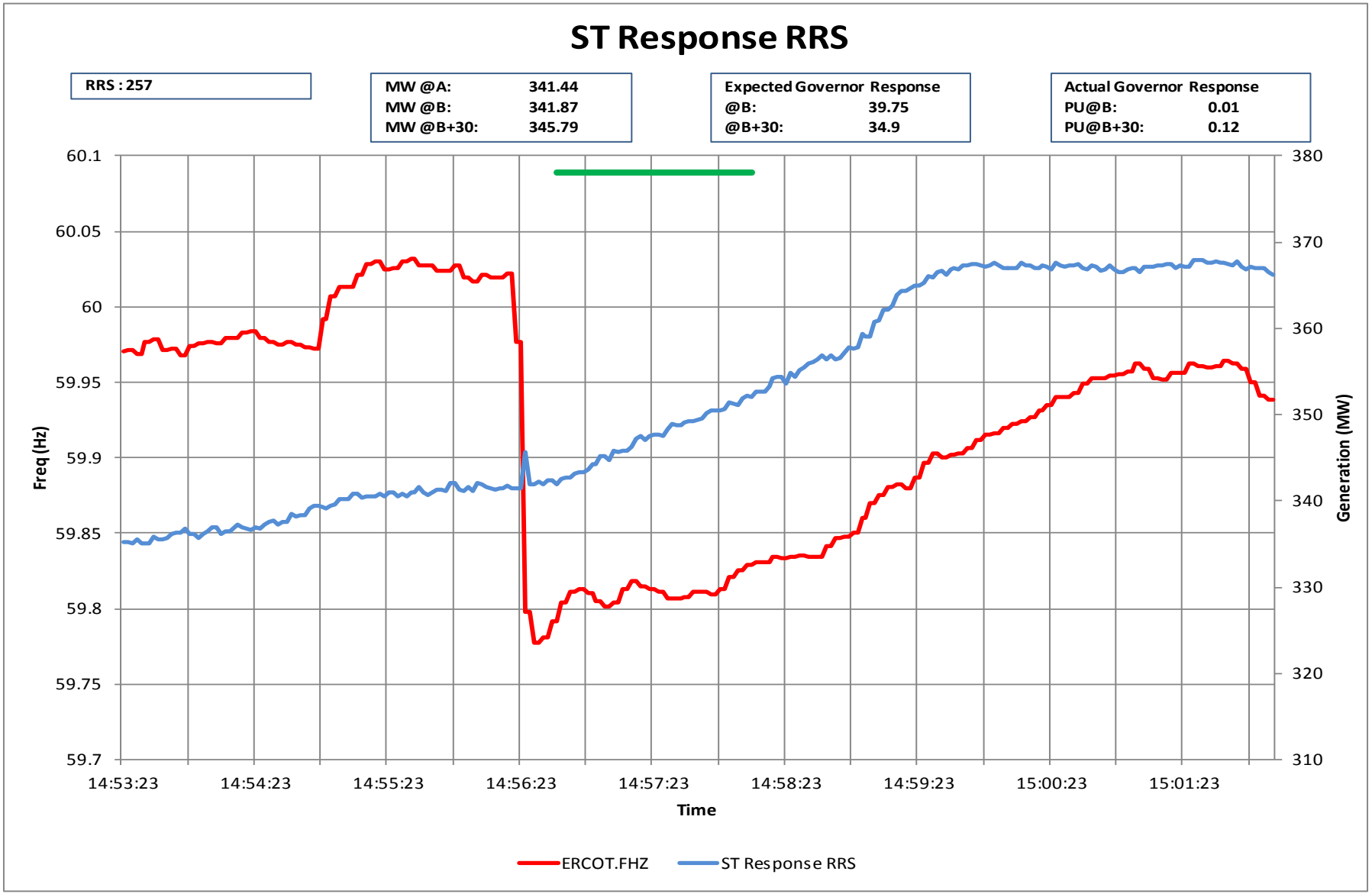
# 4/03/2012@02:07 AM 488 MW RRS ST



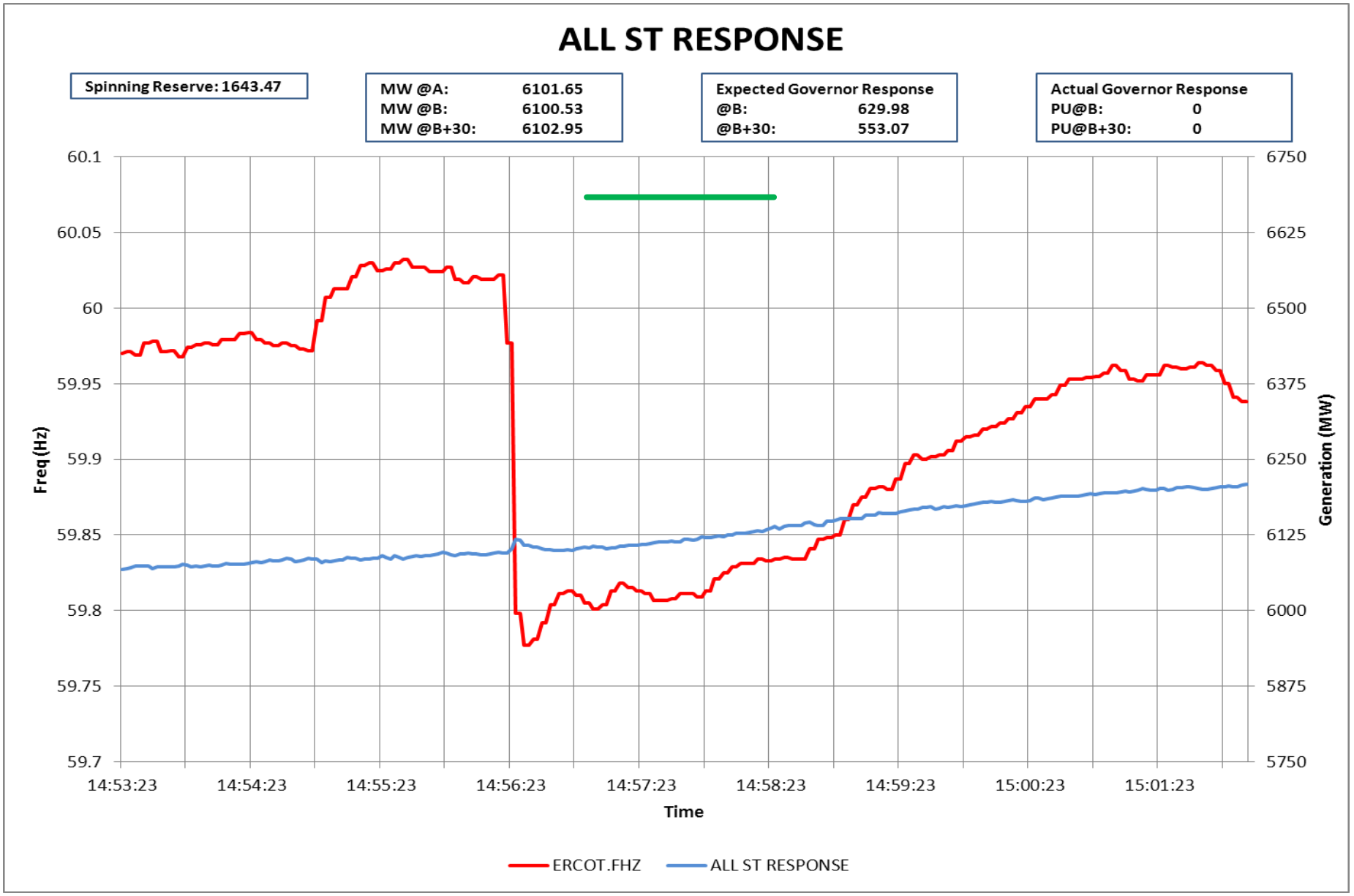
# 4/2/2012@17:54 PM – All ST



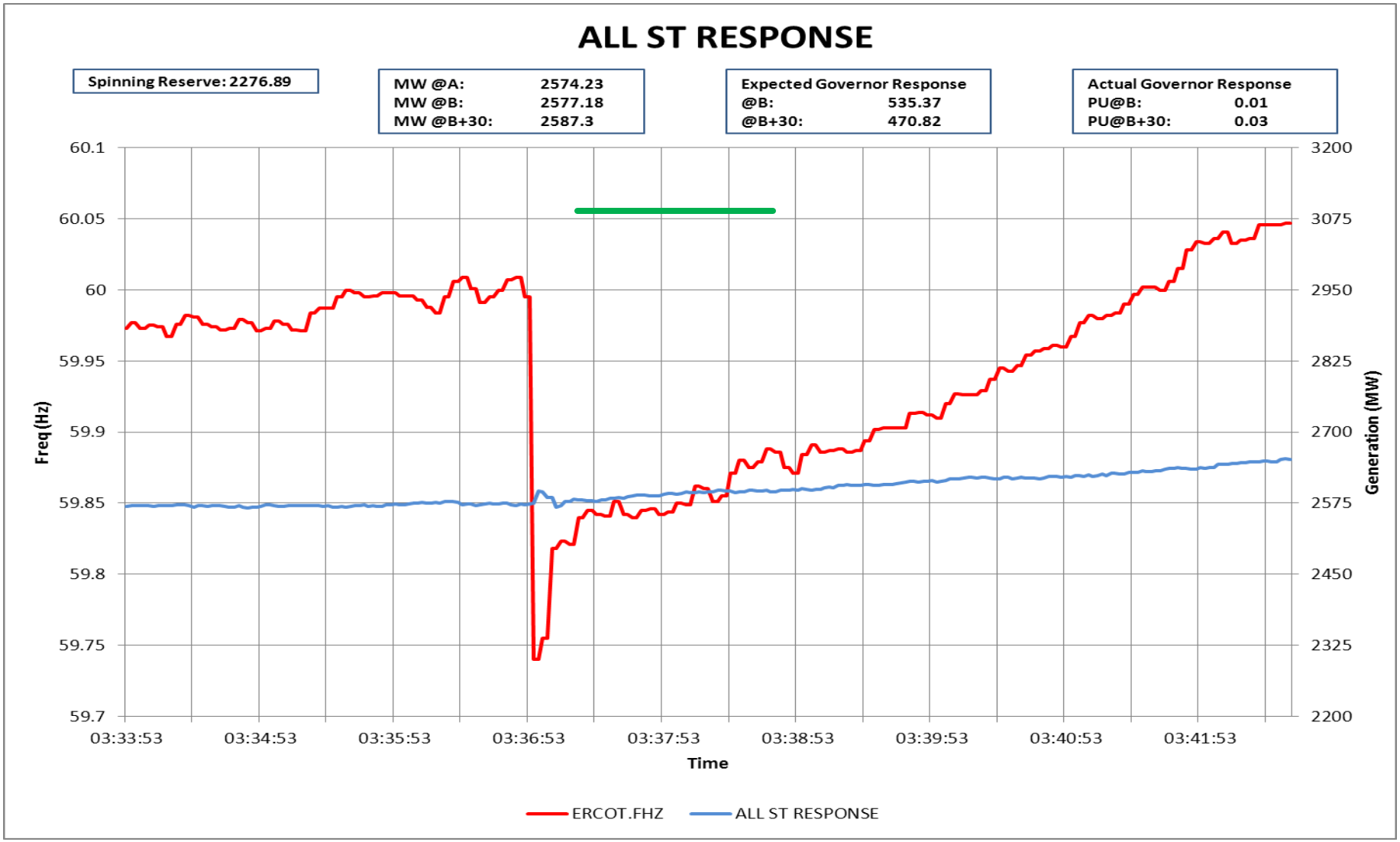
# 3/30/2012@14:56 PM 257 MW RRS ST



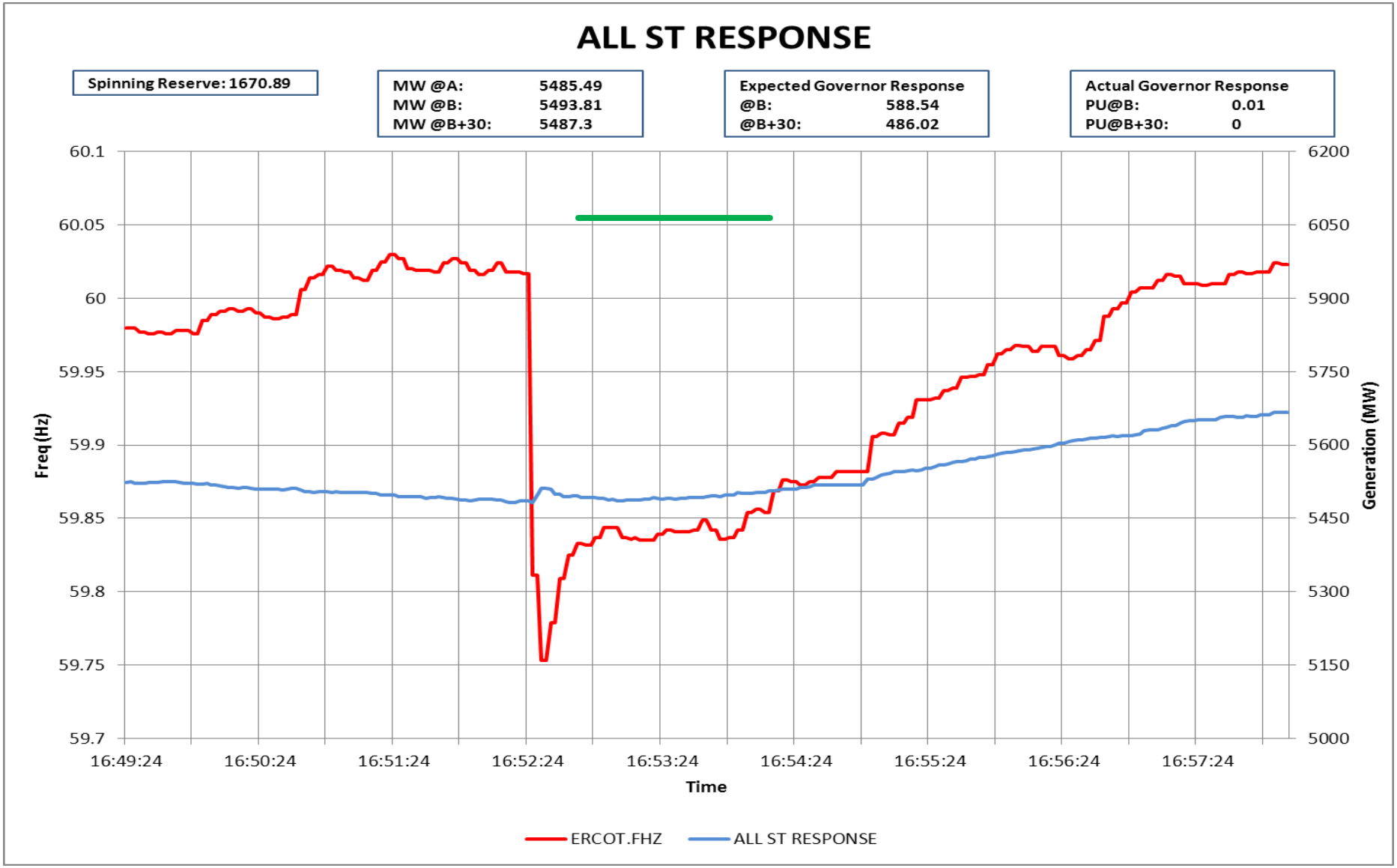
# 3/30/2012@14:56 PM -All ST



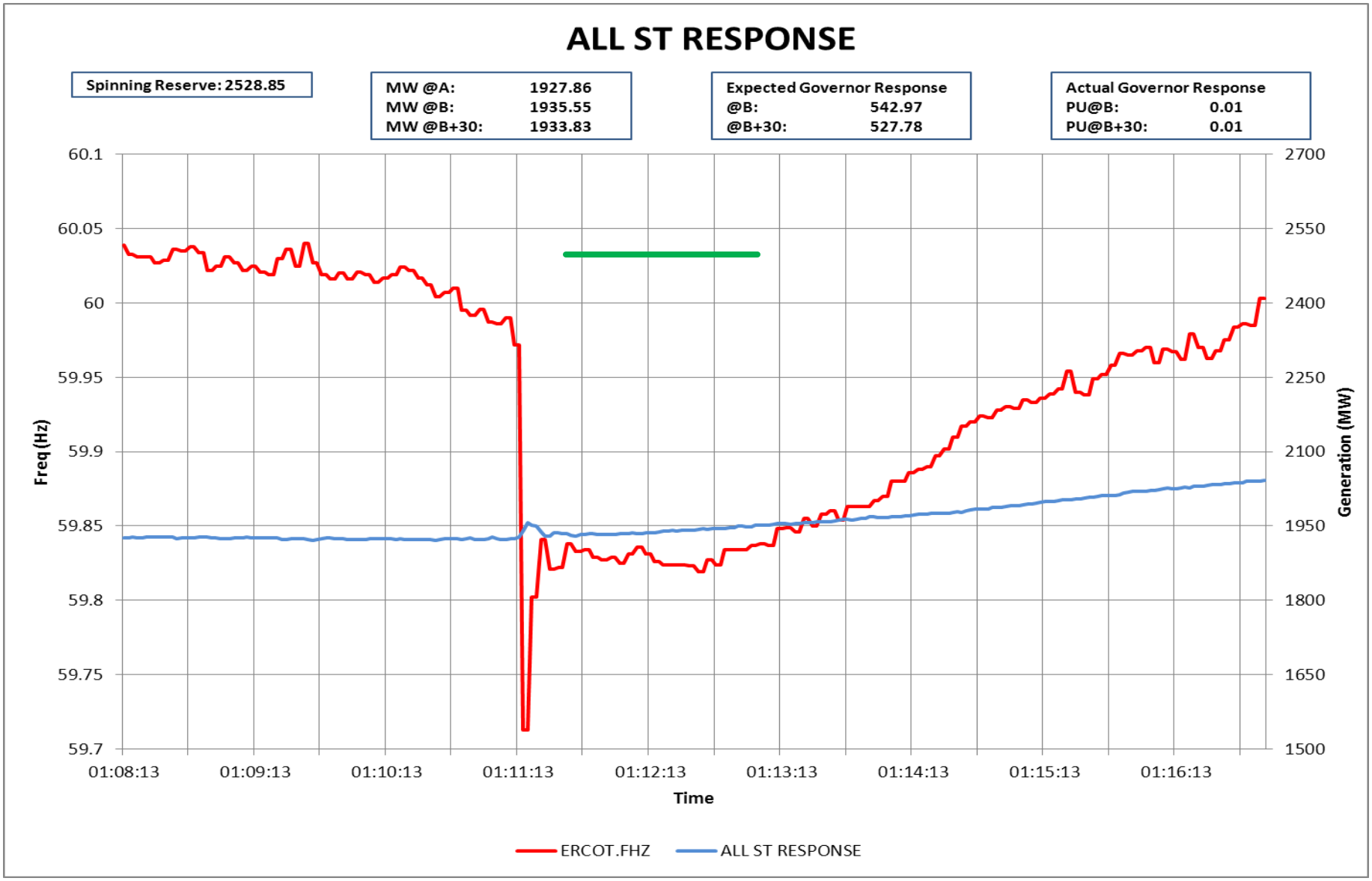
# 3/22/2012 @03:36 AM – All ST



# 3/9/2012@16:52 PM – All ST



# 3/6/2012 @01:11 AM – All ST



# Issue and Action

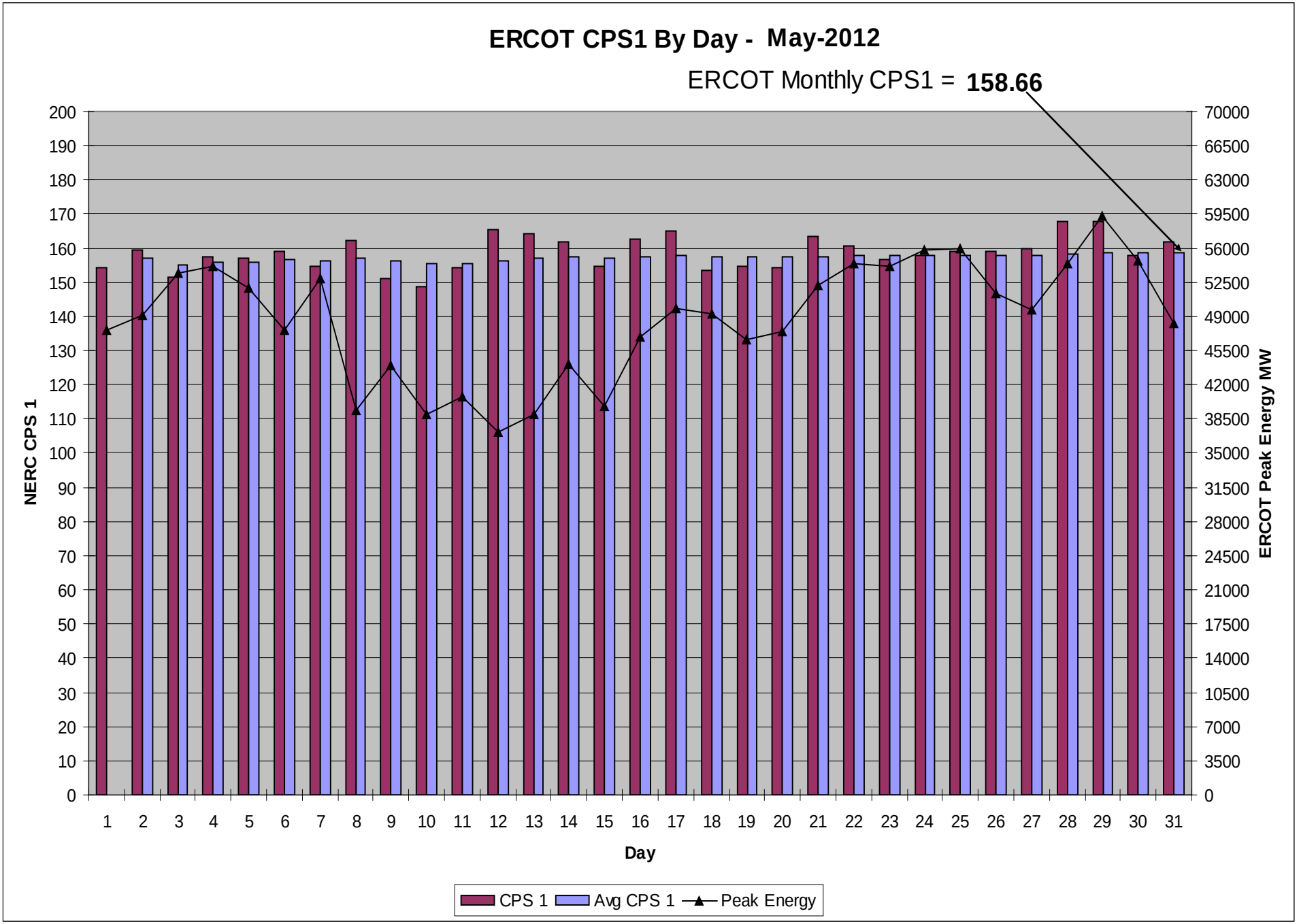
- RRS capacity provided by the ST (intentional or accidental) of a Combined Cycle generator does not provide the same level of response as other units providing RRS.
- Not advocating an NPRR or NOGRR at this time to limit RRS capacity on Combined cycles
  - Instead continue to grade the configuration against an achievable and realistic performance metric.
  - Compliance risk is on Generation Resource Owner and QSE to manage and perform to their respective RRS obligations based on current rules.
  - PDCWG will keep this an open issue and actively work to form solutions for ERCOT and ROS to endorse and implement
  - If desired by ROS or PDC, the PDC will form a task force, open to all market participants, to examine issue and recommend solutions
- ERCOT will continue compliance actions to address and follow up.
- Add ICCP telemetry to help determine expected response from online units?
- Add duct burner total capacity, status, and actual MW  point over ICCP?
  - Will also benefit the PRC calculation

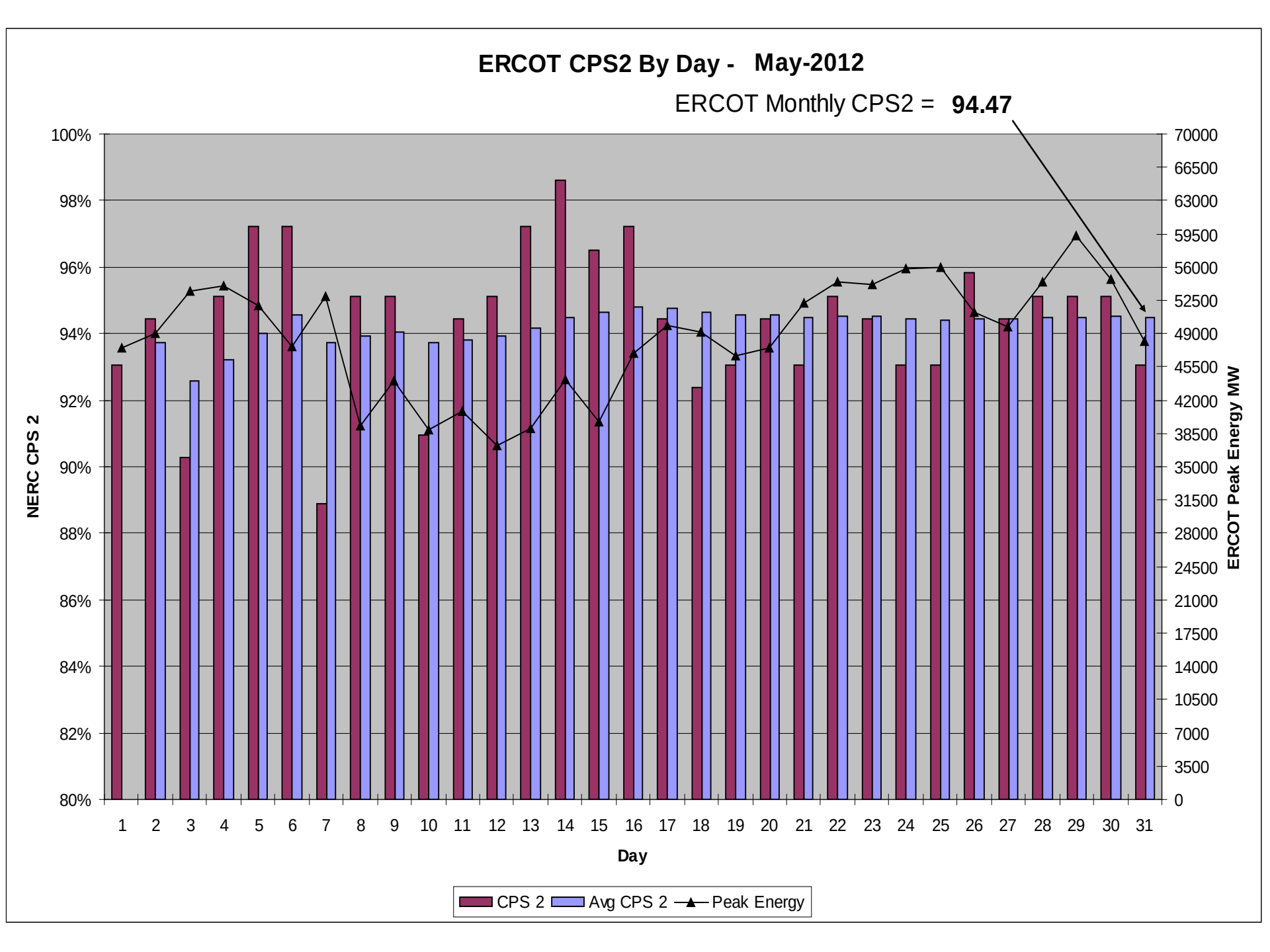
# June 6th meeting

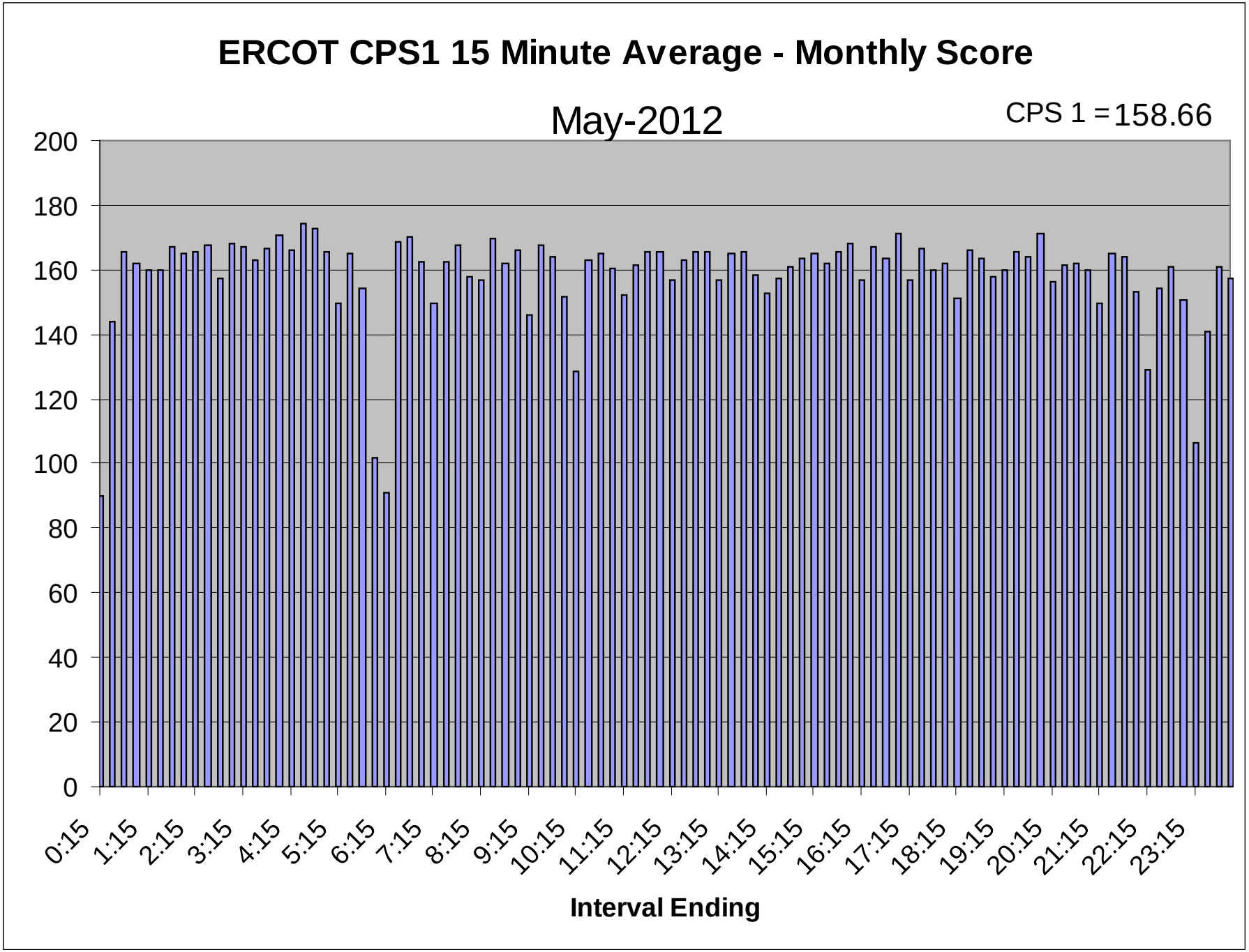
- Reviewed 3 frequency disturbance events
  - 1 event system response passed (good response carried through event)
  - 1 event system response was squelched (good initial response, did not sustain through event)
  - 1 event system response failed (low response)
- Review of PFR metrics
  - Working on NOGRR for revisions to PFR example calculations
- TRE technical workshop June 13th to review metrics
  - Expecting to identify additional NPRRs & NOGRRs

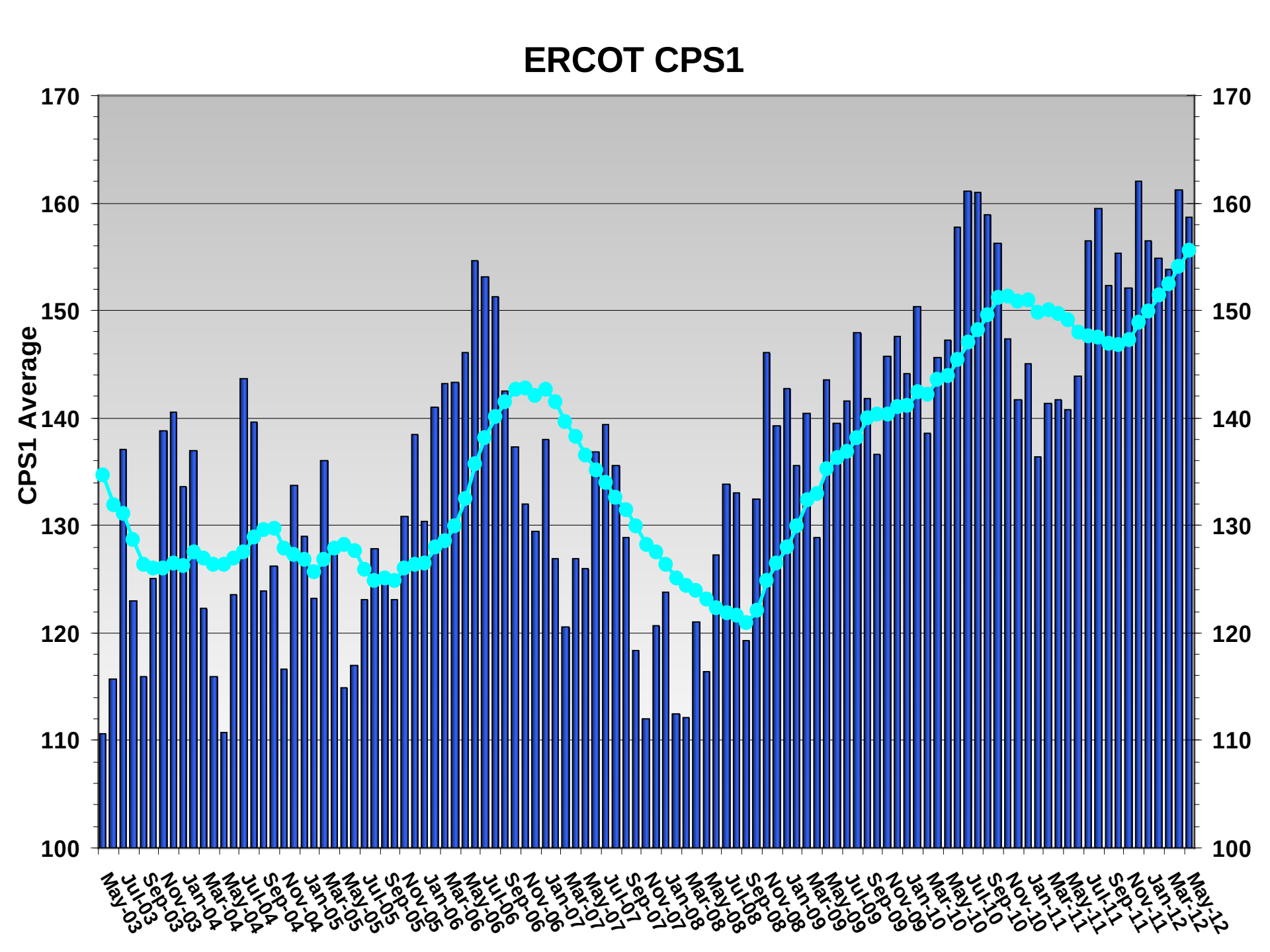
# June 6th meeting

- Control metrics (following slides)
  - Frequency distribution deviation continues
  - Frequency distribution changes may warrant new metric
- Next meeting July 3rd meeting cancelled.


ERCOT CPS1 By Day - May-2012
ERCOT Monthly CPS1 = 158.66
NERC CPS 1
ERCOT Peak Energy MW
Day
CPS 1
Avg CPS 1
Peak Energy

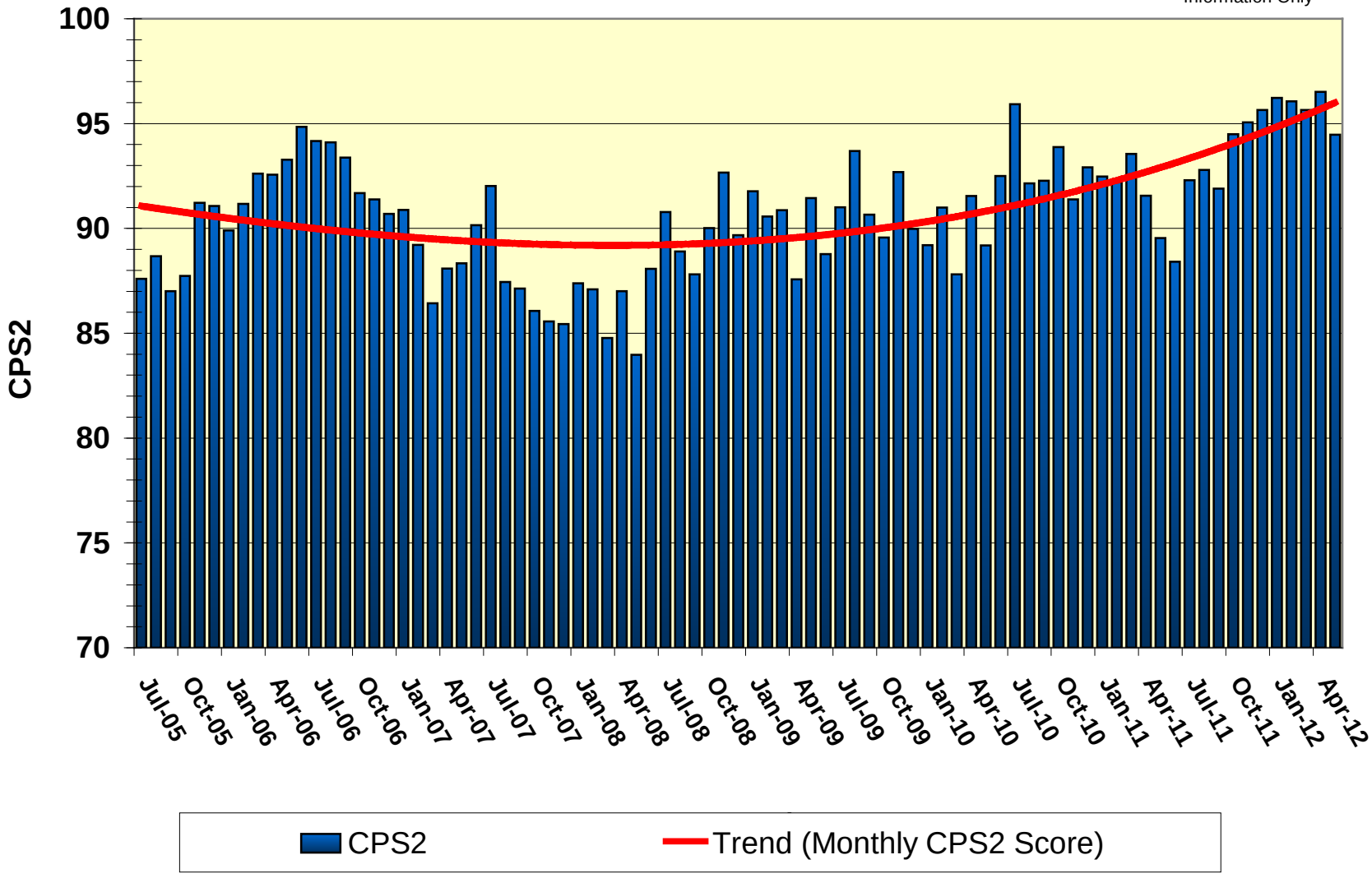

ERCOT CPS2 By Day - May-2012
ERCOT Monthly CPS2 = 94.47
NERC CPS 2
ERCOT Peak Energy MW
Day
100%
98%
96%
94%
92%
90%
88%
86%
84%
82%
80%
70000
66500
63000
59500
56000
52500
49000
45500
42000
38500
35000
31500
28000
24500
21000
17500
14000
10500
7000
3500
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
CPS 2
Avg CPS 2
Peak Energy


ERCOT CPS1 15 Minute Average - Monthly Score
May-2012
CPS 1 = 158.66
200
180
160
140
120
100
80
60
40
20
0
0:15
1:15
2:15
3:15
4:15
5:15
6:15
7:15
8:15
9:15
10:15
11:15
12:15
13:15
14:15
15:15
16:15
17:15
18:15
19:15
20:15
21:15
22:15
23:15
Interval Ending

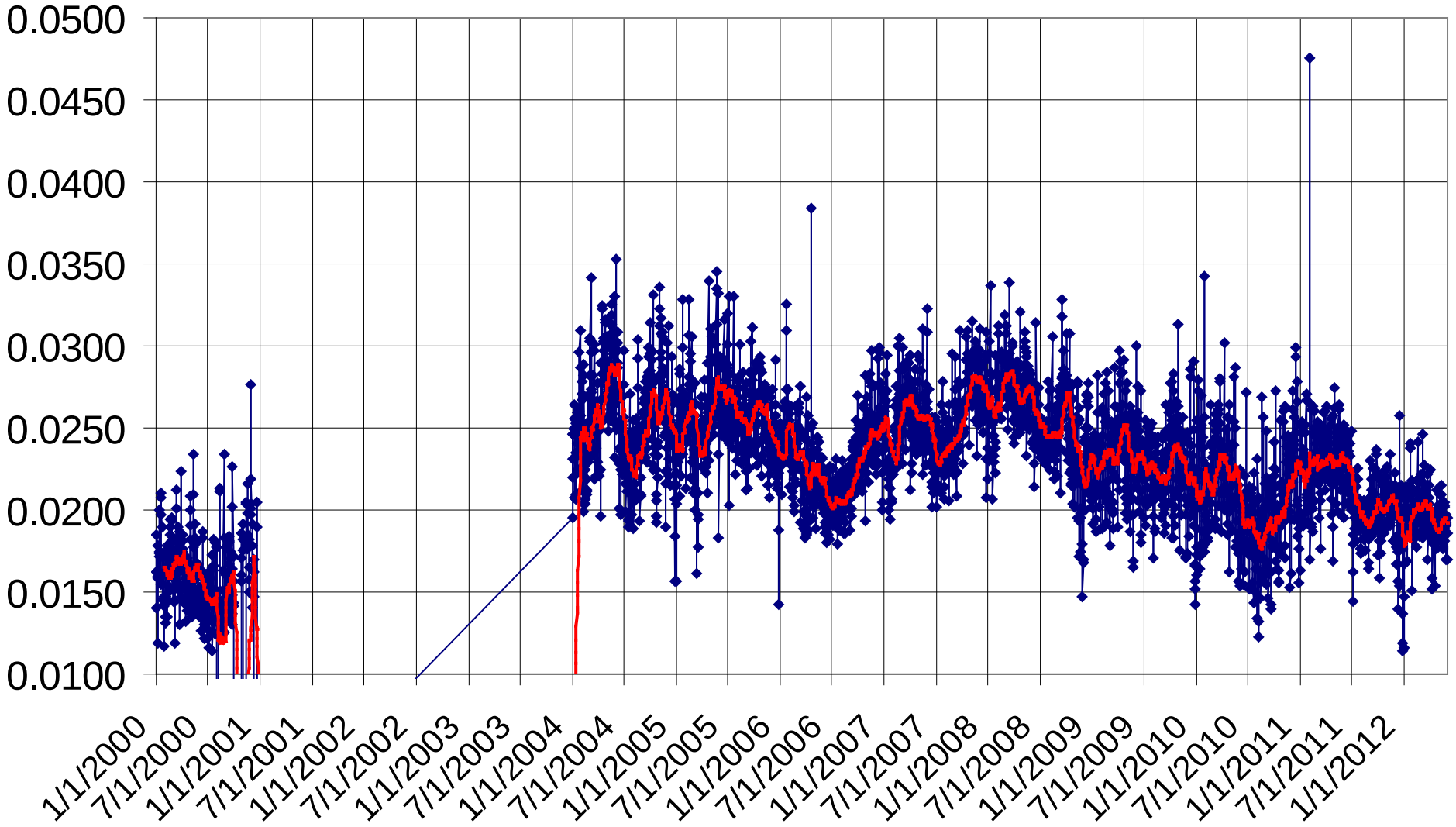

ERCOT CPS1
CPS1 Average
170
160
150
140
130
120
110
100
May-03
Jul-03
Sep-03
Nov-03
Jan-04
Mar-04
May-04
Jul-04
Sep-04
Nov-04
Jan-05
Mar-05
May-05
Jul-05
Sep-05
Nov-05
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12

# ERCOT CPS2 Score*

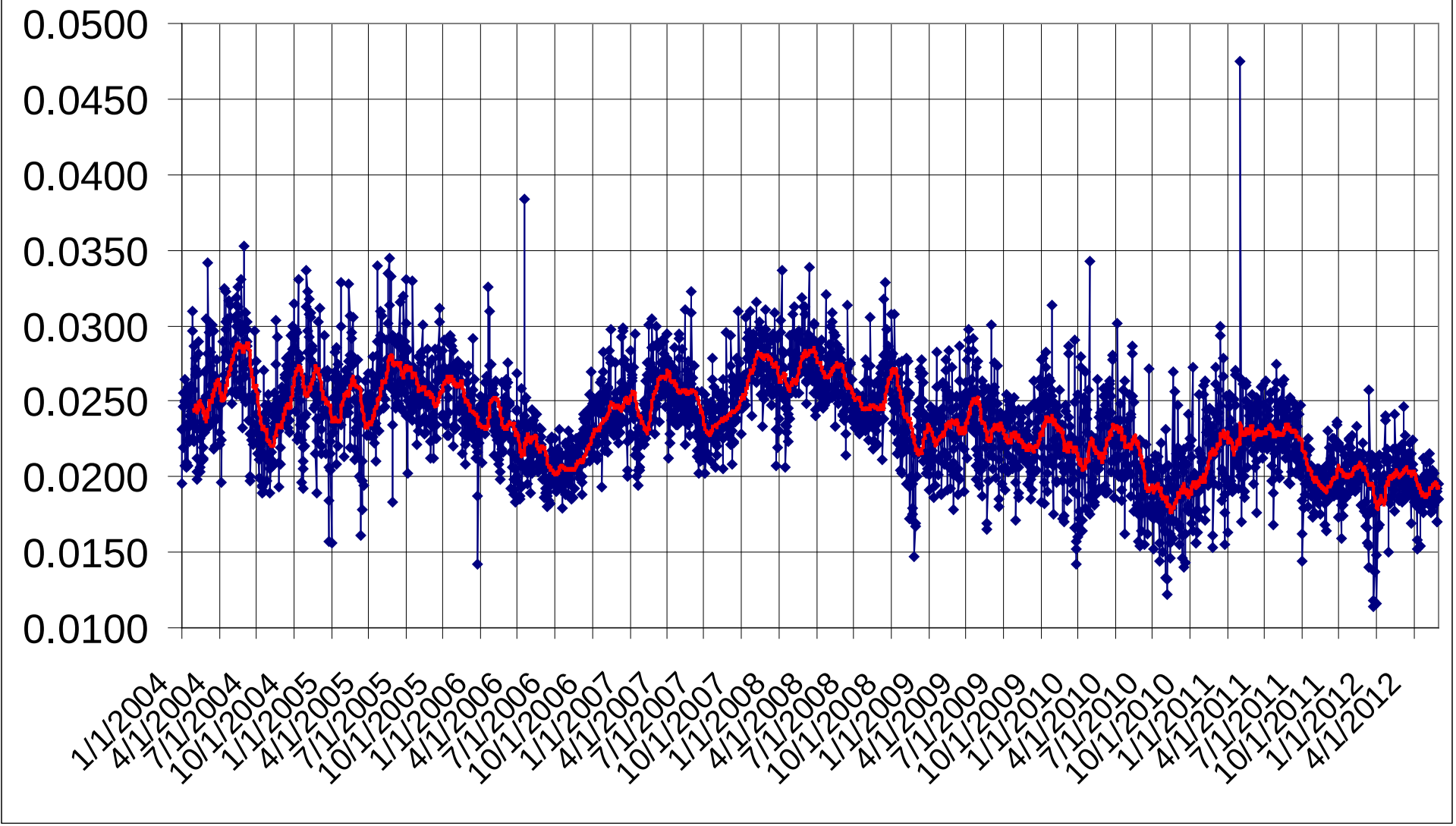
*ERCOT as a single control area is exempt from CPS2. These scores are For Information Only

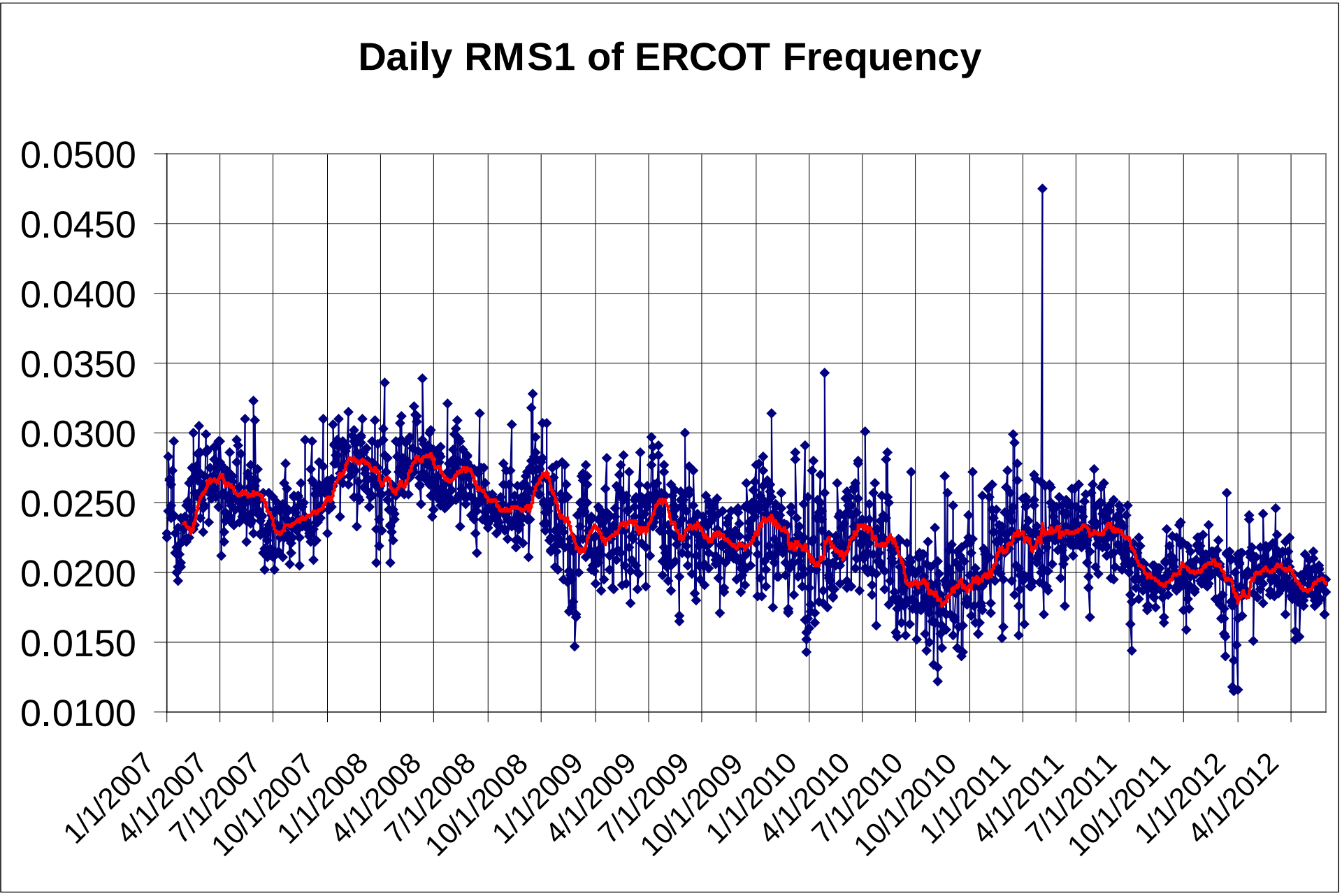


# Daily RMS1 of ERCOT Frequency

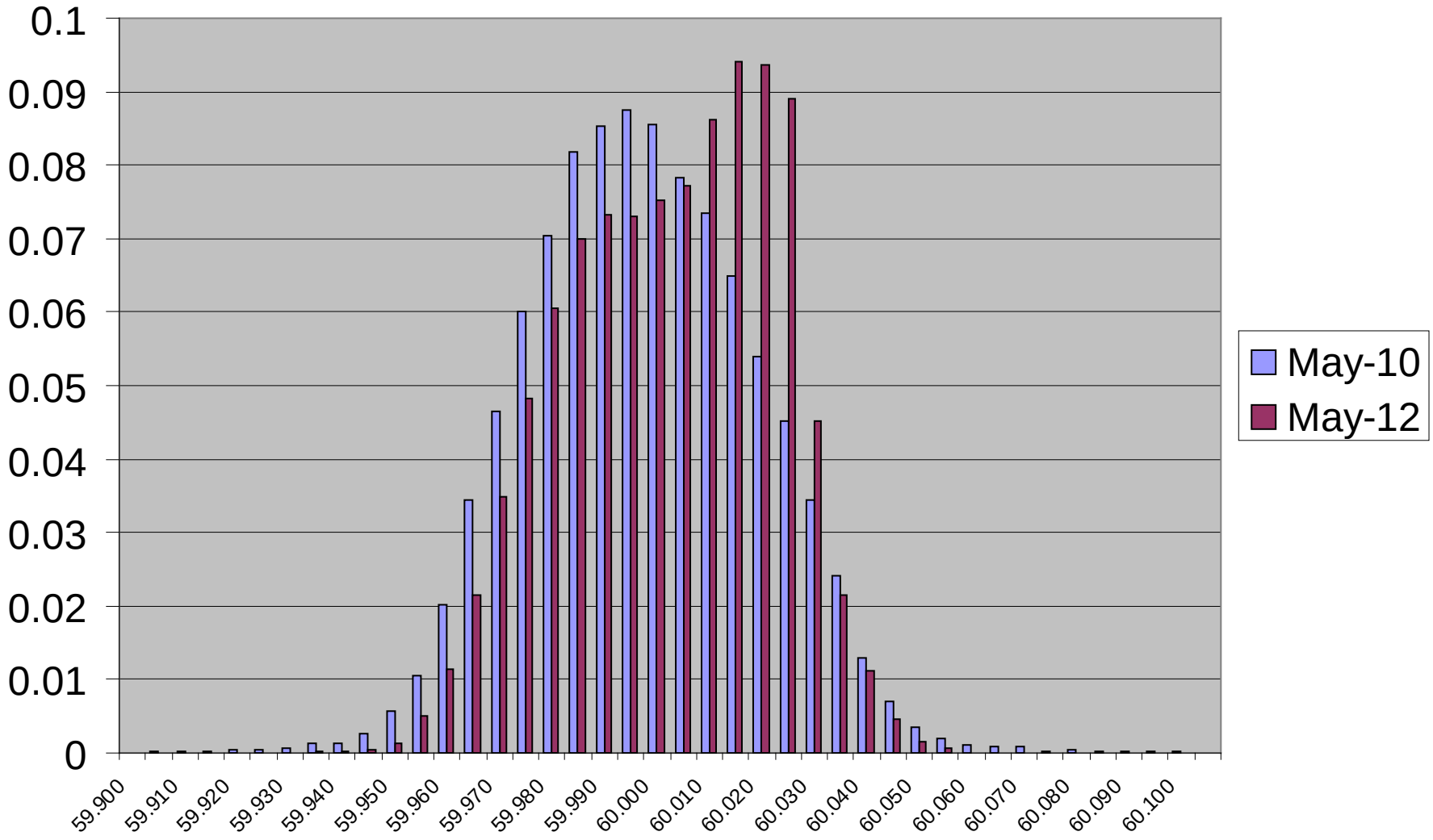


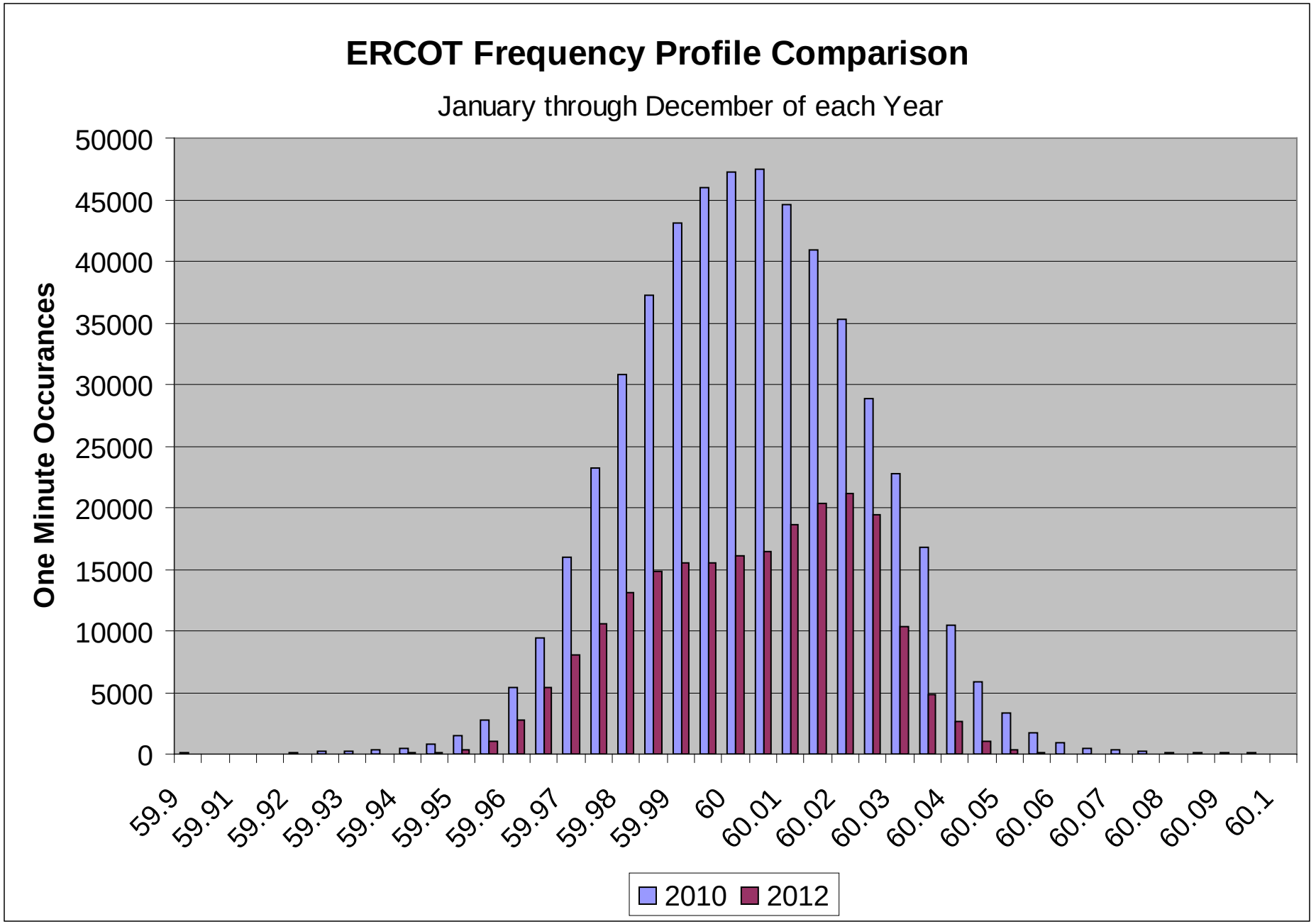
# Daily RMS1 of ERCOT Frequency

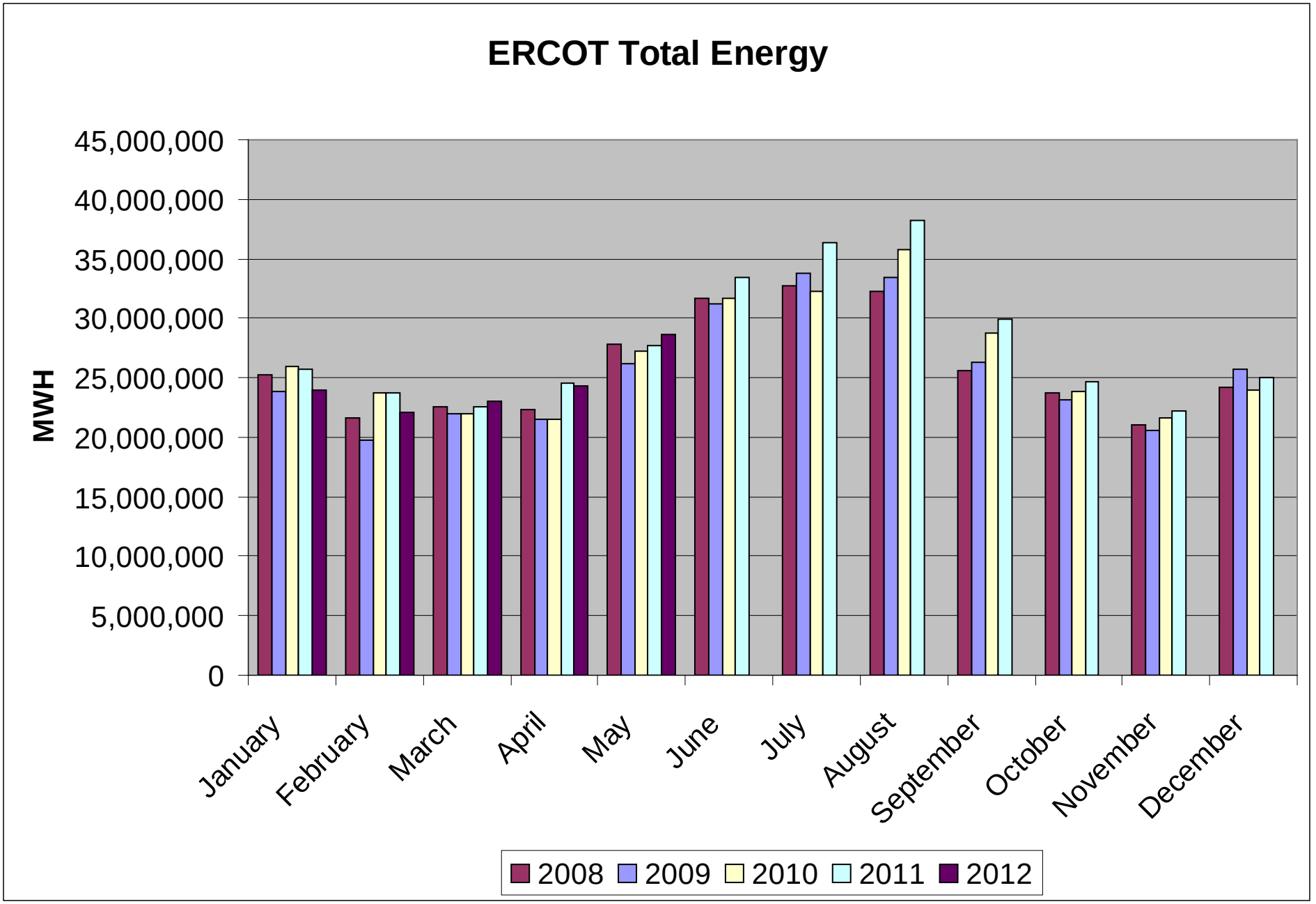


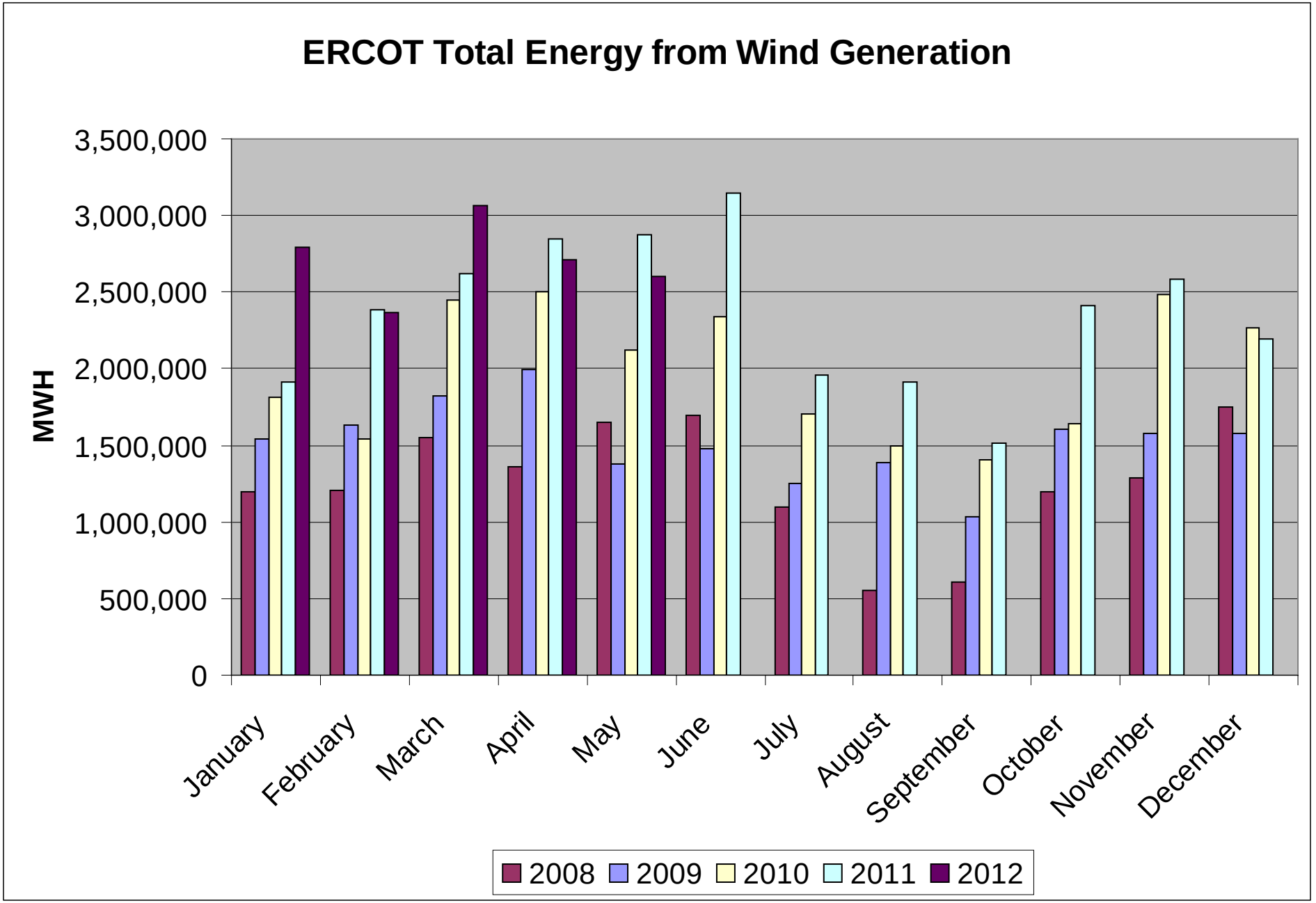

Daily RMS1 of ERCOT Frequency
0.0500
0.0450
0.0400
0.0350
0.0300
0.0250
0.0200
0.0150
0.0100
1/1/2007
4/1/2007
7/1/2007
10/1/2007
1/1/2008
4/1/2008
7/1/2008
10/1/2008
1/1/2009
4/1/2009
7/1/2009
10/1/2009
1/1/2010
4/1/2010
7/1/2010
10/1/2010
1/1/2011
4/1/2011
7/1/2011
10/1/2011
1/1/2012
4/1/2012

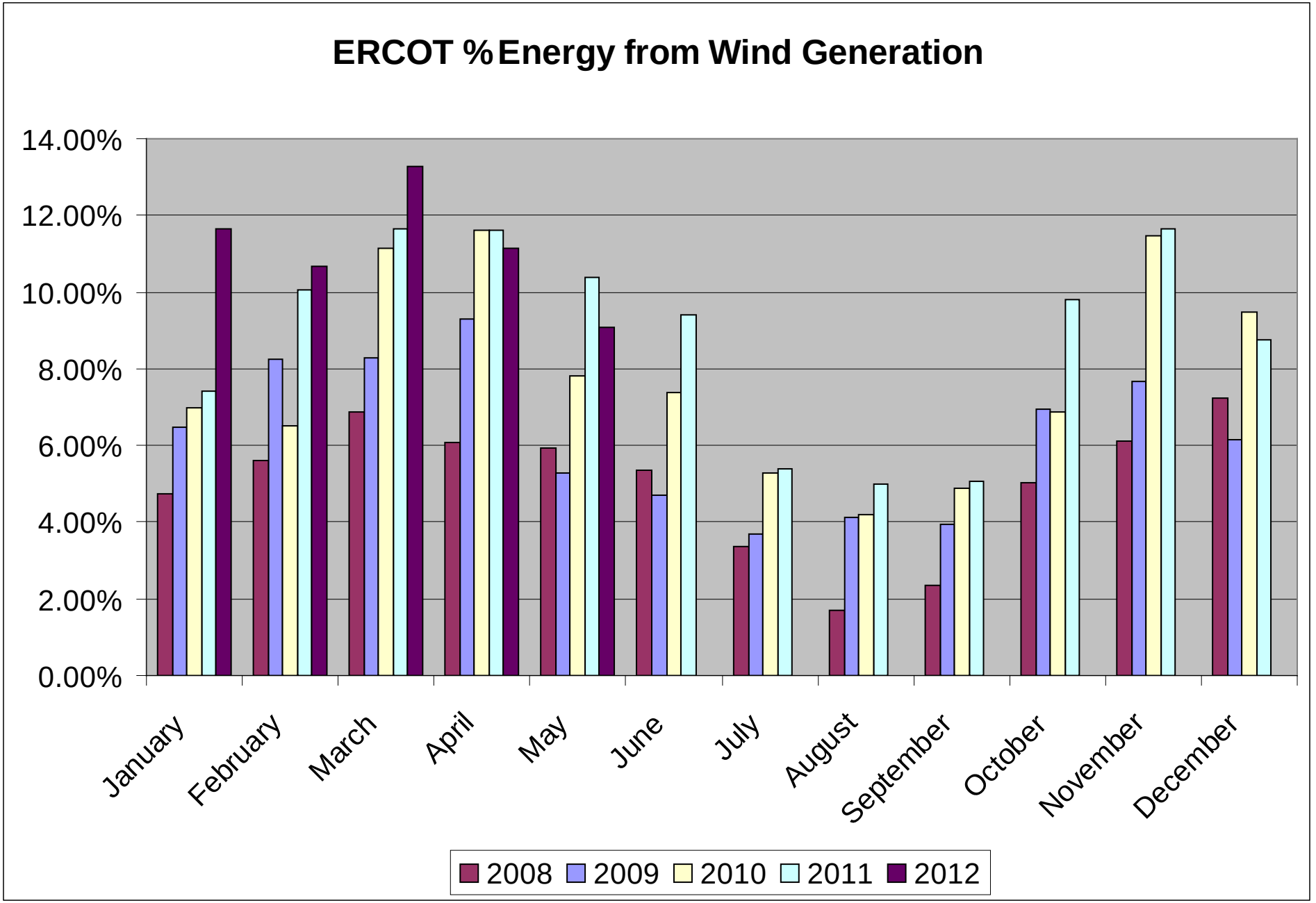
# Comparing May 2010 vs May 2012 profile of frequency in 5 mHz bins




ERCOT Frequency Profile Comparison
January through December of each Year
One Minute Occurances
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
59.9
59.91
59.92
59.93
59.94
59.95
59.96
59.97
59.98
59.99
60
60.01
60.02
60.03
60.04
60.05
60.06
60.07
60.08
60.09
60.1
2010
2012


ERCOT Total Energy
MWH
45,000,000
40,000,000
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
0
January
February
March
April
May
June
July
August
September
October
November
December
2008
2009
2010
2011
2012


ERCOT Total Energy from Wind Generation
MWH
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
January
February
March
April
May
June
July
August
September
October
November
December
2008
2009
2010
2011
2012


ERCOT % Energy from Wind Generation
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
January
February
March
April
May
June
July
August
September
October
November
December
2008
2009
2010
2011
2012