



August, 2013 Eastern, WECC, ERCOT and Hydro Quebec Frequency Events' Data Summary and Corresponding Frequency Plots

For: NERC Resources Subcommittee and Frequency Working Group

Prepare by: CERTS and Advanced Systems Researchers (ASR)

Date: September 27, 2013

NERC INTERCONNECTIONS CANDIDATE FREQUENCY EVENTS FOR AUGUST 2013

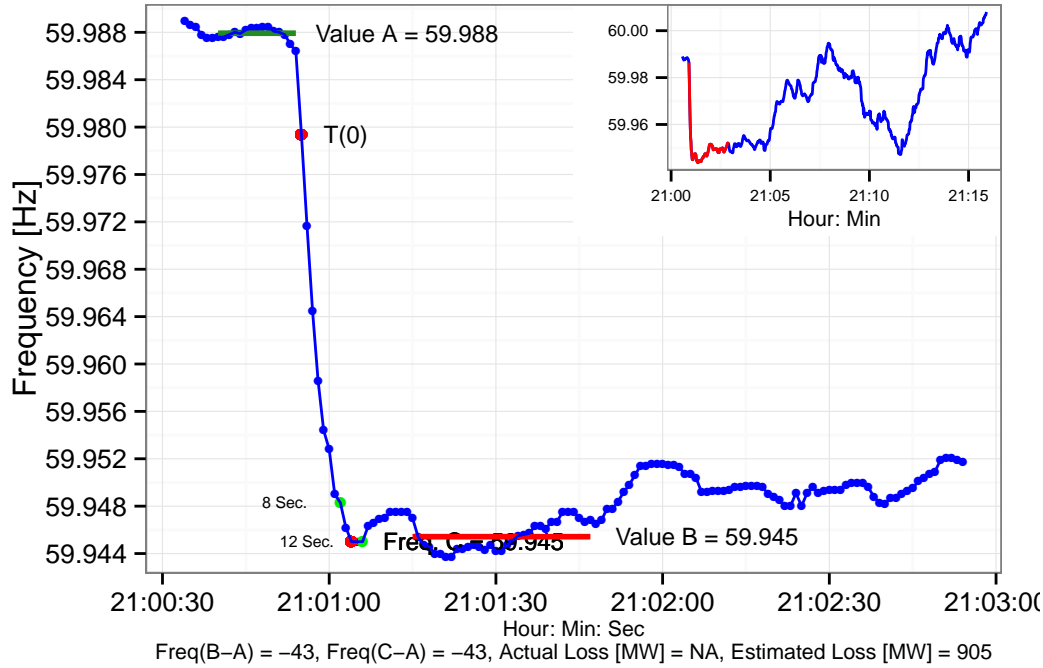
| Event Time | | | Event Frequency Data | | | | | | | Interconnection | CERTS | NERC-SA |
|------------------------------------|---------------------------------------|-----|----------------------|-----------------------|--------------------------|---------------------------|----------|------------------------------------|--------------|-----------------|---------|---------|
| UTC (t-0) | Local Time (t-0) (t = Event Start) | Day | Time Zone | A Value Freq Error | A Value (t-16 to t-1) | B Value (t+20 to t+52) | Hz Delta | Point C (w/in 12 sec after t-0) | Bias Setting | Column MW | Loss MW | |
| Date / Time (MM/DD/YY HH:MM:SS) | Date / Time (MM/DD/YY HH:MM:SS) | | Pull Dn | (from 60) | Average | Average | B-A | delta from Aave | MW/0.1 Hz | Estimate | Actual | |
| EASTERN | | | | | | | | | | | | |
| 2013-08-05 01:00:54 | 2013-08-04 21:00:54 | Sun | EDT | -0.012 | 59.988 | 59.945 | -0.043 | 59.945 | -0.043 | 6350 | 905 | -2105 |
| 2013-08-08 18:01:54 | 2013-08-08 14:01:54 | Thu | EDT | 0.001 | 60.001 | 59.950 | -0.051 | 59.945 | -0.056 | 6350 | 1322 | -2592 |
| 2013-08-10 01:18:33 | 2013-08-09 21:18:33 | Fri | EDT | 0.013 | 60.013 | 59.959 | -0.054 | 59.965 | -0.048 | 6350 | 545 | -1009 |
| 2013-08-18 16:03:35 | 2013-08-18 12:03:35 | Sun | EDT | -0.004 | 59.996 | 59.960 | -0.036 | 59.961 | -0.035 | 6350 | 584 | -1622 |
| 2013-08-19 18:14:03 | 2013-08-19 14:14:03 | Mon | EDT | -0.022 | 59.978 | 59.931 | -0.047 | 59.936 | -0.042 | 6350 | 816 | -1736 |
| 2013-08-30 15:56:30 | 2013-08-30 11:56:30 | Fri | EDT | 0.006 | 60.006 | 59.964 | -0.042 | 59.969 | -0.037 | 6350 | 960 | -2286 |
| 2013-08-31 17:15:55 | 2013-08-31 13:15:55 | Sat | EDT | -0.008 | 59.992 | 59.953 | -0.039 | 59.960 | -0.032 | 6350 | 967 | -2479 |
| WESTERN | | | | | | | | | | | | |
| 2013-08-03 09:50:43 | 2013-08-03 02:50:43 | Sat | PDT | -0.013 | 59.987 | 59.913 | -0.074 | 59.892 | -0.095 | 1952 | 405 | -547 |
| 2013-08-04 03:45:43 | 2013-08-03 20:45:43 | Sat | PDT | 0.011 | 60.011 | 59.974 | -0.037 | 59.919 | -0.092 | 1952 | 405 | -1095 |
| 2013-08-04 07:59:10 | 2013-08-04 00:59:10 | Sun | PDT | -0.017 | 59.983 | 59.921 | -0.062 | 59.903 | -0.080 | 1952 | 499 | -805 |
| 2013-08-07 22:23:01 | 2013-08-07 15:23:01 | Wed | PDT | 0.010 | 60.010 | 59.956 | -0.054 | 59.944 | -0.066 | 1952 | 296 | -548 |
| 2013-08-09 01:53:50 | 2013-08-08 18:53:50 | Thu | PDT | 0.004 | 60.004 | 59.921 | -0.083 | 59.869 | -0.135 | 1952 | 770 | -928 |
| 2013-08-10 23:46:06 | 2013-08-10 16:46:06 | Sat | PDT | -0.002 | 59.998 | 59.924 | -0.074 | 59.904 | -0.094 | 1952 | 672 | -908 |
| 2013-08-12 00:40:05 | 2013-08-11 17:40:05 | Sun | PDT | 0.001 | 60.001 | 59.943 | -0.058 | 59.905 | -0.096 | 1952 | 611 | -1053 |
| 2013-08-13 22:30:09 | 2013-08-13 15:30:09 | Tue | PDT | -0.009 | 59.991 | 59.951 | -0.040 | 59.907 | -0.084 | 1952 | 525 | -1313 |
| 2013-08-13 22:56:04 | 2013-08-13 15:56:04 | Tue | PDT | 0.007 | 60.007 | 59.970 | -0.037 | 59.933 | -0.074 | 1952 | 494 | -1335 |
| 2013-08-18 23:03:49 | 2013-08-18 16:03:49 | Sun | PDT | -0.003 | 59.997 | 59.890 | -0.107 | 59.833 | -0.164 | 1952 | 927 | -866 |
| ERCOT | | | | | | | | | | | | |
| 2013-08-02 20:34:37 | 2013-08-02 15:34:37 | Fri | CDT | -0.018 | 59.982 | 59.860 | -0.122 | 59.832 | -0.150 | 672 | 793 | -650 |
| 2013-08-11 10:43:09 | 2013-08-11 05:43:09 | Sun | CDT | 0.003 | 60.003 | 59.907 | -0.096 | 59.856 | -0.147 | 672 | 367 | -382 |
| 2013-08-12 07:57:35 | 2013-08-12 02:57:35 | Mon | CDT | -0.030 | 59.970 | 59.898 | -0.072 | 59.826 | -0.144 | 672 | 278 | -386 |
| 2013-08-16 21:02:31 | 2013-08-16 16:02:31 | Fri | CDT | 0.002 | 60.002 | 59.927 | -0.075 | 59.910 | -0.092 | 672 | 583 | -777 |
| 2013-08-16 21:33:47 | 2013-08-16 16:33:47 | Fri | CDT | -0.037 | 59.963 | 59.918 | -0.045 | 59.899 | -0.064 | 672 | 578 | -1284 |
| 2013-08-18 21:45:07 | 2013-08-18 16:45:07 | Sun | CDT | 0.006 | 60.006 | 59.895 | -0.111 | 59.867 | -0.139 | 672 | 450 | -405 |
| 2013-08-20 19:18:42 | 2013-08-20 14:18:42 | Tue | CDT | 0.004 | 60.004 | 59.923 | -0.081 | 59.894 | -0.110 | 672 | 539 | -665 |
| 2013-08-24 06:47:05 | 2013-08-24 01:47:05 | Sat | CDT | 0.008 | 60.008 | 59.953 | -0.055 | 59.922 | -0.086 | 672 | 437 | -795 |
| 2013-08-24 23:45:43 | 2013-08-24 18:45:43 | Sat | CDT | -0.032 | 59.968 | 59.887 | -0.081 | 59.849 | -0.119 | 672 | 837 | -1033 |
| 2013-08-25 11:56:52 | 2013-08-25 06:56:52 | Sun | CDT | 0.020 | 60.020 | 59.954 | -0.066 | 59.927 | -0.093 | 672 | 263 | -398 |
| 2013-08-29 23:54:57 | 2013-08-29 18:54:57 | Thu | CDT | -0.028 | 59.972 | 59.912 | -0.060 | 59.880 | -0.092 | 672 | 496 | -827 |
| HYDROQUEBEC | | | | | | | | | | | | |
| 2013-08-03 10:47:54 | 2013-08-03 06:47:54 | Sat | EDT | -0.019 | 59.981 | 60.200 | -0.219 | 60.780 | -0.799 | 448 | -1206 | -551 |
| 2013-08-03 12:37:40 | 2013-08-03 08:37:40 | Sat | EDT | 0.014 | 60.014 | 60.069 | -0.055 | 60.399 | -0.385 | 448 | -391 | -711 |
| 2013-08-05 19:10:34 | 2013-08-05 15:10:34 | Mon | EDT | 0.023 | 60.023 | 59.521 | -0.502 | 58.799 | -1.224 | 448 | 3043 | -606 |

NERC INTERCONNECTIONS CANDIDATE FREQUENCY EVENTS FOR AUGUST 2013

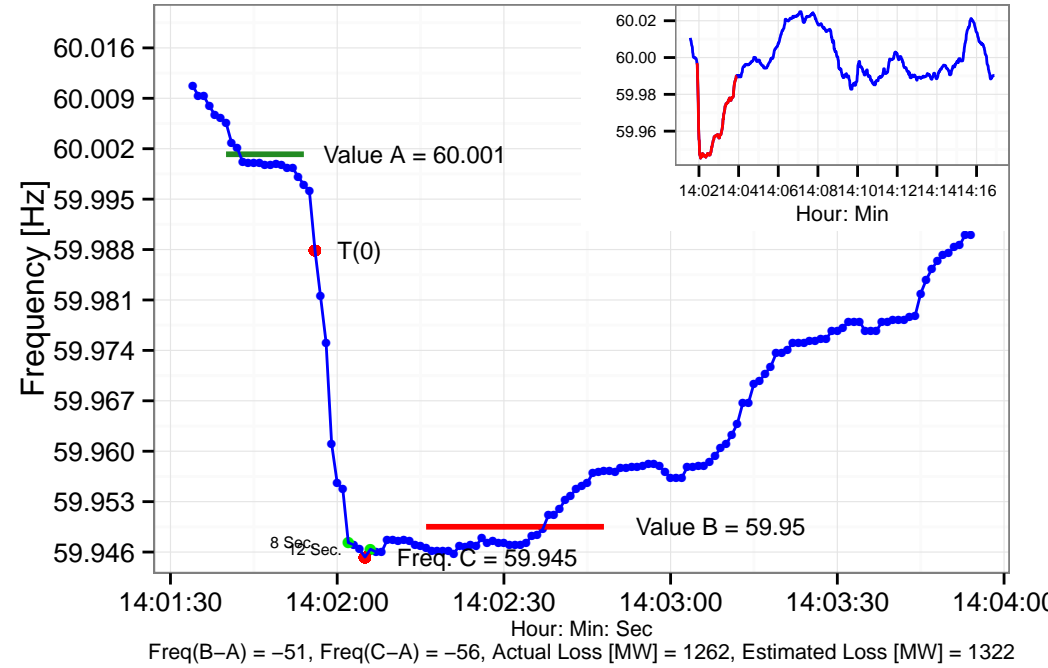
| Event Time | | | Event Frequency Data | | | | | | | Interconnection | CERTS | NERC-SA |
|------------------------------------|---------------------------------------|-----|----------------------|-----------------------|--------------------------|---------------------------|----------|------------------------------------|--------|-----------------|--------------|---------|
| UTC (t-0) | Local Time (t-0) (t = Event Start) | Day | Time Zone | A Value Freq Error | A Value (t-16 to t-1) | B Value (t+20 to t+52) | Hz Delta | Point C (w/in 12 sec after t-0) | | Bias Setting | Column MW | Loss MW |
| Date / Time (MM/DD/YY HH:MM:SS) | Date / Time (MM/DD/YY HH:MM:SS) | | Pull Dn | (from 60) | Average | Average | B-A | delta from Aave | | MW/0.1 Hz | Estimate | Actual |
| 2013-08-08 00:27:23 | 2013-08-07 20:27:23 | Wed | EDT | 0.035 | 60.035 | 60.045 | -0.010 | 60.349 | -0.314 | 448 | -281 | -2810 |
| 2013-08-16 01:22:10 | 2013-08-15 21:22:10 | Thu | EDT | 0.015 | 60.015 | 60.028 | 0.013 | 59.722 | -0.293 | 448 | -213 | -1638 |
| 2013-08-16 01:28:24 | 2013-08-15 21:28:24 | Thu | EDT | -0.101 | 59.899 | 59.985 | -0.086 | 60.092 | -0.193 | 448 | -471 | -548 |
| 2013-08-22 02:09:43 | 2013-08-21 22:09:43 | Wed | EDT | -0.005 | 59.995 | 59.923 | -0.072 | 59.637 | -0.358 | 448 | 445 | -618 |
| 2013-08-23 21:15:41 | 2013-08-23 17:15:41 | Fri | EDT | -0.002 | 59.998 | 59.886 | -0.112 | 59.512 | -0.486 | 448 | 658 | -588 |
| 2013-08-24 04:03:26 | 2013-08-24 00:03:26 | Sat | EDT | 0.013 | 60.013 | 60.096 | -0.083 | 60.368 | -0.355 | 448 | -961 | -1158 |
| 2013-08-24 04:23:32 | 2013-08-24 00:23:32 | Sat | EDT | -0.027 | 59.973 | 60.089 | -0.116 | 60.454 | -0.481 | 448 | -651 | -561 |
| 2013-08-26 01:19:49 | 2013-08-25 21:19:49 | Sun | EDT | -0.009 | 59.991 | 60.054 | -0.063 | 60.342 | -0.351 | 448 | -330 | -524 |

EASTERN INTERCONNECTION
AUGUST, 2013 FREQUENCY EVENTS

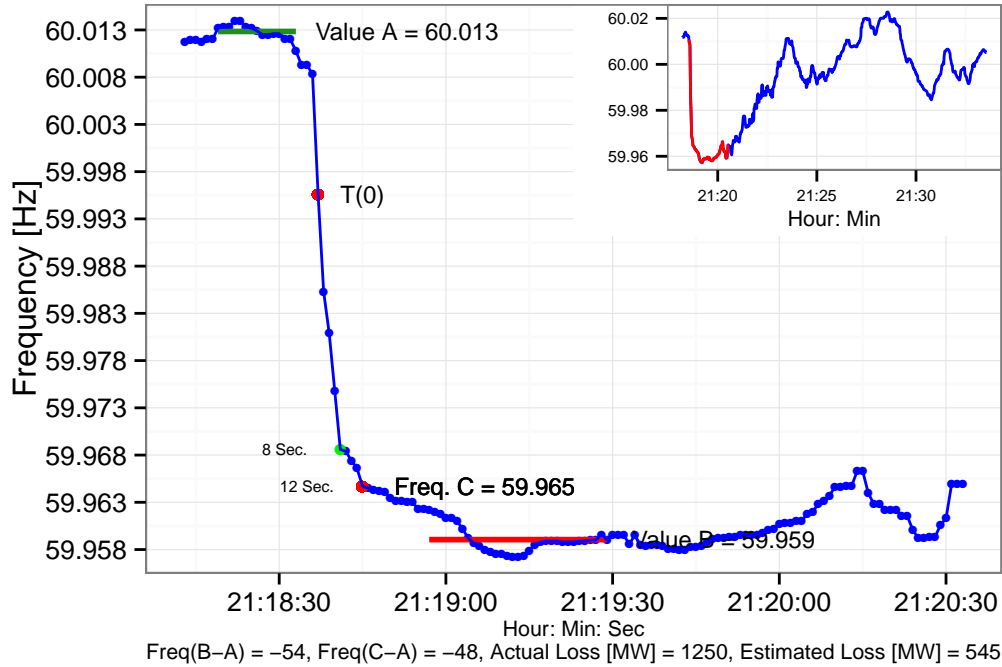
EI 2013-08-04 21:00:54 EVENT



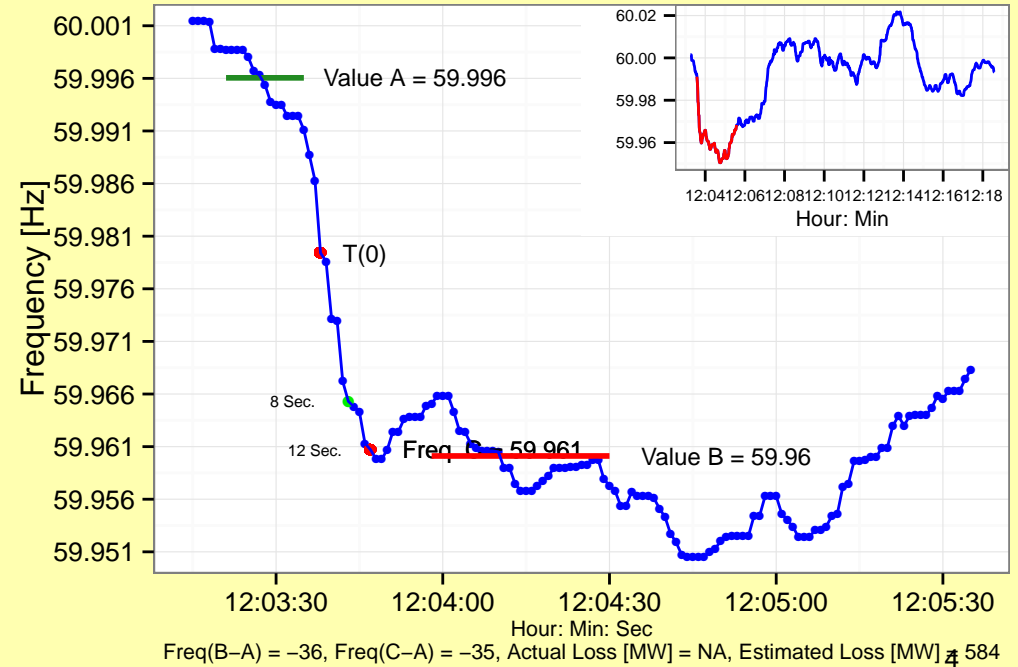
EI 2013-08-08 14:01:54 EVENT



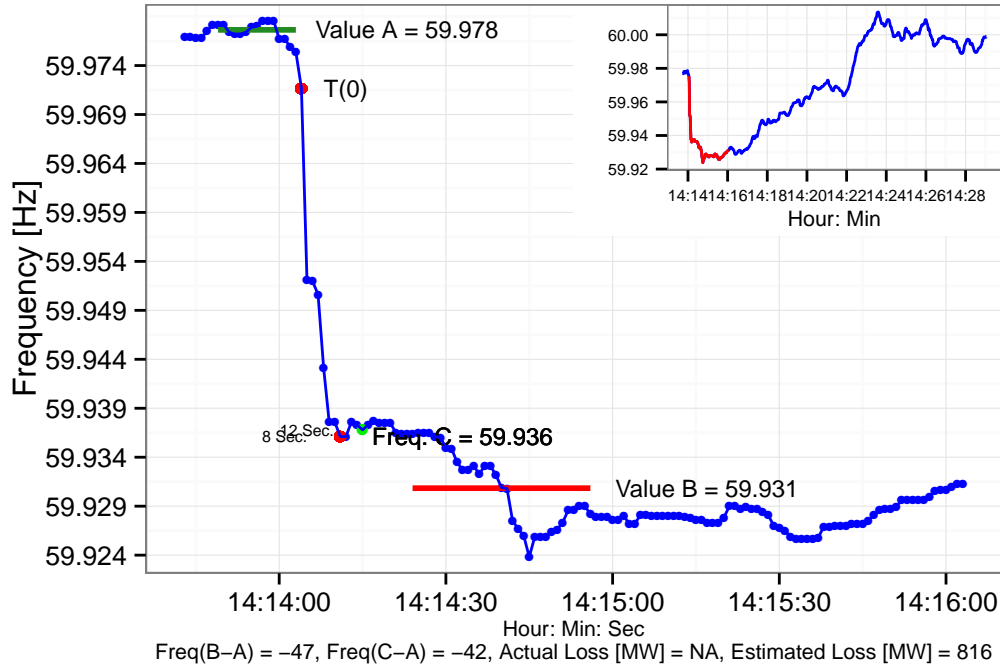
EI 2013-08-09 21:18:33 EVENT



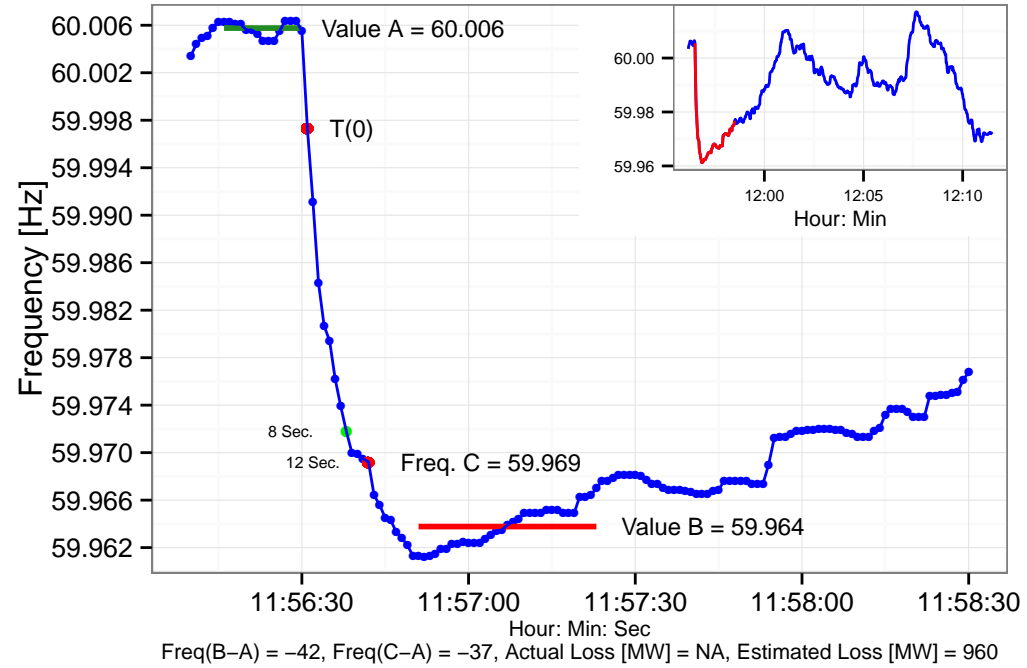
EI 2013-08-18 12:03:35 EVENT



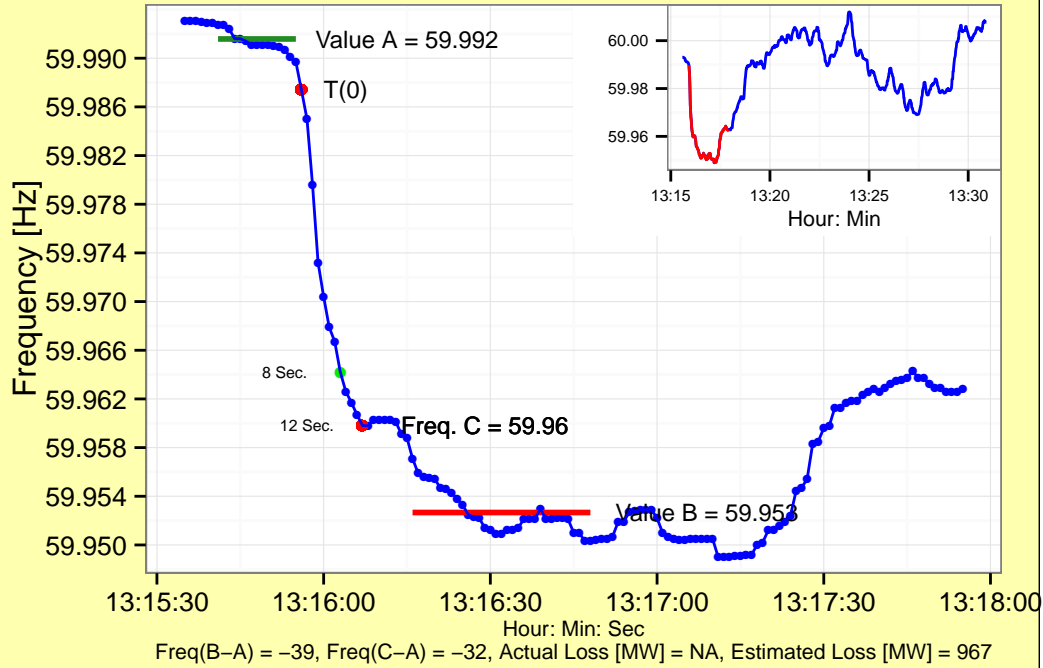
EI 2013-08-19 14:14:03 EVENT



EI 2013-08-30 11:56:30 EVENT

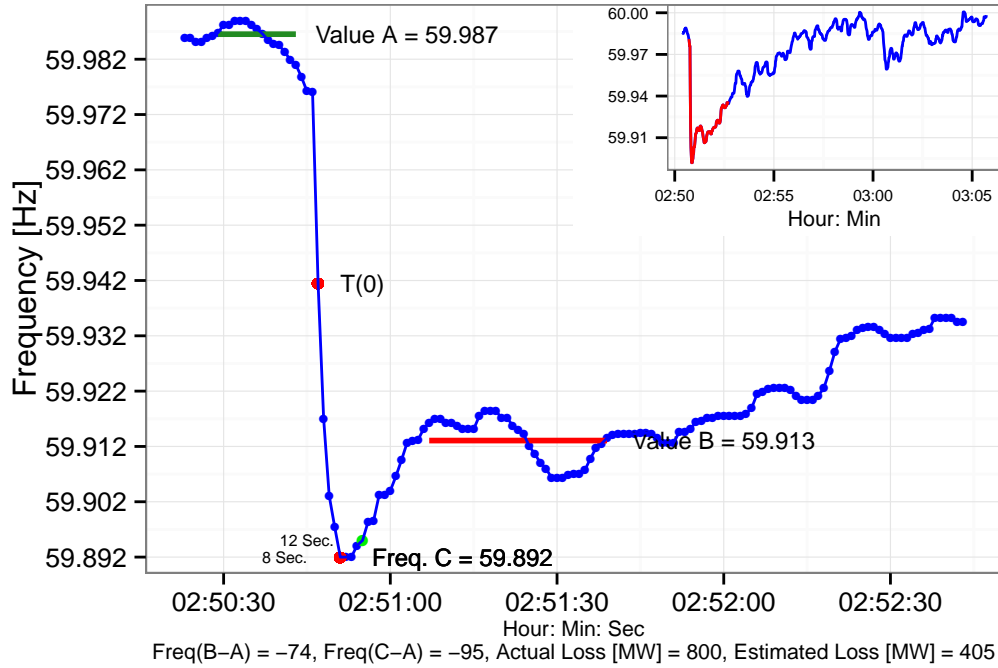


EI 2013-08-31 13:15:55 EVENT

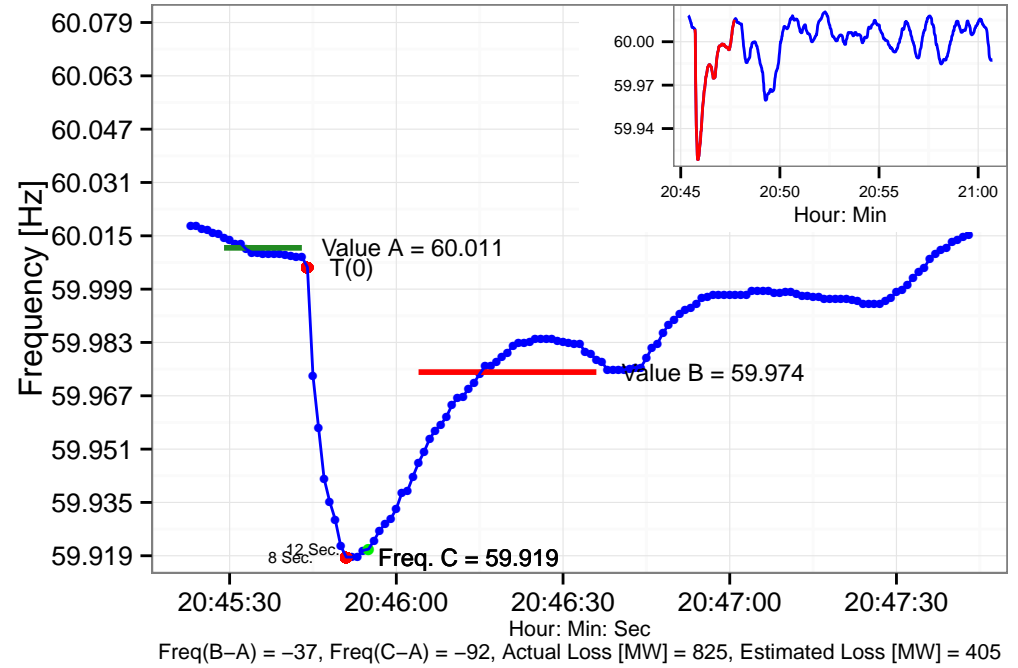


WESTERN INTERCONNECTION
AUGUST, 2013 FREQUENCY EVENTS

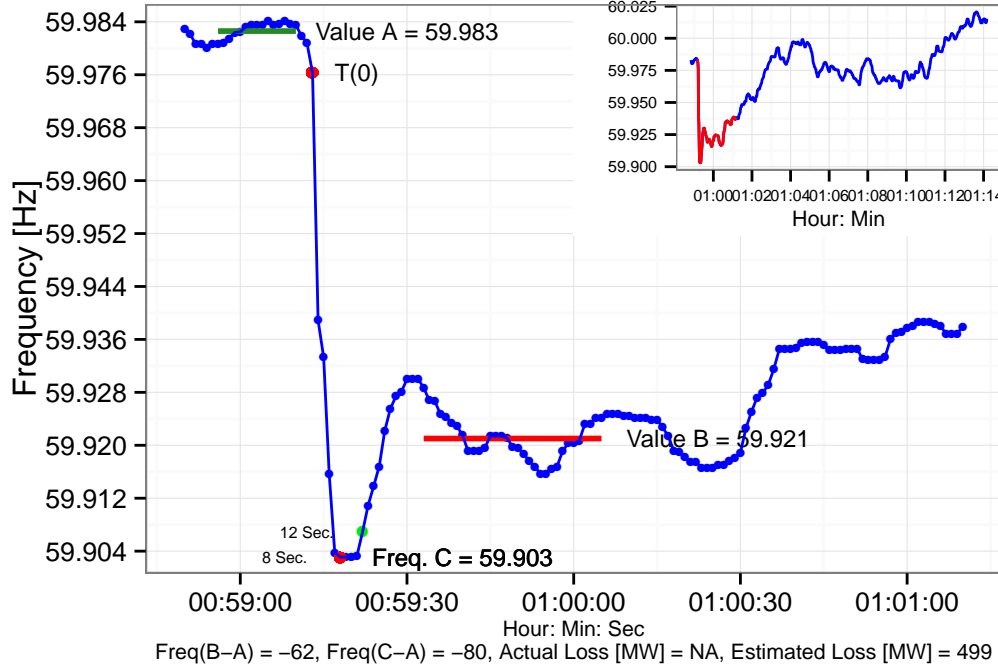
WI 2013-08-03 02:50:43 EVENT



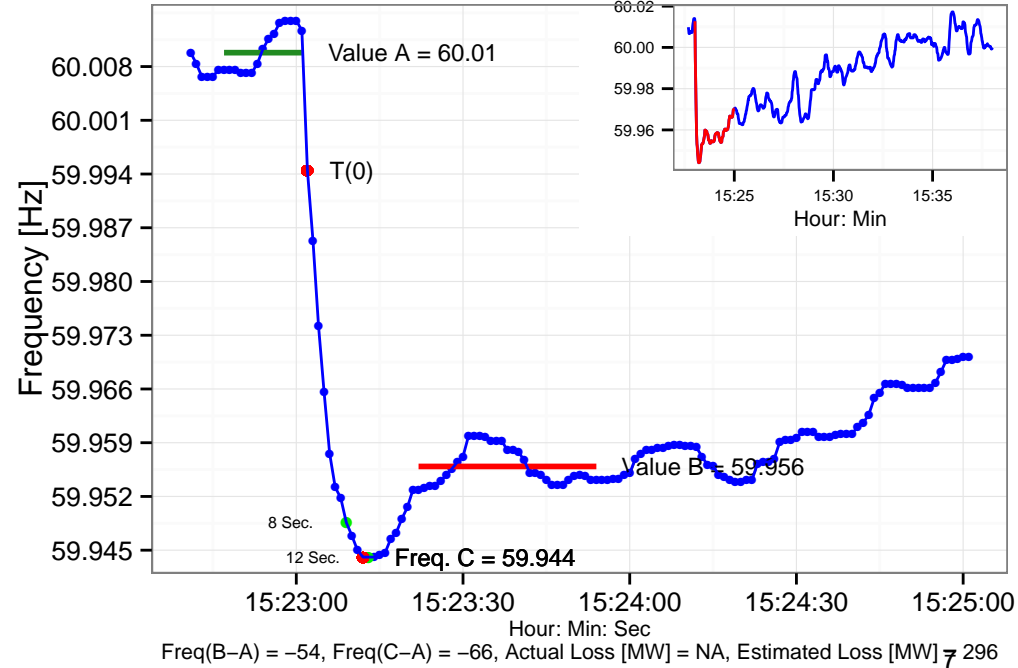
WI 2013-08-03 20:45:43 EVENT



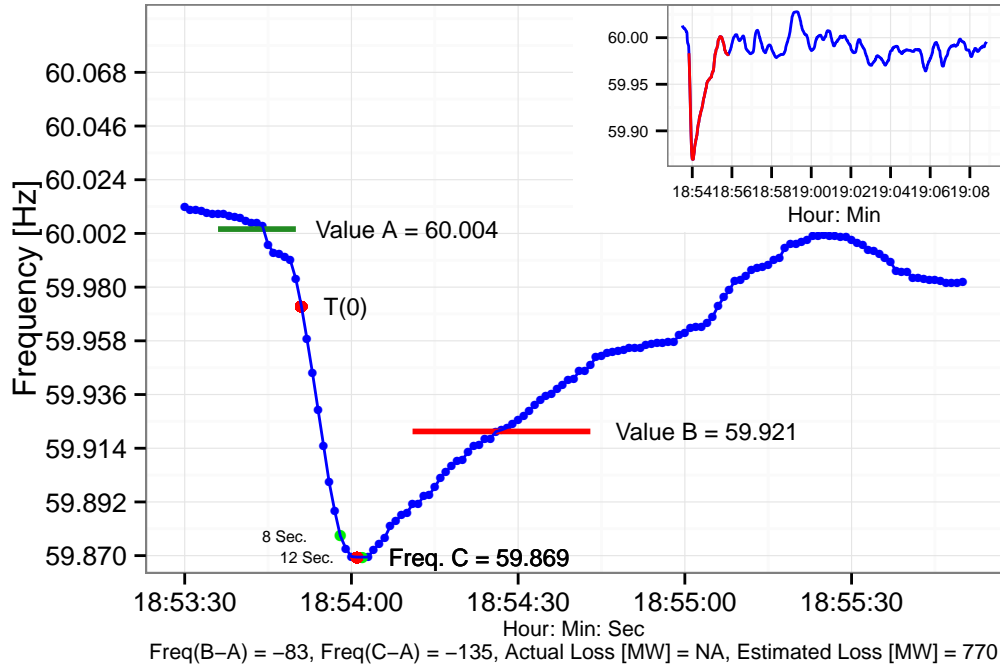
WI 2013-08-04 00:59:10 EVENT



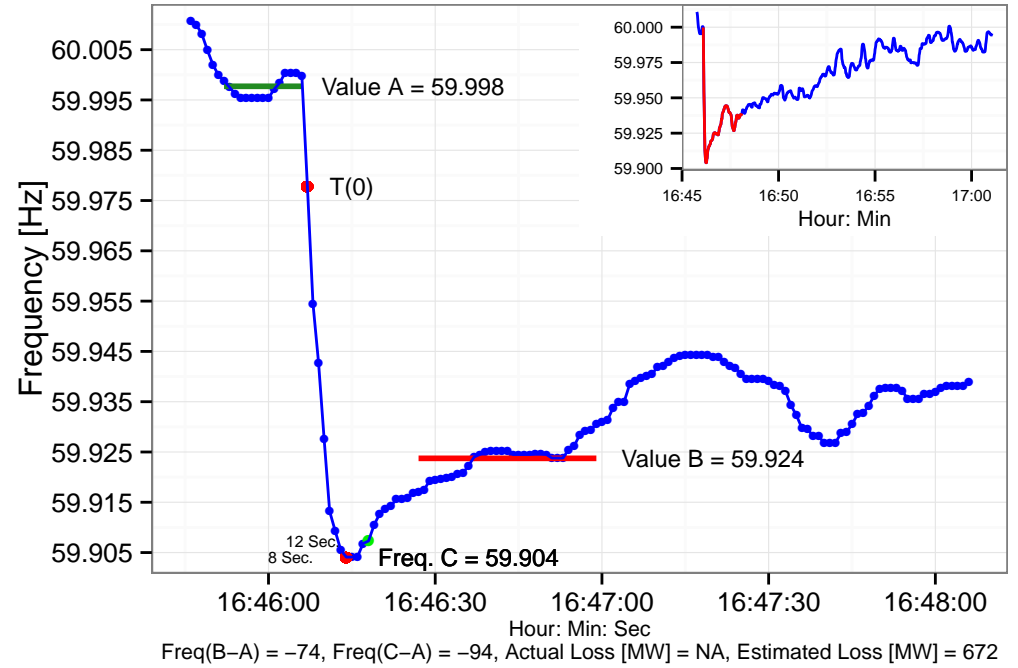
WI 2013-08-07 15:23:01 EVENT



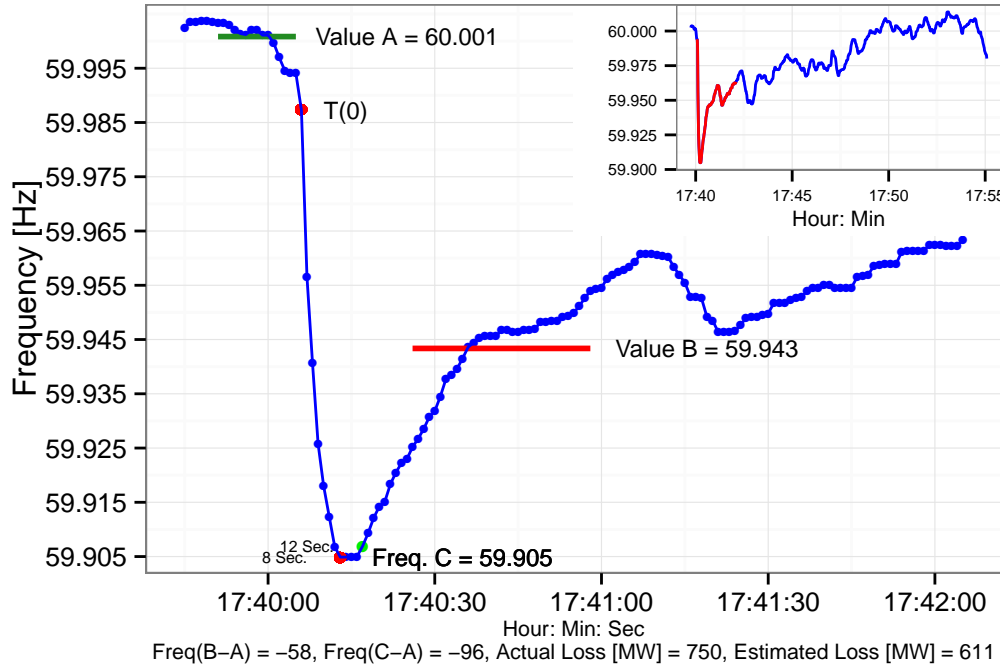
WI 2013-08-08 18:53:50 EVENT



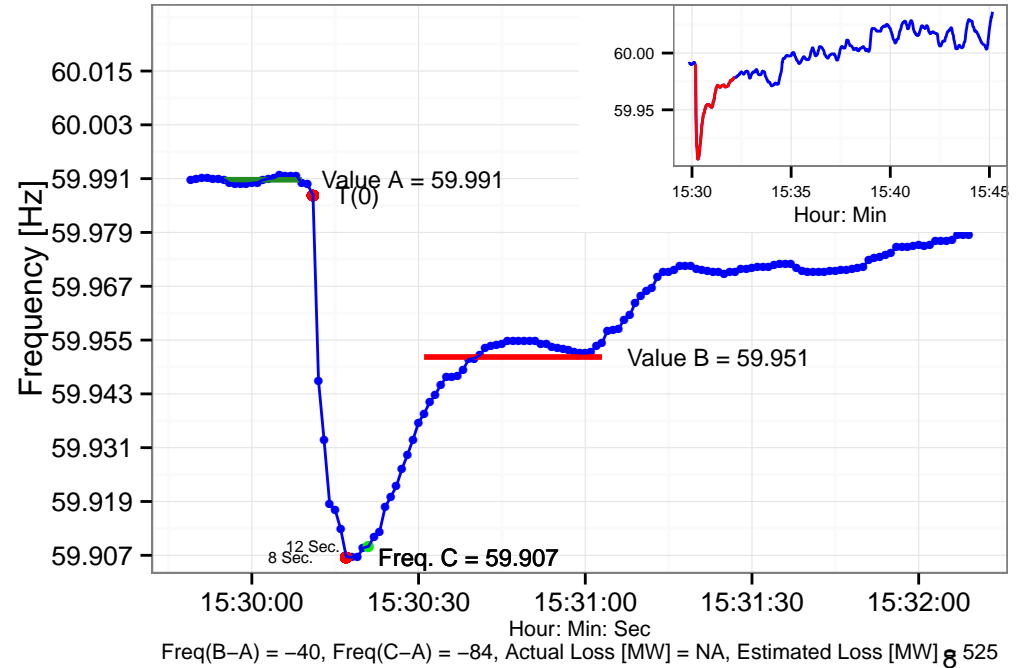
WI 2013-08-10 16:46:06 EVENT



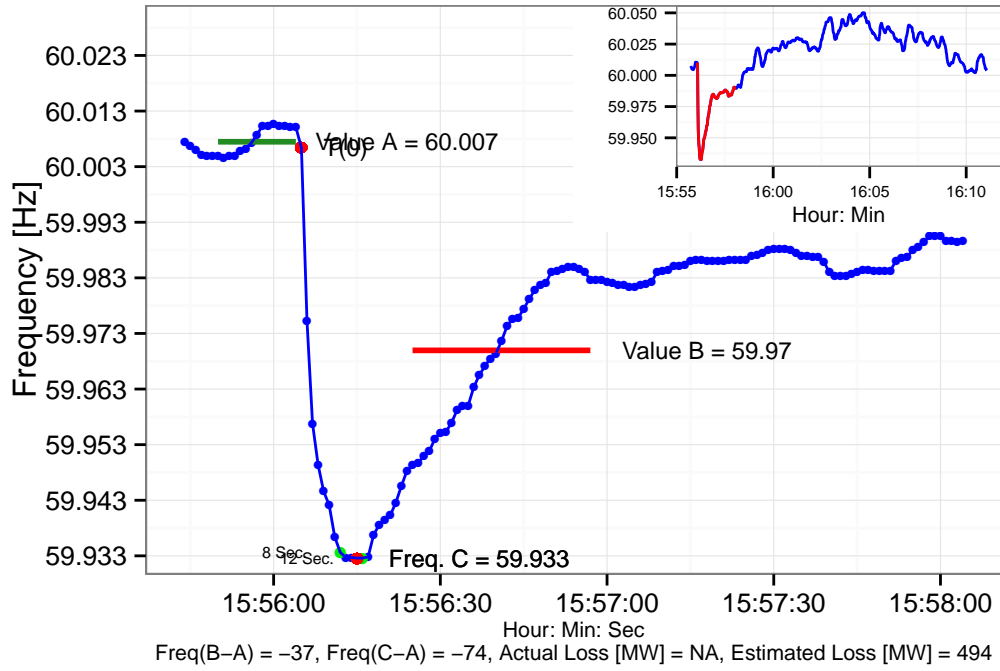
WI 2013-08-11 17:40:05 EVENT



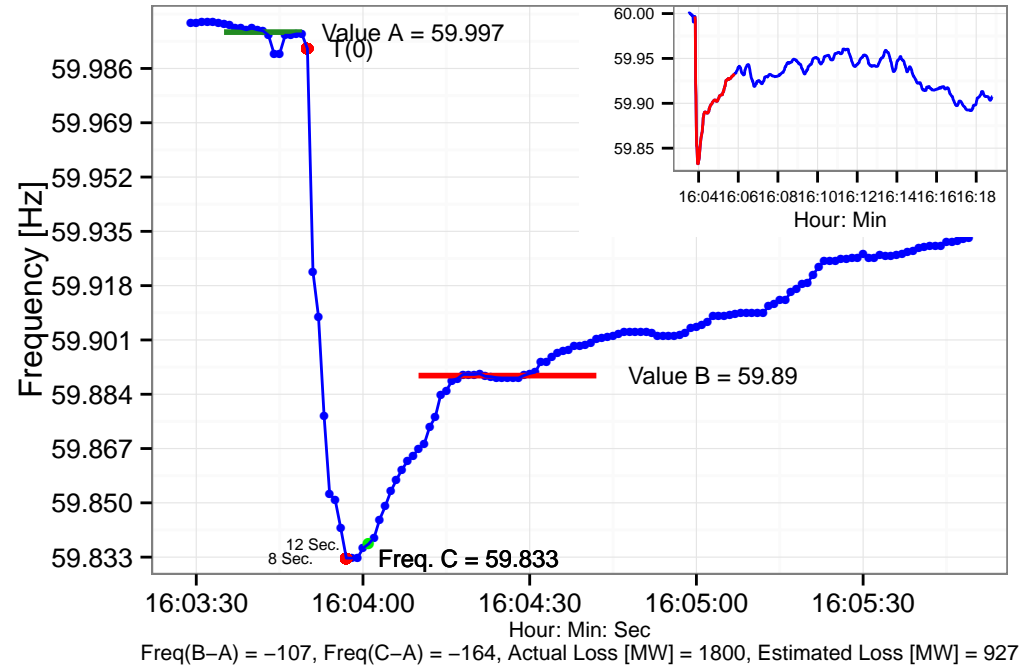
WI 2013-08-13 15:30:09 EVENT



WI 2013-08-13 15:56:04 EVENT

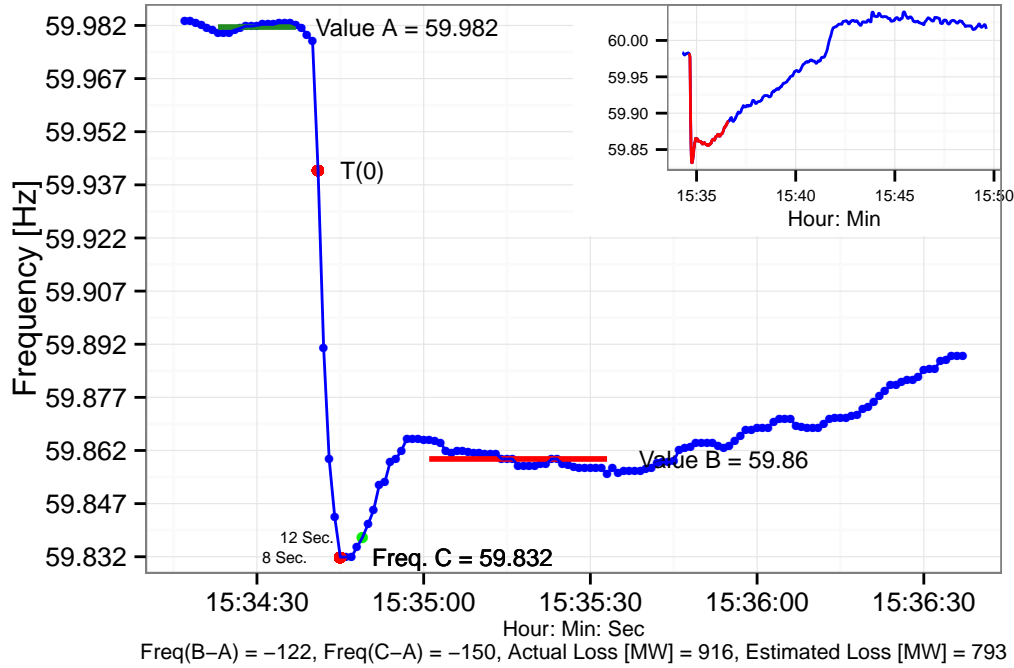


WI 2013-08-18 16:03:49 EVENT

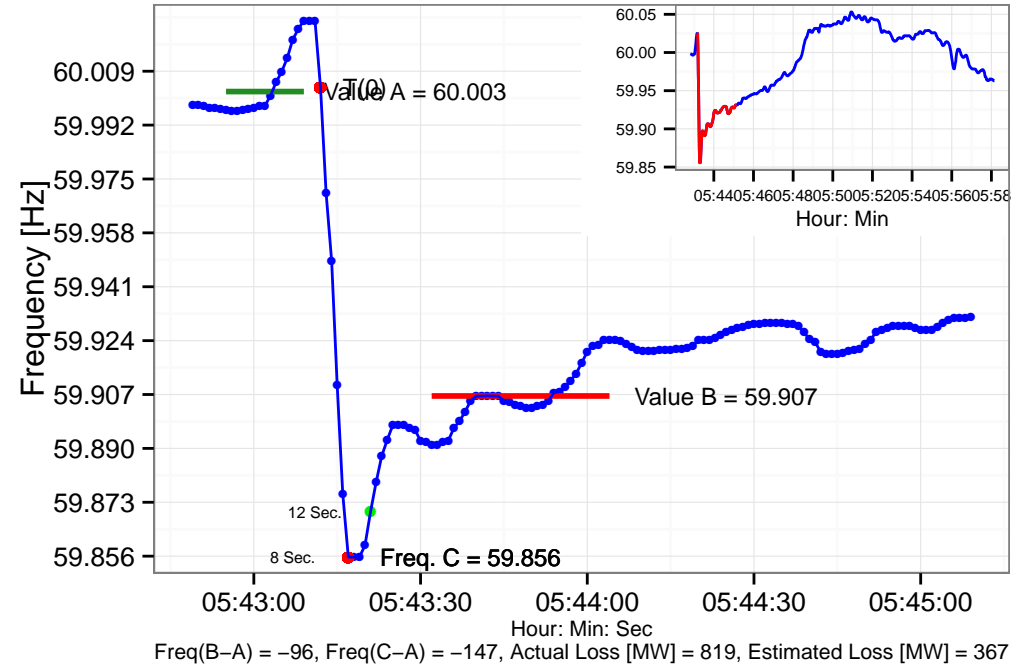


ERCOT INTERCONNECTION
AUGUST, 2013 FREQUENCY EVENTS

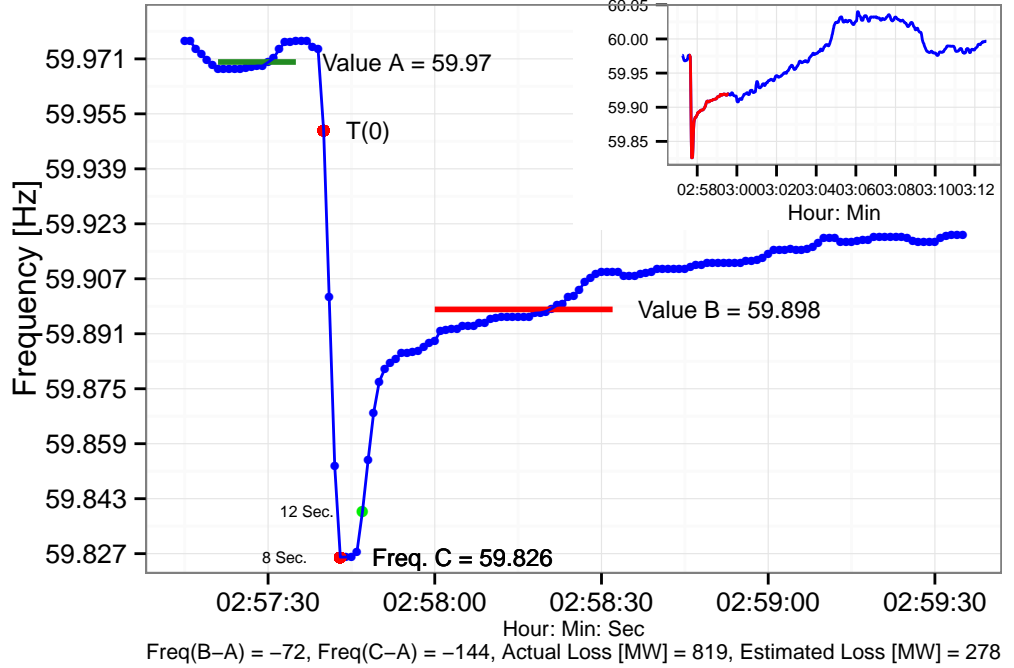
TI 2013-08-02 15:34:37 EVENT



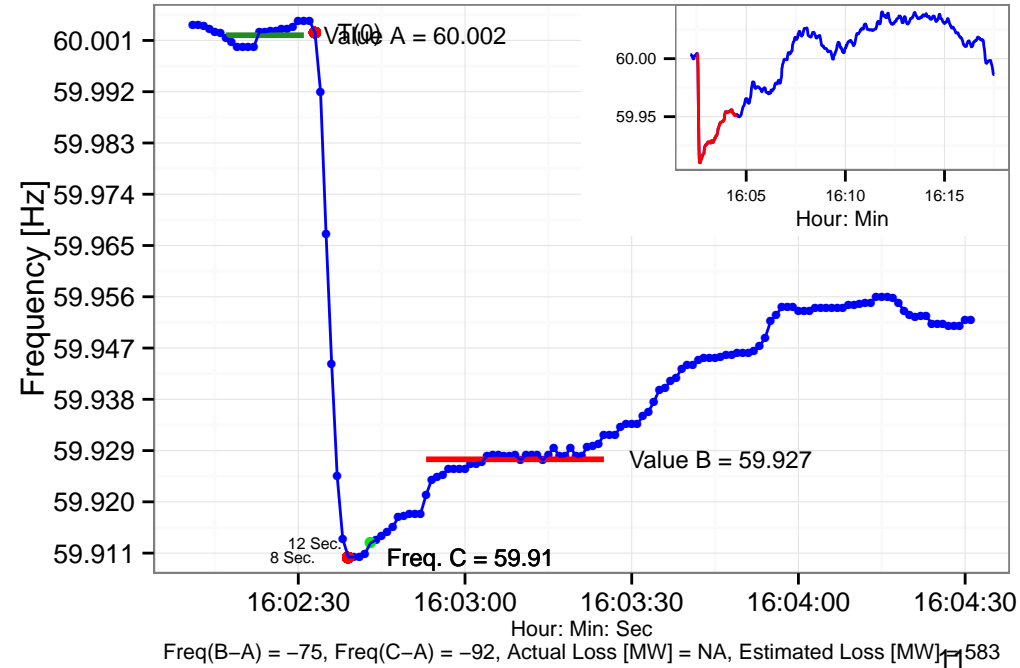
TI 2013-08-11 05:43:09 EVENT



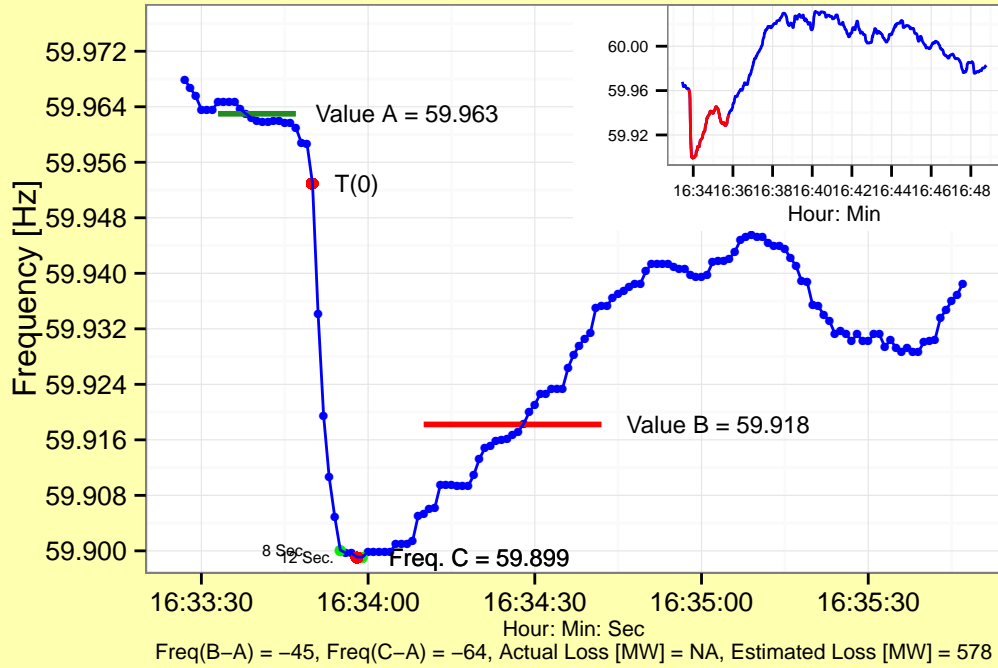
TI 2013-08-12 02:57:35 EVENT



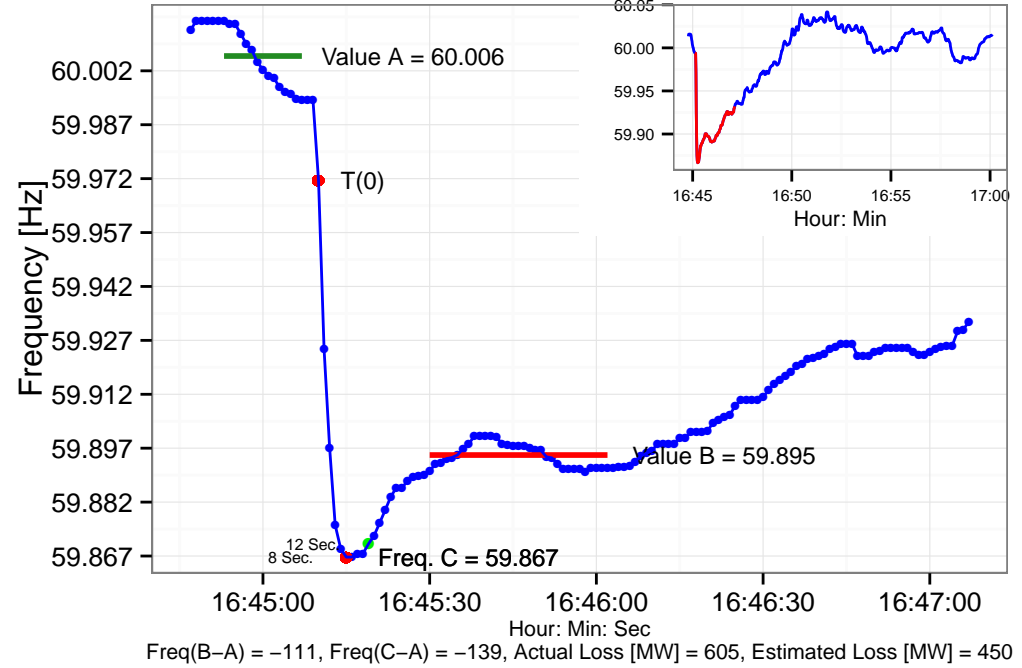
TI 2013-08-16 16:02:31 EVENT



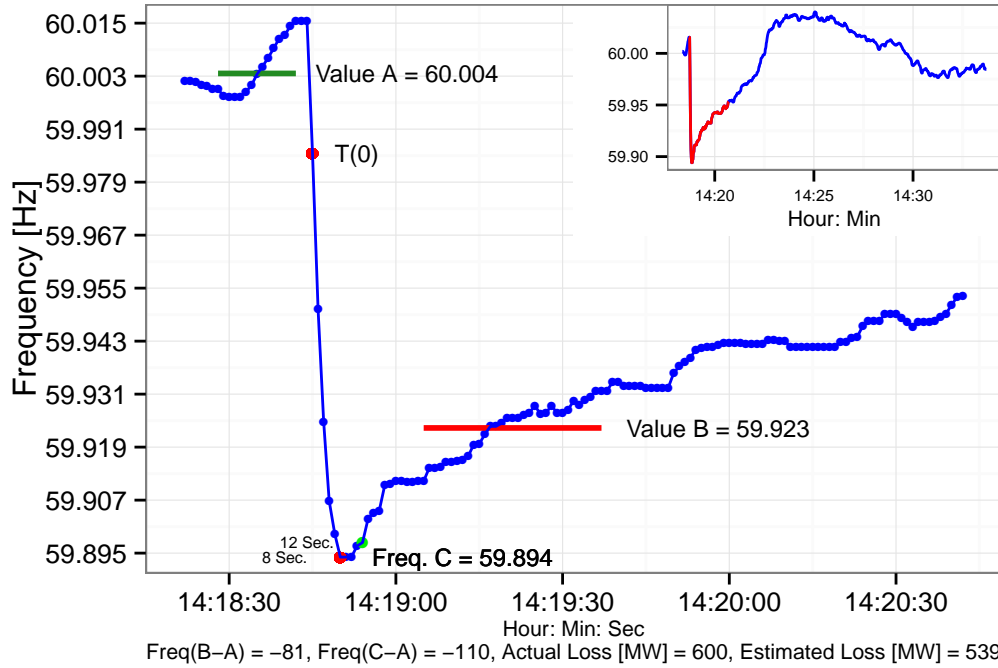
TI 2013-08-16 16:33:47 EVENT



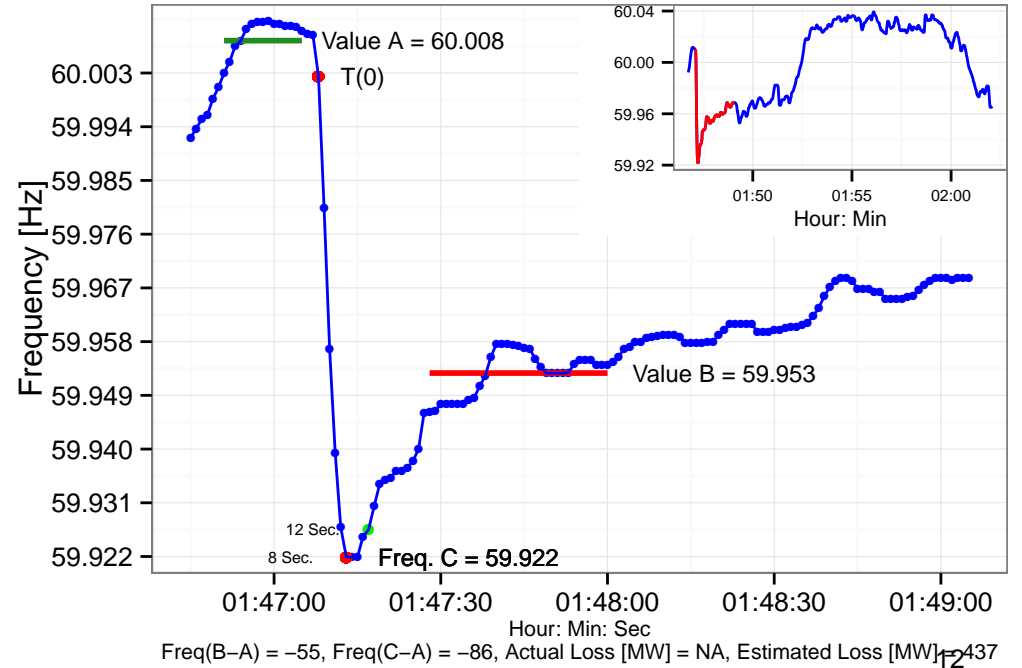
TI 2013-08-18 16:45:07 EVENT



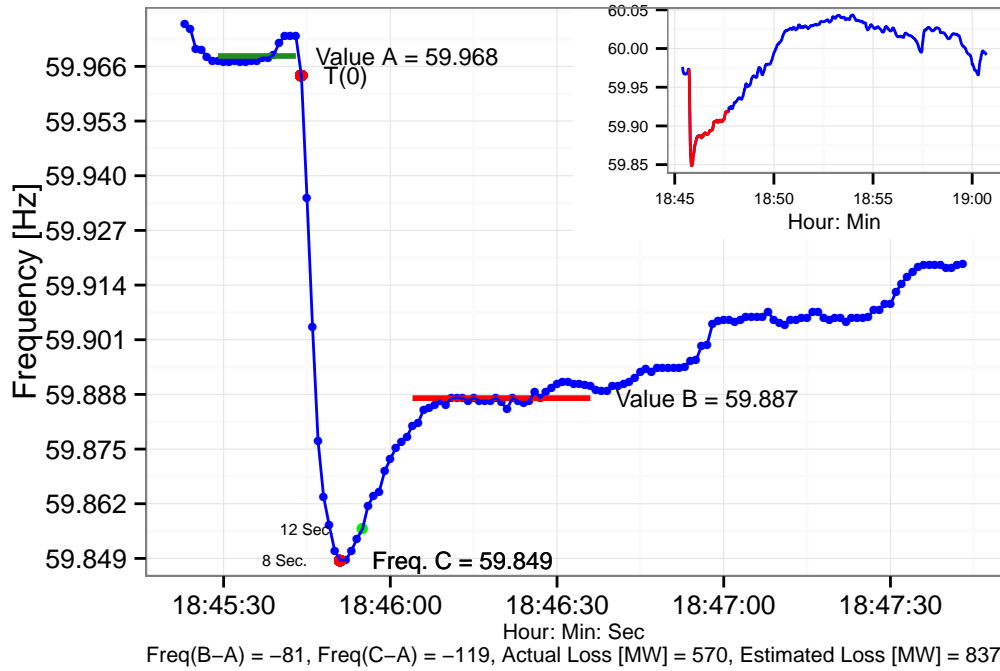
TI 2013-08-20 14:18:42 EVENT



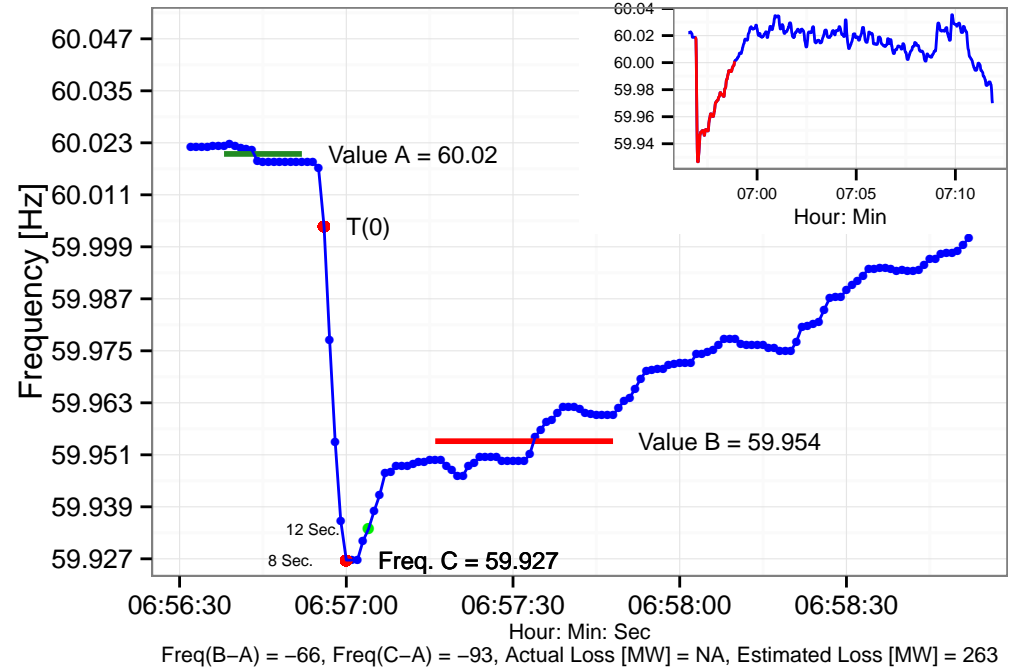
TI 2013-08-24 01:47:05 EVENT



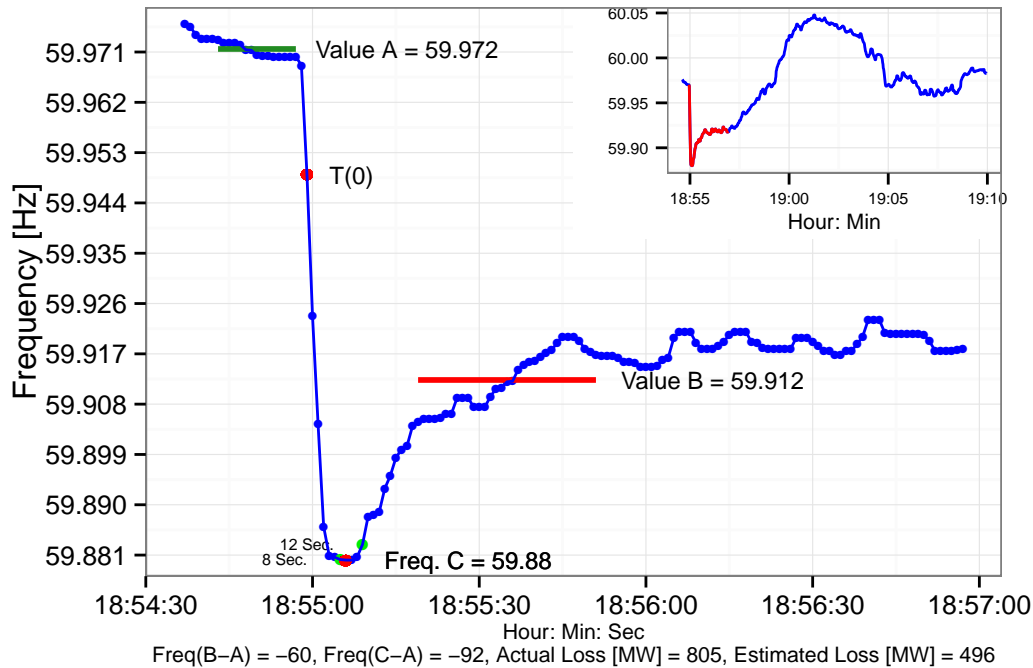
TI 2013-08-24 18:45:43 EVENT



TI 2013-08-25 06:56:52 EVENT

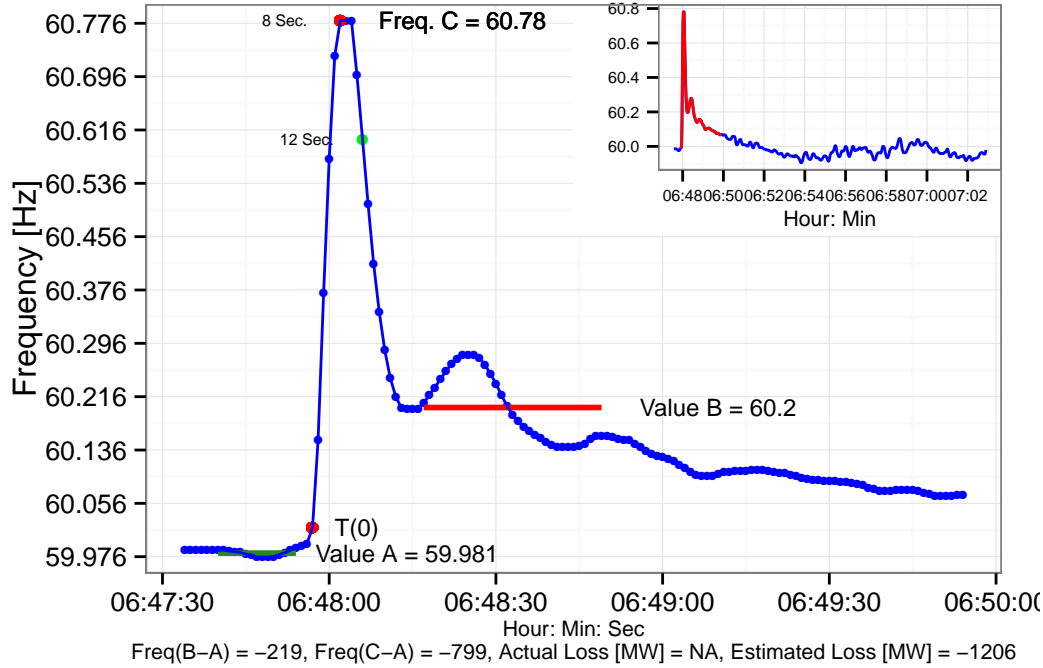


TI 2013-08-29 18:54:57 EVENT

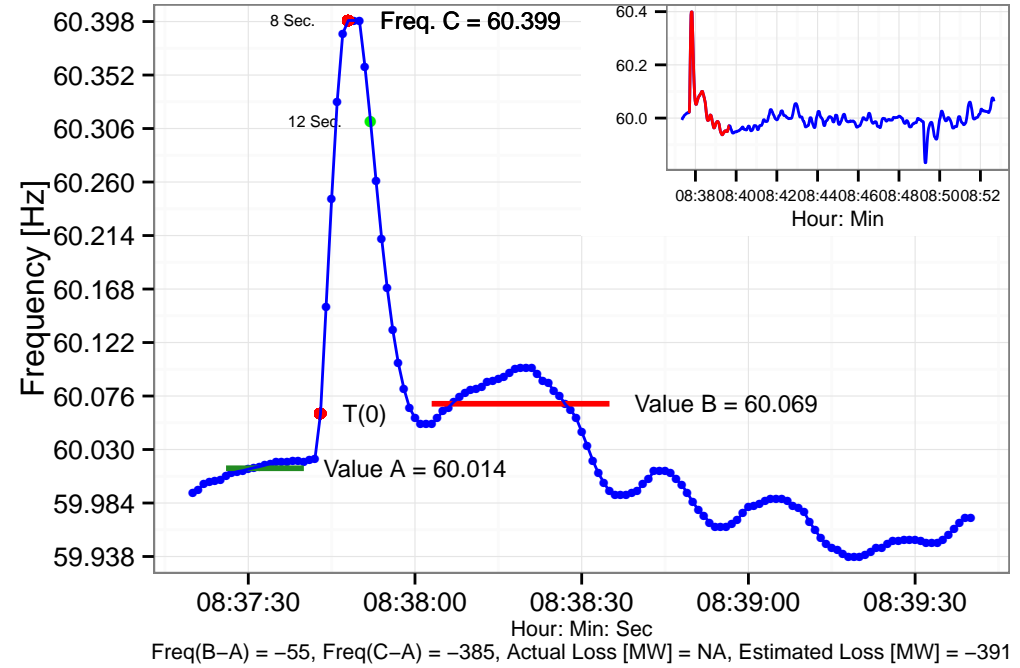


HYDRO QUEBEC INTERCONNECTION
AUGUST, 2013 FREQUENCY EVENTS

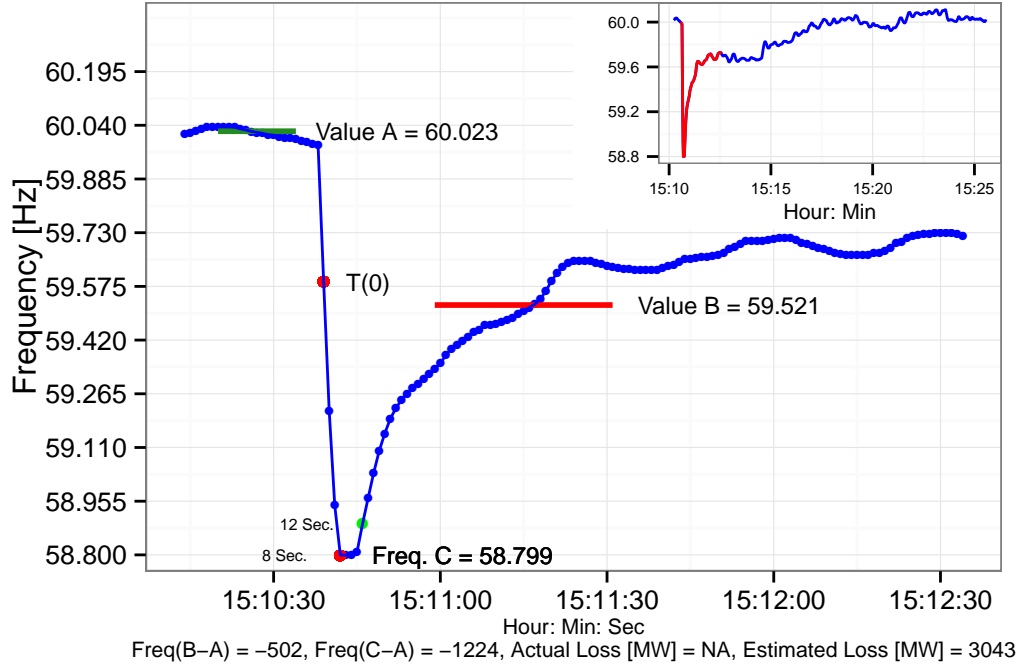
HI 2013-08-03 06:47:54 EVENT



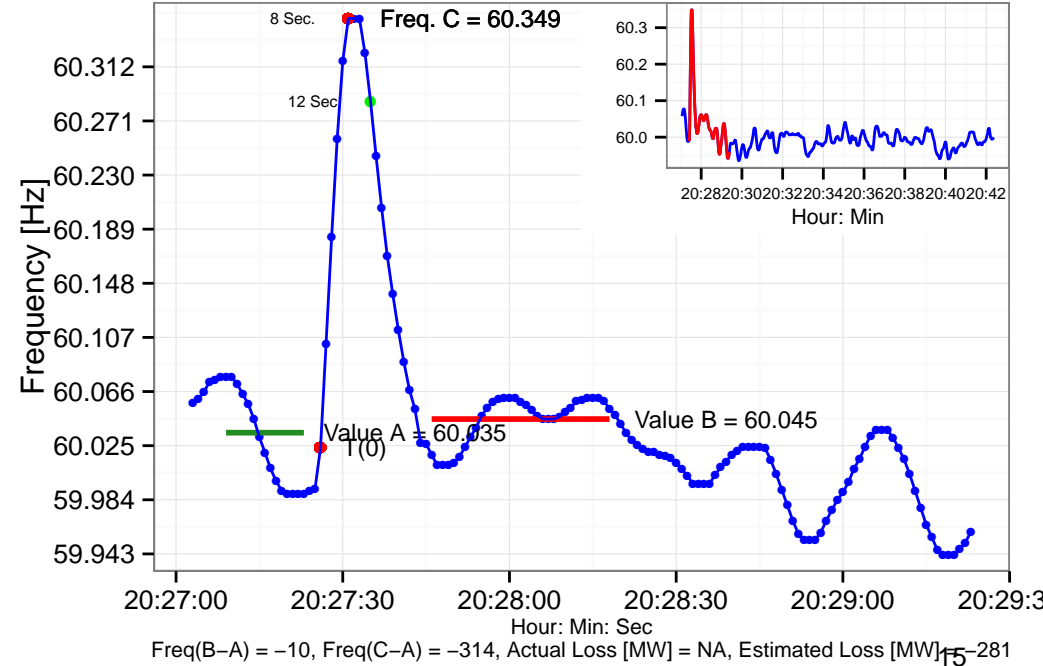
HI 2013-08-03 08:37:40 EVENT



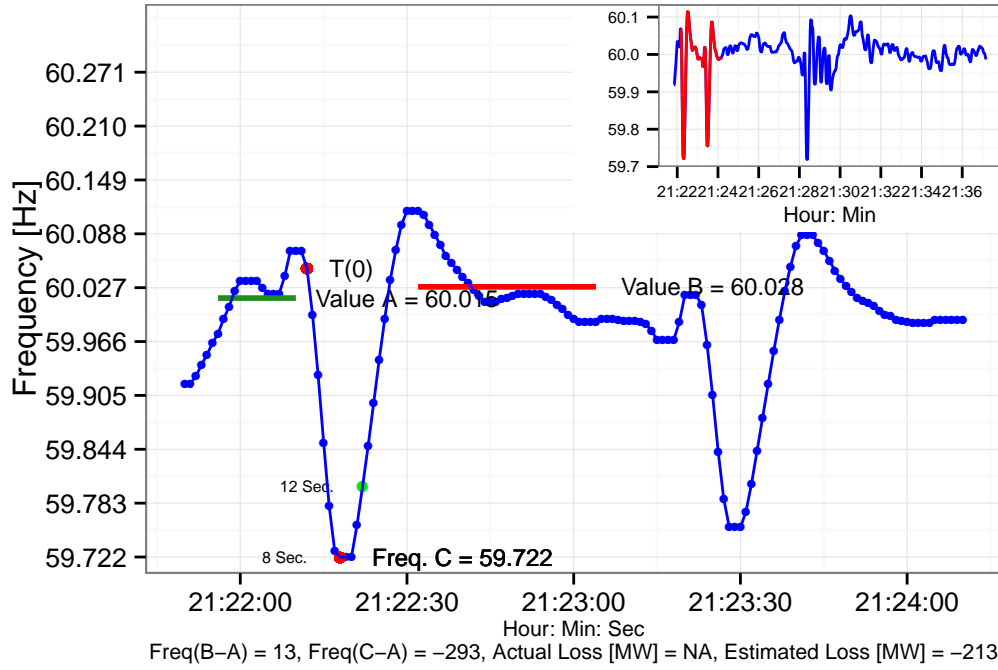
HI 2013-08-05 15:10:34 EVENT



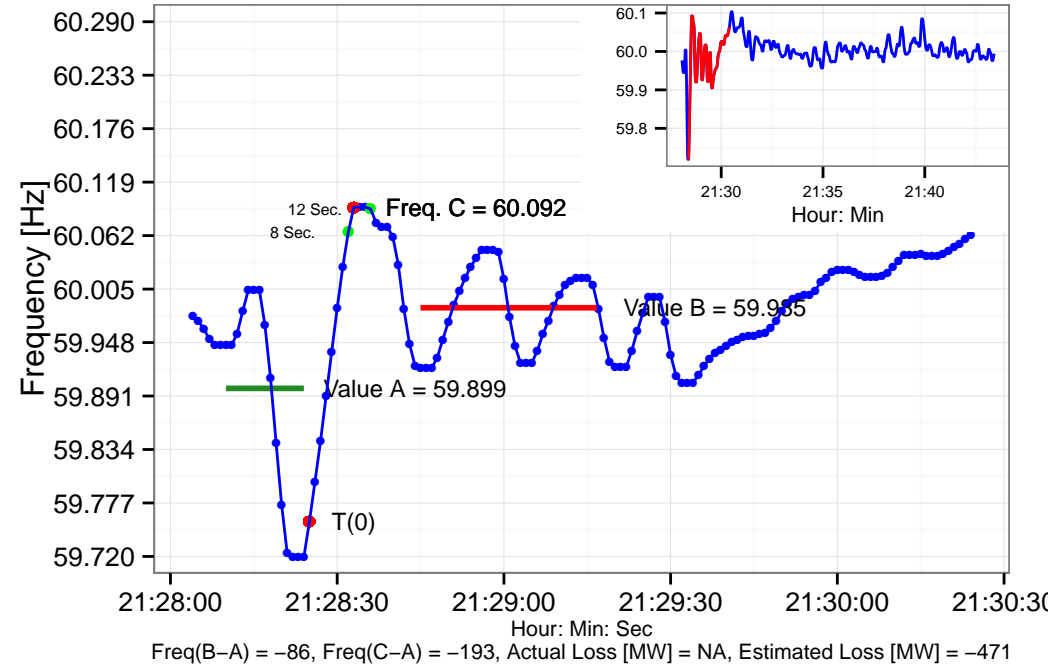
HI 2013-08-07 20:27:23 EVENT



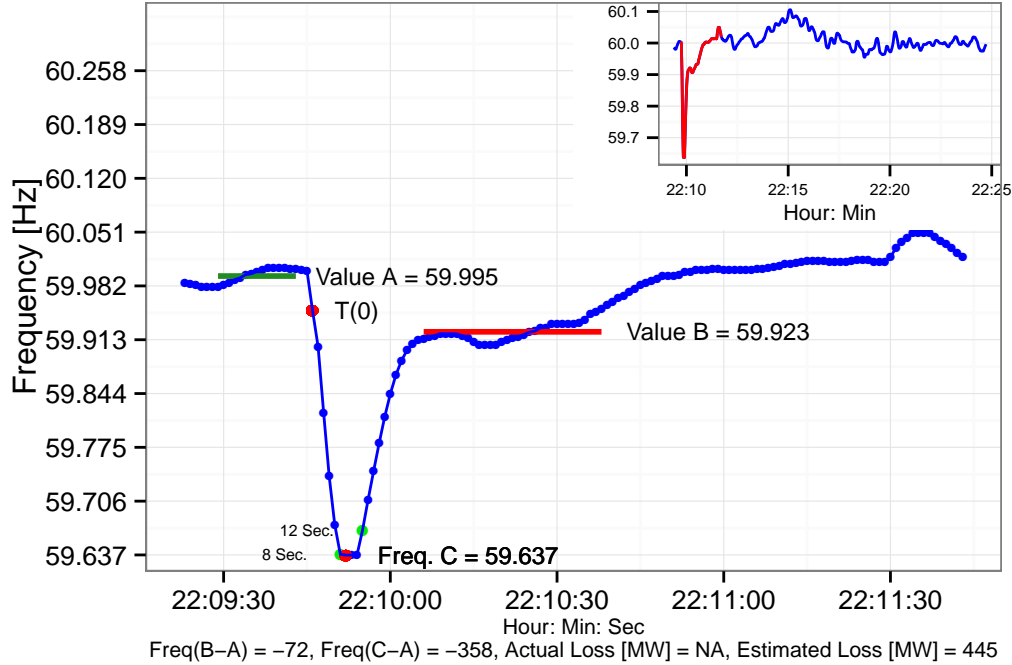
HI 2013-08-15 21:22:10 EVENT



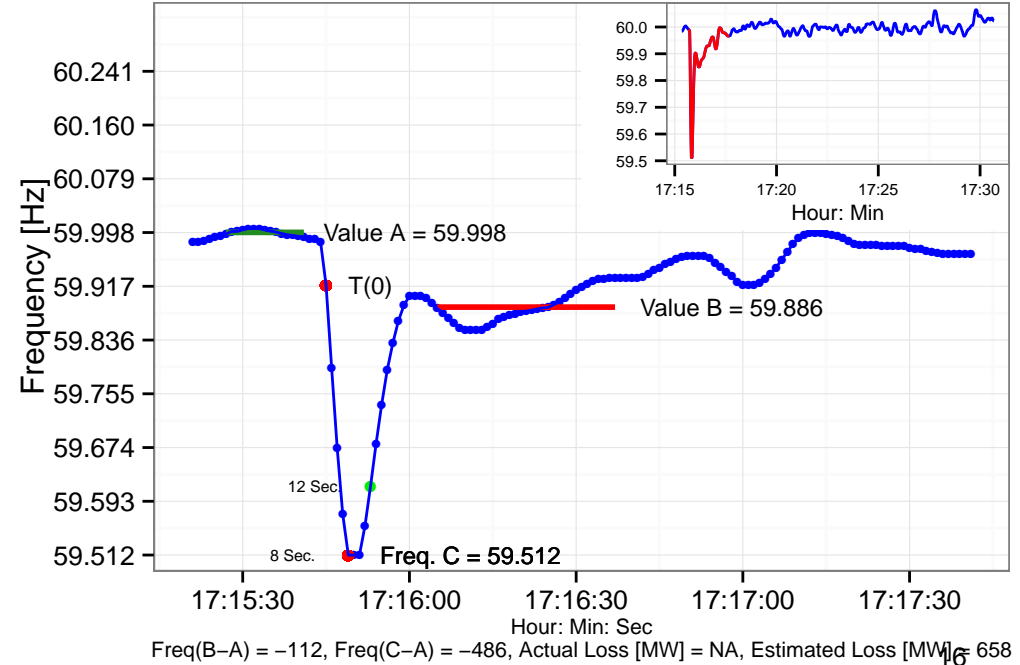
HI 2013-08-15 21:28:24 EVENT



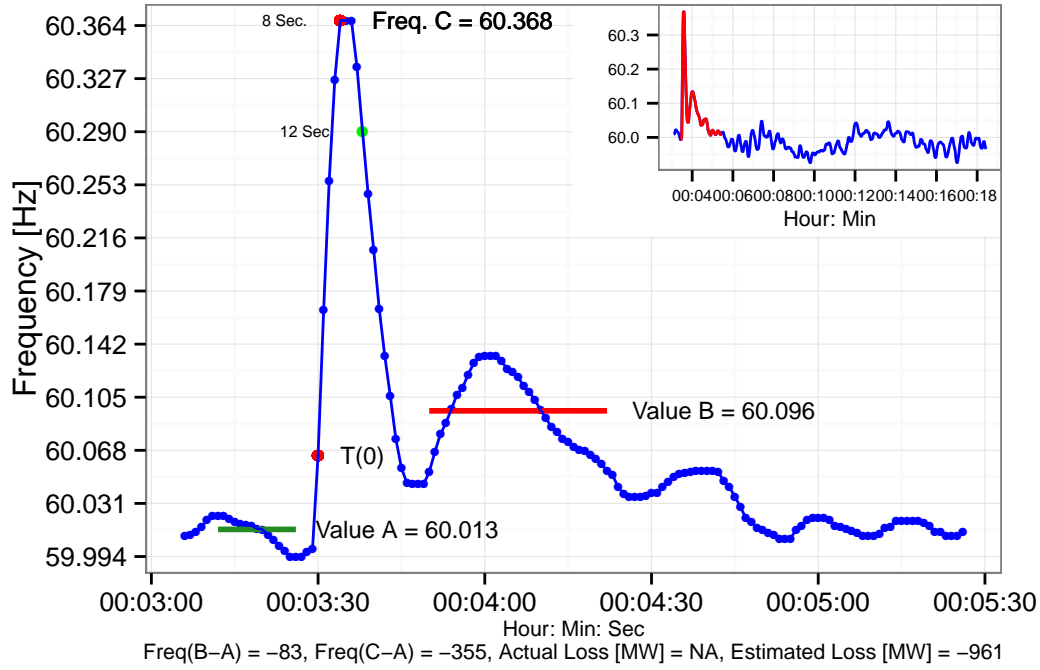
HI 2013-08-21 22:09:43 EVENT



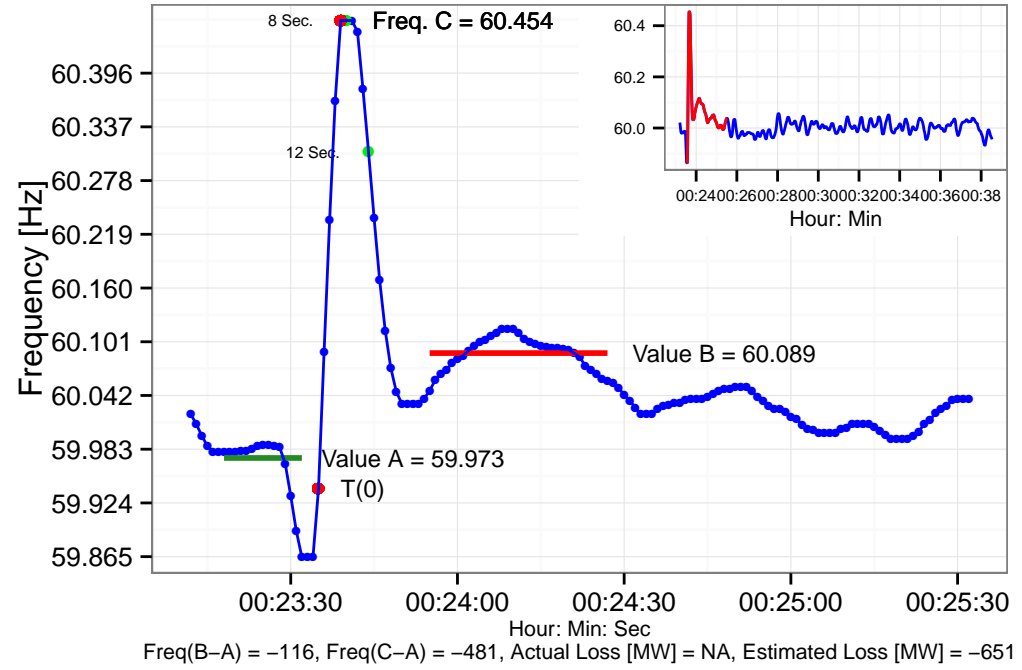
HI 2013-08-23 17:15:41 EVENT



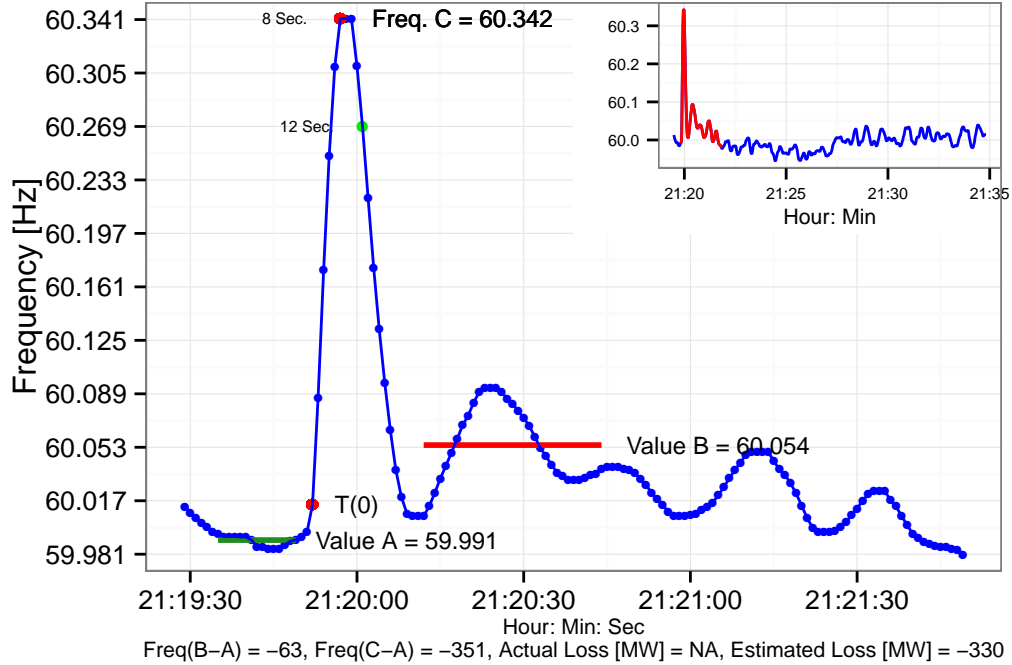
HI 2013-08-24 00:03:26 EVENT



HI 2013-08-24 00:23:32 EVENT



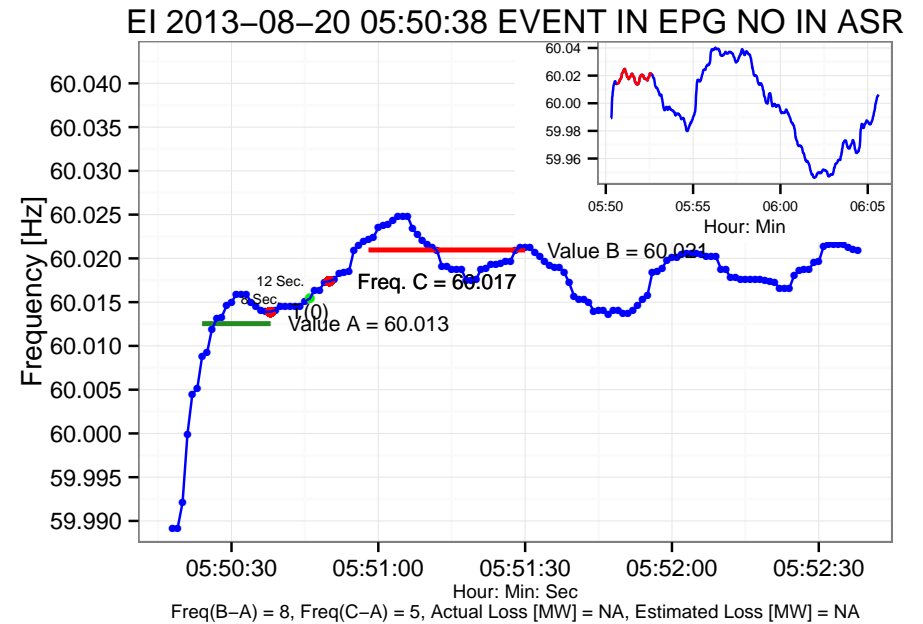
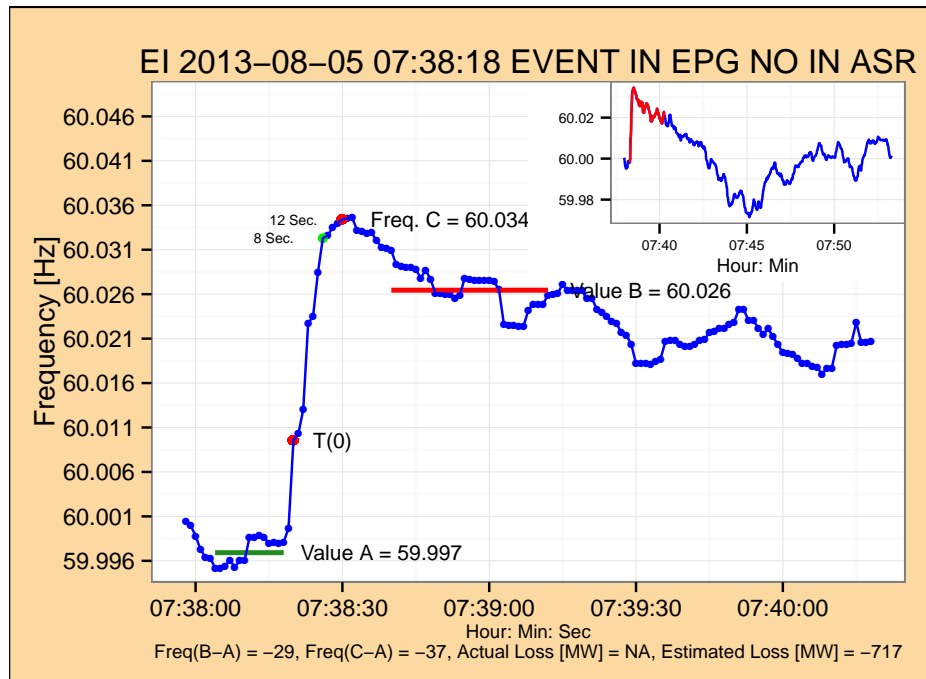
HI 2013-08-25 21:19:49 EVENT



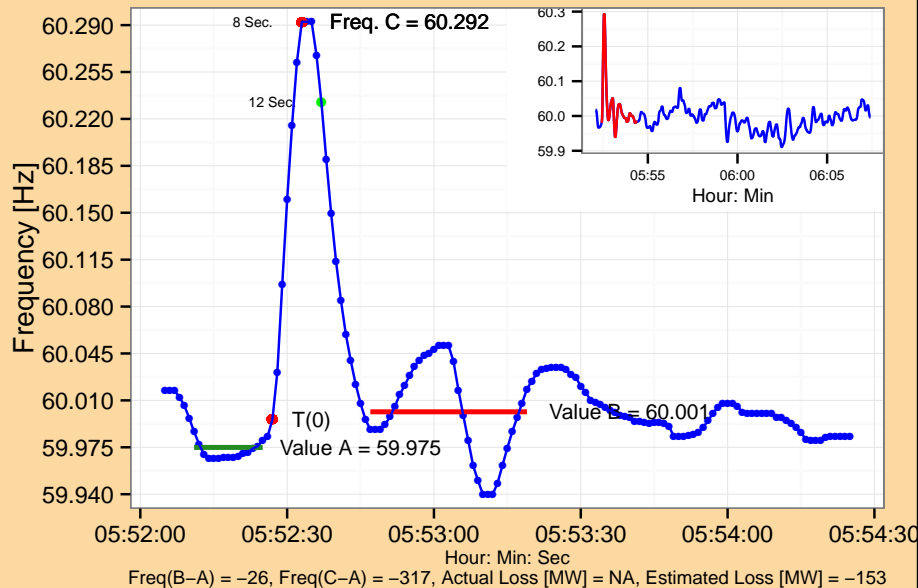
AUGUST 2013 - ASR/EPG EVENTS COMPARISON

| Event Date - Time | Event In EPG | Event In ASR | Observations (To be Defined) |
|---------------------|--------------|--------------|--|
| EASTERN | | | |
| 2013-08-05 07:38:19 | Yes | No | event identified by ASR but with criteria of 36 mhz |
| 2013-08-20 05:50:38 | Yes | No | |
| WESTERN | | | |
| ERCOT | | | |
| HYDROQUEBEC | | | |
| 2013-08-02 05:52:27 | Yes | No | event identified by ASR but with criteria of 300 mhz |
| 2013-08-10 12:09:30 | Yes | No | event identified by ASR but with criteria of 300 mhz |
| 2013-08-15 21:23:23 | Yes | No | event identified by ASR but with criteria of 300 mhz |
| 2013-08-26 09:45:24 | Yes | No | event identified by ASR but with criteria of 300 mhz |
| 2013-08-28 08:21:52 | Yes | No | event identified by ASR but with criteria of 300 mhz |
| 2013-08-29 18:25:52 | Yes | No | event identified by ASR but with criteria of 300 mhz |

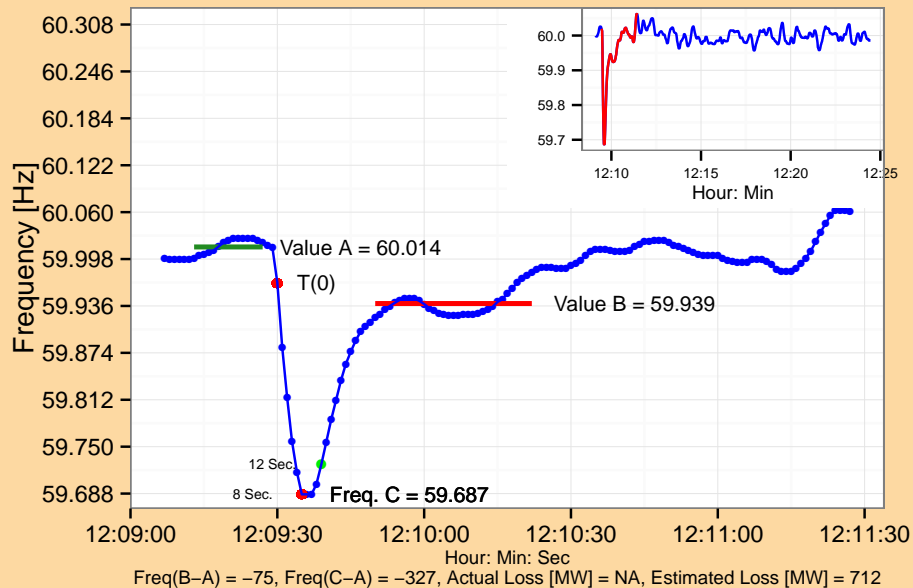
EVENTS IDENTIFIED BY ASR BUT NOT IN EPG REPORT AND EVENTS IDENTIFIED BY EPG BUT NO IN ASR REPORT



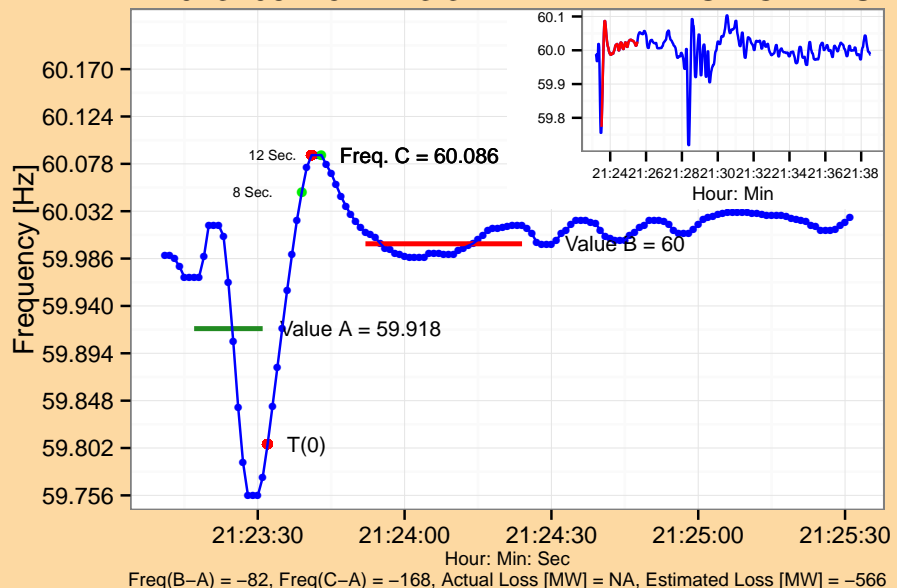
HI 2013-08-02 05:52:25 EVENT IN EPG NO IN ASR



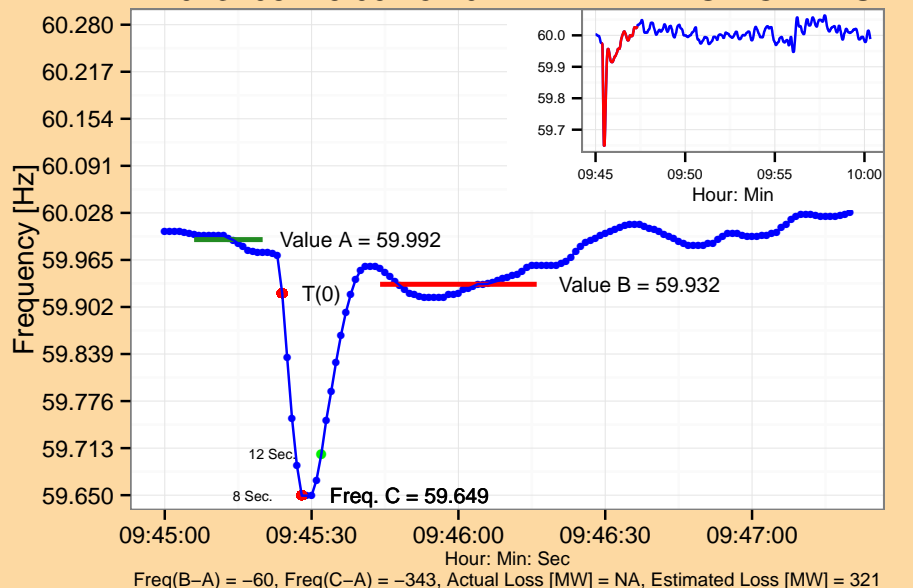
HI 2013-08-10 12:09:27 EVENT IN EPG NO IN ASR



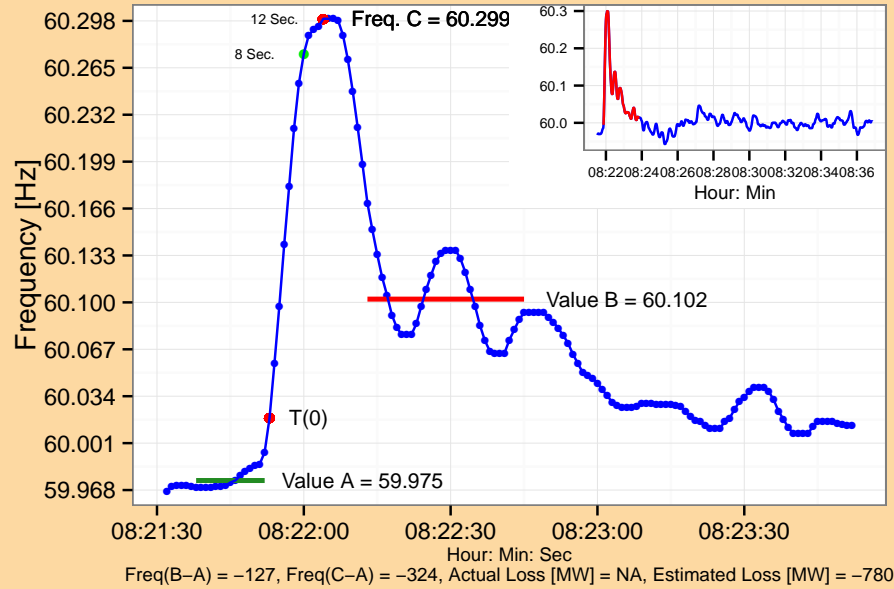
HI 2013-08-15 21:23:31 EVENT IN EPG NO IN ASR



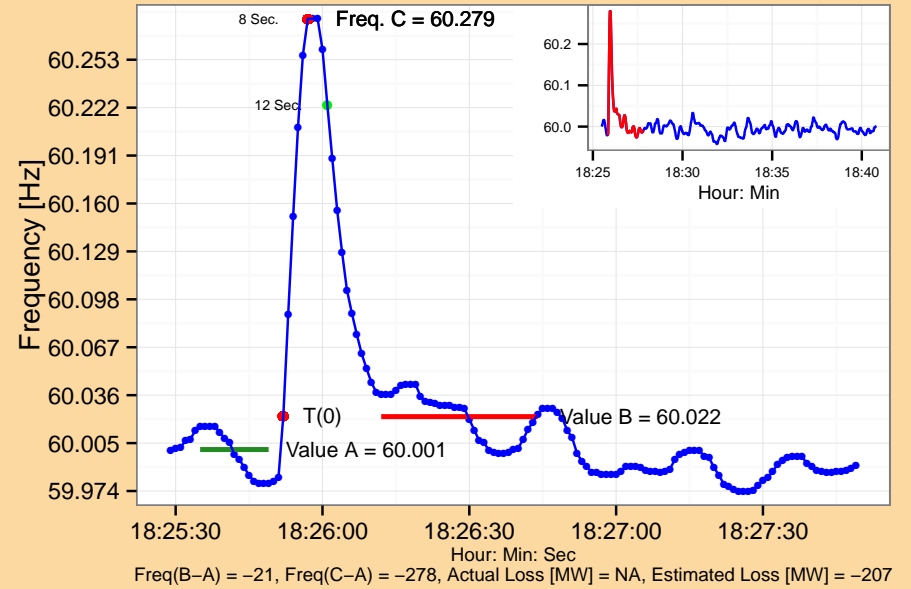
HI 2013-08-26 09:45:20 EVENT IN EPG NO IN ASR



HI 2013-08-28 08:21:52 EVENT IN EPG NO IN ASR



HI 2013-08-29 18:25:49 EVENT IN EPG NO IN ASR



AUGUST 2013 - ASR/EPG EVENTS COMPARISON

| Report - ASR | | | | | Report - EPG | | | | |
|--|-------------------------------------|--------------------------------------|---------------------------------------|-----------------------------------|---|-------------------------------------|--------------------------------------|---------------------------------------|-----------------------------------|
| Local Time (Event Start) Date / Time (MM/DD/YY HH:MM:SS) | A Value (t-16 to t-1) Average | B Value (t+20 to t+52) Average | Point C (w/in 12 sec after t-0) | CERTS Column MW Estimate | Local Time (t-0) Date / Time (MM/DD/YY HH:MM:SS) | A Value (t-16 to t-1) Average | B Value (t+20 to t+52) Average | Point C (w/in 12 sec after t-0) | CERTS Column MW Estimate |
| EASTERN | | | | | EASTERN | | | | |
| 2013-08-04 21:00:54 | 59.988 | 59.945 | 59.945 | 905 | 2013-08-04 21:00:55 | 59.988 | 59.945 | 59.945 | 904 |
| 2013-08-05 07:38:19 | NA | NA | NA | NA | 2013-08-05 07:38:19 | 59.997 | 60.027 | 60.034 | -723 |
| 2013-08-08 14:01:54 | 60.001 | 59.950 | 59.945 | 1322 | 2013-08-08 14:01:56 | 60 | 59.95 | 59.945 | 1317 |
| 2013-08-09 21:18:33 | 60.013 | 59.959 | 59.965 | 545 | 2013-08-09 21:18:37 | 60.012 | 59.959 | 59.964 | 961 |
| 2013-08-18 12:03:35 | 59.996 | 59.960 | 59.961 | 584 | 2013-08-18 12:04:02 | 59.963 | 59.955 | 59.957 | 426 |
| 2013-08-19 14:14:03 | 59.978 | 59.931 | 59.936 | 816 | 2013-08-19 14:14:04 | 59.978 | 59.931 | 59.936 | 1246 |
| 2013-08-20 05:50:38 | NA | NA | NA | NA | 2013-08-20 05:50:38 | 59.982 | 60.019 | 60.016 | -595 |
| 2013-08-30 11:56:30 | 60.006 | 59.964 | 59.969 | 960 | 2013-08-30 11:56:31 | 60.006 | 59.964 | 59.966 | 1115 |
| 2013-08-31 13:15:55 | 59.992 | 59.953 | 59.960 | 967 | 2013-08-31 13:15:56 | 59.991 | 59.953 | 59.96 | 906 |
| WESTERN | | | | | WESTERN | | | | |
| 2013-08-03 02:50:43 | 59.987 | 59.913 | 59.892 | 405 | 2013-08-03 02:50:47 | 59.984 | 59.913 | 59.892 | 546 |
| 2013-08-03 20:45:43 | 60.011 | 59.974 | 59.919 | 405 | 2013-08-03 20:45:44 | 60.011 | 59.974 | 59.919 | 376 |
| 2013-08-04 00:59:10 | 59.983 | 59.921 | 59.903 | 499 | 2013-08-04 00:59:13 | 59.983 | 59.921 | 59.903 | 499 |
| 2013-08-07 15:23:01 | 60.010 | 59.956 | 59.944 | 296 | 2013-08-07 15:23:02 | 60.01 | 59.956 | 59.944 | 296 |
| 2013-08-08 18:53:50 | 60.004 | 59.921 | 59.869 | 770 | 2013-08-08 18:53:50 | 60.004 | 59.919 | 59.869 | 776 |
| 2013-08-10 16:46:06 | 59.998 | 59.924 | 59.904 | 672 | 2013-08-10 16:46:07 | 59.998 | 59.924 | 59.904 | 672 |
| 2013-08-11 17:40:05 | 60.001 | 59.943 | 59.905 | 611 | 2013-08-11 17:40:06 | 60 | 59.943 | 59.905 | 565 |
| 2013-08-13 15:30:09 | 59.991 | 59.951 | 59.907 | 525 | 2013-08-13 15:30:11 | 59.991 | 59.951 | 59.907 | 494 |
| 2013-08-13 15:56:04 | 60.007 | 59.970 | 59.933 | 494 | 2013-08-13 15:56:05 | 60.008 | 59.97 | 59.933 | 466 |
| 2013-08-18 16:03:49 | 59.997 | 59.890 | 59.833 | 927 | 2013-08-18 16:03:50 | 59.997 | 59.89 | 59.833 | 928 |
| ERCOT | | | | | ERCOT | | | | |
| 2013-08-02 15:34:37 | 59.982 | 59.860 | 59.832 | 793 | 2013-08-02 15:34:41 | 59.981 | 59.86 | 59.832 | 935 |
| 2013-08-11 05:43:09 | 60.003 | 59.907 | 59.856 | 367 | 2013-08-11 05:43:12 | 60.008 | 59.907 | 59.856 | 852 |
| 2013-08-12 02:57:35 | 59.970 | 59.898 | 59.826 | 278 | 2013-08-12 02:57:40 | 59.972 | 59.898 | 59.826 | 764 |
| 2013-08-16 16:02:31 | 60.002 | 59.927 | 59.910 | 583 | 2013-08-16 16:02:33 | 60.002 | 59.927 | 59.91 | 780 |
| 2013-08-16 16:33:47 | 59.963 | 59.918 | 59.899 | 578 | 2013-08-16 16:33:50 | 59.962 | 59.918 | 59.899 | 526 |
| 2013-08-18 16:45:07 | 60.006 | 59.895 | 59.867 | 450 | 2013-08-18 16:45:10 | 60.002 | 59.895 | 59.867 | 886 |
| 2013-08-20 14:18:42 | 60.004 | 59.923 | 59.894 | 539 | 2013-08-20 14:18:45 | 60.006 | 59.923 | 59.894 | 728 |
| 2013-08-24 01:47:05 | 60.008 | 59.953 | 59.922 | 437 | 2013-08-24 01:47:08 | 60.01 | 59.953 | 59.922 | 823 |
| 2013-08-24 18:45:43 | 59.968 | 59.887 | 59.849 | 837 | 2013-08-24 18:45:44 | 59.969 | 59.887 | 59.849 | 504 |
| 2013-08-25 06:56:52 | 60.020 | 59.954 | 59.927 | 263 | 2013-08-25 06:56:56 | 60.019 | 59.954 | 59.927 | 888 |
| 2013-08-29 18:54:57 | 59.972 | 59.912 | 59.880 | 496 | 2013-08-29 18:54:58 | 59.971 | 59.912 | 59.88 | 811 |
| HYDRO QUEBEC | | | | | HYDRO QUEBEC | | | | |
| 2013-08-02 05:52:27 | NA | NA | NA | NA | 2013-08-02 05:52:27 | 59.972 | 60.001 | 60.292 | -76 |

AUGUST 2013 - ASR/EPG EVENTS COMPARISON

| Local Time (Event Start) Date / Time (MM/DD/YY HH:MM:SS) | Report - ASR | | | | Local Time (t-0) Date / Time (MM/DD/YY HH:MM:SS) | Report - EPG | | | |
|--|-------------------------------------|--------------------------------------|---------------------------------------|-----------------------------------|---|-------------------------------------|--------------------------------------|---------------------------------------|-----------------------------------|
| | A Value (t-16 to t-1) Average | B Value (t+20 to t+52) Average | Point C (w/in 12 sec after t-0) | CERTS Column MW Estimate | | A Value (t-16 to t-1) Average | B Value (t+20 to t+52) Average | Point C (w/in 12 sec after t-0) | CERTS Column MW Estimate |
| 2013-08-03 06:47:54 | 59.981 | 60.200 | 60.780 | -1206 | 2013-08-03 06:47:57 | 59.983 | 60.2 | 60.78 | -368 |
| 2013-08-03 08:37:40 | 60.014 | 60.069 | 60.399 | -391 | 2013-08-03 08:37:43 | 60.017 | 60.069 | 60.399 | NA |
| 2013-08-05 15:10:34 | 60.023 | 59.521 | 58.799 | 3043 | 2013-08-05 15:10:39 | 60.009 | 59.521 | 58.799 | 280 |
| 2013-08-07 20:27:23 | 60.035 | 60.045 | 60.349 | -281 | 2013-08-07 20:27:26 | 60.019 | 60.045 | 60.349 | -183 |
| 2013-08-10 12:09:30 | NA | NA | NA | NA | 2013-08-10 12:09:30 | 60.017 | 59.939 | 59.687 | NA |
| 2013-08-15 21:22:10 | 60.015 | 60.028 | 59.722 | -213 | 2013-08-15 21:22:12 | 60.029 | 60.028 | 59.722 | 26 |
| 2013-08-15 21:23:23 | NA | NA | NA | NA | 2013-08-15 21:23:23 | 59.989 | 60.009 | 59.756 | NA |
| 2013-08-15 21:28:24 | 59.899 | 59.985 | 60.092 | -471 | 2013-08-15 21:28:17 | 59.972 | 59.988 | 59.719 | 99 |
| 2013-08-21 22:09:43 | 59.995 | 59.923 | 59.637 | 445 | 2013-08-21 22:09:46 | 59.999 | 59.923 | 59.637 | 489 |
| 2013-08-23 17:15:41 | 59.998 | 59.886 | 59.512 | 658 | 2013-08-23 17:15:45 | 59.996 | 59.886 | 59.512 | 118 |
| 2013-08-24 00:03:26 | 60.013 | 60.096 | 60.368 | -961 | 2013-08-24 00:03:30 | 60.007 | 60.096 | 60.368 | -658 |
| 2013-08-24 00:23:32 | 59.973 | 60.089 | 60.454 | -651 | 2013-08-24 00:23:35 | 59.952 | 60.089 | 60.454 | -1156 |
| 2013-08-25 21:19:49 | 59.991 | 60.054 | 60.342 | -330 | 2013-08-25 21:19:52 | 59.99 | 60.054 | 60.342 | -149 |
| 2013-08-26 09:45:24 | NA | NA | NA | NA | 2013-08-26 09:45:24 | 59.986 | 59.932 | 59.649 | 201 |
| 2013-08-28 08:21:52 | NA | NA | NA | NA | 2013-08-28 08:21:52 | 59.975 | 60.105 | 60.299 | NA |
| 2013-08-29 18:25:52 | NA | NA | NA | NA | 2013-08-29 18:25:52 | 59.995 | 60.022 | 60.279 | -268 |

AUGUST 2013 DATA AVAILABILITY AND DATA QUALITY

| Interconnection | Data Missing (Sec.) | | | | Total - Good - Bad Event | | | | Continous Period with Max Sec Lost | | |
|-----------------|---------------------|------------------------|----------------------|---------------------|--------------------------|-----------|----------------------|------------------------|------------------------------------|---------------------------|-----------------|
| | Total August | Total August Available | Total August Missing | % of August Missing | Total Candidate | Good Data | Events with Bad Data | % Events with Bad Data | From Period Missing Seconds | To Period Missing Seconds | Missing Seconds |
| | Seconds | Seconds | Seconds | Seconds | Events | Events | Data | | | | |
| EASTERN | 2678400 | 2677902 | 498 | 0.02 | 7 | 7 | 0 | 0 | 2013-08-15 15:18:12 | 2013-08-15 15:25:17 | 425 |
| WESTERN | 2678400 | 2678381 | 19 | 0 | 10 | 10 | 0 | 0 | 2013-08-12 07:21:28 | 2013-08-12 07:21:48 | 20 |
| ERCOT | 2678400 | 2678383 | 17 | 0 | 11 | 11 | 0 | 0 | 2013-08-12 09:21:28 | 2013-08-12 09:21:46 | 18 |
| HYDRO QUEBEC | 2678400 | 2678383 | 17 | 0 | 20 | 11 | 9 | 45 | 2013-08-12 10:21:25 | 2013-08-12 10:21:43 | 18 |
| TOTAL | 10713600 | 10713049 | 551 | 0.01 | 48 | 39 | 9 | 18.75 | NA | NA | 481 |

EVENTS WITH BAD DATA

| UTC (t-0) Date / Time (MM/DD/YY HH:MM:SS) | Local Time (t-0) Date / Time Day (MM/DD/YY HH:MM:SS) | | Time Zone | A Value Freq Error (from 60) | A Value (t-16 to t-1) Average | valueB (t+20 to t+52) Average | Hz Delta B-A | Point C (w/in 12 sec. after t-0) | Hz Delta C-A | Interconnection Bias Setting MW/0.1 Hz | Loss MW Estimate | Frequency Response Estimate |
|--|--|-----|--------------|------------------------------------|-------------------------------------|-------------------------------------|-----------------|--|-----------------|--|---------------------|-----------------------------------|
| EASTERN | | | | | | | | | | | | |
| WESTERN | | | | | | | | | | | | |
| ERCOT | | | | | | | | | | | | |
| HYDROQUEBEC | | | | | | | | | | | | |
| 2013-08-02 09:52:35 | 2013-08-02 05:52:35 | Fri | EDT | 0.071 | 60.071 | 60.009 | -0.062 | 59.988 | -0.083 | 448 | 338 | -545 |
| 2013-08-08 00:27:33 | 2013-08-07 20:27:33 | Wed | EDT | 0.095 | 60.095 | 60.048 | -0.047 | 60.027 | -0.068 | 448 | 471 | -1002 |
| 2013-08-26 13:45:30 | 2013-08-26 09:45:30 | Mon | EDT | -0.107 | 59.893 | 59.937 | -0.044 | 59.957 | -0.064 | 448 | -239 | -543 |