

EVENT DETAILS

On February 18th, 2014, at about 8:30 am, after logging on into RTDMS system, ERCOT Operations Engineers noticed oscillations on the RTDMS displays as shown in Figure 1. On analysis, it was found that the oscillations were showing up only at Line 1@West 4 PMU as shown in Figure 2a and Figure 2b. ERCOT looked at the generation at the Hydro Unit close to West 4 PMU. It was generating about 25 MW (Figure 3). It was found that when the unit went offline at about 10:00 am, the oscillations died down as shown in Figure 4. It was noticed that, when the second unit at the same plant was running there were no oscillations observed. Oscillations showed up again on February 27th, 2014 when Unit 1 came online, as shown in Figure 5a and Figure 5b. Analysis of these oscillations using Phasor Grid Dynamics Analyzer (PGDA) tool indicated that the dominant mode that was present was 1.8 Hz as shown in Figure 6a and 6b. ERCOT discussed with the power plant operators to find the root cause of these oscillations with one of the units of the plant. It was confirmed that they could also see the oscillations for that unit. It was then decided that the plant operators would change some of the control cards for the problematic unit and test to see if it would solve the problem. Usually they operate the units alternatively. Since ERCOT was going through some severe weather conditions, the plant operators decided to operate only the good unit until ERCOT passed through this severe weather conditions. On March 5th, when weather conditions were good, Unit 1 (for which some of the control cards had been replaced) was brought online at about 4:00 pm (Figure 7). It was found that the oscillations were significantly reduced, as shown in Figure 7a, Figure 7b and Figure 7c after the control cards were replaced.



Figure 1: Frequency oscillations on RTDMS System on February 18th, 2014.

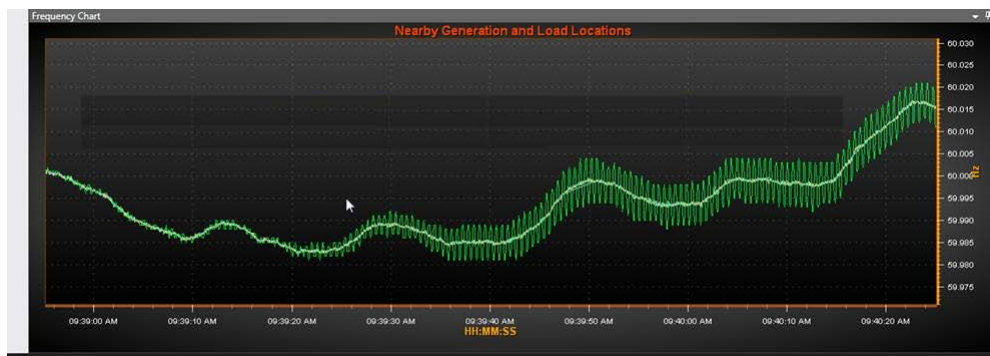


Figure 2a: Frequency Oscillations in West 4 PMU on February 18th, 2014.

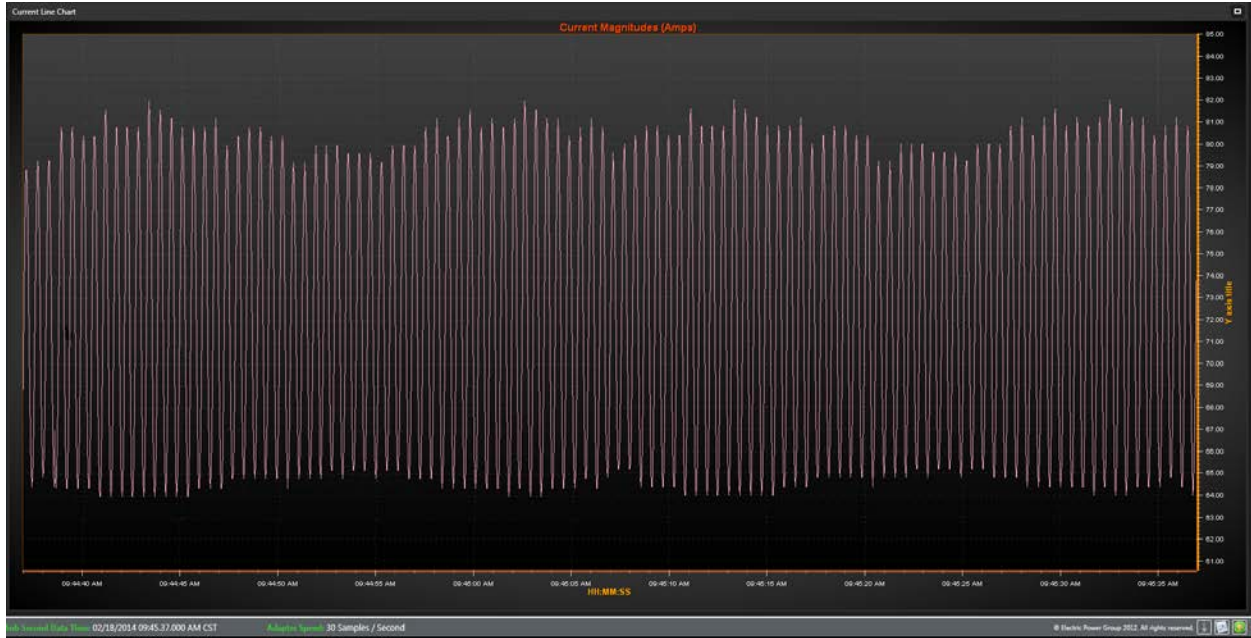


Figure 2b: Current oscillations on West 4 PMU on February 18th, 2014.

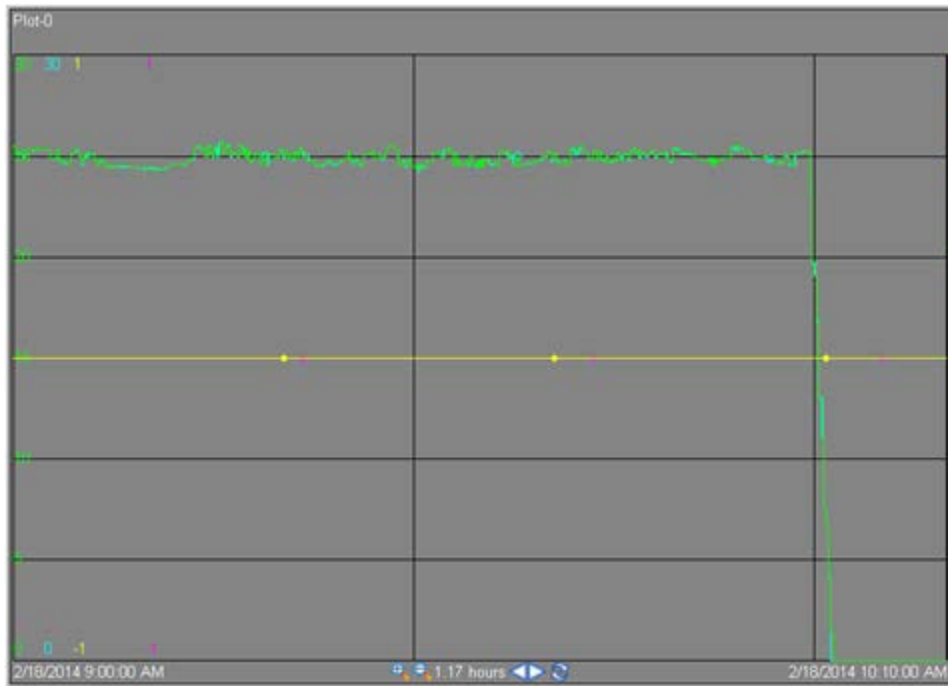
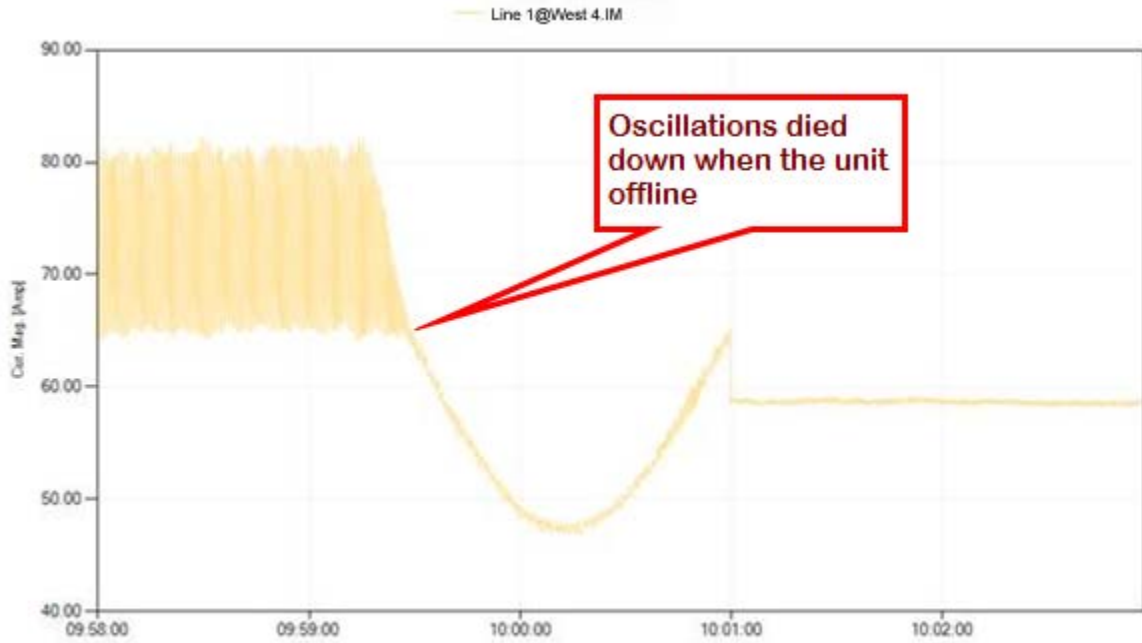
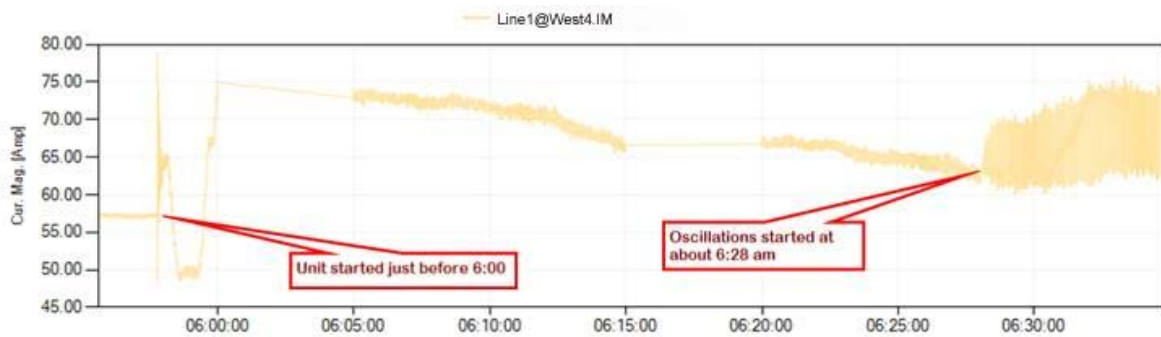


Figure 3: EMS trend for generation at the power plant on February 18th, 2014 at 10:00 am



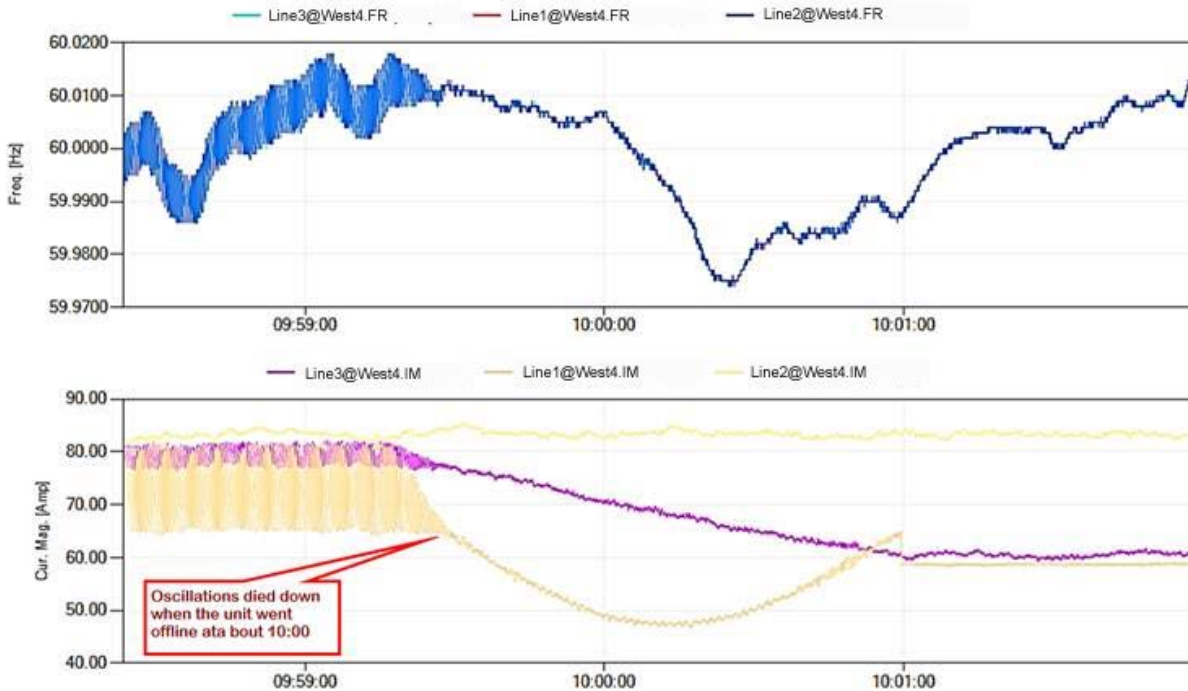
Start Time: 2014-02-18 09:58:00.000 | End Time: 2014-02-18 10:02:57.291 | Reference: 1

Figure 4: Current Oscillations when the unit went off line on February 18th, 2014 at 10:00 am



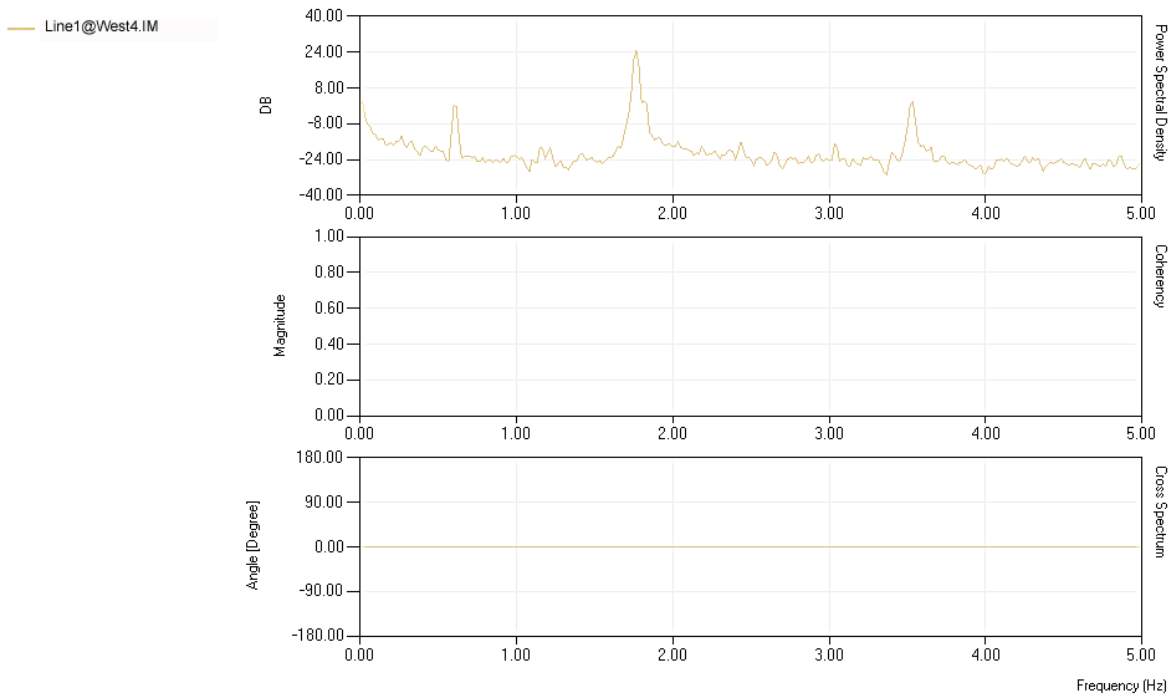
Start Time: 2014-02-18 05:55:37.911 | End Time: 2014-02-18 06:34:46.943 | Reference: 1

Figure 5a: Oscillations on February 27th, 2014



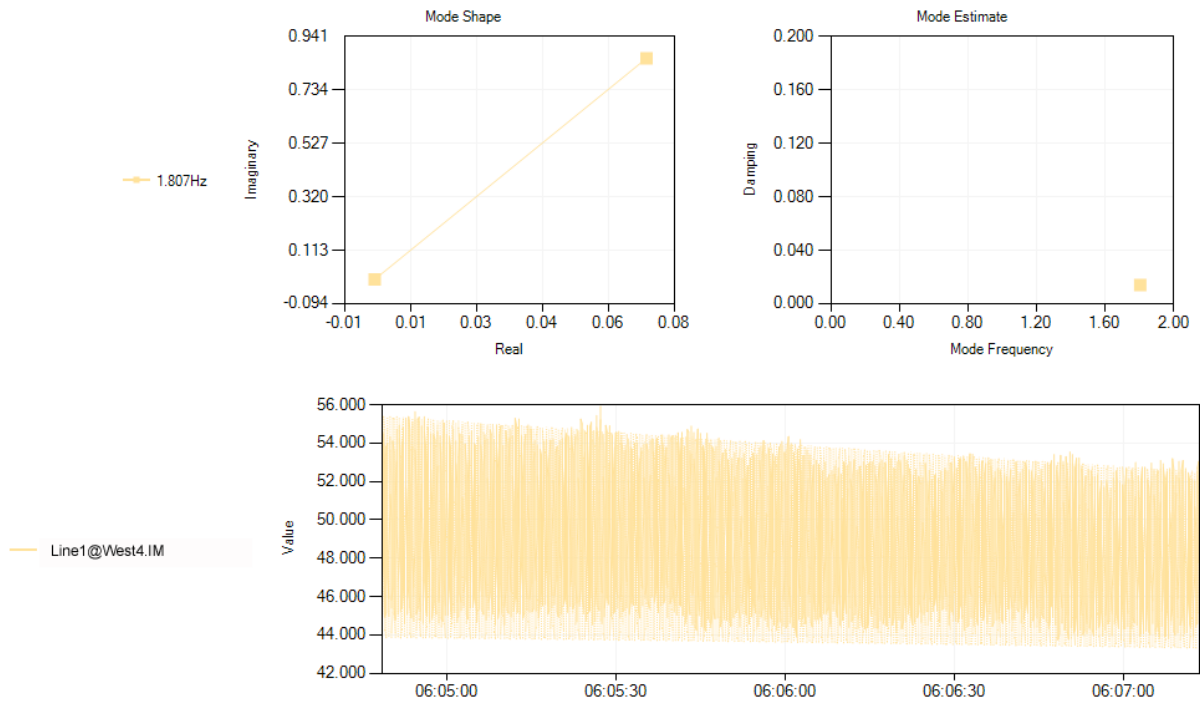
Start Time: 2014-02-18 09:58:23.586 End Time: 2014-02-18 10:01:58.913 Reference: #

Figure 5b: Oscillations when the unit went off line on February 27th, 2014 at 9:59 am



Start Time: 2014-02-27 06:03:16.125 End Time: 2014-02-27 06:07:13.501 Reference: Line1@West4.IM

Figure 6a: Modal Analysis of the current data using PGDA on February 27th, 2014.



Start Time: 2014-02-27 06:04:48.438 | End Time: 2014-02-27 06:07:13.501 | Reference: 0

Figure 6b: Modal Analysis of the current data using PGDA on February 27th, 2014.

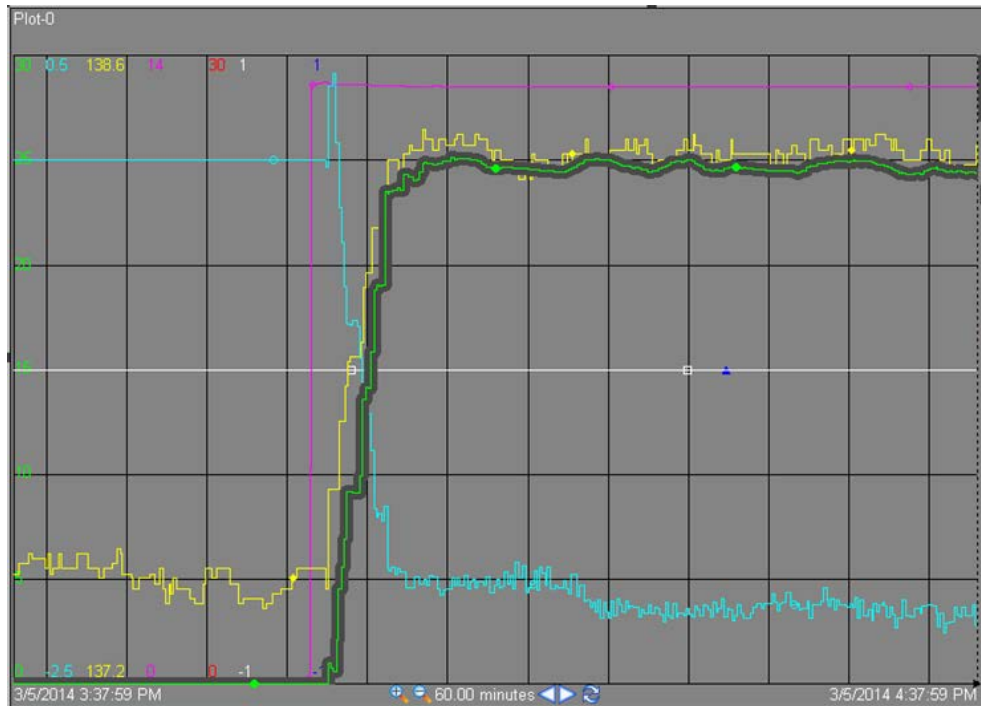


Figure 7: EMS display showing Unit 1 coming online at 4 pm on March 5th, 2014

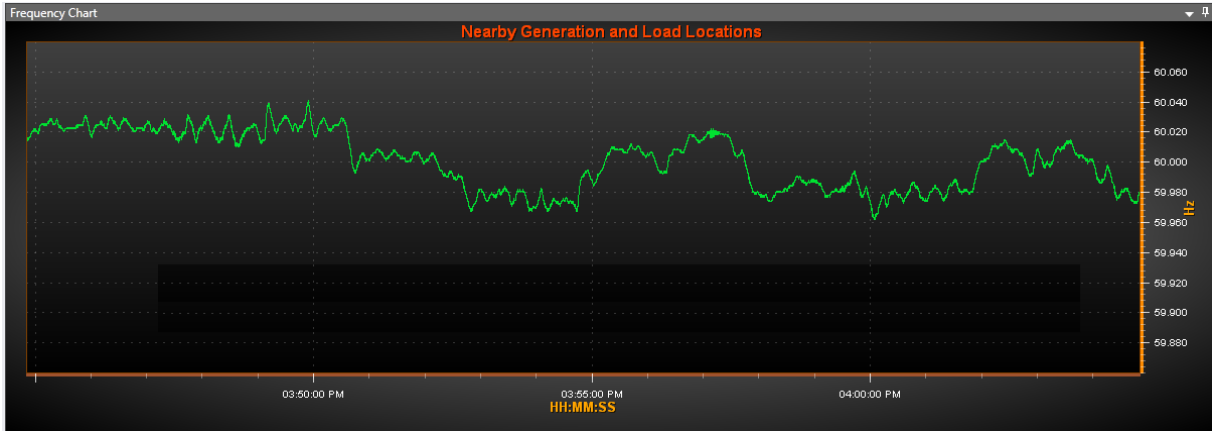
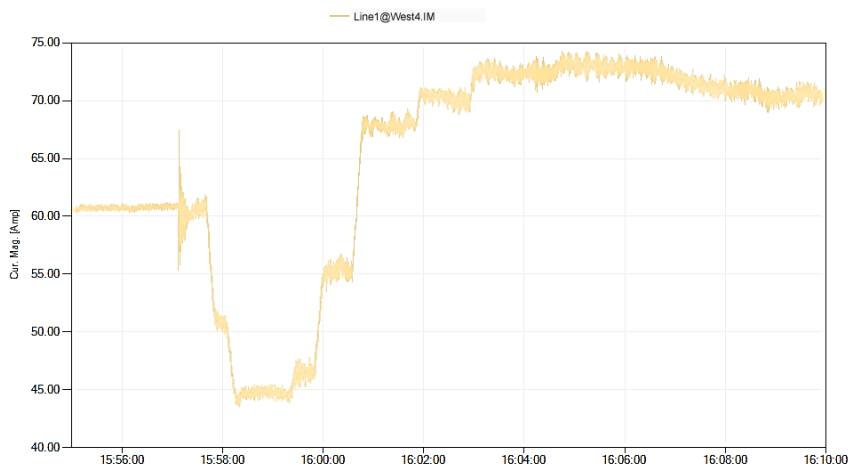
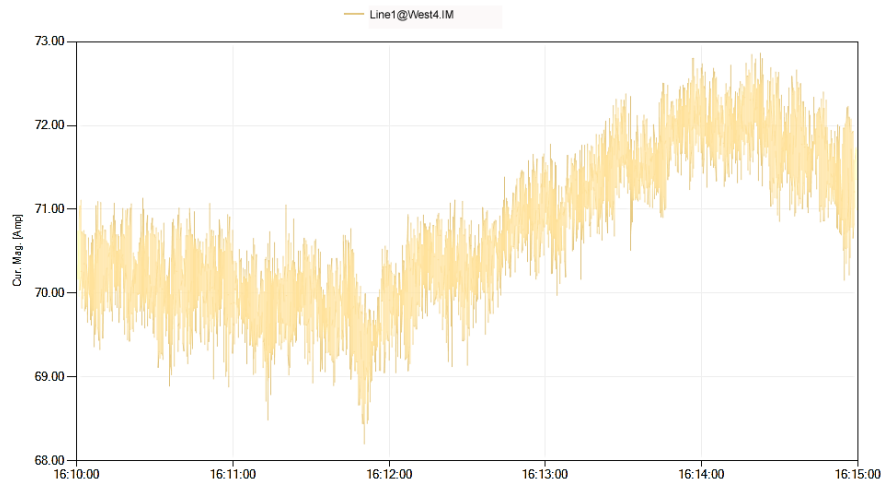


Figure 8a : Frequency display on RTDMS on March 5th, 2014



Start Time: 2014-03-05 15:55:00.0000 End Time: 2014-03-05 16:10:00.0000 Reference: 0

Figure 7b: Current display on PGDA on March 5th, 2014



Start Time: 2014-03-05 16:10:00.0000 End Time: 2014-03-05 16:15:00.0000 Reference: 0

Figure 7c: Current display on PGDA on March 5th, 2014