

Under Frequency Throughout the Entire US Western Grid: PQube 3's Capture Every Detail

PQube®3 Technical Note (Revision 2.1)



On March 3rd at 13:04 PM PST (Pacific Time), a major event, a big generator in the Northwestern US states disconnected from the US Western Grid. This disconnection created, for a couple of minutes, a sustained deviation of the grid mains frequency.

The nominal frequency in the US is 60Hz. However, if we look carefully at the measurements during a day, the frequency varies as the generation of power and the load consumption balance across the grid. An excess of power generated compared to the demand will drive the frequency above nominal, and an excess of power consumed compared to the available power will drive the frequency below nominal.

The figure 2 shows how the frequency changes during a day – usually with variations up to 80mHz above and below the nominal. The March 3rd event brought down the frequency to 59.793Hz – a deviation of 207mHz.

Although frequency excursions of a few hundreds of milli-Hertz are common in islanded networks (e.g. Dominican Republic, Azores islands...), this is a rather rare event on large interconnected grids, such as in US or in Europe.



Figure 1 The Western US Transmission grid

The PQube3 generates and sends you a frequency trend every day. This graph is sent directly to your mail box – No software required! PQube3's have all spotted the under frequency at 3:04PM, and have recorded the excursion as the minimum value reached during that day.

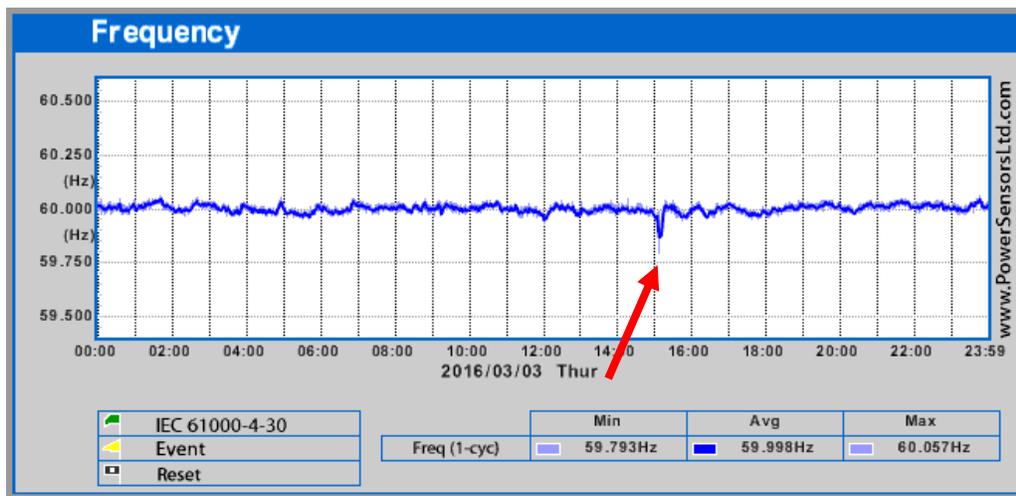


Figure 2 PQube3 records the trends, min and max values during the day, everyday...

What is remarkable is that PQube3's installed all across the Western grid, from Seattle in Washington State to San Diego in Southern California have captured the under frequency event with an amazing consistency.

Seattle and San Francisco Bay area PQube3s have a minimum of respectively 59.794Hz and 59.793Hz.

The PQube3 in San Diego PQube3 has recorded a minimum of 59.792Hz. All of those measurements agree within one or two mHz

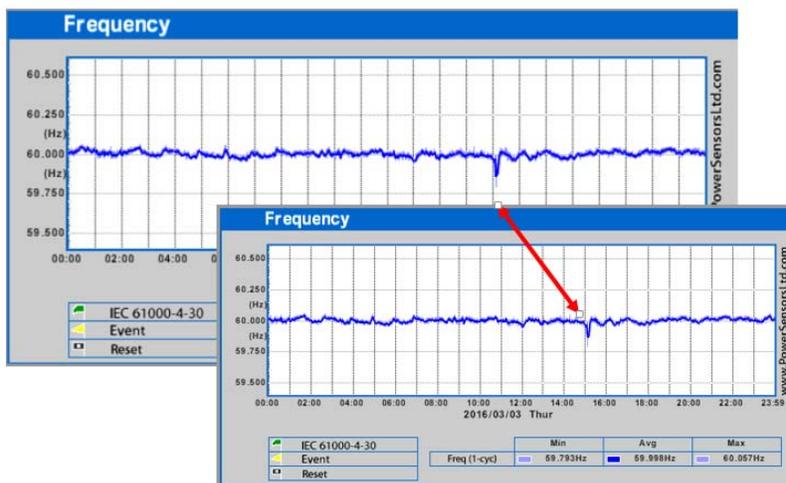


Figure 3 PQube 3's in San Diego and Alameda (San Francisco bay) record the same deviation to the mHz

The PQube3 in Alameda was configured with a tight frequency deviation threshold and triggered the following under-frequency event:

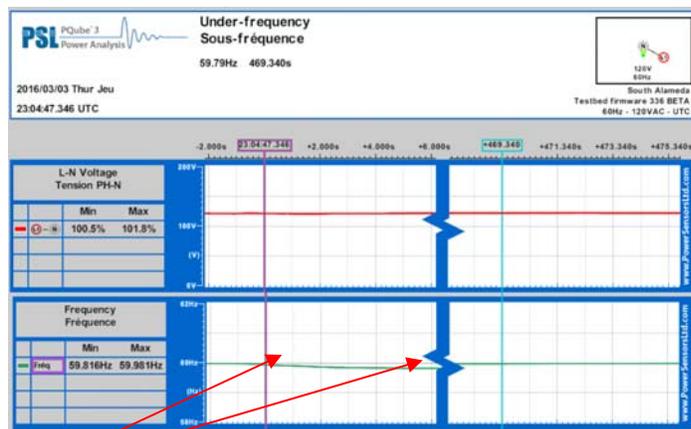
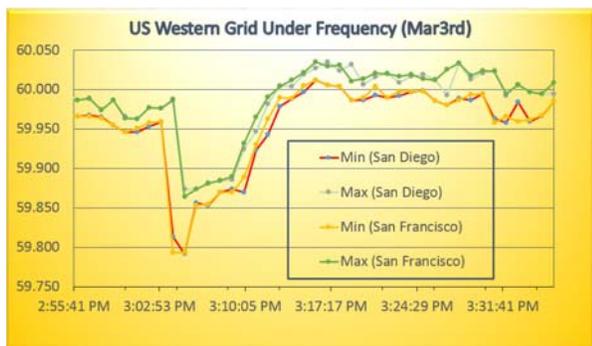


Figure 4 PQube 3 triggered and recorded an under frequency event

The sudden excursion of 200mHz over the course of just of few seconds is clearly visible.

More information

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