

Case Study

Advanced Phasor Measurement Unit (PMU) For The Cafayate Solar Park Argentina



Unlike conventional grids, where energy suppliers have synchronous generators to support their stability, grids with renewable energy sources require a lot more to attain stability in case of interruptions.

Basic Phasor Measurement Units (PMU) in the smart grid are the sensing devices strategically placed in order to capture power system phasors using a common time source for synchronization. The process is usually done over wide geographical areas, through global positioning system enabled time-stamping. The data obtained from the device form the basis of all monitoring and control actions for wide-area measurement systems. The resulting measurement is known as a synchrophasor. A PMU is the structured form of a wide-area measurement system.

Unlike typical scalars power parameters such RMS and harmonics, synchrophasor outputs are vectors comprised from both magnitude and phase measurement. The errors can occur from either the magnitude or the phase, or both. Therefore, the PMU ability to measure synchrophasors at high resolution is crucial to the dynamic monitoring in the energy supply system.

Phasor Measurement Challenges in Solar Farms

A typical PMU can report 2 parameters, amplitude and phase, of the fundamental frequency with a resolution of up to 2 measurements per network cycle. This is not enough for the solar requirements. Connecting solar systems to the grid, comes with power quality challenges such as: frequency and voltage anomalies, overloading of existing transmission lines and demand and supply mismatch, which can be a source of problem to the energy producers and consumers.

Elspec solution with its continuous waveform recording extends the synchrophasor data to non-fundamental frequencies, reporting 5,000 power parameters per 1/2 cycle resolution. This capability enables solar farm operators not only to comply with the grid standards and requirements, but also to get the most accurate investigation and presentation of all electrical parameters based on the applicable industry standards.



The Cafayate Solar Park Case

Cafayate Solar PV Park is a 100.1MW solar plant in Argentina and part of the government's RenovAr program for renewable energy resources expedition launched in 2019. The Cafayate Solar Park is spread over an area of 180 hectares and has a 20-year power purchase agreement with CAMMESA, the national wholesale power market administrator of Argentina.

Elspec Phasor Measurement Unit, The G5PMU, equipped with Elspec unique [PQSCADAD Sapphire](#) energy management software, was chosen to be installed in this project. With our agent, Computec SRL, we successfully installed the G5PMU in the customer's systems.

The solution has proven to be an invaluable aid to the operation of the plant generators and transmitters, because of the ability to monitor in real time and conduct historical research, using charts and other visualization tools.



Elspec G5PMU Advanced Phasor Measurement Unit

The [G5PMU](#) is an embedded phasor measurement unit with integrated PQZIP technology. It offers a Fault Recorder, a Power Quality Analyzer and a PMU functions all in one solution. The device continuously records and stores all waveform signals at sampling rate of 1,024 samples per cycle thanks to its PQZIP compression algorithm, enabling data analysis at any time.

The [PQSCADAD Sapphire](#) energy management software enable the user to see any event in a graphic way such as histograms and tables as well as statistical summaries of the stored parameters. The user can analyze sags/dips, swells, interruptions or any other type of power quality event easily.

Unique Features

- Complies with the most updated standard for power systems synchrophasor measurements IEEE C37.118-2011, including the amendment IEEE C37.118.1a-2014.
- Transmission rate of up-to 200/240 frame per second (50/60Hz), exceeding C37.118 Synchrophasor requirements for both M and P classes.
- Time accuracy higher than 1µs with GPS and PTP time sources.
- Modular design
- 7" touch LCD screen
- Scalable architecture
- Comprehensive web interface



PQ ZIP inside



Superior Transmission Rate



P&M Class Simultaneously



Synchronized Monitoring



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