




**SIEMENS**

*Ingenuity for life*



## Quality of supply and renewable energies

### High-quality, sustainable, renewable energy is necessary – and possible

The world needs to transition to safer, more affordable, low-carbon energy systems.

The climate and energy goals for 2020 and 2030 that were approved by the European Union can be achieved only through a vigorous expansion of renewable energies. At the same time, however, their efficiency and reliability are highly dependent on the quality of the electrical energy generated.

Practice has shown that technologies such as photovoltaics and wind power can have a negative effect on the quality of generated power. Consequently, as the share of renewables grows, so does the number of inverters – and thus the amount of higher frequency levels in the power grid (2 to 150 kHz).

The following phenomena and challenges must be overcome:

- **Voltage fluctuations** (related, for example, to weather or time of day) can cause plant shutdowns, decrease efficiency, and reduce the service life of electrical equipment. Such phenomena as flickering lights can also result.
- **Harmonics**, produced by inverters, can increase the risk of overheating in transformers and capacitor banks and can cause neutral conductor overload as well as protection device malfunctions.
- **Transients** and rapid changes in voltage caused, for example, by switching operations, can result in hardware failures, data losses, and

the destruction of power supply units.

#### The solution: energy monitoring with SICAM Power Quality and Measurement

First and foremost, overcoming these challenges requires precise measurements. Our SICAM P855, SICAM Q100, and SICAM Q200 multifunction measuring devices guarantee comprehensive monitoring of all relevant parameters in the electrical power supply system. In accordance with the IEC 61000-4-30 standard, all requisite power quality parameters are continually measured, stored, and analyzed.

Our SICAM PQS / SICAM PQ Analyzer software is available to efficiently process the measured data. Our software automatically analyzes archived PQ variables and results and provides users with comprehensive information on the extent of compliance with grid codes. In this way, it simplifies the identification and correction of system disruptions and contributes generally to greater transparency in the power supply.



**SICAM P855**

Device to record, display and analyze electrical variables in accordance with IEC 61000-4-30: **Class S**, EN 50160



**SICAM Q100**

Device to record, display and analyze electrical variables in accordance with IEC 61000-4-30: **Class A**, EN 50160



**SICAM Q200**

Device to record, display and analyze electrical variables in accordance with IEC 61000-4-30: **Class A**, EN 50160, recording and evaluation of high-frequency disruptions (2-150 kHz) and high-resolution transients

#### SICAM PQS/SICAM PQ Analyzer

Software to evaluate archived PQ variables and fault records – makes the job of rectifying power grid faults easier and faster

# Optimized Power Quality Monitoring in the grid of the future

The use of standard communication protocols and data formats such as IEC 61850, PQDIF, and COMTRADE guarantees simple data exchange.

For SCADA systems such as WinCC and SICAM SCC, all measured values and results are also available via MODBUS/TCP.

## Power Quality Monitoring with Siemens: how you benefit

- The monitoring of relevant grid parameters not only allows you to identify problems, but also provides you with information on the integration of renewables into the grid and the associated effects. In this way, you guarantee the quality of the electrical power supply within the framework of the requisite limits.
- Analyzing the effects of renewable energies on grid performance protects power companies from potential operating problems.

It also helps improve the integration of renewables and renders investments as effective as possible.

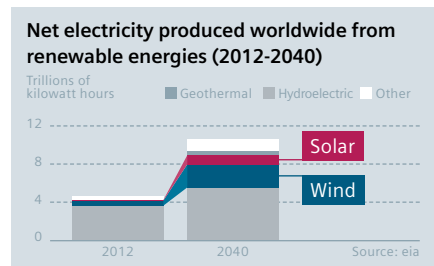
- Understanding the problems caused by fluctuations in power quality is the first step toward defining grid codes and developing preventive solutions.

## Greater availability, reliability, and quality of power – all the time

PQ solutions from Siemens make energy flows transparent while also helping you to identify potential optimizations and savings. Naturally, our systems comply with international standards and meet the highest quality requirements.

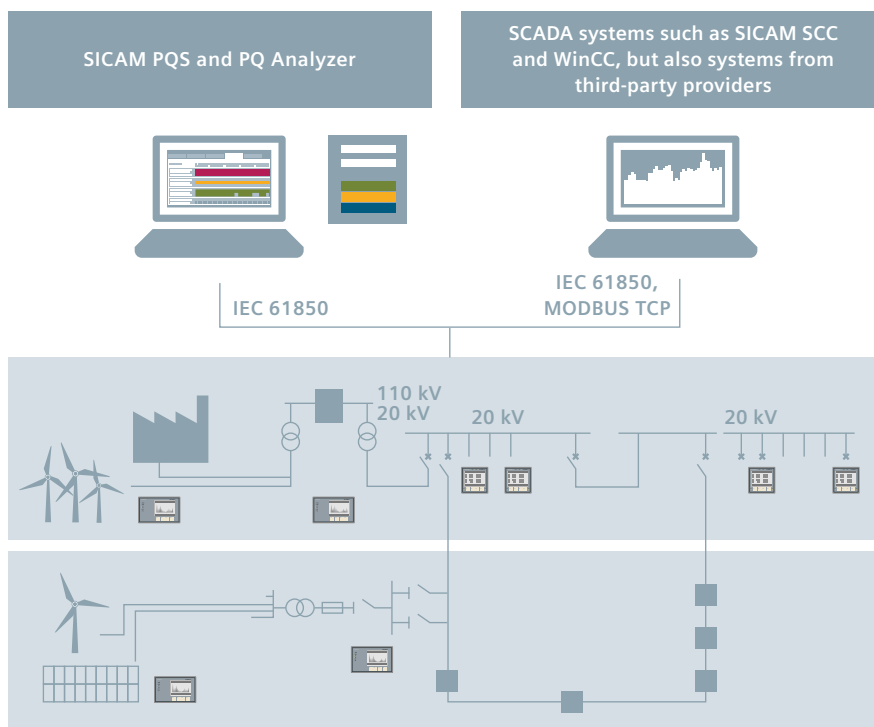
- IEC 61000-4-30 defines the measurement processes, accuracy and interpretation of grid quality parameters for Class A and Class S devices.

- IEC 62586-2 defines functional testing and uncertainty requirements for Power Quality Instruments (PQI).
- EN 50160 sets forth how these parameters must be evaluated.
- IEC 61850 sets forth how data and information must be forwarded.
- The data formats are standardized for fault records in the form of IEEE 1159 and COMTRADE.



The more sun and wind, the more inverters – and thus the more risks for power quality

## Siemens helps you to sustainably integrate renewable energies in the grid.



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Energy Management Division  
Freyeslebenstrasse 1  
91058 Erlangen, Germany

Tel.: +49 180 524 70 00  
E-Mail: support.energy@siemens.com

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