

# Power quality in electrical distribution systems

Adequate power quality bares a huge financial potential. Continuously recorded and evaluated measurements relevant to power quality help to detect disturbing issues and offer the chance to correct failures. Some of these failures do not seem so obvious at first sight as following three use cases will show.

## Renewable power generation

### Harmonics and transients damage valuable electrical equipment

With the growing share of renewable energy sources, like photovoltaic fields and wind farms, the use of power electronics and inverters in the power grid increases as well. Power electronics and inverters emit interferences in the power network, with a negative impact on the power quality.

Start-up of motors of wind mills causes voltage fluctuations, which can result in plant shutdowns, decrease efficiency, and reduce the service life of electrical equipment. Occasionally, strong injections prior to times of low load will cause a rise of the supply voltage. This increases the motor current. The heat generated in the motor's core can damage the insulation of the motor, which decreases its lifetime.

Photovoltaic inverters generate harmonics, which increase the risk of overheating in transformers, motors and capacitor banks and can cause neutral conductor overload as well as protection device malfunctions. Supra-harmonics in the frequency range of 2 kHz to 150 kHz affect sensitive electronics, like IT infrastructure, automation- and communication systems.

Day-time dependent power need requires switching operations, which cause transients and rapid voltage changes. The risk of hardware failures, data losses, and the destruction of power supply units increases seriously.

SICAM Q200 power quality instruments are the best choice to investigate the cause of the failures.

SICAM Q200 can detect transients up to 1  $\mu$ s / 6 kV and supra-harmonics in the frequency range of 2 kHz to 150 kHz. With the in SICAM Q200 integrated web browser the fault records and power quality data of the power network are analyzed. With this information a fast localization of the cause can be concluded.

Analyzing the effect of renewable energies in the power grid protects power companies from potential operating issues.



Onshore wind



Photovoltaics

# Power supply quality

## Electric vehicle charging station

### Interference and interaction with other users

Charging stations for electric vehicles work as converters and therefore cause circuit feedback, which interfere with other users in the electrical power system. These interferences are inrush currents, total harmonics distortion produced by non-linear loads, unbalance and high frequencies in the range of 30 kHz to 60 kHz.

Additional load peaks lead to unstable voltage levels and to an increased load of equipment.

Possible consequences are interaction between vehicles of the same type, failure of sensitive neighboring electronics and faulted energy measurement by smart meters. The risk for paying penalties to customers increases seriously.

SICAM Q200 power quality instruments can detect the frequencies in the range of 30 kHz to 60 kHz. With the in SICAM Q200 integrated web browser the fault records and power quality data of the power network are analyzed. With this information countermeasures can be taken.



e-Mobility

## Residential areas

### Influence propagation of interferences

The increasing number of connected electronic devices in private households significantly influence propagation of interferences. Residential areas bare a potential source of interferences for the electrical power system.

Microwaves, radio, TV-signals and poor grounding cause harmonics with a potential failure of sensitive electronics.

Switching power supplies, hotplates and chargers of cell phones cause mechanical resonances, which generate undesirable noise in the electrical power system.

Possible impacts are failure of typical household devices, for example, coffee machines, touch dimmer lamps, entertainment electronics, hair dryers. It can lead to an increased thermal load of electronic parts in energy saving lamps or even to faulted energy measurements by smart meters. The risk of claims for compensation increases rapidly.

Analysis of the fault records and power quality data with SICAM Q200 power quality instruments enable you to get a hand on all described interferences. SICAM Q200 measures, records and analyzes current-voltage curves. Analysis makes interferences in your processes visible and understandable. Now, interferences can be reduced with targeted counter measures and improve your processes.



Private

More than  
**€150 bn**

damage each year caused by production and IT downtimes in Europe alone can be traced back to insufficient voltage quality.\*

\*Quelle: J. Manson, R. Targosz, "European Power Quality Survey Report", Leonardo Energy, 2008

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