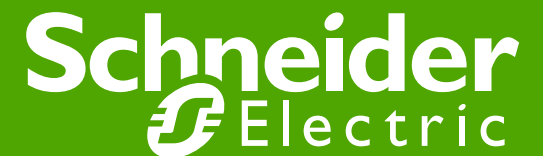


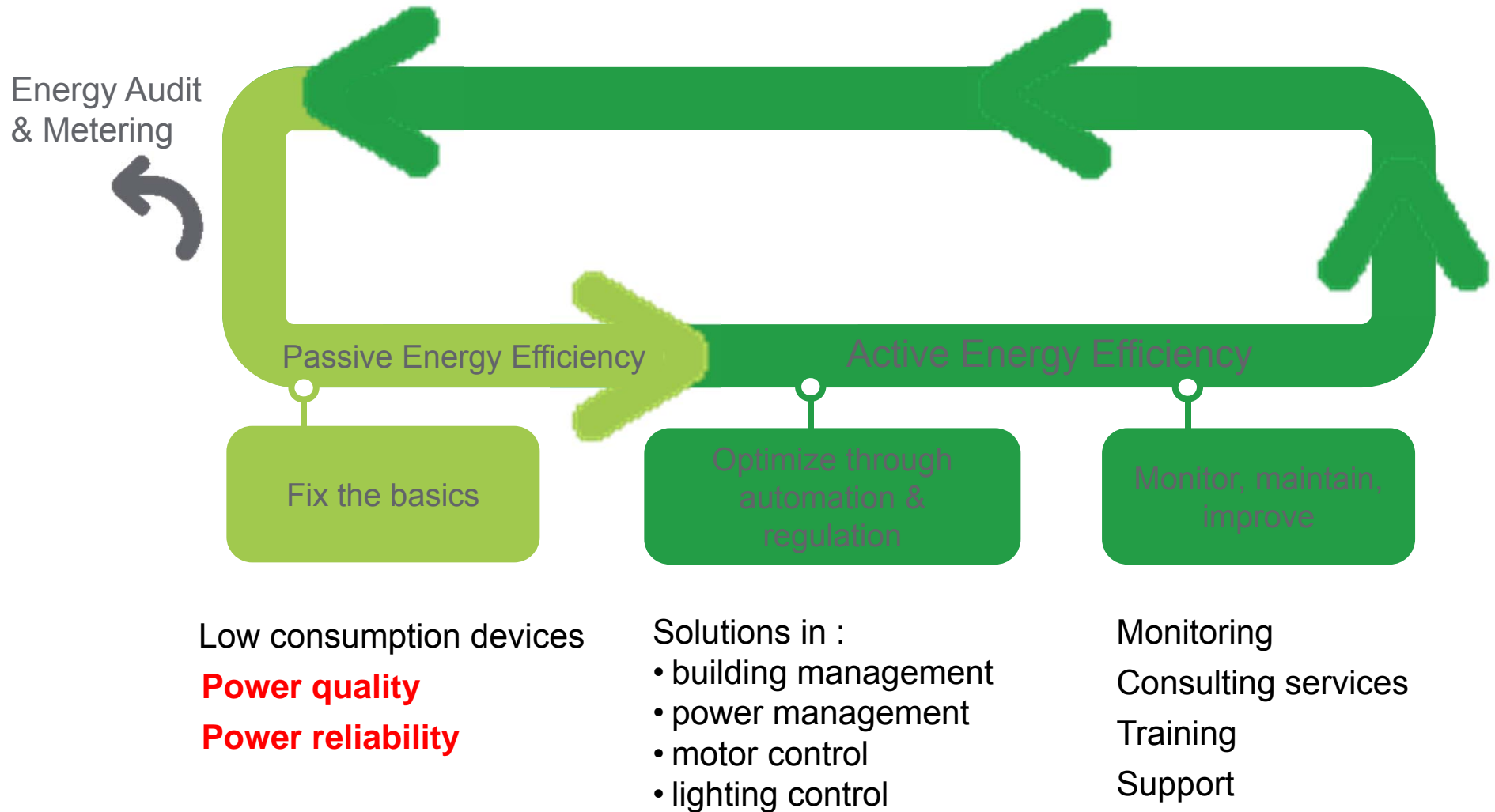
Power Quality Metering

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We enable the Energy Efficiency Lifecycle



IEEE 519 – Recommend Practice for Monitoring Electric Power Quality

- IEEE 519 includes definitions for power quality phenomena in general terms, from both an IEEE (North America) and IEC (European) perspective.

Category	Types	Typical Duration	Common Causes
Transients	Oscillatory, Impulsive	Less than 1 cycle	Lightning, Switching Loads
Short Duration Variations	Sags, Swells, Interruptions	Less than 1 minute	Faults, Motor Starting, Utility Protective Equipment
Long Duration Variations	Undervoltages, Overvoltages, Sustained Interruptions	Over 1 minute	Poor Voltage Regulation, Incorrect Transformer Tap Setting, Overloaded Feeder, Utility Equipment
Voltage Imbalance	—	Steady State	Unbalanced Loads, Equipment Failure
Waveform Distortion	Harmonics, Notching, Noise	Steady State	Electronic Loads
Voltage Fluctuations	—	Steady State	Arcing Loads, Loose Connections
Power Frequency Variations	—	Steady State	Poor Generator Control

Table 1: Summary of IEEE 1159 terms

The PQ Basics

- Paying attention to basic power quality issues are the easiest way improving the overall operation of your electrical system.
- Power Factor
 - Its an indication of how efficiently your electricity is used
 - Easy to correct with capacitors, but be mindful of the harmonics
- Total Harmonic Distortion (THD)
 - THD is a standard PQ measurement of voltage and current harmonics, per phase
 - Harmonics symptoms include a high neutral current loading, and transformer over heating
 - Review the individual harmonics to help determine their source, and determine compatibility of power factor correction capacitors
 - IEEE 519 recommends max 5% for a system with 69 KV or below, and max 3% for individual voltage harmonic component

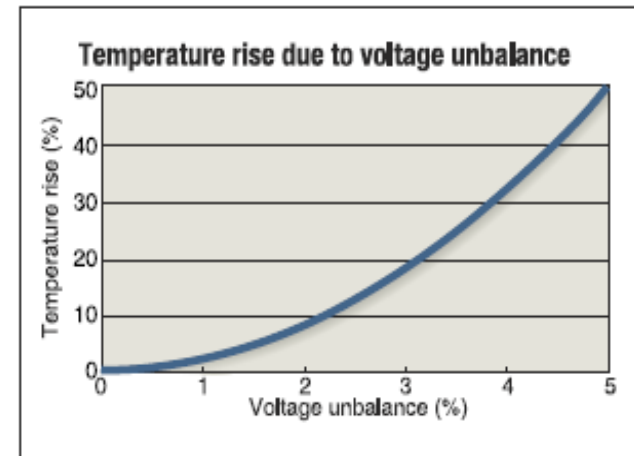
More Basics

● Voltage unbalance

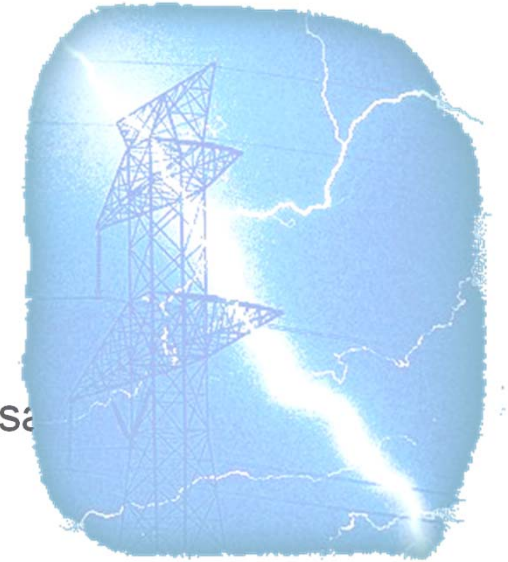
- Voltage unbalance is a leading cause of motor failures and a major contributor to energy loss
- Operating a motor at a 2% unbalanced voltage will decrease the efficiency by around 2%
- Each 10° C of temperature rise above rated temperature, shortens motor life by 50%.

● Under/ Over Voltage

- Impact on current can cause equipment over heating, shortening equipment life



More Basics



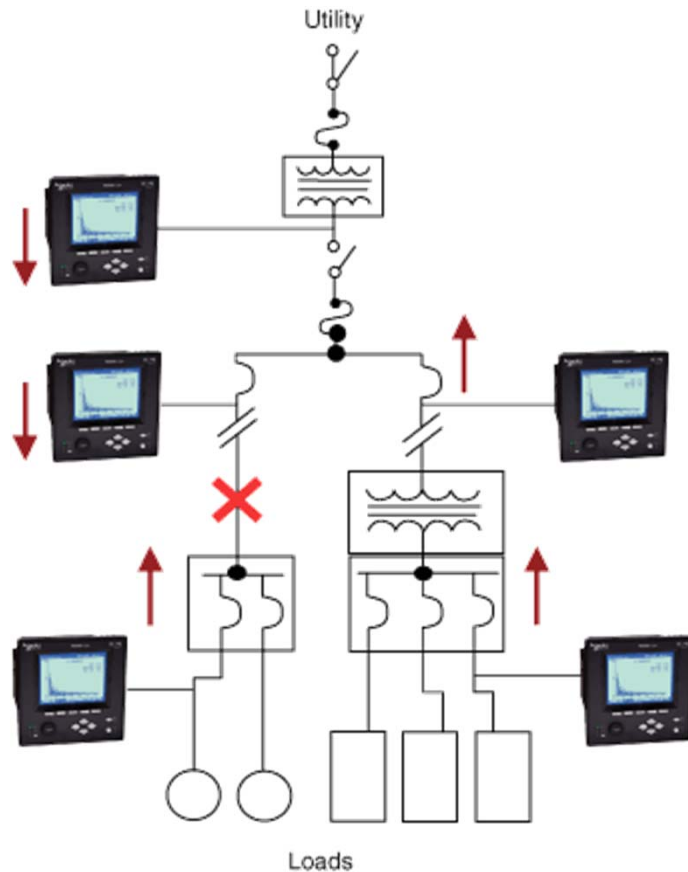
- **Voltage Sags and Swells**

- Contactor and relay coils can drop out due to voltage sags
- Variable frequency drives can trip off
- All these mean loss of production due to down time
- PQ metering can detect and record the associated waveform of the voltage disturbance

- **Transients**

- Transients are the “silent killer” of printed circuit boards (PCB) and motor winding insulation
- Although they are very short in duration, the high voltage spikes gradually break down the insulation, eventually causing the PCBs or motor insulation to fail
- ION7650, ION8600, and ION8650 meters can capture transients

Disturbance Direction Detection



- Determine the location of a voltage disturbance relative to the meter.
- Analyzing disturbance direction detection information from multiple meters in a power monitoring system enables the location of the cause of the disturbance to be determined more quickly and accurately.
- Disturbance Direction Detection is standard in ION7550 and ION7650 meters.

EN 50160 (European Norm 50160)

- This European standard has been accepted by many countries around the world for transmission and distribution systems.
- It defines acceptable levels of power quality phenomena, including:
 - Power Frequency
 - Flicker
 - Supply voltage dips
 - Short & long interruptions
 - Temporary over voltage
 - Supply voltage magnitude
 - Supply voltage unbalance
 - Harmonic voltage
 - Inter-harmonic voltage
 - Mains signaling voltage
- It uses a statistical approach to see if the system meets compliance
 - For example, power frequency the system value must be within ± 0.5 Hz for 95% of the time, and within +2 Hz to -3 Hz for 100% of the time
- EN 50160 data reporting is available on the ION7650 and ION8650.

IEC 61000-4-30 Edition 2

- This international standard defines the methods for measurement and interpretation of results for power quality parameters in 50/60 Hz ac power supply systems.
- Measurement methods are described for each relevant type of parameter
- It makes it possible to obtain reliable, repeatable and comparable results regardless of the instrument being used
 - The instrument needs to be certified
- In general, EN50160 defines levels of PQ acceptability, while IEC 61000-4-30 defines the measurement calculations
- Also requires compliance with IEC 61000-4-7 for Harmonics and Interharmonics, and IEC 61000-4-15 for Flicker



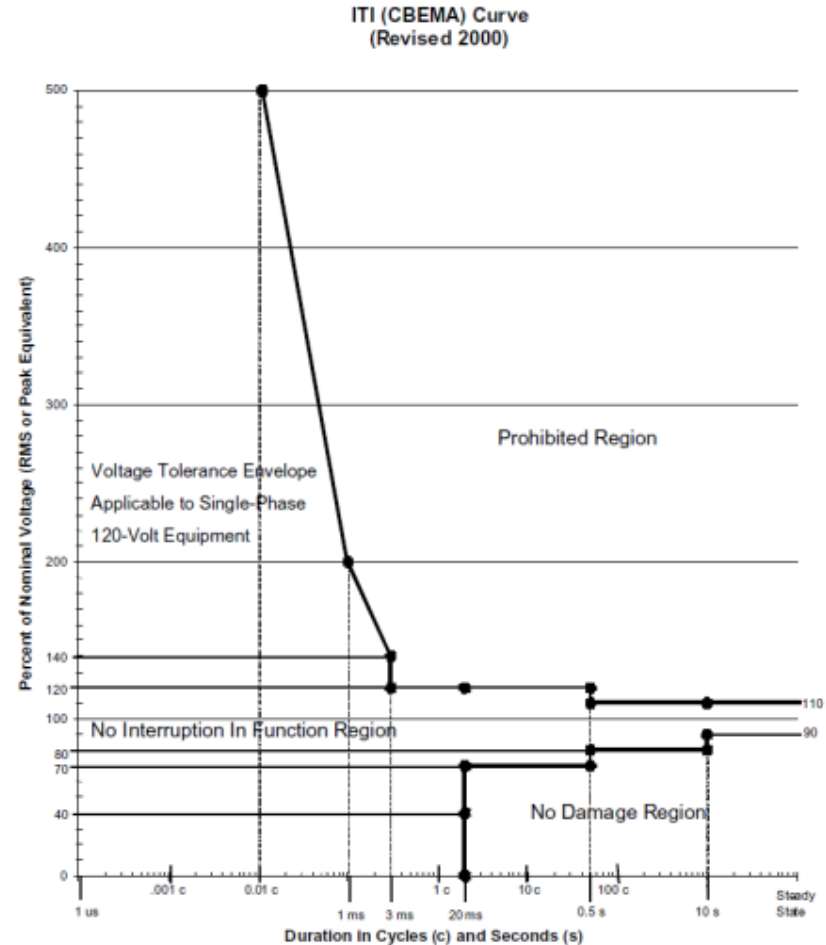
IEC 61000-4-30 – 2 Classes



- IEC 61000-4-30 has 2 classes of measurement performance
- Class A is the most stringent, for the most critical applications
 - Meters from 2 manufactures should provide the same readings
- Class S is used where precise measurements are not necessary.
 - The algorithm to calculate a given parameter may give differing results in devices from different manufacturers
- The ION7650 and ION8650 have been certified for Class A, Edition 2

ITIC / CBEMA Curve

- Originally developed as a fault tolerance guideline for the semiconductor manufacturing industry
- It defines the minimum depth and length of voltage sags for which the equipment must tolerate
- The PowerLogic system provides this plot.




Summary

- The PowerLogic power monitoring system provides you with the means to better understand your electrical system
 - Detect the PQ phenomena with the meters
 - Record the events, both in time stamped values and waveform captures
 - Use these through the software reports to determine what changes may be needed in the system

Thank you...

Make the most of your energy

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