



TECHNICAL SOLUTIONS
industrial technology

COMPLETE POWER QUALITY SOLUTIONS FOR HEALTHCARE

Ensuring **uninterrupted, reliable** and **stable** power for mission-critical healthcare environments.



PROTECT

Sensitive Equipment
& Patients



ENSURE

Continuous Operation
24/7



ENHANCE

Performance &
Reliability



SCALABLE

Solutions for Any
Requirement



END-TO-END

Services from Design
to After-Sales



Uninterrupted
Power



Voltage
Stability



Maximum
Uptime



Safe & Reliable
Healthcare Operations

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Power Quality for Healthcare Facilities

Why reliable power quality matters for patient safety, equipment performance, and operational continuity

Modern hospitals depend on sensitive electronic medical equipment and digital systems that require clean, stable power. Power disturbances—such as voltage sags, surges, harmonics, and outages—can cause equipment malfunction, downtime, costly service interruptions, patient discomfort, and even life-threatening situations.

Power quality at the **Point of Utilization / Point of Common Coupling (PCC)** is simply the condition of electrical power where your facility connects to or uses the power. Monitoring and improving it ensures your critical systems operate safely, accurately, and without interruption.



Why Power Quality Matters in Healthcare



Patient Safety

Reliable power helps prevent life-threatening events and ensures safe patient care.



Diagnostic Accuracy

Clean power supports precise measurements and trustworthy diagnostic results.



Equipment Reliability

Protects sensitive equipment from stress, premature wear, and unexpected failures.



Operational Continuity

Minimizes downtime and keeps critical systems and services running without interruption.



Common Effects of Poor Power Quality

- Distorted medical information
- Incorrect diagnostic results
- Equipment lockup
- Procedure interruptions
- Loss of stored data
- Control/alarm malfunctions



“ Power quality is the quality of **voltage, current,** and **frequency** at the point of use. ”

How Poor Power Quality Affects Medical Equipment

Typical consequences for diagnostics, monitoring, imaging, and patient care



1. Incorrect Diagnostic Results

Electrical disturbances may alter stored control parameters and displayed values.



2. Distortion of Displayed Medical Information

Distorted images or waveforms on monitors, printouts, X-ray film, LCDs, or imaging systems.



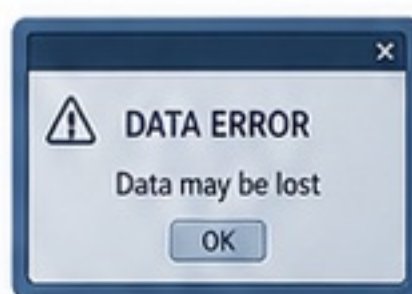
3. Equipment Lockup

Microprocessor-based equipment may freeze and fail to capture or process data.



4. Procedure Interruptions

Clinical workflow and imaging procedures may be delayed or repeated.



5. Loss of Stored Data

Data or settings can be lost or corrupted.



6. Control or Alarm Malfunctions

Alarms, controls, or communication functions may behave incorrectly.

Clinical Risk Example

Power-related artifacts may create misleading readings.

This waveform artifact could be misinterpreted as arrhythmia.



Operational Impact

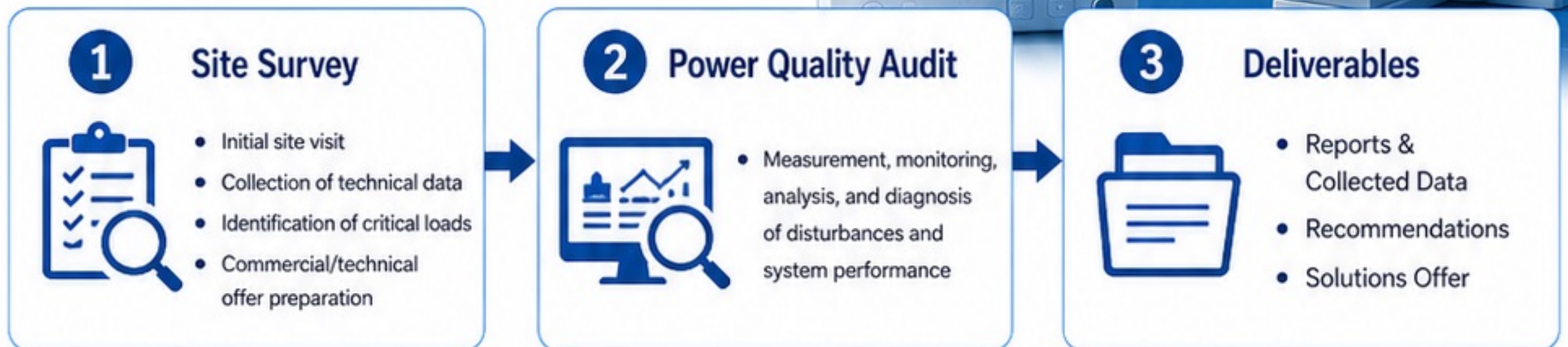
- ✓ Increased downtime
- ✓ Higher service cost
- ✓ Longer reboot time
- ✓ Patient discomfort
- ✓ Possible life-threatening risk in critical applications



**Technical
Solutions LLC**

Technical Solutions Power Quality Services

From site survey and auditing to implementation, supervision, consultancy, and training



Solution Pathways



What You Gain



Protect healthcare operations with smarter power quality management.

Contact Technical Solutions LLC for site survey, power quality auditing, solution support, or training.



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Monitoring, Harmonics, and System Performance

How measurement and auditing improve reliability, efficiency, and compliance



Voltage Unbalance

- Voltage unbalance leads to current unbalance.
- Causes overheating, rotating-field problems, and drive tripping.



Harmonics (THD)

- Non-linear loads create harmonic distortion.
- Affects motors, generators, capacitors, relays, and control systems.



Motor / Drive Impact

- Increased current raises heating, vibration, and noise.
- Can reduce performance and shorten equipment life.
- Keep THDv at motor terminals below 10%.



Capacitor Impact

- Overheating and premature failure.
- Resonance risk.
- Increased capacitance losses.



Reference Standards



IEEE 519 acceptable harmonic limits



IEC 61000-3-6/-12 compliance support



Measurement-based decision making for reliable systems

Benefits of Power Quality Monitoring

Direct / Technical Benefits

- Improved equipment performance
- Energy savings
- Prioritizing system improvements
- Reduced temperature rise
- Improved reliability and life of transformers, motors, electronics, capacitors
- Identifying problems to reduce malfunctions

Indirect / Regulation Benefits

- Penalty savings
- Demand-charge reduction
- Improved power factor management
- Compliance to standards and regulations



Good Power Quality = Customer Loads Perform Properly with Minimal Problems



Understanding Power Quality Problems

Key definitions, categories, and why they matter in healthcare environments



Power quality is any power problem manifested in voltage, current, or frequency deviations that results in failure or mis-operation of equipment.



Power quality can also be described as the electrical boundaries that allow equipment to perform as intended without significant loss of performance or life expectancy.

Long-Duration Variations (> 1 minute)



Voltage Regulation

Causes overheating and insulation stress.



Voltage Unbalance

Leads to equipment problems and reduced life.



Harmonics

Causes overheating, misoperation, and neutrals overload.



Frequency Variation

Causes rotating field weakening and equipment stress.



Flicker

Causes vibration, light fluctuation, and user disturbance.



Over/Under Voltage

Causes insulation stress and reduced equipment life.



Sustained Interruptions (Blackouts)

Causes production interruption and patient-service disruption.

Short-Duration Variations (< 1 minute)



Voltage Sag (Dip)

Causes data loss, process interruption, and equipment reset.



Voltage Swell

Causes insulation overstress and equipment instability.



Transients

Causes equipment malfunction and electronic damage.

Power Quality Problems Equation



Source / Supply Conditions

Variability from the utility or on-site generation



Distribution System

Impedance, switching, load changes



Sensitive Healthcare Loads

Life-critical and mission-critical equipment



Equipment Performance

Reliability, safety, and continuity of care

Why Poor Power Quality Matters



Increased system losses

More energy lost as heat and waste.



Lower energy efficiency

Higher consumption and operating costs.



Blocked capacity / higher investment

Limits growth and raises capital needs.



Additional heating / lower reliability

Stress on equipment and components.



Equipment failure or malfunction

Unexpected downtime and repair costs.



Poor operational efficiency

Disruptions, delays, and productivity loss.





TECHNICAL SOLUTIONS

— industrial technology —

POWERING RELIABILITY. PROTECTING WHAT MATTERS.

We deliver advanced, reliable and efficient power solutions for mission-critical healthcare facilities.



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OUR SERVICES



CONSULTATION & DESIGN

Tailored power solutions designed to meet your specific needs



SUPPLY & INSTALLATION

Professional installation with minimal disruption to your operations



MAINTENANCE & SUPPORT

Preventive maintenance and 24/7 technical support



UPGRADES & EXPANSION

Scalable solutions that grow with your business

RELIABLE POWER. SEAMLESS OPERATIONS. BETTER CARE.



WHY CHOOSE US?

With expertise in power quality and decades of experience, we are the trusted partner for healthcare institutions across Libya.



EXPERIENCED
TEAM



QUALITY
ASSURED



COMMITTED TO
EXCELLENCE