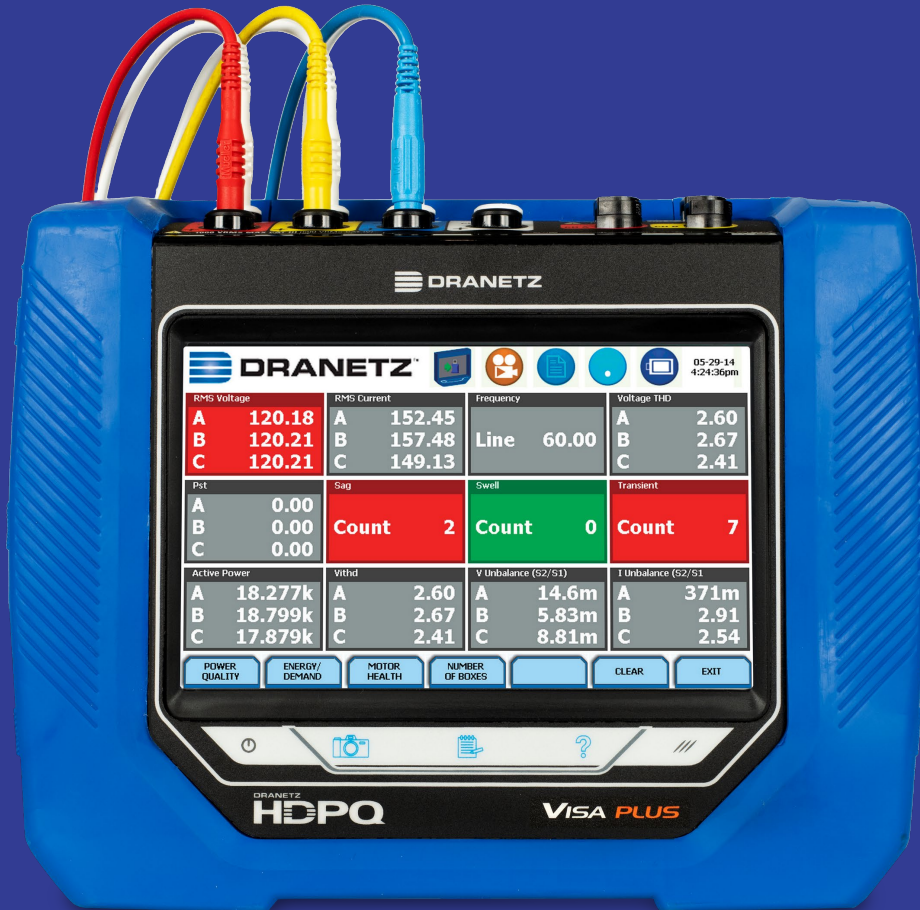




How to Perform a Power Survey

LIVE WEBINAR | Sept 10, 2026

Agenda

- 1 Welcome and Introductions
 - Lindsay Welch, TRS-RenTelco Marketing Manger
- 2 TRS-RenTelco: Test & Measurement Solutions
 - Garrett Dodd, Product Manager
- 3 Dranetz: How to Perform a Power Survey
 - Ross Ignall, Director of Business Development & Marketing
- 4 TRS-RenTelco: Equipment & Special Promotions
 - Garrett Dodd, Product Manager
- 5 Q&A – Joint TRS Dranetz

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Plan, acquire, and efficiently utilize instruments to maximize return on investment.

- End-to-end fulfillment from our Dallas, TX headquarters
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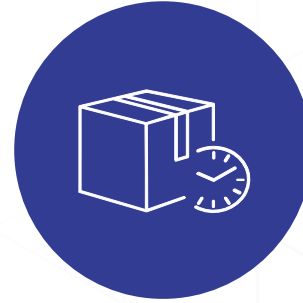


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How To Perform a Power Survey

Today's agenda

- Types of power surveys
- Available tools
- Steps to conduct a power survey
- Data analysis & review
- Next steps
- Q&A

General types of surveys

Can be separate or combined

Power Quality Survey

- Determine the cause and source of power quality problems
- Determine suitability of available power for expansion or installation of new equipment
- Evaluate impact of power quality on facility costs
- Put you on equal footing with your utility
- Select mitigation equipment

Energy Survey

- Understand where and when electricity is consumed
- Determine usage patterns and associated costs
- Identify areas and methods for energy reduction
- Overall goal is to reduce costs while maintaining mission objectives
- Ongoing energy management to verify savings and continue future improvements

What Tools are Available?

Power Quality Survey

- Handheld PQ instruments
- Permanent PQ instruments
- Oscilloscopes
- Fault recorders
- Spectrum analyzers

Energy Survey

- Handheld energy loggers & meters
- Panel mount energy meters
- Existing utility meters
- Remote energy management systems
- Portable PQ instruments often have energy capabilities
- Permanent PQ instruments often have energy capabilities

Choose the right tool for the job

- The resolution of energy meters is typically measured in seconds
- The resolution of PQ instruments is typically measured in microseconds
- PQ instruments can often be used for energy measurements but not vice versa
- Make sure the meter conforms to any needed monitoring standards
 - IEC 61000-4-30, IEEE 519, etc.
- Make sure the accuracy of the meter & transducers are adequate for the task



Survey Approach

- Although the objectives may be different, PQ and Energy surveys have a lot in common
 - Safety considerations
 - Instrument connections
 - Transducer selection
 - Monitoring procedure

Safety Considerations

- References

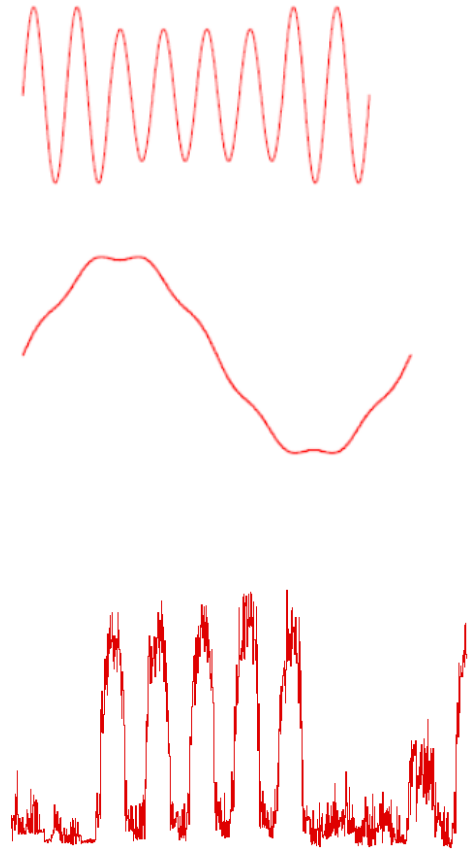
- NFPA (National Fire Protection Association) 70E, *Standard for Electrical Safety in the Workplace*
- ANSI (American National Standards Institute) C2 National Electrical Safety Code
- OSHA (Occupational Safety & Health Administration) 29 CFR Parts 1926 and 1910
- Local codes
- Corporate policy

Basic Procedure

- **Plan/Prepare** ←
 - **Inspect**
 - **Monitor**
 - **Analysis**
 - **Solution**
 - ***Repeat if necessary*** —
- 

Planning - Survey Objectives

- ***What*** are the survey objectives?
 - PQ: Troubleshooting for Sags/Swells, Transients, Harmonics. You may not know this in advance
 - Energy: KW, KWh study. Where & when consumed
 - ***Where*** to monitor?
 - PQ & Energy: Localized, system-wide, etc.
 - ***When*** to monitor?
 - PQ: Specific time of day, random, etc. Coincident with other events such as process interruptions, breaker trips, etc.
 - Energy: Business, process cycle
 - Baseline before energy savings measures are employed
-
- Confirmation of savings after installation & throughout the life of the facility

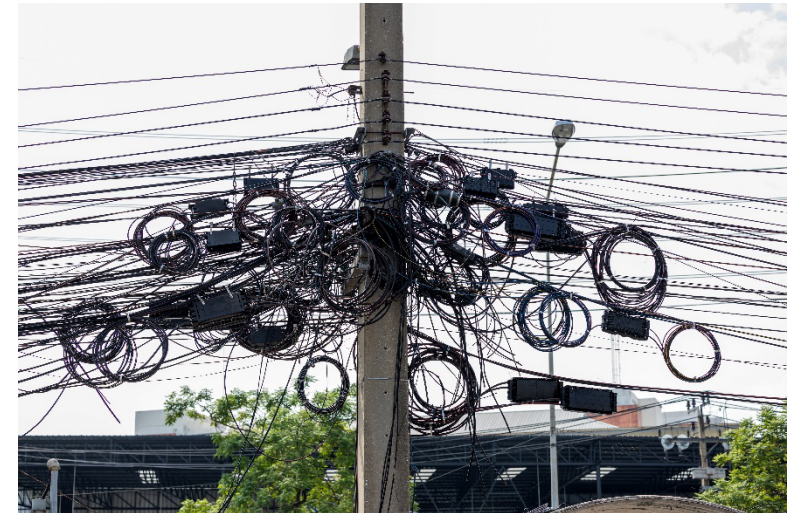


Site/Equipment History

- PQ
 - Catalog any equipment failures or site problems
 - Time, date, known outside influences
 - Play detective...Interview operators and other personnel. Could provide valuable clues
- Energy
 - Understand the facility
 - Review site schematic, loads, etc.
 - Are energy savings measures already employed?

PQ Inspection

- Use all your senses (except touch & taste!)
- Any abnormal odors?
- Any abnormal sounds?
- Visual Inspection
 - Loose connections
 - Code violations
 - Wiring problems
- Have there been any recent changes?
 - Wiring, load, shift, new equipment, etc.



Where to Monitor

- PQ
 - Localized problem. Monitor the equipment that is affected or the circuit feeding that area
 - Otherwise, must deduce source
 - Utility Point of Common Coupling (PCC)
 - May originate from utility
 - Distribution panels
 - Determine directivity (upstream/downstream). The directivity of V & I is the clue!
- Energy
 - Depends on survey objectives
 - Entire facility
 - Individual loads, processes, business units, etc.

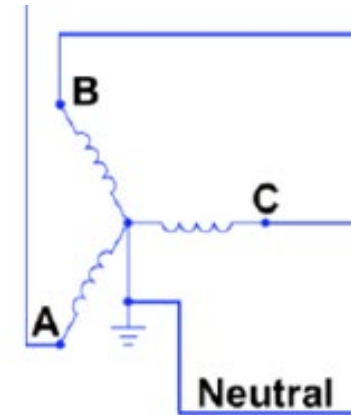
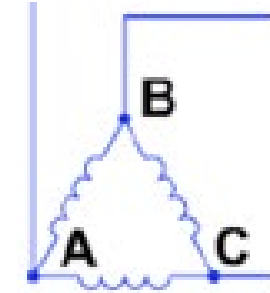
Instrument Connection

- PQ & Energy
 - How should the instrument be connected?
 - Phase to Neutral, Phase to Phase?
 - How are your loads distributed?
- PQ
 - Should you monitor the current? Yes!
 - Current monitoring provides directivity: Upstream vs. downstream
 - Disturbances can be current in origin: Motor starts, Transients (surge suppressors)

Instrument Connection

Rules of thumb

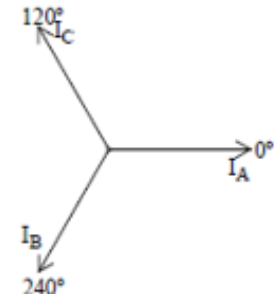
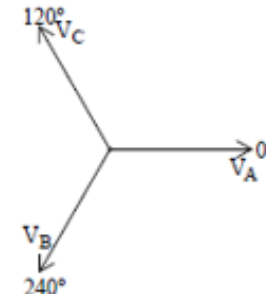
- PQ
 - Delta – connect as a 3 wire, **3 probe** delta. A-B, B-C, C-A
 - Wye – you have a choice
 - Connect the meter the way the load is connected
 - Otherwise, wye is preferred. Human readable phase readings
- Energy
 - Delta – connect as a 3 wire, **2 probe** delta. A-C, B-C. Fewer wires and probes
 - Wye – you have a choice
 - Connect the meter the way the load is connected
 - Otherwise, 2 probe delta is preferred.



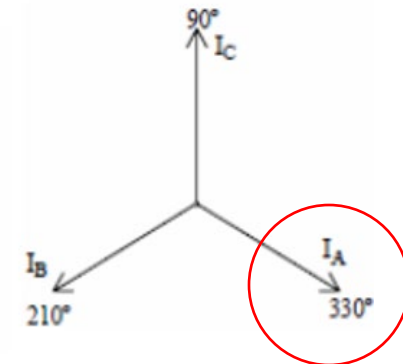
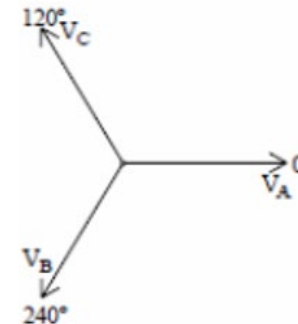
Instrument Connection

- Verify V & I are connected correctly
- Look for inverted CT's
- Wye connection easy to see
- Delta can be confusing.
30 deg phase shift
between V & I

Wye

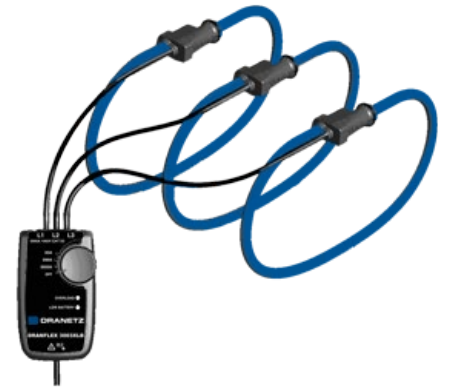


Delta



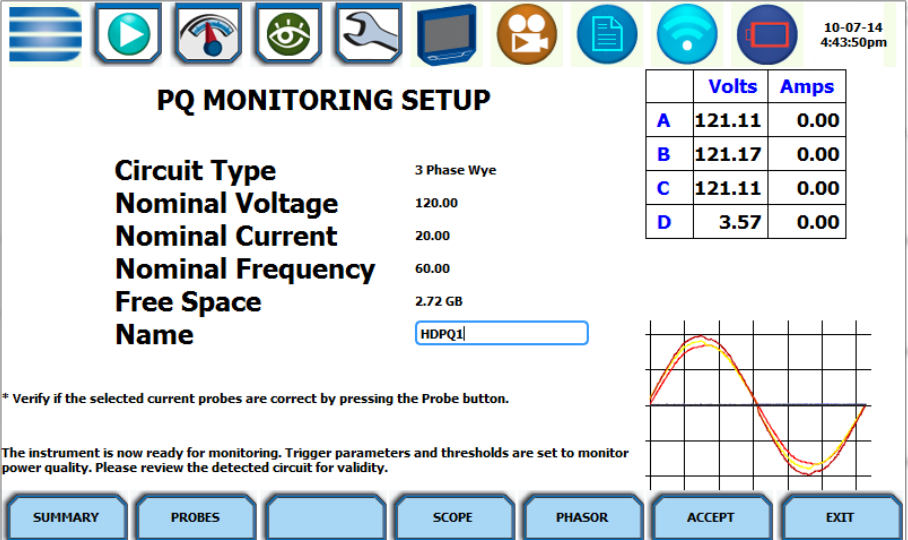
Transducer Considerations

- PQ & Energy
 - Match to the instrument and monitoring requirements
 - Follow good instrumentation practice...Measurements should be near the middle of the transducers range
 - CT's sized appropriately and oriented correctly (arrow towards the load).
 - PT is sized appropriately (if applicable)
- PQ
 - Voltage & current transducers *can* have limited bandwidth that can affect the transient monitoring capabilities of the instrument
- ***Results are only as good as the weakest link in the chain!***
- ***Poor selection of PT's and CT's can reduce accuracy, bandwidth and otherwise negatively effect your measurements***



PQ Instrument Settings

- Match to load/circuit specifications when possible
- IEEE 1159 recommends +/- 10% of nominal for voltage high and low limits
 - Ex: 480V
 - High = 528V
 - Low = 432V
 - Good place to start
- *Auto configuration option*



PQ MONITORING SETUP

Circuit Type: 3 Phase Wye
Nominal Voltage: 120.00
Nominal Current: 20.00
Nominal Frequency: 60.00
Free Space: 2.72 GB
Name: HDPQ1

	Volts	Amps
A	121.11	0.00
B	121.17	0.00
C	121.11	0.00
D	3.57	0.00

* Verify if the selected current probes are correct by pressing the Probe button.

The instrument is now ready for monitoring. Trigger parameters and thresholds are set to monitor power quality. Please review the detected circuit for validity.

SUMMARY PROBES SCOPE PHASOR ACCEPT EXIT

Electrical Environment Considerations

- PQ
 - Know the details of where you are monitoring
 - Are surge suppressors present
 - Can affect monitoring results
 - Are other mitigation devices in use?
- Energy
 - What type of loads
 - Lighting, etc.

Sanity Check

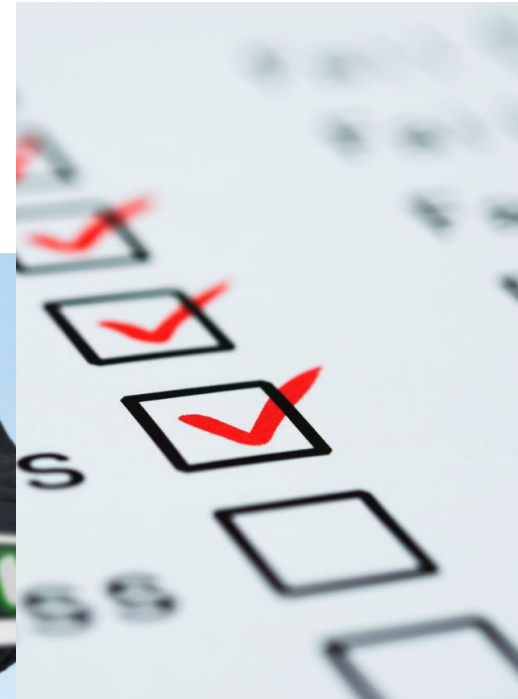
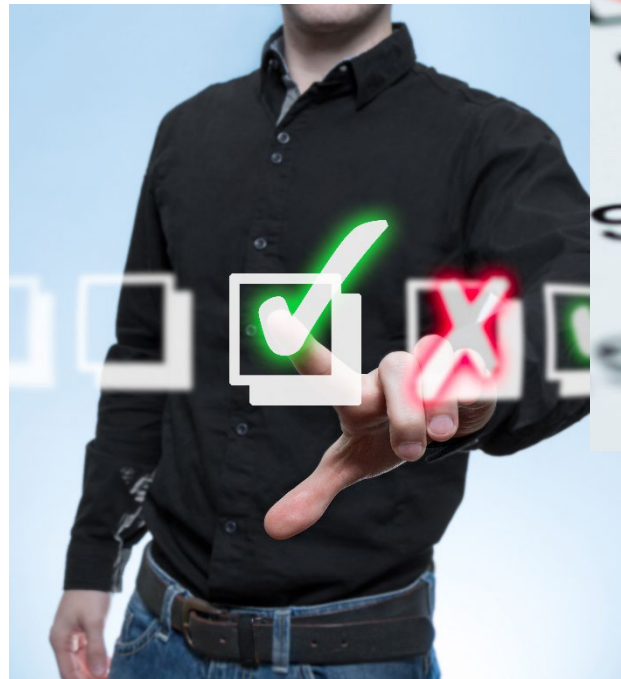
- PQ & Energy
 - Verify instrument is properly connected
 - Real time meters to verify expected readings
 - Scope/Phasor to verify proper wiring
- PQ
 - Compare real time measurements to thresholds
 - Is the instrument set up correctly?
 - Transducer scale factors properly entered?
 - Monitor for a short period of time and review results
 - Could have immediately found the problem
- Numerous events could indicate improper settings

How Long and When to Monitor

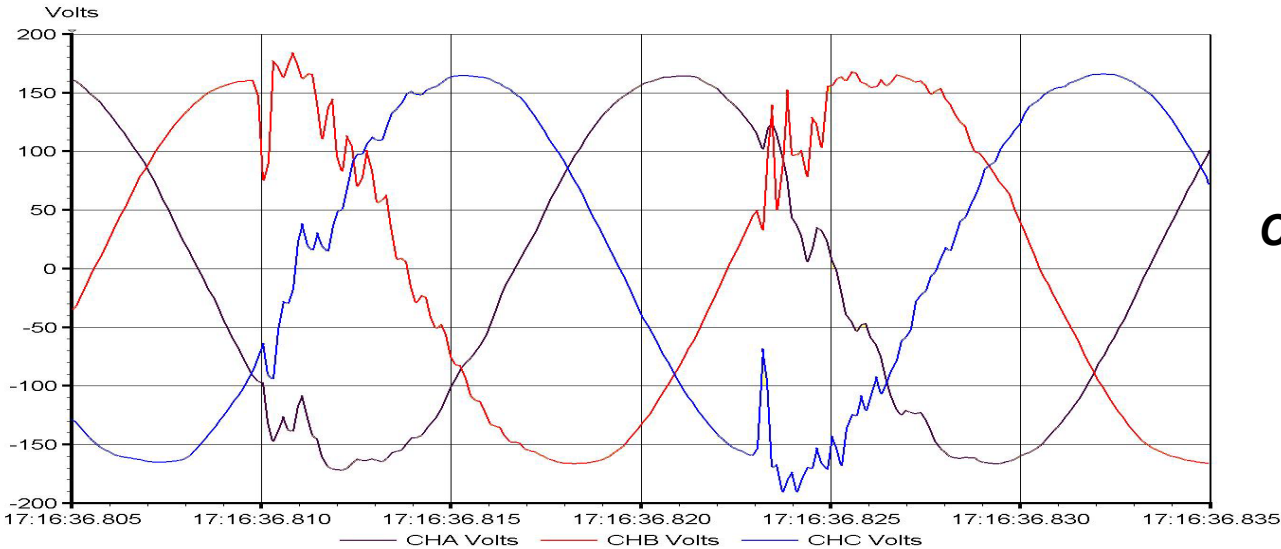
- PQ
 - Can you predict when problems will occur?
 - Time of day, shift, etc. If so, monitor at that time
 - Otherwise
 - During varying load conditions
 - Duration
 - As appropriate for application. 1 day, 1 week, business cycle, etc.
- Energy
 - Measured in increments of business or process cycle
 - Make sure the survey represents real world, typical situation. Monitor for several weeks or more if needed

Data Analysis & Review

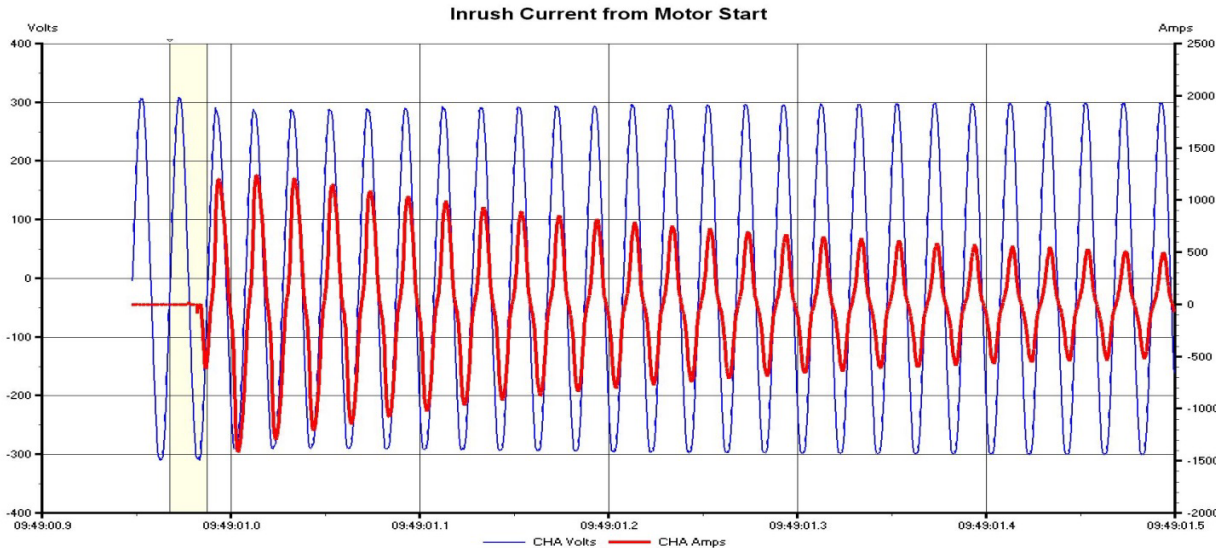
My survey is done. What's next?



PQ Data Analysis & Review

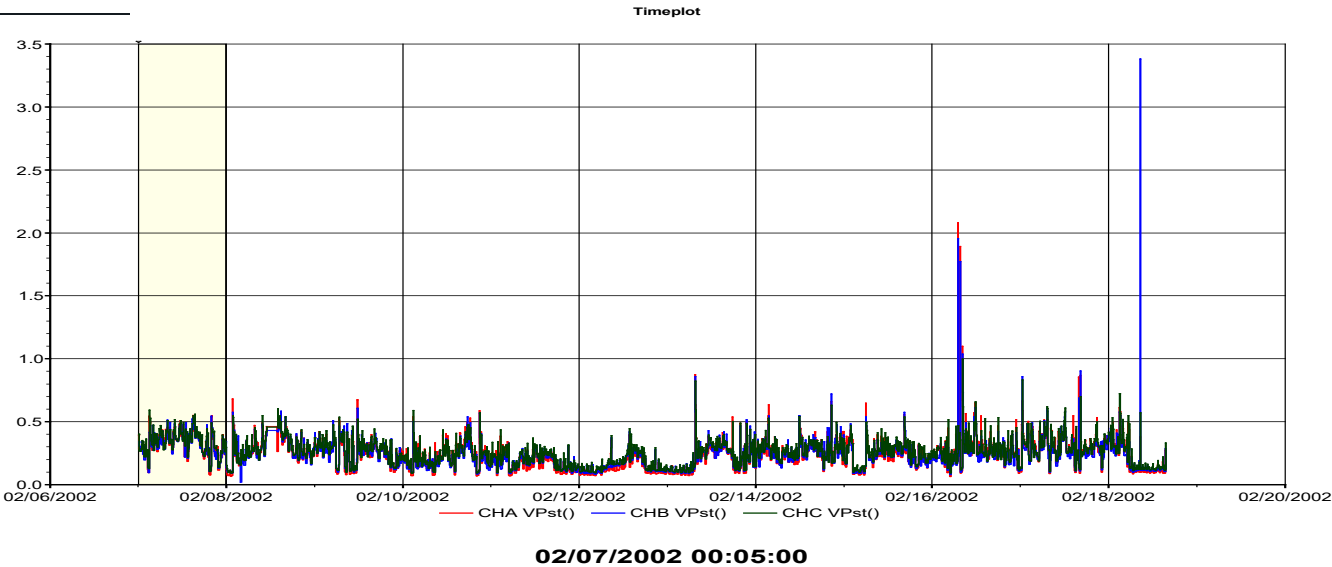


**Power Factor
Correction Capacitor
Switching**



Motor inrush/startup

PQ Data Analysis & Review



High Voltage
Flicker

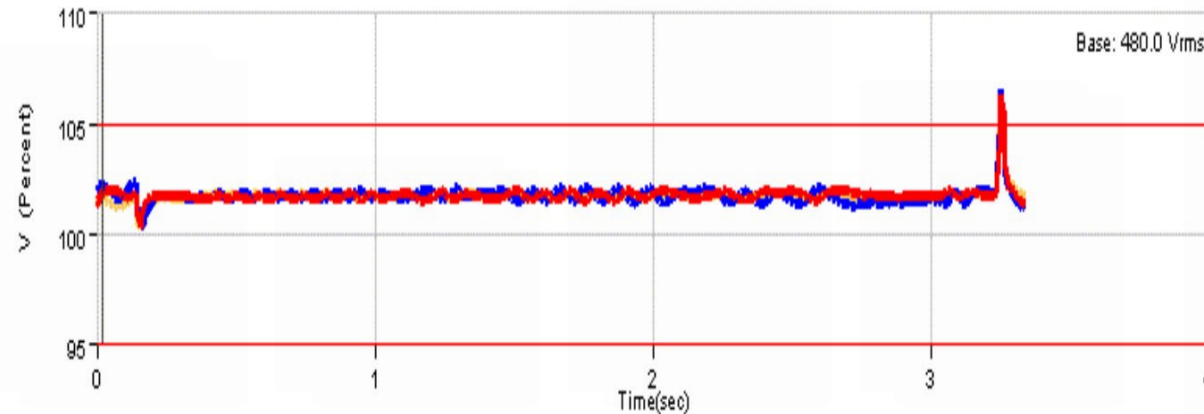
Harmonics Statistics				
Reports for 31 days prior to and including:		Apr 17, 2017		
Date	Interval	Statistic	Compliance	Channel
Apr 17, 2017	Daily	Very Short (99th)	Pass	
Apr 16, 2017	Daily	Very Short (99th)	Pass	
Apr 15, 2017	Weekly	Short (99th)	Pass	
Apr 15, 2017	Weekly	Event Details/Waveforms		
Apr 15, 2017	Daily			

IEEE 519-2014
Harmonics

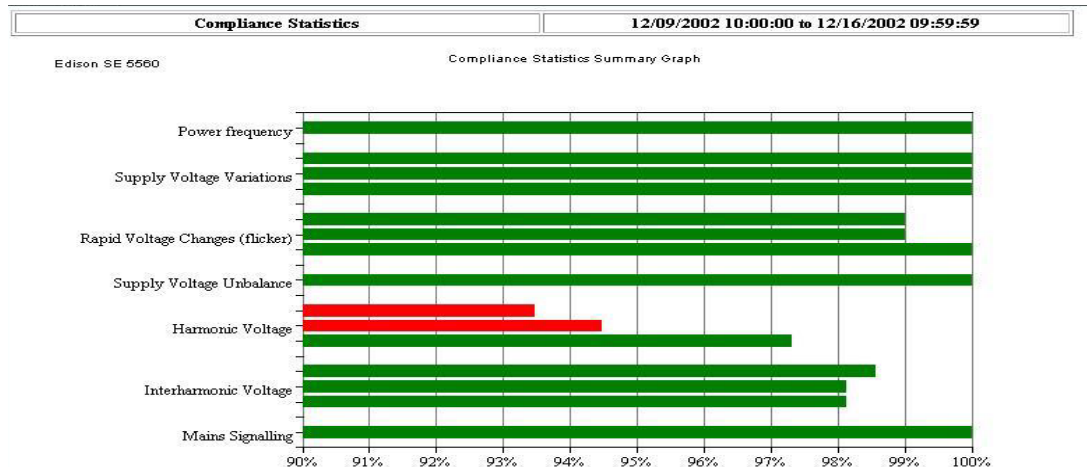
Date:	Interval:	Statistic:	Compliance:
10/25/2017	Daily	Very Short (99th)	Fail
Nominal voltage:	Nominal current:	Max.Demand Current:	Max.ShortCir Current:
230.00	10.33	10.00	100.00

PQ Data Analysis & Review

SYSB Output



UPS Swell Problem



Failed EN50160

PQ Data Analysis & Review

- Did the problem occur while monitoring?
 - Look for events that were coincident with equipment malfunctions
- Were any events recorded?
 - If the problem occurred, the source may not be power related if no PQ events were recorded
- Identify data exceeding equipment specifications. Voltage, THD, etc.
- Were steady state measurements as expected?
 - Unusually high, low, etc. that could indicate the potential for failure.

Energy Data Analysis & Review

- Largely dependent on survey objectives and on a case by case basis. Such as:
 - Record a baseline for future reduction
 - Identify areas for reduction
 - Verify energy savings
 - Comparison to utility bill

Next steps

Now what?



Question

- Do you have the expertise in-house to design and apply mitigation or energy saving devices and measures?
 - Yes
 - No

What to do Next

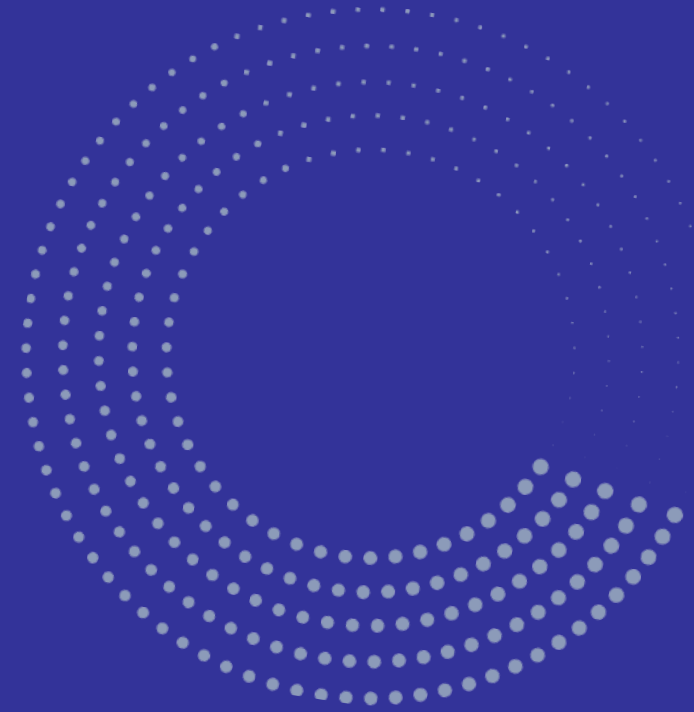
- Who to call
 - PQ Problem
 - Source – Utility: Call your customer representative
 - Source - Internal to your facility: See below
 - PQ & Energy
 - In-house resources: Engineering/electrical dept.
 - Electrical contractor: 3rd party resource. Do they have the expertise?
 - Consultants: Assess depth and breadth of experience
 - Make sure they have a proven history...
 - Check references

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Questions?





Thank you.
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