Today's Webcast starts at 1:00 p.m. Eastern.

Thank you for joining us.

Today's Moderator

Wendy Dietzler

VP, Education & Conferencing

TradePress Media Group

Today's Presenter

William McLemore

Offer and Remote Services Manager

Schneider Electric Digital Power

Will McLemore graduated from the University of Tennessee with a Bachelor of Science in Electrical Engineering. He has 13 years' experience in operations, sales, and marketing with Schneider Electric providing power management solutions to customers with critical power facilities.

Disclosure:

Today's presenter is currently employed by Schneider Electric, which manufactures the technology referenced in this presentation.

Learning Objectives

- Learn how data quality can affect your system's performance and how to improve it
- Understand how to use your data to drive maximum benefits and learn how improved analytics can help optimize your system
- Learn about hidden power issues that could cause increased utility bills and wreak havoc on your equipment
- Identify new cost savings opportunities from power system efficiency improvements like optimizing power factor, balancing loads and mitigating power quality problems

To Ask Questions:

Please use the question and answer panel on the right-hand side of the screen, and send to all panelists.

Presentation Handouts

All participants will receive an e-mail by the end of the day with a link to download a PDF copy of today's presentation slides.

CEU Information

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ACCREDITED IACET PROVIDER

Power Your Facility Efficiently

Learn the Top 5 Efficiency Opportunities of Power Management

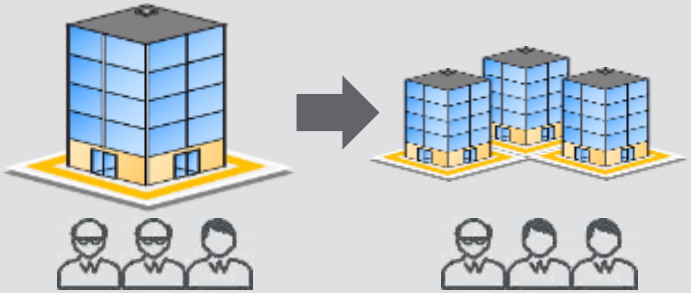
Will McLemore
Offer Manager
Schneider Electric USA

Life Is On Schneider Electric

Why are we talking about this? The Macro Trends

1. 50% of Workforce will Retire in Next 10 Years

2. 3X the Work



3. Unprecedented computing power, storage, and intelligence

MOBILITY + CLOUD + ANALYTICS

5.5B connected devices in buildings by 2020!

Increased challenges when managing modern power systems

2 characteristics that define modern power systems:

Criticality

- Efficient use of energy can have significant impacts on budgets
- Asset longevity is affected by power quality
- Poor power quality can increase risks to personnel and property

Complexity

- Generation from single to multi source, PV, Wind, CoGen etc.
- Drive for cost reduction, VSD's, LED's and other Eco measures
- System visibility can be limited, and expertise to manage scarce

Why is visibility into your power system important?

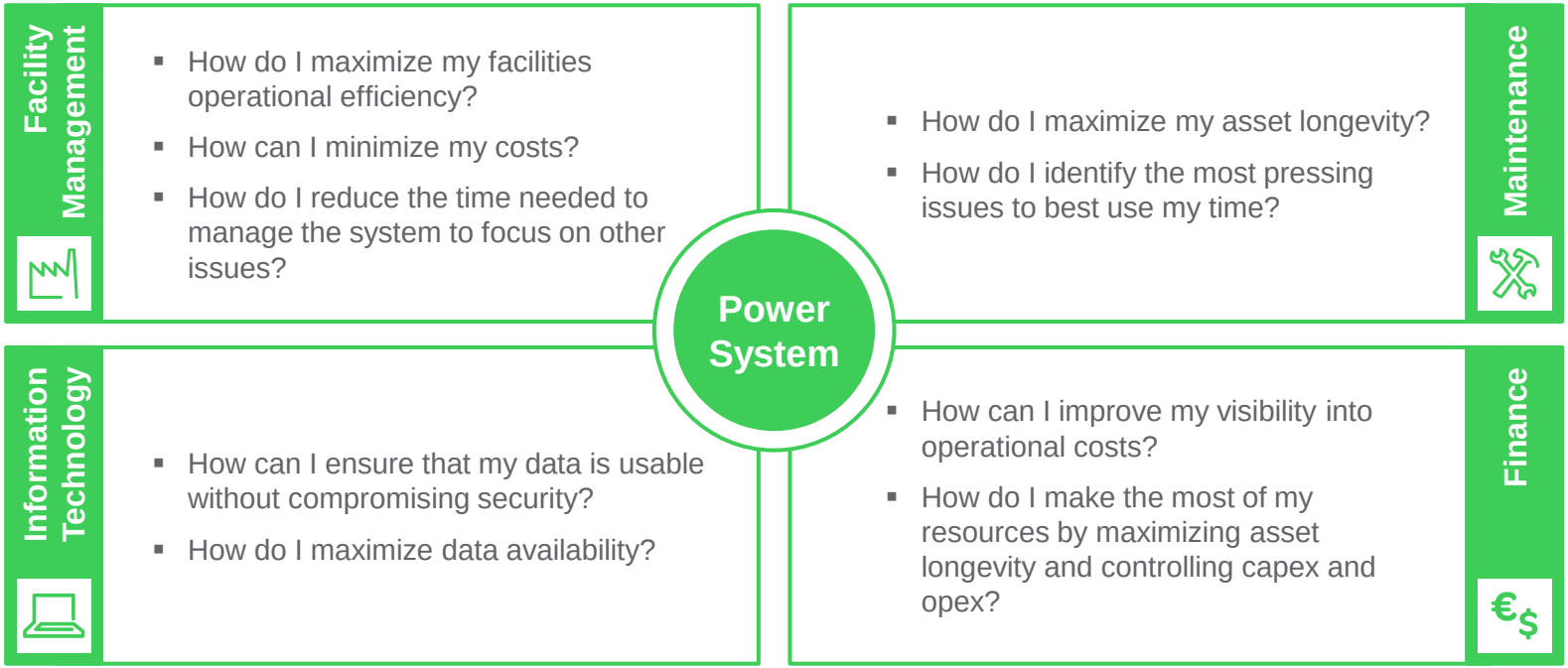
>70% of facilities operate with problematic electric conditions, which could lead to equipment damage and unplanned downtime

80% of power management systems have outdated configurations that put monitoring and control of the network at risk

10-15% of devices in the typical power management system are nearing end of their supported lifecycle

Countless hours of non-productive on site maintenance activity can be needed to investigate the system and identify issues

Balancing the management of your power system



1 Data Quality

What's your Trust Level of your Data?

1

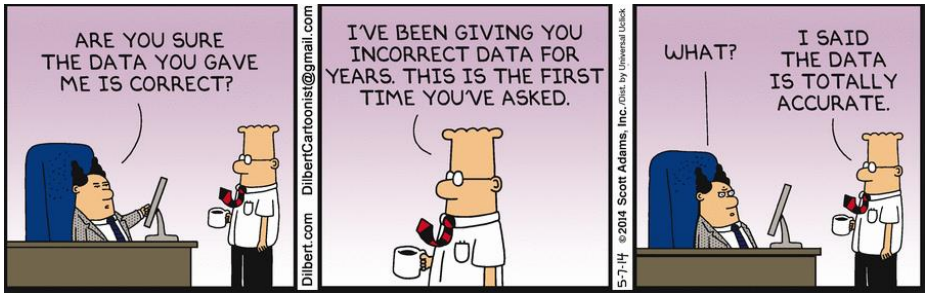
Trust your data:
>90% of power mgmt. systems have misconfigurations impacting data quality.

Data Quality

- Zero, missing & constant values
- Energy balance violations
- Under & over-reporting
- Mismatched logging intervals
- Negative energy values
- Unmetered loads
- Alarm thresholds too low
- Device mis-configuration
- Database admin issues

2

Once you can trust your data, you can depend on analytics to identify issues with your electrical network



* From analysis of >500 Power Advisor systems

What to look for in your data

It’s not Rocket Science

Data Quality Issue	Explanation
Energy Balance Violation	Sum of children devices’ energy consumption more than parent’s consumption.
All Zero Values	Device(s) logged consistently zero values over query period.
Unchanging Value	Logged values did not change over query period.
Negative Values Present	Device(s) logged a mix of negative and positive values in query period.
Mismatched logging intervals	Sampling intervals differ between feeder and submeters.
High Speed Logging	Data logging time intervals are set below one minute
Conflicting Communication Settings	Multiple devices reported identical communication settings.
Firmware version mismatch	Different firmware versions have been found on devices of the same type.
Data Spike	Some data values over query period were extreme or abnormal. Those values have been replaced with estimated values for analysis purposes. No changes have been made to the data in the source system.

2

System Digitization

Are You Fully Utilizing Your System?

How do you run your facility?

Don’t Let the Eraser Ruin Your Day

Then

Now

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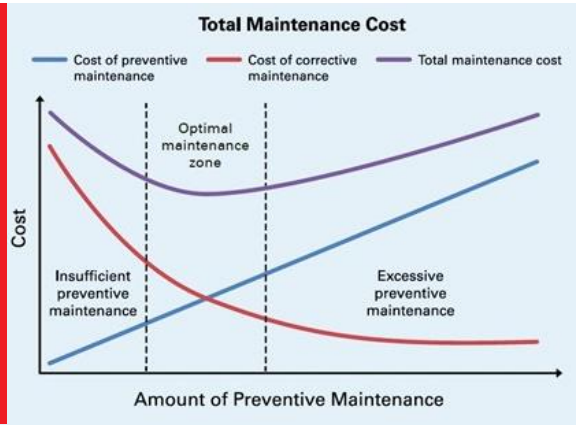
Why is preventative maintenance so important?

Minimize the asset total cost of ownership



NFPA 70B

The lowest total annual expense is realized by maintaining an inspection frequency that keeps the sum of repair / replacement and Equipment Preventive Maintenance costs at a minimum. The total cost of ownership is optimized if preventive maintenance is performed each 2-3 years.

Reduce risk of downtime & fire
Maximize asset lifetime

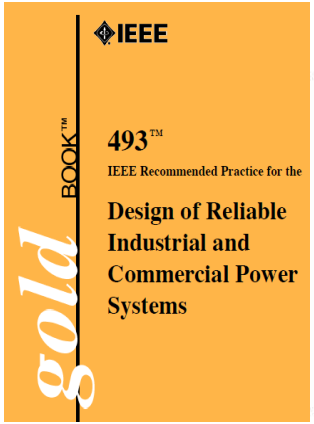


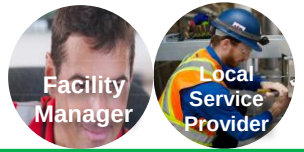
Table 5-2—Percentage of failure caused from inadequate maintenance vs. month since maintained

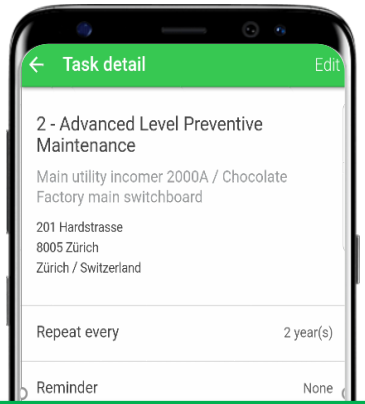
Failure (months since maintained)	All electrical equipment classes combined (%)	Circuit breakers (%)	Motors (%)	Open wire (%)	Trans-formers (%)
Less than 12 months ago	7.4	12.5[a]	8.8	0[a]	2.9[a]
12 to 24 months ago	11.2	19.2	8.8	22.2[a]	2.6[a]
More than 24 months ago	36.7	77.8	44.4	38.2	36.4
Total	16.4	20.8	15.8	30.6	11.1

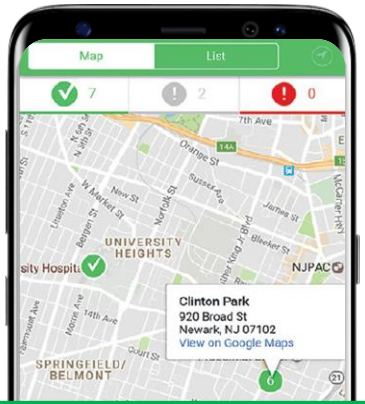
IEEE 493

Experience indicates that equipment lasts longer and performs better when covered under a preventive maintenance program. An effective preventive maintenance program can reduce accidents and operator error, and minimize costly breakdowns and unscheduled outages by identifying and solving problems early, before they become major problems. The risk of failure is multiples when the system is poorly maintained.

How do you run your facility?







Plan the maintenance

Access maintenance templates for assets to quickly generate the maintenance plan.

Be notified

Receive notifications in advance to plan for production shutdown, avoid any nasty surprises!

Assign task & create report

- Easily and quickly capture and share issues.
- Give clear instruction to the designated service engineer.
- Automatically generate event log & report.

Get things done!

- Store relevant context and documentation to identify & solve issue more quickly.

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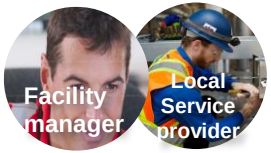
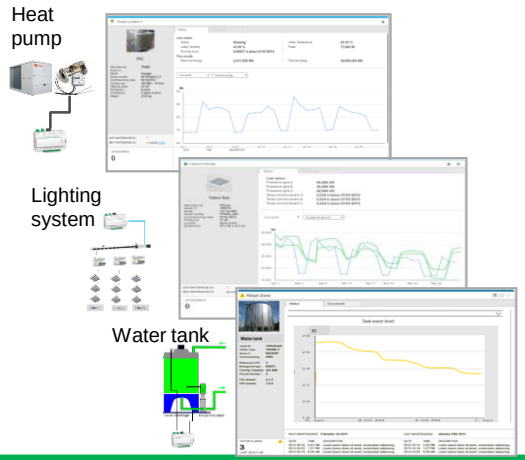
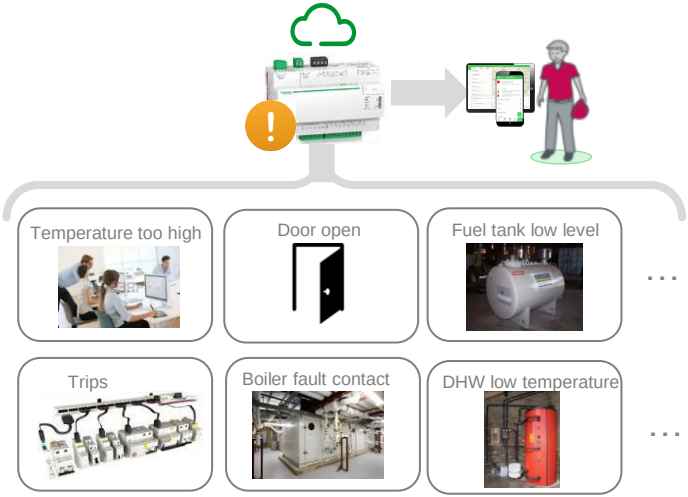
Stay connected: proactive reaction & faster issue resolution







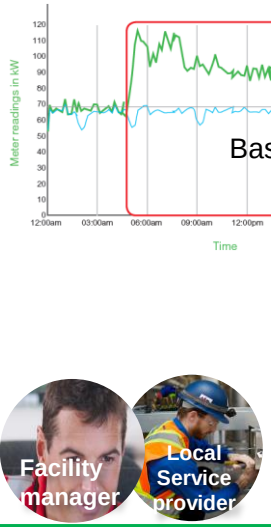
Switch from time based maintenance to conditional maintenance

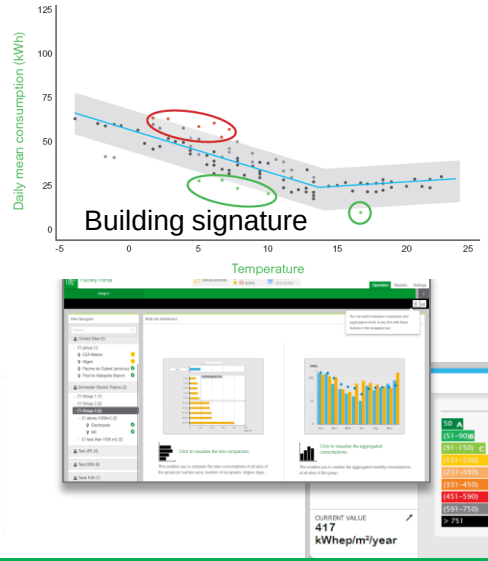
Pre-configured dashboard per asset family (HVAC machine, Boilers, PV stations, Lighting systems, Switchboards)

Get real time alert in case of malfunction

Set threshold & Boolean to monitor asset real time status through an Energy Server or Gateway

Optimize, Analyze, Benchmark, Scorecard





Understand how energy is consumed

- Breakdown per zone and per energy usage
- Identify deviations comparing period to period
- Relate energy consumptions with business (working hour, surface, number of people etc)

Benchmarking for improvement

- Benchmark with energy performance level
- Benchmark site to site

Monthly scorecards

Copilot view Energy Monthly Reports, performance of each defined zone and usage

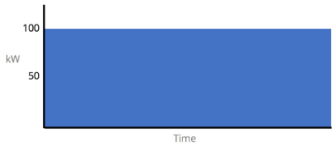
3 Peak Demand

Peak Demand 101

- What are demand charges?
- How are demand charges calculated?
- Why do demand charges exist?
- Who pays demand charges?
- Why worry about demand charges?

Company A

Monthly Energy Usage



Utility Bill

		Rate	Charge
Energy Usage:	72,000 kWh	$0.10	$7,200
Peak Power **Demand**:	100 kW	$8	$800
		TOTAL:	$8,000

Demand Charges = 10%

of Company A's monthly electricity costs

Company B

Monthly Energy Usage

Utility Bill

		Rate	Charge
Energy Usage:	7,290 kWh	$0.10	$729
Peak Power **Demand**:	100 kW	$8	$800
		TOTAL:	$1,529

Demand Charges = 52%

of Company B's monthly electricity costs

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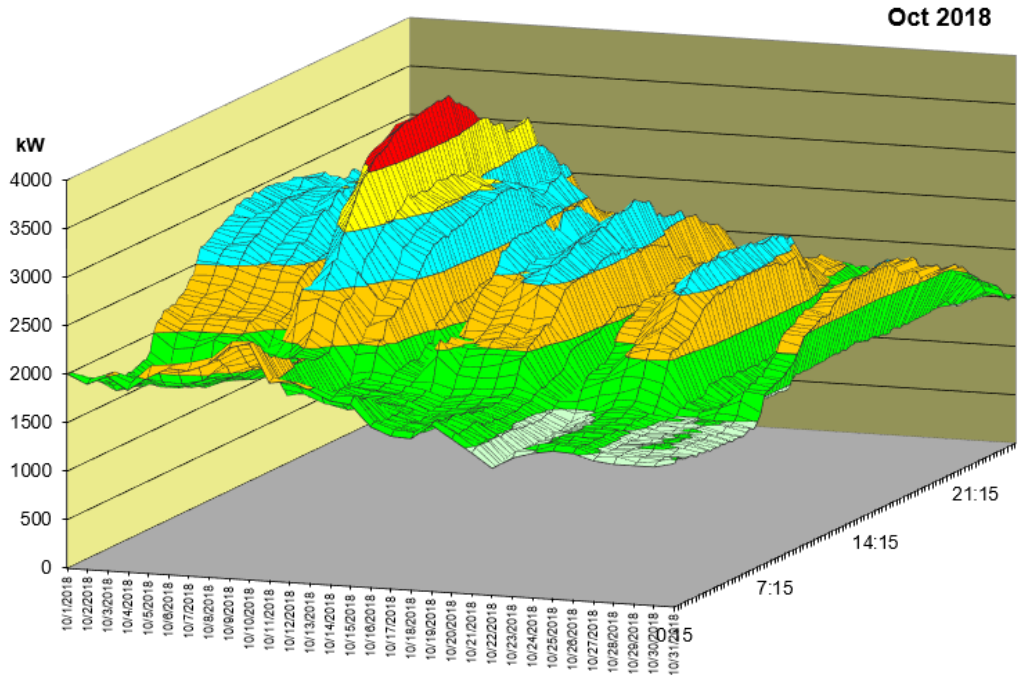
How to analyze your demand

Visualization through Excel

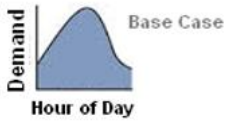
Gather 15 min interval data

	0:00	0:15	0:30	0:45	1:00	1:15	1:30	1:45
	0:15	0:30	0:45	1:00	1:15	1:30	1:45	2:00
10/1/2018	501	501	489	477	480	468	465	459
10/2/2018	477	486	483	477	465	459	456	444
10/3/2018	501	504	504	492	486	474	471	462
10/4/2018	468	483	489	483	483	477	468	456
10/5/2018	504	531	525	510	477	462	456	453
10/6/2018	531	534	534	507	474	465	465	462
10/7/2018	528	546	540	525	486	489	483	480
10/8/2018	549	561	552	546	531	522	498	486
10/9/2018	594	606	594	576	555	534	519	513
10/10/2018	609	609	597	588	570	561	546	546
10/11/2018	510	519	507	498	477	456	459	453
10/12/2018	519	510	507	489	468	468	459	459
10/13/2018	498	501	492	477	447	441	435	435
10/14/2018	474	480	486	459	441	429	426	423
10/15/2018	468	486	480	468	465	465	450	438
10/16/2018	414	423	420	411	417	411	417	411
10/17/2018	393	405	405	402	402	405	402	399



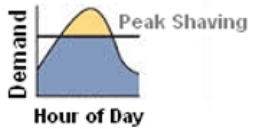
How To Mitigate Peak Demand

Determine the reasoning for the spike in demand and how much it’s costing you



Options:

1. Conservation. Spread visibility and awareness.
2. Load Shifting.
   - Change internal process to reduce peaks.
3. Peak Shaving Control Scheme.
4. Co-Generation.

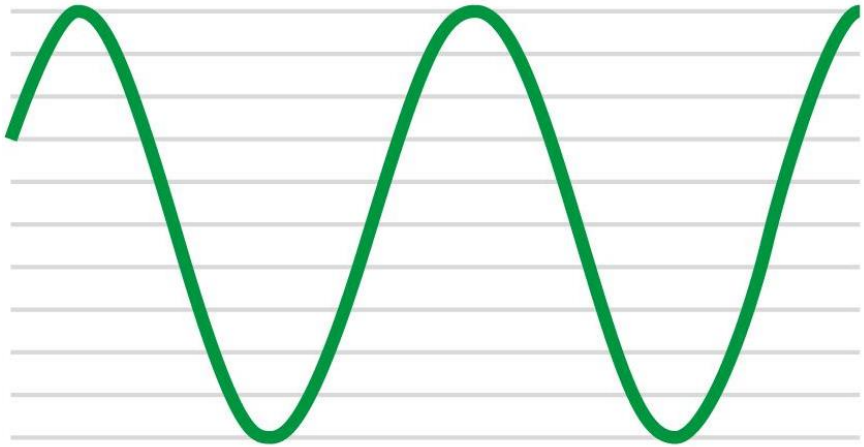


4 Power Factor

Power Quality 101

Maintaining a high level of power quality can:

- Improve equipment efficiency
- Decrease capital, operational, and maintenance expenses
- Increase equipment life expectancy
- Reduce environmental impact



Interpreting Power Quality Problems

Not always straightforward

Power Quality is complex and I don't have time to investigate

I cannot easily share with my managers the impact of PQ in our operations

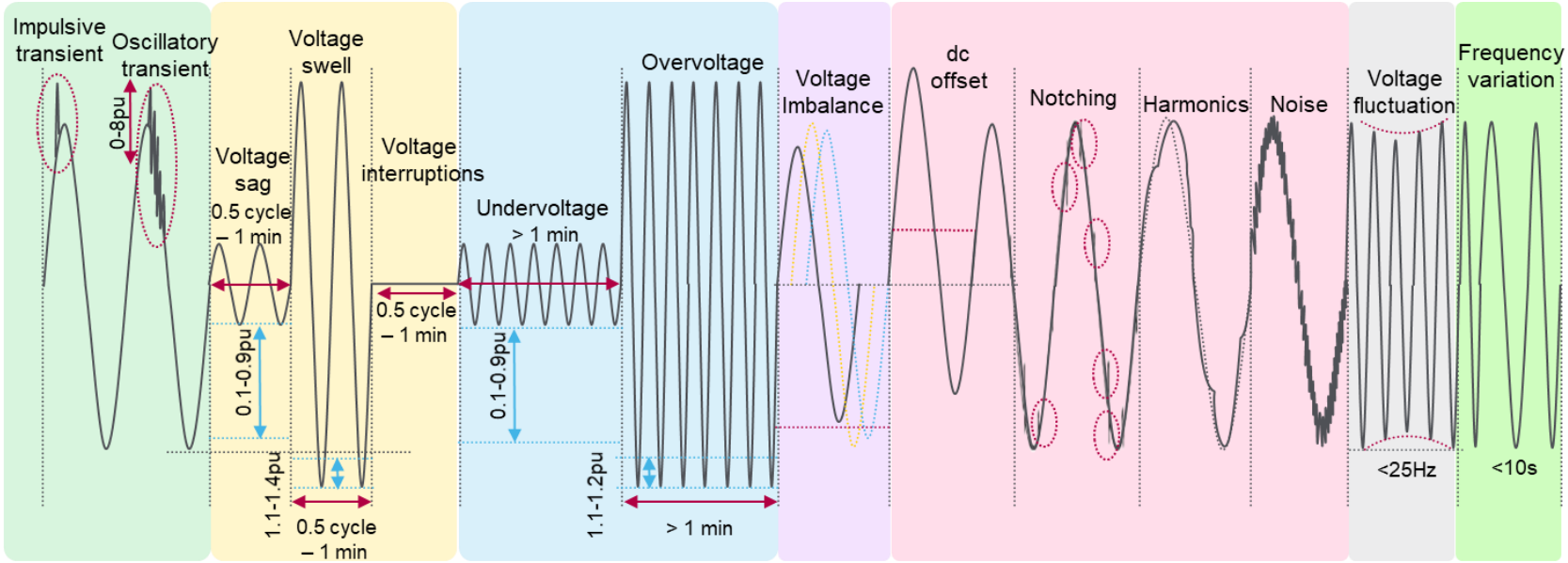
I know we have PQ issues but not sure where, when and how they are impacting my facility

I need a to have a simple continuous view of my facility's power supply quality

PQ auditors provide complex reports that nobody understands, I need something easy to read

Are my investments in power quality mitigation equipment paying off? Are they operating normally?

Summary of PQ Waveforms & RMS

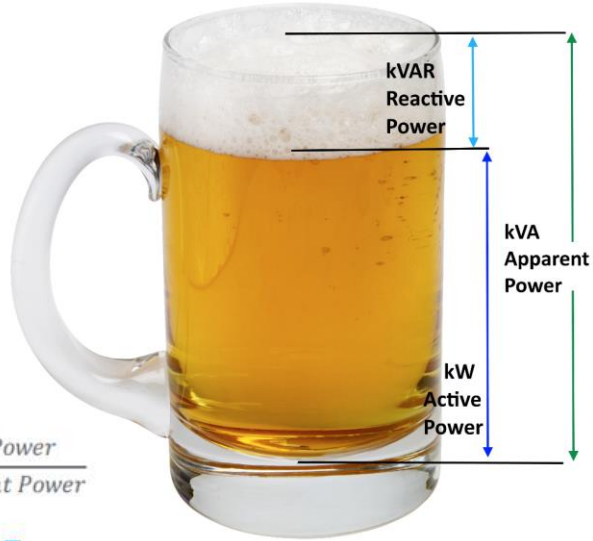


Power Factor

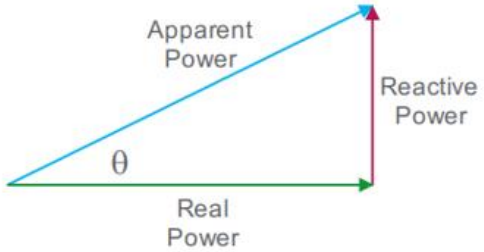
Potential Effects

- Equipment with a low power factor draws more internal current than equipment with a high power factor. This can cause excess heating, and potentially shorten the equipment's lifespan
- Electric utilities typically charge industrial customers a penalty if their overall system power factor falls below a certain threshold, typically 0.9 to 0.95, raising the total energy cost.

**We have seen companies who have to pay $350,000 a year in Power Factor penalties!

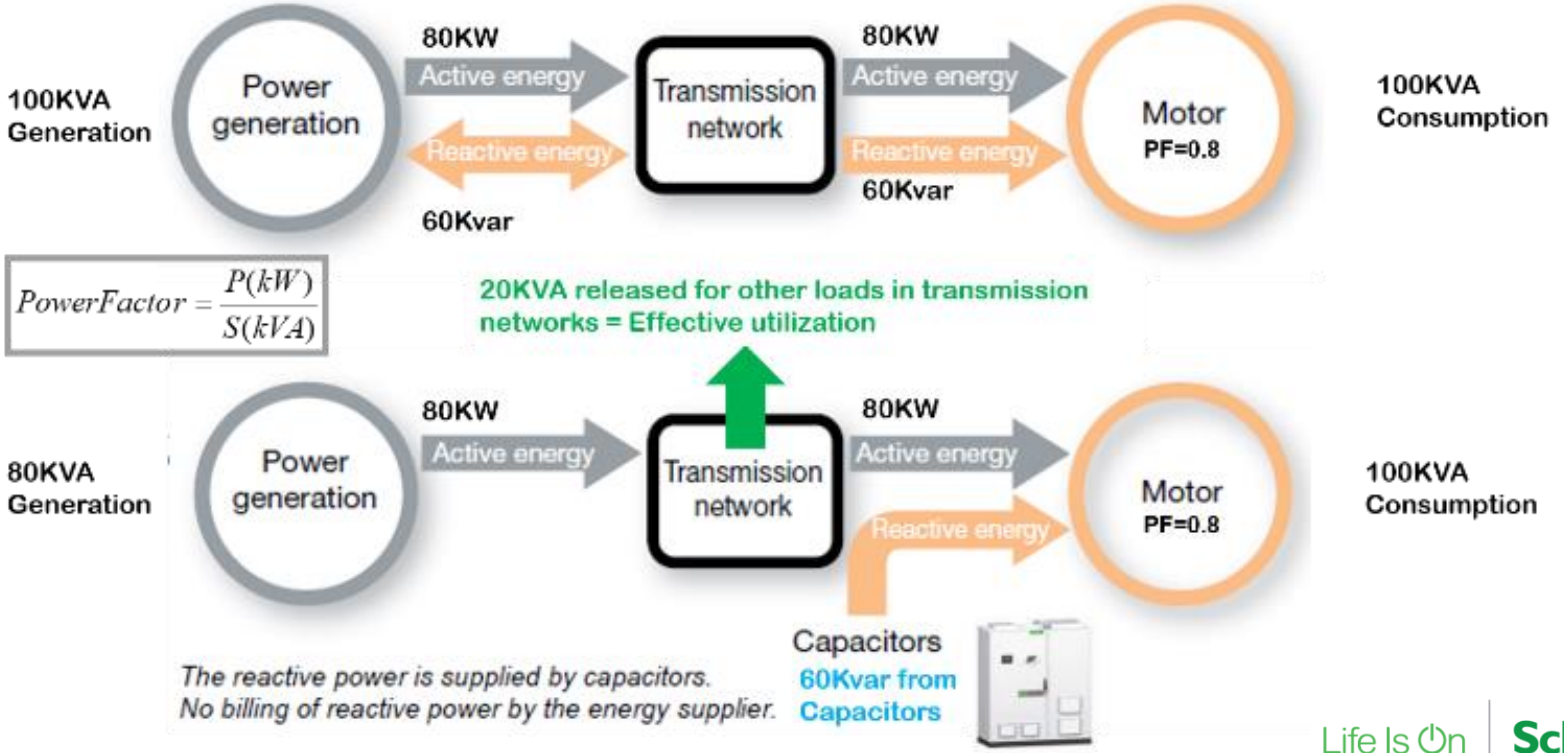


$$Power\ Factor = \cos\theta = \frac{Real\ Power}{Apparent\ Power}$$



Power Triangle: relation of components used to determine power factor

Reactive Energy Management



Power Factor

Excessive Lagging

- Easy To Identify!
- Medium Cost to Implement!
- High Opportunity for Energy Savings!

What to Look For:

- Power Factor Penalties on Utility Bill
- Main meter PF nearing or < 0.95
- Report showing degrading PF
- Lack of capacity correction in the mechanical room near the transformers

What to Do:

- ✓ Check the utilization of steps on existing PFC banks. If 100% loaded, then may have to expand or purchase a new one.
- ✓ Check existing PFC banks for degradation or end of life capacitor which could have caused the low PF (typical after 4-6 years).

5 Harmonics and Voltage Issues

Excessive Voltage Harmonics

- 30-40% of all unscheduled downtime is related to PQ issues.
- 80% of PQ issues are caused by equipment inside a facility.
- Harmonic distortion can produce a number of harmful effects in electrical equipment including:
  - Mis-operation and reduced life expectancy of sensitive microprocessor-based equipment
  - PFC or power supply capacitor failure and/or fuses blowing
  - Additional energy losses
  - Overheating of motor, transformer and neutral conductors
  - Intermittent breaker and/or relay operation
  - Shorter equipment life

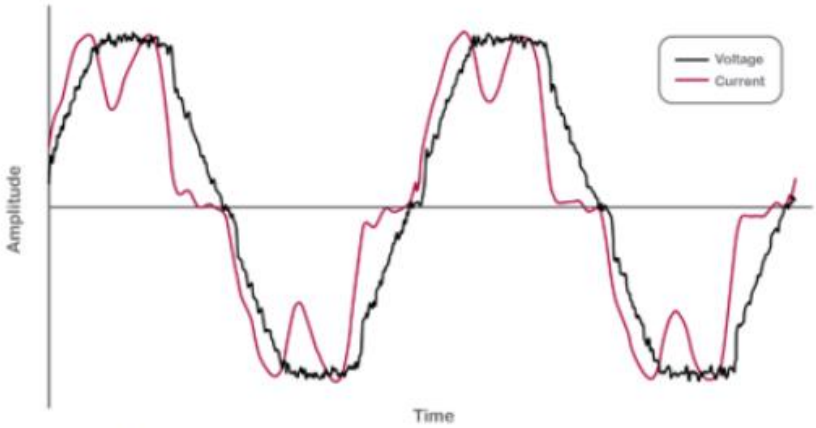


Figure 1. Single-Phase Voltage and Current Waveforms for a Non-Linear Three Phase Load.

Excessive Voltage Harmonics

What to Look For:

- Significant loads without PQ metering, including new, or planned, new loads
- Loads known to generate PQ issues (VFDs, large engines, etc.)
- Issues related to unexplained wear and tear of electrical equipment

What to do:

- Get visibility and understanding of how to identify PQ issues at the measure point
- Plan mitigation solutions to prevent outages by identifying areas at risk

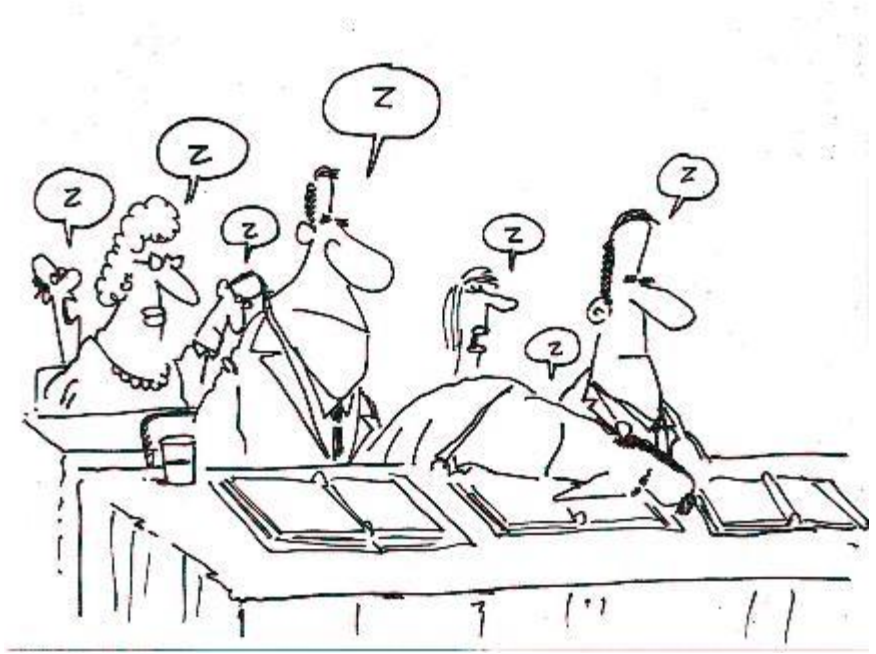
Facility Impact:

- Reduce maintenance and unscheduled downtime
- Improve electrical network health reliability
- Improve reporting and facilitation of planning corrective and preventive actions

You survived!

If you missed everything else, just remember these 5 takeaways

1. *Trust your Data.*
2. *Digitize your system*
3. *Pique your interest in Peak Demand*
4. *Factor in your Power Factor*
5. *Listen to the Harmonics*



Questions ? More Resources

Check out Schneider Electric's Digital Power Services page

https://www.schneider-electric.us/en/work/services/field-services/power-management/

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Facility Expert

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