Power Monitoring Systems

Server: Application + Database
Thick Clients: Engineering Tools
Thin Clients: Main User Interface (Web based)

IP Backbone

Power Meters
Protection Relays
Breakers, Trip Units, Gateways
UPSs
Variable Speed Drives
PQ Correction Equipment
Final Distribution Breakers, Sensors, Gateways
RTUs, PLCs

Water, Air, Gas, Steam

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About US

• Headquartered in Norcross, GA
• Founded in 2011 by Nabil Taha and Nasser Hamdan
• **Focused on providing PQ solutions and harmonic mitigation**
• Emphasis on the Data Center / Critical Power Industry
  • Successful implementation of dozens of DC’s overall over a gigawatt total
• 2018- *Currently have over 35 employees, and global offices in Netherlands, Singapore and Taiwan*
Not all monitoring systems are created equal...

The User and the use case defines the system needed
- Environmental Comfort
- Safety
- Regulated
- 24x7 Monitored
The Right Tool for the Job

Downtime

Back up Power

Predictive Maintenance

Downtime / Reliability / Power Quality

Simplest System

Basic Energy Management

The Right Tool for the Job
**Commercial Buildings**
- High rise, mixed use
- University or Campus
- Government Facilities

**Typical use case**
- Provide Comfort for the occupants
- Energy conservation and management – basic metering, tenant metering, cost allocation
- Power quality and sequence of events not a priority

**Solution / Needs** – kwhr – Led by BMS – lesser need for stand-alone EPMS – except in cases where cost allocation of energy usage is required (University Campus / Higher Education)
Typical use cases

• **Downtime avoidance**
• Power Quality mitigation via active front end drives or stand alone harmonic filters
• **Electrical Distribution System reliability**
• Maintenance of system
• **Sequence of events in cases of unexpected outages**
• Power management – basic and advanced metering, cost allocation, PQ Analysis
Typical use cases

- Shadow Billing of Utility
- **Building Management systems not the primary system**
- Process Control Systems and data historians become more important
- **Internal Cost allocation**
- Integration via software – OPC or via multiple connections to the same device
Typical use cases

- Remote electrical system analysis
- Remote software system diagnostics
Typical use cases

• Downtime avoidance
• **Power Quality mitigation for sensitive electronic equipment**
• Electrical Distribution System reliability
• **Generator Testing – Joint Commission Reporting**
• Power management – basic and advanced metering, cost allocation, PQ Analysis
**Typical use cases**

- Internal Cost allocation
- Building Management Systems more important
- **Integration of BMS and EPMS can be compelling**
- More complex mechanical systems, including chiller plants may warrant stand-alone systems or integration of key points only from the electrical system to the BMS
- **Sequence of Event recording**

![Diagram of healthcare system components](image)
Data Centers

Typical use cases

• Complex electrical distribution systems
• Complex mechanical systems, chiller plants, air handling units
• Generator / Back up system testing
• Power Quality mitigation for sensitive electronic equipment
• Critical to commission accurately and comprehensively
• Electrical Distribution System reliability
• Power management – basic and advanced metering, cost allocation, PQ Analysis
• IEC 61850 for protection and control
Typical use cases

- Multiple systems fire, building management, critical building management
- Less likely to integrate systems into 1 system
- PQ Analysis
- More likely to have an external data collection system for analysis and AI
- Sequence of Event recording, 1ms time stamping
> **Servers / Software**
  - Primary and backup servers in a ‘hot standby’ configuration

> **Network**
  - Redundant Ethernet ring topology

> **PLC**
  - Hot standby PLCs for automatic transfer applications
Data Centers

Typical use cases
- **Commissioning** – integral part of the project
- Validate the complex back-up distribution systems
- Utilize the EPMS to make sure everything operates correctly
- Able to view the whole system

Critical Power

System Verification
- Real Time Status
- Before and after
- Breaker status
- Generator status
- Voltage status
- Load status
- Metering
Shifting Priorities – changing trends
- Testing at equipment builders – integrators and electrical manufacturers
- Testing with load
- Validation
- More important to have EPMS integration early in the process

Enhanced Documentation and Reporting:
Sequence of Events Logs

Document:
- Response to utility outages
- Generator transfers
- UPS system transfers
- ATS operations
- Switching procedures
- Maintenance procedures
Remote Analysis and Commissioning Support

Typical use cases

- **Upload historical data to the cloud for analysis**
- Determine wiring issues
- Metering issues
- Communication issues
- Generate a report based on the findings
- Offline data collection available
- E-mail
Dashboard Only
Google spokesperson said the fully automated version saves 30 percent of energy annually, with more savings expected in the future.
“Now we’re taking this system to the next level: instead of human-implemented recommendations, our **AI system is directly controlling data centre cooling**, while remaining under the expert supervision of our data centre operators. This first-of-its-kind cloud-based control system is now safely delivering energy savings in multiple Google data centres.” from Deep mind website
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  • 24x7 Monitored
The Right Tool for the Job

- Downtime
- Back up Power
- Predictive Maintenance
- Downtime / Reliability / Power Quality
- Simplest System
- Basic Energy Management
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