



IEEE IAS Atlanta Chapter Meeting

02/21/23

Agenda

- ▶ Members Open Forum
- ▶ Main Presentation
- ▶ Q&A
- ▶ Next Meeting Announcement

Members Open Forum

In an Orderly Fashion, Please Unmute Yourself or Request the Microphone



The Metering Market: Overview & Case Studies

Presenter: Jared Bosanko, Director – Anord Mardix

- ▶ Bachelor of Science, Economics, United States Naval Academy
- ▶ Based in Jacksonville, FL
- ▶ Joined Anord Mardix 2018
- ▶ Experienced in Power Distribution, Energy Management & Data Analytics
- ▶ Specializes in custom metering applications and software integration for BMS and DCiM solutions



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The Metering Market: Overview & Case Studies

Presenter: Alan Katz, Product Mgr – Anord Mardix

- ▶ 25 years industry experience design critical power devices (UPS, Static Switch, RPP, PDUs and metering)
- ▶ Co-Founder of Incusense (now part of Flex); leading multi-circuit metering company



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Why Power Metering?

- ▶ Power Quality: Modern devices profoundly impacted by power quality issues ranging from sags to surges.
- ▶ Energy Utilization: Being aware of energy utilization allows for passive conservation / carbon reduction; especially when submetering
- ▶ SLA Compliance: Ensure that power is uninterrupted and within specification
- ▶ Spotting Anomalies: Power anomalies are invisible but can interrupt critical processes
- ▶ Sub-metering: An aggregate energy usage number does not tell where the energy is being used and hampers reduction efforts
- ▶ Tenant billing / cost allocation
- ▶ Capacity planning

The Green Facts

- ▶ The grid is facing increasing stress as we move to electric transportation and home appliance electrification
- ▶ Conservation is key but we are moving in the opposite direction
- ▶ Knowing exactly where energy is being used facilitates passive conservation which can lead to 5-25% reduction in electricity consumption.

Metering Overview: Governance, Compliance & Standards

▶ Compliances & governance

- IEEE: **Large array of relevant standards**
- ANSI/ASHRAE/IES 90.1
 - Buildings and high rise residential energy codes for minim energy efficiencies for: Total electrical energy • Heating, ventilating, and air-conditioning (HVAC) systems • Interior lighting • Exterior lighting • Receptacle circuits
 - 2016 vs 2004 versions of standard 90.1 – 35% savings
- California Title 24
- 2016 DCOI (Data Center Optimization Initiative)
- MID (Europe)

▶ Accuracy Compliance:

- The American National Standards Institute (ANSI) code for Electricity Metering (ANSI C12.1) and code for Electricity Meters – Accuracy and Performance (ANSI C12.2)
- The International Electrochemical Commission (IEC) standards for Electricity Metering Equipment (IEC 62053)

▶ Additional Compliance:

- Leed certification – U.S. Green Building Council
- The International Electrochemical Commission (IEC) standards for Electricity Metering Equipment (IEC 62053)

Impact: Deploying more metering throughout facilities at higher densities and better accuracies

- Paves way for multi-circuit metering
- Enhanced features to facilitate both installation and integration
- Evolving technology to provide additional metrics beyond the current “standard”

Meter Market Observations

- **Hyperscale & Enterprise Data Centers**

- “Standard designs” vs Green Initiatives
- Project visibility of 3+ years and beyond
- Expedited onboarding of OEMs due to needs
- Creating massive backlog & straining “preferred” OEMs
- Legacy sites reaching EOL
- Desire for standardization but often not practical
- Supply chain crisis “victims”

- **Buildings Market**

- **Tenant cost allocation**
- **Energy reduction initiatives**
- **Power quality for critical processes**
- **Ensuring utility complianec**

- **Colocation (Scale)**

- Constant pursuit of hyperscale tenants
- Large buying power
- Procurement divisions gaining more input
- Losing innovation based on long term buys
- At mercy of LDs w/ trickle-down effect
- Contributing to reshuffling of current orders & OEM job prioritization

- **Colocation (Colo)**

- Focused on smaller new customer fit-outs
- Spec flexibility due to equipment availability
- High dependance on metering for billing
- Investigating alternative solutions (i.e. new vendors, diff approach, etc.)

Impact: Searching for the right product to meet all their specific needs

- Customers willing to explore all “approved equivalent(s)” to meet build objectives and meter requirements
- OEMs expanding product base and stock options to meet customer needs & reduce costs
- Investigation of innovative solutions (e.g. designs, products, etc) to curb impact of material delays

Multi-Circuit Monitoring

Standard sub-circuit metering

- Providing branch level V, A, kW, kWh, PF
- Use cases varied on customer need(s): e.g. PUE initiative, ROI calculations, SLA adherence, capacity planning
- High cost due to Metrology
- Installation costs for retrofit environment
- Integration costs due to different systems throughout switchgear, PDUs, Busway, RPPs or panelboard applications
- Protocols varied on system – often requires converters
- Accuracy dependant upon both system & CT types (solid core, split-core, Rogowski coil)
- Specs becoming increasingly detailed

Enhanced sub-circuit metering

- Presence of voltage detection & waveform capture
- Same device supporting switchgear, PDUs, Busway, RPPs or panelboards
- Native ethernet w/ simplified configuration & remote upload capability
- No additional software necessary (Modbus TCP/IP, SNMP and BACnet capabilities)
- Provides application specific peripherals (e.g. Aux contacts, temp/humidity, etc.)
- Adherence to all accuracy standards (ANSI, IEC, MID, etc.)
- Increased polling rates and data storage
- Easy to install and cost effective

Comparison Chart (System)

Branch Circuit Metering (BCM) Feature	Standard BCM	Anord Mardix MCMS
Sampling Rate	< 3 kHz	3kHz /40 kHz
Polling Rate	15 min	0.1-0.3 seconds
Meter Accuracy	1-2%	0.2%
System Accuracy	CT Dependant	0.5%
Operating System	Firmware	RTOS (ThreadX)
Hardware Penetration Security	Non-certified	SERTIT Certified
Onboard web server	✘	✓
Remote HTML display	✘	✓
Waveform capture on event per circuit	✘	Manual & Automatic
Local Storage and Logging	✘	32 GB
Logging interval	NA	Variable
True Circuit Display	?	✓
Presence of Voltage Detetction	✘	✓
Branch circuit summation	✘	✓
Predictive Health Monitoring per circuit algorithm	✘	✓

Enhanced Multi-Circuit Monitoring

Installation feature benefits

- HTML web interface for configuring / commissioning
- Auto CT orientation correction so never have to swap a CT again!
- Additional options to meet the need (e.g. panelboard vs Switchgear vs busway)
- Ability to connect most 3rd party peripheral monitoring devices (e.g. IO modules, temp sensors, etc.) eliminating cost of additional systems
- Solutions compatible with existing CTs
- Wireless compatibility to negate need for wiring

Integration feature benefits

- Ability to pre-configure panel schedules and thresholds in the meter
- Inherent SNMP, Modbus TCP/IP and BACnet protocols which eliminates "adder" costs of any comms devices (e.g. EGX)
- Dual ethernet: meters can be connected in series reducing amount of switches required in high density environments
- REST / API functionality greatly reducing software integration time
- Bulk upload capability so you can configure all RPPs at once, instead of each one individually - this can save DAYS on site

Comparison Chart (Communications & Integration)

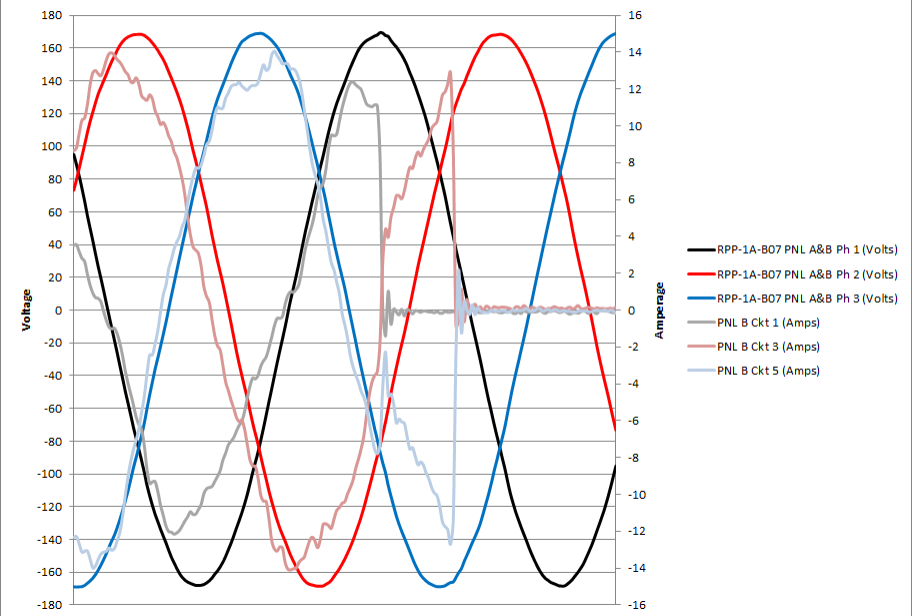
Communications & Integration Support	Standard BCM	Anord Mardix MCMS
Modbus RTU	✓	✓
Modbus TCP/IP	?	✓
BacNET	?	✓
SNMP	✓	✓
Cellular Communications	✗	✓
Real Time Clock	✗	✓
External NTP time link	✗	✓
Native GPS time link	✗	✓
Pulse input support	✗	✓
Cloud/ REST API	✗	✓
Firmware Updates	Field technician	USB Drive, network
Configuration	Field technician	USB, webpage or remote
Peripherals & Options		
Second voltage source support	✗	✓
Thermal Sensing	✗	✓
Native Rogowski coil support	✗	✓
Digital Input	✗	2-24
Digital Output	✗	2
Display	Basic LCD	Graphical LCD

Case Study 1 – Datacenter PUE Initiative

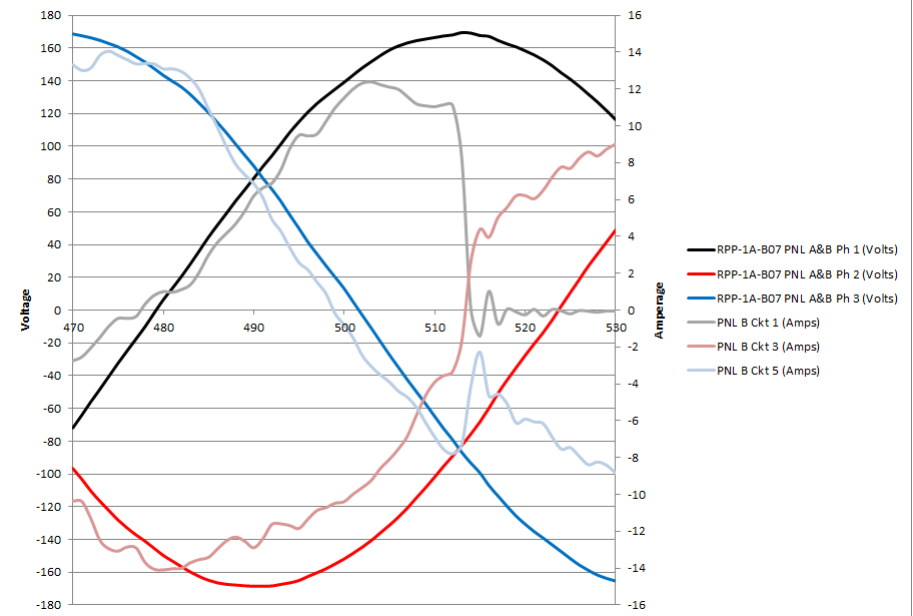
- ▶ The Project: Large TELCO w/ legacy facilities across US launched an initiative to increase visibility across their total profile.
 - Standardized on 2 meters (utility meter & advanced MCMS) and 1 software platform.
 - Facilities included office spaces, datacenter, electric rooms, and mech rooms
- ▶ The Process:
 - Customer & vendor “partnership” to define overall objectives and specifications
 - Worked w/ engineers (3rd Party) to develop options based off of SLDs
 - Training performed at each site for installation teams & lessons learned
 - Facilitated software integration using “holistic” approach and advanced features
 - Trained facility managers on both meters & software
- ▶ Summary:
 - 5 facilities completed within 1 year
 - Increased visibility of energy for decision making / next steps for future improvements and ROI calculations (Ex: UPS upgrades, Chillwater plant replacements, etc)
 - Accuracy improvement from legacy systems allowing for internal billing
- ▶ Customer feedback:
 - Cost savings in standardization (replacements, training, operations, etc.)
 - Customer satisfaction improved
 - Additional analytics sped up RCA (example on next slide) and evolving into predictive maintenance plan

Case Study 1 – Faulting Breaker on Datcenter RPP Update?

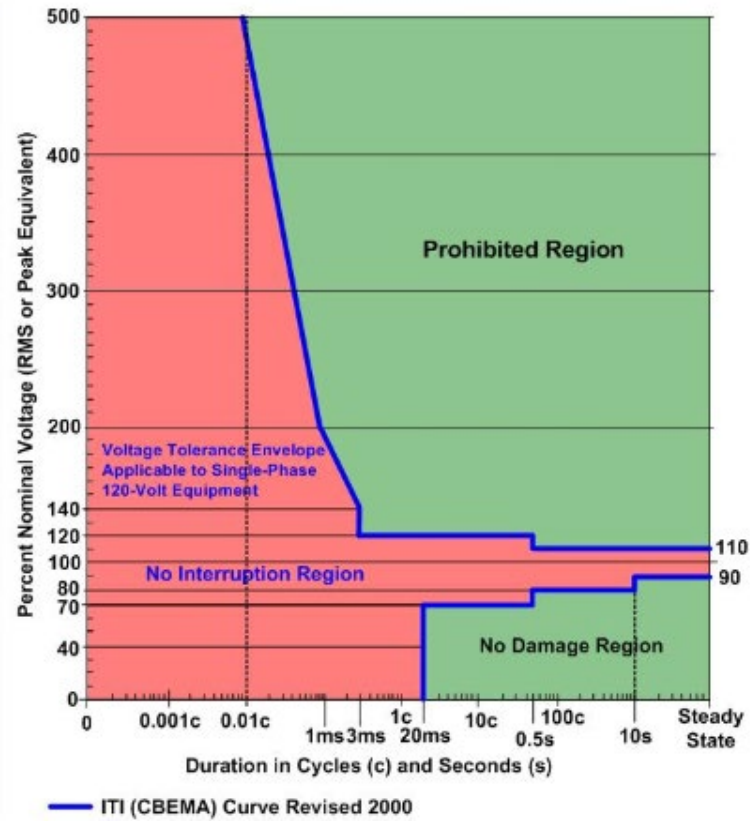
COSP K15 Power Event 8-8-2017



COSP K15 Power Event 8-8-2017



Case Study 1 – CBEMA/ITIC – the power quality envelope



Case Study 2 – Building or Maybe Cologix Retrofit?

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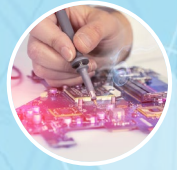
Key Takeaways:

- Advanced Energy Efficiency
 - Managing the unknown
 - Benefits of more data
 - White vs Grey
- Cost Savings
 - Installation (hardware)
 - Modifications & troubleshooting
 - Integration (Start up & Cx)
 - TCO
- Time Savings
 - Retro vs New
 - Serviceable designs
- Quality / Uptime
 - Design parameters
 - The evolution of data analytics and where it's going
- Innovative Thinking
 - Metering 10 yrs ago
 - Metering NOW
 - Metering TOMORROW



Open Discussion and Q&A





Next Meeting: Monday, 03/20/23

Topic: Motor Starting and Running Studies

Presenter: Tryton Bower – PDG Team Lead – Mangan, Inc.

