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

Outreach Opportunities

Job Openings

Related Announcements

Recommended Topics

Asks
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

Jared.Bosanko@anordmardix.com
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

alan.katz@flex.com
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.
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 compliance

• 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)

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

<table>
<thead>
<tr>
<th>Communications &amp; Integration Support</th>
<th>Standard BCM</th>
<th>Anord Mardix MCMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus RTU</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Modbus TCP/IP</td>
<td>?</td>
<td>✓</td>
</tr>
<tr>
<td>BacNET</td>
<td>?</td>
<td>✓</td>
</tr>
<tr>
<td>SNMP</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Cellular Communications</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Real Time Clock</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>External NTP time link</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Native GPS time link</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Pulse input support</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Cloud/ REST API</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Firmware Updates</td>
<td>Field technician</td>
<td>USB Drive, network</td>
</tr>
<tr>
<td>Configuration</td>
<td>Field technician</td>
<td>USB, webpage or remote</td>
</tr>
</tbody>
</table>

**Peripherals & Options**

<table>
<thead>
<tr>
<th></th>
<th>Standard BCM</th>
<th>Anord Mardix MCMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second voltage source support</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Thermal Sensing</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Native Rogowski coil support</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Digital Input</td>
<td>×</td>
<td>2-24</td>
</tr>
<tr>
<td>Digital Output</td>
<td>×</td>
<td>2</td>
</tr>
<tr>
<td>Display</td>
<td>Basic LCD</td>
<td>Graphical LCD</td>
</tr>
</tbody>
</table>
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 (3’rd 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 Datacenter RPP Update?
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.