T71 - Energy Monitoring and Control Using FactoryTalk EnergyMetrix and RSLogix 5000
Agenda

Rockwell Automation Energy Management Message

FactoryTalk EnergyMetrix

PEM Products - Hardware

Energy in other products
The Challenge: Energy Management

The traditional outside-in approach views energy as:

- An unavoidable cost of doing business
- Measured by overall facility use
- Managed only by using less
- Not sure where to begin
- Internal audit teams are limited in scope and availability
- Improvements are often seen as expenses instead of investments
Overcome the Challenge

- Accurate visibility of energy consumption of your assets
- Compare energy efficiency across plants and assets with normalized data
- Analyze energy usage trends compared to historical patterns and forecasts
- Trigger alerts from unexpected deviations
- Prioritize actions and investments based on financial and operational parameters

The Industrial GreenPrint provides a roadmap to transform manufacturers into strategic managers of energy
The Plan - Industrial GreenPrint

A Multi-Phased Methodology to Continual Sustainability / Energy Management
Industrial GreenPrint Awareness
Monitor, Measure & Verify

*Understand your Energy Usage with Facility and Plant Floor Energy Monitoring*

- Energy assessments to identify energy savings opportunities
- Leverage installed devices to gather data for Water, Air, Gas, Electricity, Steam (WAGES) usage
- Real-time measurement & verification of energy usage
- Monitor equipment to establish baselines
- Improve profitability / performance, uniform reporting

Creating a WAGES baseline is crucial to increasing energy efficiency

Know how much, when and where you are using energy
Industrial GreenPrint Efficiency

• **Analyze**
  - Against baselines, production output, corporate targets, and regulatory limits, actionable KPIs and benchmarks
  - Process efficiencies – energy per unit produced
  - Identify inefficiencies and develop energy action plan

• **Visualize**
  - Energy usage against production output,
  - Compare performance across multiple facilities

• **Control Processes**
  - Control Production & Central Plant Utilities
    • Improve equipment, line, system performance with deployment of automation
    • Refrigeration – chillers, compressors, cooling towers
    • Compressed air
    • Steam and hot water generation
    • Boilers
    • Balance of plant

Accountability is the key driver to changing behavior
Industrial GreenPrint Optimization

Predictive.
Advanced algorithms:
- Multiple Constraints.
- Globally Optimal.
- Performance in real time.

Adaptive.
- Adapt to any production environment.
- Adjust to forecast and real time changes.

Energy By Demand.
Match production with optimal allocation of energy assets ... Just-in-time, Just enough.

Economic Optimization.
Highly accurate methods of quantifying costs of options.

Increased profitability by modeling assets with energy data
Industrial GreenPrint Aggregation

- Enhance plant-wide optimization with energy as a raw material
- Enhance business tracking systems with energy and GHG consumption information
- View energy and GHG on Bill of Material
- Expand supply chain data model to include energy genealogy
Agenda

Rockwell Automation Energy Management Message

FactoryTalk EnergyMetrix

PEM Products - Hardware

Energy in other products
FactoryTalk EnergyMetrix

Bringing the Energy Picture into Focus
FactoryTalk EnergyMetrix Manager

- Base software license for EnergyMetrix functionality
  - Added functionality can be added on through additional licenses

- Functionality
  - Set up groups, domains, roles, users, devices, meters
  - Log data from Allen-Bradley devices using RSLinx Classic drivers or OPC client
  - 6 Basic reports and 2 charts
  - Rate schedules
  - 10 meter licensing
    - OPC or A-B meters as part of the 10
  - Offered with or without Microsoft SQL Server 2008 Runtime license (Single or Unlimited)
  - Alarming
Charts included in Manager

**Trend Chart**
- Plots up to 5 selected variables (kWh, kVARh, KW Demand etc) from one or more meters on a web page
- All variables are plotted with the same selected time axis

**Calendar Trend Chart**
- Plots 1 variable overlaid on a monthly calendar
  - Clicking on a date on the calendar displays a larger graph of that variable on that date
  - Multiple dates may be overlaid on the daily graph for analysis and comparisons
Reports Included in Manager

Reports detail various information for selected meter(s) or group(s) for a specified date/time range

- **Consumption Report**
  - Reports consumption values (kWH, kVARh, etc)

- **Demand Analysis Report**
  - Reports kW demand values
  - Also reports "worst case scenario" peak demand

- **Billing Report**
  - Runs billing reports and outputs a list of line items and a total charge
  - Each line item consists of a description, quantity, rate and charge

- **Cost Allocation Report**
  - Reports cost per department or process based on actual usage.

- **Power Quality Report**
  - Displays sag/swell information detected by PowerMonitor™ 3000 and 5000 products

- **Pareto Report**
  - Plots energy data on a Pareto chart
Additional Options

- Real Time
- OPC Client
- ChartsPlus
- ReportsPlus
- Meter Bundles
Real Time

- FactoryTalk EnergyMetrix RT is the real-time communications, configuration and data display package.
  - Configure and view Allen-Bradley power monitors
  - View the meter data including real-time and historical stored within the monitors
  - Display waveforms and harmonics in graphical or log formats
OPC Client

OPC Client is an option package to allow FactoryTalk EnergyMetrix to communicate and collect data from 3rd party meters, sensors, PLCs, and power monitors

- Single OPC license required to enable all license meters to communicate via OPC
  - Bring consumption, demand data from 3rd party power monitors into FactoryTalk EnergyMetrix
  - Bring pulse and sensor data into FactoryTalk EnergyMetrix
  - Bring data collected via 3rd party PLCs into FactoryTalk EnergyMetrix
FactoryTalk EnergyMetrix ChartsPlus is an option package to add additional chart types that are not included with the standard manager license

- **Additional or enhanced charts**
  - Enhanced consumption trend
  - Enhanced calendar trend
  - Monthly consumption/demand comparison
  - Load factor
  - Custom

- **X-Y trend, targeting and CUSUM analysis**
  - Powerful energy benchmarking, forecasting, and analysis tool
  - Linear regression methods to identify energy saving opportunities, and compare data set to targets
  - CUSUM Analysis pinpoints changes in process behavior that cost or save energy dollars
FactoryTalk EnergyMetrix ReportsPlus is an option package to add additional report types that are not included with the standard manager license.

- Report templates
  - Comparative billing
  - Billing roll-up
  - Efficiency
  - Trend

- Custom Reports
  - Customizable reporting tools to create, save, run, and reuse exactly the reports your business needs
    - Excel template
    - Excel add-on
    - Visual Basic Scripting
    - Sparklines
Meter bundles

Additional meters can be added to the license count of FactoryTalk EnergyMetrix by the purchase of various meter bundles

- Meters can be purchased in the following bundles and have whatever functionality is governed by Manager and Optional license purchases (i.e. Manager and OPC licenses give all meters Manager and OPC functionality)
  - 10 meters
  - 50 meters
  - 100 meters
  - 500 meters
New Functionality to FactoryTalk EnergyMetrix

- New graphics, catalog structure, and activations
- Support and integration for PowerMonitor 5000 M5 product
- FactoryTalk live data
  - OPC Tag browsing
- Automatic waveform and transient download for PowerMonitor 3000 and PowerMonitor 5000
- Enhanced custom reporting tools including Excel templates, add-ons, and Visual Basic Scripting
- Trend chart report
Agenda

- Rockwell Automation Energy Management Message
- FactoryTalk EnergyMetrix
- **PEM Products - Hardware**
- Energy in other products
PEM Product Offering

$ Price

- Bul. 1411 - CTs
- Bul. 1425 - PM500
- Bul. 1420 - PMW250
- Bul. 1408 - PM1000
- Bul. 1404 - PM3000
- Bul. 1407 - CGCM
- Bul. 1405 - PM5000
- Bul. 1412 - PowerPad
- Bul. 1413 - Cap Bank Controller

IA Compatible Functionality
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<th>Name</th>
<th>PMW250</th>
<th>PM500</th>
<th>PM1000</th>
<th>PM3000 (M4/5)</th>
<th>PM3000 (M6)</th>
<th>PM3000 (M8)</th>
<th>PM5000 (M5)</th>
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<td>Panel mounted power monitor</td>
<td>Power Monitor</td>
<td>Power Quality power monitor</td>
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CGCM

- Combined Generator Control Module
- Multi-function digital device for generator control and protection
  - Excitation control
  - Generator protection
  - Synchronization control
  - Full-function metering
  - Integration with Rockwell Automation ControlLogix Family
PowerMonitor™ 1000

**Metering**
- Consumption (kWh)
- Demand (kW)*
- Power Factor (%)*

* Optional

**Key Features**
- Embedded web page for real-time data and configuration
- DIN-rail mounted
- Diagnostic utility for incorrect wiring
- Two status inputs for external metering (Water, Air, Gas, etc.)
- Integrated display for configuration

**Communication**
- EtherNet/IP
- Serial

**Sub-Process Meter**
PowerMonitor™ W250

**Metering**
- Consumption (kWh)
- Demand (kW)
  - Derived in EnergyMetrix

**Communication**
- Wireless to Serial Receiver
  - 802.15.3 Wireless standard
  - Modbus RTU from receiver

**Key Features**
- Wireless repeater for extended range
- Integrated current transformer coils
- Wireless diagnostic tools in EnergyMetrix
- Self-configuring wireless networking

**Future Developments**
- Ethernet receiver
- Wireless Pulse Meter

**Wireless Sub-Meter**

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Sample Network Configurations

Simple Star Network

Extended Star Network
PowerMonitor™ 500

**Metering**
- Consumption (kWh)
- Demand (kW)
- Power Factor (%)

**Communication**
- EtherNet/IP*
- Serial

* Future Release

**Key Features**
- Door mounted
- Large backlit display for real-time monitoring
- Fully configurable by touchkeys and display
- Configurable alarming
- Integration with FactoryTalk EnergyMetrix
- Integrated analog or digital outputs (optional)

At-Process Meter
PowerMonitor™ 5000

**Metering**
- Consumption (kWh)
- Demand (kW)
- Power Factor (%) 
- THD, Crest Factor 
- Sag/Swell, Flicker 
- Harmonics (n=127) 
- Waveform Capture

**Key Features**
- Logix Add-On Profile (v22)
- Virtual correction of wiring errors
- Revenue Grade Accuracy (Class 0.2)
- IEEE 1588 time synchronization
- CIP energy support
- Status inputs / relay outputs
- ControlFLASH upgradable
- Flicker
- Sub-cycle transient detection

**Communication**
- EtherNet/IP
- EtherNet/IP DLR*
- ControlNet*
- DeviceNet*

* Future Releases

**Feed Meter**
PowerMonitor ™ 5000

The PowerMonitor 5000 is the next generation high-end, power quality metering product from Rockwell Automation. This new line leverages new technology and capabilities to capture an exhaustive amount of data about your energy network.

- More Information
  - Monitors 4 voltage and 4 current channels for every electrical cycle
    - 1024 data points across 8 channels every 12-17 milliseconds
  - Measures up to the 127th Harmonic
    - Roughly 1,000 data points every cycle
  - Calculates over 6,000 parameters every cycle
  - Option for two communications ports
  - 4 digital inputs for WAGES data collection
  - 4 outputs for connection to SCADA or control systems
  - Configurable alarms for up to 20 events
  - Virtual rewiring capability
Agenda

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- PEM Products - Hardware
- Energy in other products
What is CIP Energy?

- Common Industrial Protocol (CIP) for Energy Data

Why CIP Energy?

- No uniform method for measuring energy consumption
- CIP Energy services will reduce implementation cost of monitoring technology
- Efforts and will increase consumption visibility and enable smart grid management

Includes services for communicating:

- Rate of Electrical Energy Consumption (kW)
- Total Consumed Electrical Energy (kWh)
- Non-Electrical Energy Data (MMBtu, Gallons, Therms)
- Accuracy of provided data (%)
CIP Energy

- Energy measured:
  - Power monitor
  - Line or department

- Energy derived:
  - Overload relay
  - Motor (measured)
  - Aux controls (estimated)

- Energy fixed:
  - Power supply 300 nominal kW

- Energy aggregated:
  - Loads

- Parent/child relationship:
  - Specified using EPATH

- Software application
The proxy method augments the transition to Native CIP Energy implementation.
Product Candidates for CIP Energy

- Power Monitors (PowerMonitor 5000 / 1000)
- Overload relays (E3 Plus)
- AC Drives
- Disconnect switches
- Logix controllers (AOP aggregator functionality)
- Energy Monitoring Software
Intelligent Motor Control
Energy Savings

- Variable frequency drives
  - Reduce wear on motors from excessive starting torque
  - Reduce energy consumption by running motors at the needed speed

- Reduced voltage starters
  - Significantly reduce inrush currents that result in peak demand charges
  - Reduce wear on motors from excessive starting torque

Efficiency translates to savings –
Owens Corning saved $60K annually after installing Rockwell Automation VFD
IntelliCENTER Energy

- Integrate IntelliCENTER with FactoryTalk EnergyMetrix
  1. Preconfigure FactoryTalk EnergyMetrix with IntelliCENTER information
  2. Introduce Power customers to Energy Management software
  3. Provide upgrade path to full FactoryTalk EnergyMetrix

- Responds to industry focus on energy management
- Energy management for IMC devices
- Rockwell Automation exclusive functionality

Available December 2012
IntelliCENTER Energy will offer:

- All of the features that are currently in IntelliCENTER
- Automatic, preconfigured setup of FactoryTalk EnergyMetrix for devices in the MCC
- Real-time energy consumption and historical trending to the device level directly from IntelliCENTER Software

  *Most manufacturers monitor at the utility level, rarely do they monitor at the load level for more granular insight to make the best energy decisions*

- The ability to monitor and ultimately manage the energy usage through the CENTERLINE Motor Control Center

The energy delivered by an MCC each year will typically cost 5x more than the original purchase price of the MCC.

If energy monitoring allows just a 1% **energy savings**, this will result in an **annual savings of 5%** of the purchase price of MCC.
Vantage Point and EnergyMetrix

RS EnergyMetrix Connector Creator Wizard

Connector name: RSEM
RS EnergyMetrix Server: localhost

Security setting options
- Server authentication
  - User name:
  - Password:
- Integrated
- Advanced

Database:
- master
- tempdb
- model
- msdb
- IncuityStore
- IncuitySample
- IncuityHistory
- IncuityDiagnostics
- EMMA

Add...

Finish
| Power, Energy & Environmental | PE02 | PE02 - Optimizing plant-wide control with PlantPAx in Power Generation | Though a DCS is the traditional choice for control systems in this industry, this session will demonstrate the key elements of a PlantPAx solution as used in a combined cycle gas plant. Attendees will learn about the essential functions and features required by such a system, and how Logix, FactoryTalk Historian, FactoryTalk Discussion & Demo | 1 | St. John’s 24 |
| Power, Energy & Environmental | PE03 | PE03 - Software-based, Continuous Emissions Monitoring Systems for Reporting & Optimization | Software CEM® is a patented, model-based, Predictive Emissions Monitoring System that provides a certifiable, cost-effective solution as an alternative to costly, hardware-based CEMS. Software CEM utilizes powerful analytic models of the process and emission sources with real-time validation to provide highly Discussion | 1 | St. John’s 24 |
| Power, Energy & Environmental | PE04 | PE04 - Automated Emissions Monitoring and Compliance/Reporting | Learn how both Real-time Environmental Monitoring (REM) and Software CEM solutions are applied to the various emissions sources, plant-wide. REM is an environmental compliance and reporting system providing automated data collection, validation and aggregation for active compliance continuously, in real-time. Discussion | 1 | St. John’s 24 |
| Power, Energy & Environmental | PE05 | PE05 - Defining and Implementing a Foundation for Energy Management | This session will address effective energy management solutions. Customer examples of point solutions for energy visualization and control using FactoryTalk EnergyMetrix and FactoryTalk VantagePoint EMI will be presented as a foundation for energy conservation. The process of defining and delivering tailored Discussion | 1 | St. John’s 24 |
| Power, Energy & Environmental | PE06 | PE06 - Hands-on Lab: Energy Monitoring and Visualization utilizing FactoryTalk EnergyMetrix | This lab will provide hands-on learning to utilize FactoryTalk EnergyMetrix and the integration of FactoryTalk VantagePoint EMI via a connector. This product will provide detailed data capture, historization, reporting and analytics to enhance your visibility into past, present, and potential future energy uses. This lab will instruct Lab | 2 | Suwannee 17 |

- Classes through CSM
- Noggin
- www.rockwellautomation.com
Questions?