

PMCS



Integrated Energy Management Solution

Unlock the Full Potential of Power Networks Through Integration

Power Management Control System (PMCS) is a highly customizable, fully integrated end-to-end Energy Management Solution providing industry specific functional solutions for Monitoring, Power Quality, Control and Automation and Cost Allocation. Access GE Multilin and third-party devices and systems in real-time for graphical representations of substation equipment status, energy trends, remote control of devices and automated responses to system conditions. By optimizing methods used to control both processes and equipment, energy efficiency is realized to utilize assets more effectively and efficiently.



Informed Decisions

Throughout various industries from Oil & Gas to Data Centers, end operators encounter incredible challenges in understanding all aspects of increasingly complex facilities loaded with an array of equipment and processes. PMCS provides a clear and accurate perspective on the facility to make informed, timely decisions when overcoming challenges such as:

- Energy costs escalating out of control
- Revenue robbing process downtime
- Premature equipment failure
- Materials/Inventory loss and process stoppage due to power outages
- Expensive system capacity upgrades

Complete Solution

The solution can range from a simple remote monitoring system to a full featured, engineered automated control system. PMCS is delivered by the GE Integrated Energy Management Solutions (IEMS) team who provides complete integration service capabilities along with software and hardware components.

- Consultation Services
- IEMS Managed Solutions
- IEMS Project Services
- Solution Training
- Maintenance
- Support



imagination at work

Key Benefits

PMCS delivers a highly customized, comprehensively integrated Energy Management Solution with the following key benefits:

- **Improved predictive maintenance for less downtime** – Identify maintenance tasks and make scheduled corrections to asset damage and downtime. Redundant configurations are also available to ensure maximum uptime and reduce outage risks.
- **Faster problem determination** – Quickly pinpoint the root cause of problems using tools such as time-tagged alarms, sequence of events logs and triggered waveform capture.
- **Increased safety** – Provide a centralized source of information, reducing the need for physical contact with equipment and reduce shop-floor or substation presence.
- **Higher productivity** – Free up maintenance and repair personnel to perform other needed duties.
- **Improved power quality** – Identify sources of “dirty” power and take corrective action to save wear and possible damage to critical production equipment and other loads.
- **Increased scalability** – Open, comprehensive protocol and device support to easily integrate and expand existing systems and/or include a multitude of third-party devices in the system solution.

Complete, End-to-End, Integrated, Industry Solutions from HMI to Field Devices.

Industry



DATA CENTERS



OIL & GAS



MINING



FOOD & BEVERAGE



INSTITUTIONAL & COMMERCIAL



WATER/ WASTEWATER

GE PMCS HMI

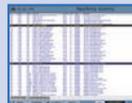
MONITORING



Site Plan



Network Communication



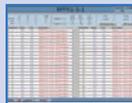
Alarms



One Line



Device



Events



POWER QUALITY

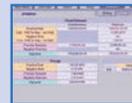


Trending



Waveforms

COST ALLOCATION & REPORTING



Real-Time Metering



Energy Consumption

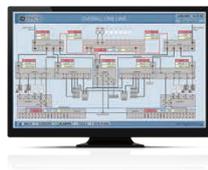
CONTROL & AUTOMATION



Control



Load Shed



Other Switchgear, System Devices, Systems, etc.

Switch/Protocol Converter
Power Meters
Protection Relays
Breaker
Trip Unit





Monitoring

Energy monitoring brings together information from disparate devices and provides a window to the system, keeping users completely and accurately informed of status. Through the PMCS Monitoring module, end users can easily identify system information down to the device

level in real-time both locally and remotely through customized views which aggregate and scale information to best suit the user's needs.

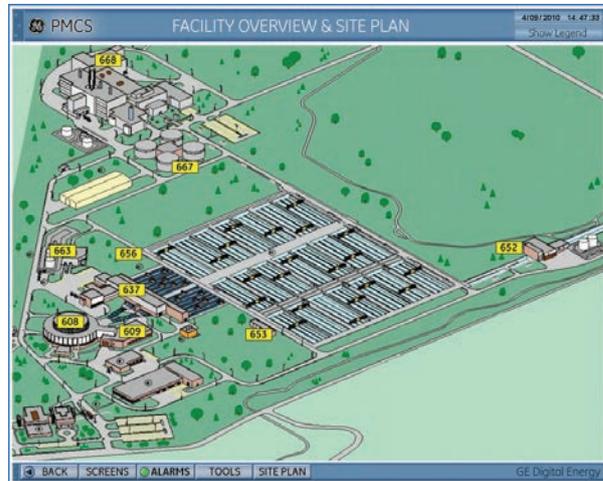
PMCS Monitoring truly brings the facility's energy interface to the user. A birds-eye graphical site diagram provides a model representation of the complete facility. By selecting location specific items on the screen users can quickly gain more detail of specific, customized, dynamic one line schematics for the site location and even individual installed devices and monitored values.

The PMCS Monitoring module captures voltage, current, power, energy and demand data from various field devices such as meters, relays and breaker trip units providing insight on the status of main power feeders, branch circuits and electrical equipment.

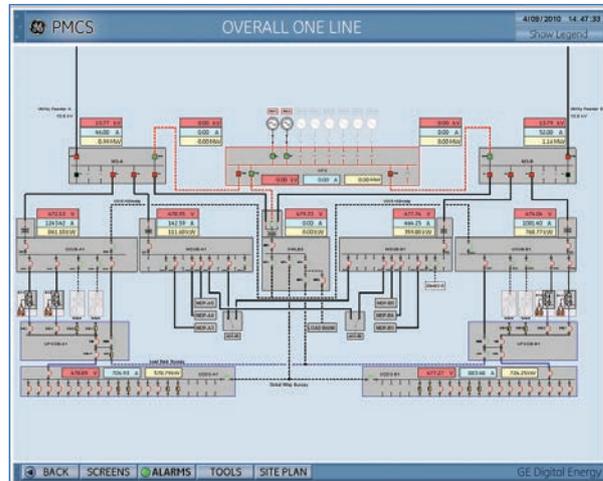
Typical monitored values include:

- RMS current
- Current demand
- Peak current
- RMS voltage
- KW and KWh
- Peak KW demand
- KVA and KVAh
- KVAR and KVARh
- Power factor
- Frequency
- Event records

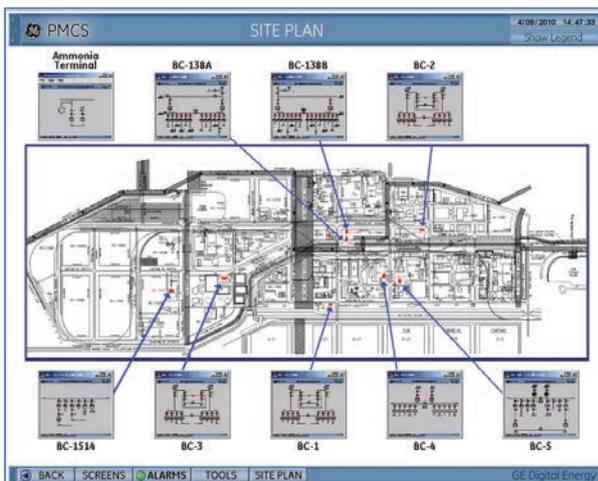
Along with monitoring values, PMCS provides event and alarm management capabilities alerting operators through a multitude of channels for specific conditions and allowing them to acknowledge alarms remotely. PMCS also provides customized monitoring views to track and trend real-time energy consumption to give various users both at the enterprise and operator level perspectives for decision making.



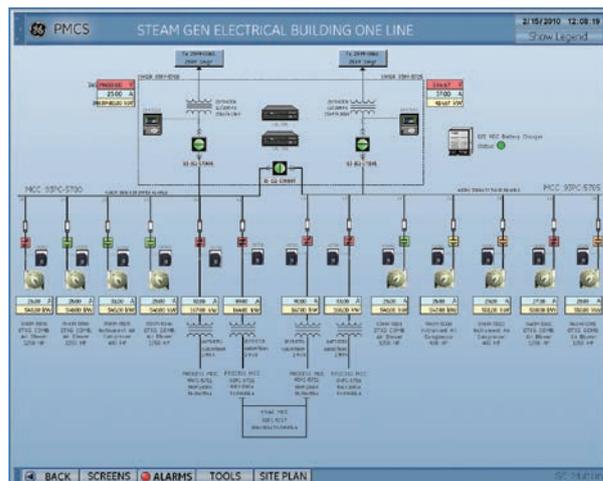
Facility overview and site plan.



One Line overview of entire network.



Site plan screens.



One Line with asset details.



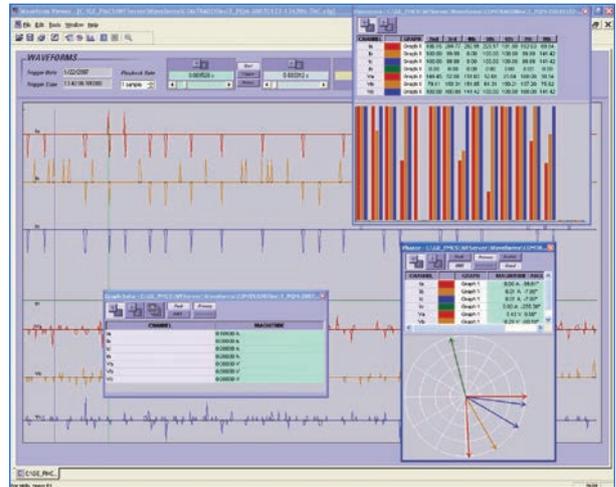
Power Quality

The Power Quality functional module collects data from integrated devices to determine power quality metrics and capture disturbances on the electrical network such as total harmonic distortion, individual harmonic distortion and sub-cycle transients. This previously unknown information is presented

in a clear visual format to facilitate quick identification of dirty power sources and tracking of the resulting negative effects on other equipment. By employing mitigation techniques, the overall lifespan of electrical assets is increased and overall process downtime is reduced.

Through the data logging and trending capabilities of PMCS, power quality information and events can be easily analyzed to highlight the frequency, duration and severity of problems. Specifically, PMCS has the capability to perform event triggered waveform recording, sag and swell analysis, and out-of-limit logs to provide an accurate system-wide depiction of power disturbances.

Essential where there is a high mix of non-linear loads and expensive equipment, PMCS Power Quality brings visibility to



Monitor and perform waveform analysis using updated device data.

previously hidden network events, allowing preventative action before costly process shutdown.

PMCS

PQMII POWER ANALYSIS

4/09/2010 14:47:33
[Show Legend](#)

DEVICE DETAILS

Device Name: POWERQUALITYMETER_II
 Device Type: PQM II
 Hardware Revision: D
 Main Program Revision: 2.24
 Boot Program Revision: 3.00
 Supervisor Revision: 0.00
 VT Connection Type: 3 Wire Delta/2 VTs
 Modbus Address: 3
 Mod File Numbers: 1 2 3 4 5
 000 000 000 000 000

[Events](#) [Trend](#)
[Wave](#) [Exit](#)

Overview
Analysis
Maximum
Settings
Commands

Average Current THD

4.2 %

Average Voltage THD

3.0 %

Currents - Total Harmonic Distortion (THD)			
Phase	Present	Maximum	Time of Maximum
A (%)	1.7	298.1	11/11/2012 18:41:11
B (%)	9.8	791.5	10/29/2012 06:05:06
C (%)	1.2	844.7	11/11/2012 18:39:47
N (%)	0.0	0.0	10/17/2012 13:54:19

Voltages - Total Harmonic Distortion (THD)			
Phase	Present	Maximum	Time of Maximum
Vab (%)	1.5	52.6	12/04/2012 12:48:42
Vbc (%)	4.6	720.2	12/10/2012 13:02:06
Vca (%)	N/A	N/A	N/A

Power Quality Values

la Crest Factor	1.399
lb Crest Factor	1.523
lc Crest Factor	1.389
la Transformer Harmonic Derating Factor	1.010
lb Transformer Harmonic Derating Factor	0.928
lc Transformer Harmonic Derating Factor	1.017

BACK
SCREENS
ALARMS
TOOLS
SITE PLAN

Monitor and perform waveform analysis using updated device data.



Cost Allocation & Reporting

The PMCS Cost Allocation and Reporting module is an essential tool for managing energy usage and identifying areas for cost savings. The Cost Allocation module provides functionality for the automated creation of power usage reports and capability to supply individual energy

reports and bills for a variety of groupings by aggregating specific energy data. For example, billing can be generated with a variety of detail by device, by department/cost center, or by floor.

The format of the reports and bills are fully customizable and can match the same format found in utility bills, including values such as total energy and peak demand power use based on time of use schedules, seasonal rate schedules and regionally specific rate structures.

PMCS brings accountability to the facility by providing the capability to allocate costs based on usage and specifically identify usage for particular areas of the facility. This focuses the scope and increases the effectiveness of energy management strategies by providing measurable results.

Cost Allocation also provides an easy to use utility configurator, which helps in understanding the costs that appear on the utility bill. Energy management strategies can be developed and tested to see the impact of load shedding, peak demand shaving, shifting rate schedules or even changing utility suppliers.



Start Date	End Date
3/11/2013 12:04 AM	3/12/2013 11:59 PM

Report Generated on 3/22/2013 9:59:40 AM



Switchgear USS 1A-1

Capacity: 665 kW
Voltage: 480/277VAC
Location: Basement SWGR RM 1A

DEMAND



Energy Used: 70.20 kWh

Average Demand: 1.47 kW

Peak Demand: 7.44 kW

Peak Demand Date/Time: 3/12/2013 9:44:53 PM

Generate energy and demand reports.



EPM 9450 DEMAND

Alarm Status

Overview
Analysis
Demand
Digital
Max Date
Settings
Common

Block (Fixed) Window			
	Instantaneous	Maximum	Time of Maximum
Positive Real kW	-159.82	0.00	02/16/2005 20:03:41.07
Negative Real kW	N/A	-1901.07	11/25/2011 16:14:13.02
Positive Reactive (kvar)	17.43	-1650.31	11/25/2011 16:14:13.02
Negative Reactive (kvar)	N/A	N/A	N/A
Apparent (kVA)	180.77	2517.45	11/25/2011 16:14:13.02

Rolling (Sliding) Window			
	Instantaneous	Maximum	Time of Maximum
Positive Real kW	-150.96	0.00	02/16/2005 19:30:00.05
Negative Real kW	N/A	-1899.62	11/30/2011 10:30:00.05
Positive Reactive (kvar)	109.96	-1649.40	11/30/2011 11:30:00.03
Negative Reactive (kvar)	N/A	N/A	N/A
Apparent (kVA)	186.77	2515.75	11/30/2011 10:30:00.05

Device Name: AEPH9450

Boot Version Number: 5.5

Runtime Version Number: 2.1.7

DSP Boot Version No: 1.8

DSP Runtime Version No: 2.1.2

Serial Number: 49325

VT Connection Type: Wye

On Time: 12/12/2012 11:54:48.940

Current Time: 12/12/2012 11:59:35.940

Track energy consumption.



EPM 9450 OVERVIEW

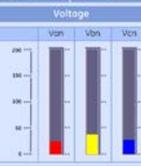
Alarm Status

Overview
Analysis
Demand
Digital
Max Date
Settings
Common

Current



Voltage



System Frequency



	A	B	C	N (Measured)	N (Calculated)	Energy
Current (Amps)	1663.30	166.18	1429.60	0.00	68.25	
Voltages (Volts)	24.33	58.07	27.79	0.00		
Real Power (kW)	40.15	6.33	39.61	39.61	-151.33	
Reactive Power (kvar)	-5.12	0.00	3.09	3.09	109.94	
Apparent Power (kVA)	40.67	6.33	39.71	39.71	187.06	

Real-time metering.



Control & Automation

The PMCS Control and Automation module provides capabilities to implement energy management solutions with automated strategies by interfacing directly with facility devices (GE and non-GE) controlling on-site generators, utility feeds and the power distribution network. The Control and Automation module along with GE devices allows the creation and implementation of customized control and automation schemes to protect assets and ensure optimal energy efficiency and value.

- Implement fast load shedding strategies by isolating local system anomalies to prevent catastrophic system failure and plant shutdown.
- Reduce the chaotic effects of utility power outages by employing automatic transfer schemes that shed non-critical loads, switch to stable power feeds and control start-up of generators.
- Reduce energy charges with automated shedding of non-critical loads during peak rate times.
- Reduce peak demand surcharges through automated staging of equipment during process start-up.

Close Control Pop-Up

Relay Designation

Breaker Designation

Relay Contact Positions

Open/Close Buttons

Warning Pop-Up

Perform remote control safely and securely.

Integrated Energy Management Solutions (IEMS)

Deep Industry Expertise and Comprehensive Energy Services Offerings

GE Digital Energy brings together more than 20 years of both functional and industry specific expertise and experience to deliver complete, end-to-end energy solutions from consulting and design to delivery, maintenance and support. Through a comprehensive and industry diverse resource base of experienced energy professionals, the GE Integrated Energy Management Solutions (IEMS) team focuses on solutions to optimize client energy assets to help clients drive business value and growth through their core industry expertise. For more information contact integrated.solutions@ge.com.

INDUSTRY ALIGNED SERVICES OFFERINGS



DATA CENTERS



OIL & GAS



MINING



FOOD & BEVERAGE



INSTITUTIONAL & COMMERCIAL



WATER/WASTEWATER

Consulting Services	<ul style="list-style-type: none"> • System analysis and design • Audits
IEMS Managed Solutions	<ul style="list-style-type: none"> • Complete managed solutions (services, software, hardware devices) • Maintenance and support service level agreements
IEMS Project Services	<ul style="list-style-type: none"> • Project management • Site evaluation and consultation • Integrated system design • Testing • Implementation
Solution Training	<ul style="list-style-type: none"> • Post-implementation solution training
Maintenance	<ul style="list-style-type: none"> • Solution expansion and upgrades • System maintenance and performance tuning • Enterprise IT system integration
Support	<ul style="list-style-type: none"> • Solution specific support

Functional Applications



Load Shed Challenge

A major food and beverage corporation needs to control electrical energy demand to key manufacturing equipment to stay under peak demand levels and to ensure service continuity to critical loads on other automated assembly line operations. Loss of power to the critical assembly line operations would cause significant loss of raw materials and a lengthy restart process subject to regulatory inspection.

PMCS Solution

GE's Multilin Load Shedding solution provides immediate business benefits through reducing downtime and eliminating the need to restart processes. It keeps critical processes running by identifying when there is a lack of power and dynamically shedding least critical loads to keep processes essential to the business running. Moreover, GE Digital Energy's Load Shedding solution provides ongoing risk reduction for outages and automates outage processes when load shedding is required.

Key Benefits

- User friendly and manageable solution allowing dynamic changes to system settings and load priorities
- System intelligence to shed only necessary loads based on generation and real-time load consumption values
- Very fast load shedding system to prevent plant shutdowns as a result of generation loss
- Advanced protection schemes to increase the reliability and availability of power as well as protect and monitor critical assets such as transformers, generators and motors
- Reduction in operation and maintenance costs through use of IEC 61850 communication standards
- Automatic reports generation to facilitate record keeping and further analysis and optimization
- Highly customizable, scalable and easily integrated solution for a variety of applications



Power Quality Challenge

A leading data center is concerned about the power quality of the electrical network and has requirements to analyze the energy usage throughout the facility as well mitigate risks due to critical equipment outages. Their customers have critical uptime requirements and service level agreements.

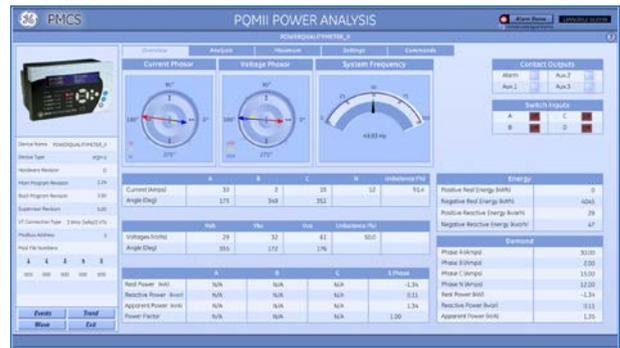
PMCS Solution

Using PMCS, data can be obtained from a wide array of points from Utility feeds down to the health of individual devices. Leveraging and analyzing this data through PMCS reporting allows simulations and informed decisions based on facts, eliminating the guesswork and implementation of trial and error solutions.

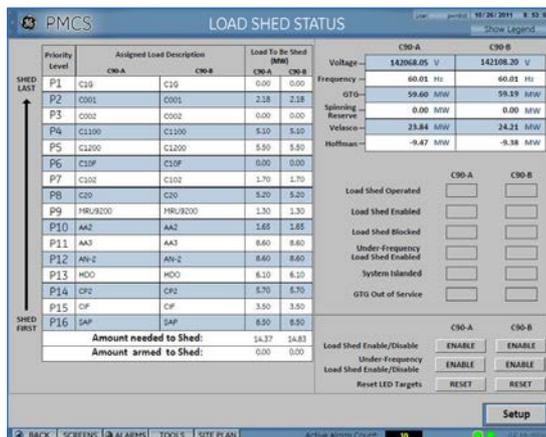
By monitoring and trending key data points from devices the lifespan of electrical assets are also more accurately predicted, thereby reducing risk of critical equipment outage.

Key Benefits

- Remote capture of disturbances on the electrical network such as harmonic distortion and sub-cycle transients
- Quick identification of dirty power sources and tracking of the resulting negative effects on equipment
- Support preventative action before costly process shutdown



Monitor power quality.



Easily configure, maintain and monitor load shed status.

Functional Applications (cont'd)



Motor Control

Challenge

Within a petrochemical refinery facility, motors provide the lifeline to driven equipment required to maintain critical processes with significant uptime during production and operations. A failure of one of these critical motors could be detrimental to personnel safety, production and have serious environmental consequences. From a business perspective, a motor failure can lead to significant risks and costs associated with impacts such as production downtime, loss of materials, asset repair/replacement and safety and environmental liability. Thus ensuring motors are running efficiently and reliably is fundamental from both an operational and business perspective.

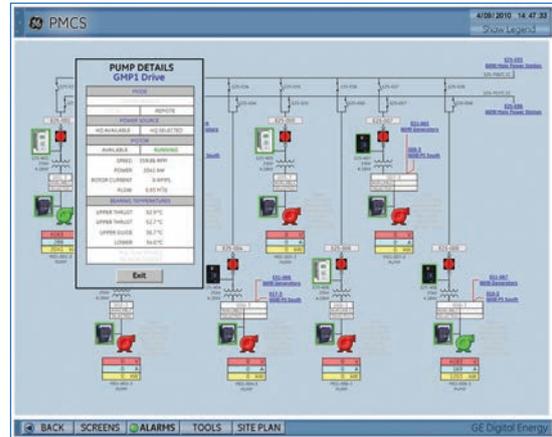
Solution

GE's Multilin PMCS Motor Protection Solution which includes the M60 Motor Protection device, provides advanced condition monitoring and asset life reporting to avoid expensive repairs, process interruption and losses because of motor failure.

The solution offers comprehensive protection and control solutions for medium to large sized three-phase motors and includes advanced automation and communication capabilities, extensive I/O options and powerful fault recording features that can simplify postmortem fault analysis and help minimize motor downtime.

Key Benefits

- Advanced protection sensitivity through a flexible thermal model
- Enhanced motor health diagnostics
- Multiple communication options including embedded IEC 61850
- Seamless integration into SCADA and DCS systems



Monitor the status of critical facility assets to prevent downtime.

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