Energy Efficiency Compliance (NEMA)

Comply with Standards Related to Energy Management Systems

EcoStruxure Power Digital Application

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EcoStruxure™ Power

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Overview

Context of Application

Today’s building owners are facing increasing pressure to make their facilities operate more efficiently on multiple fronts. Energy prices certainly remain high in many regions and are the primary driver for businesses seeking to lower their ongoing operating costs. More recently, energy efficiency regulations also have been pushing owners to understand and begin reducing their energy use.

Problem to Solve

The facility/energy manager needs to:

- Demonstrate compliance with standards related to energy efficiency (ISO 50001, 50002, 50006, Superior Energy Performance® , NEC 220.12, ASHRAE 90.1, CA Title 24, IECC, LEED, and other local/regional energy efficiency standards).
- Communicate the energy efficiency program to stakeholders, and report on energy performance improvements.


CERTIFICATE

Audited energy data management system

ISO 50001 Certificate

Purpose of the Application

Enable a systematic approach to achieving continuous energy performance improvement

- By making energy usage visible at all stages of an energy management and improvement plan.
- By providing transparency through reporting on energy performance indicators (EnPI) to regulators or shareholders, and demonstrating continuous improvement.

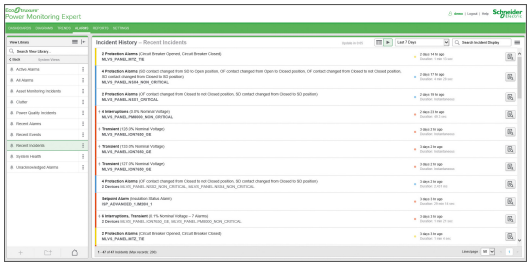
Application Outcomes

Live Data Display

Measured energy values such as kWh and peak demand (kW) can be visualized in custom graphical diagrams and live data tables in the Edge Control software.

Events and Alarms

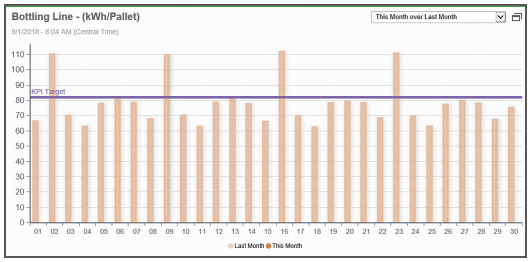
Smart alarms can be configured to alert energy managers or operations staff in case of energy-related events which require attention (imminent exceeding of peak demand threshold, etc.).



Events and Alarms

Trends

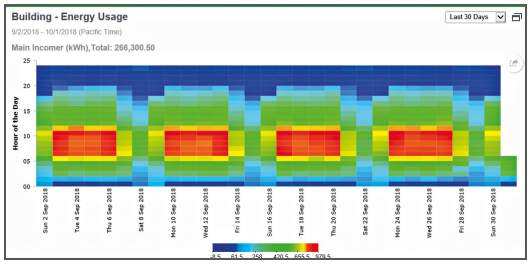
Measured energy values, ratios of measured values, or KPIs (kWh/unit of production, etc.) can be trended in the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation).



Peak Demand Trend

Dashboards

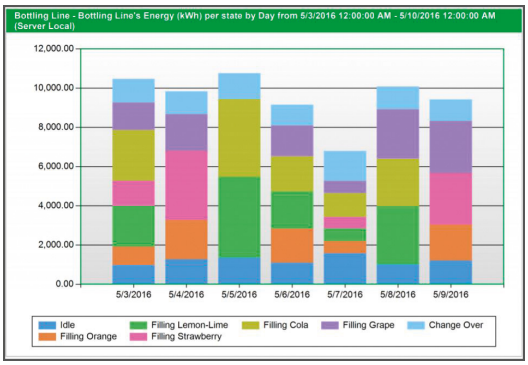
- Energy cost comparison
- Energy consumption ranking
- Energy heat map
- Pareto charts
- Sankey diagram
- KPI (Key Performance Indicator) dashboards
- General line graphs, bar charts, and pie charts



Energy Heat Map

Reports

- Consumption Ranking Reports
- Energy Comparison Reports
- Energy Modeling Reports
- Energy Usage Reports
- Calendar Trend Reports
- KPI Engine Reports
- Load Profile Reports
- Energy Cost Reports



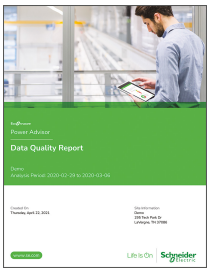
Energy Usage per Status Report

Notifications[1]

SMS or email notifications are sent on pre-alarm and alarm conditions described above to enable fast action.

Cloud-based Analytics and Services

As an option, EcoStruxure Service Plan powered by EcoStruxure Power Advisor provides data quality analytics with recommendations from our Schneider Electric service experts.

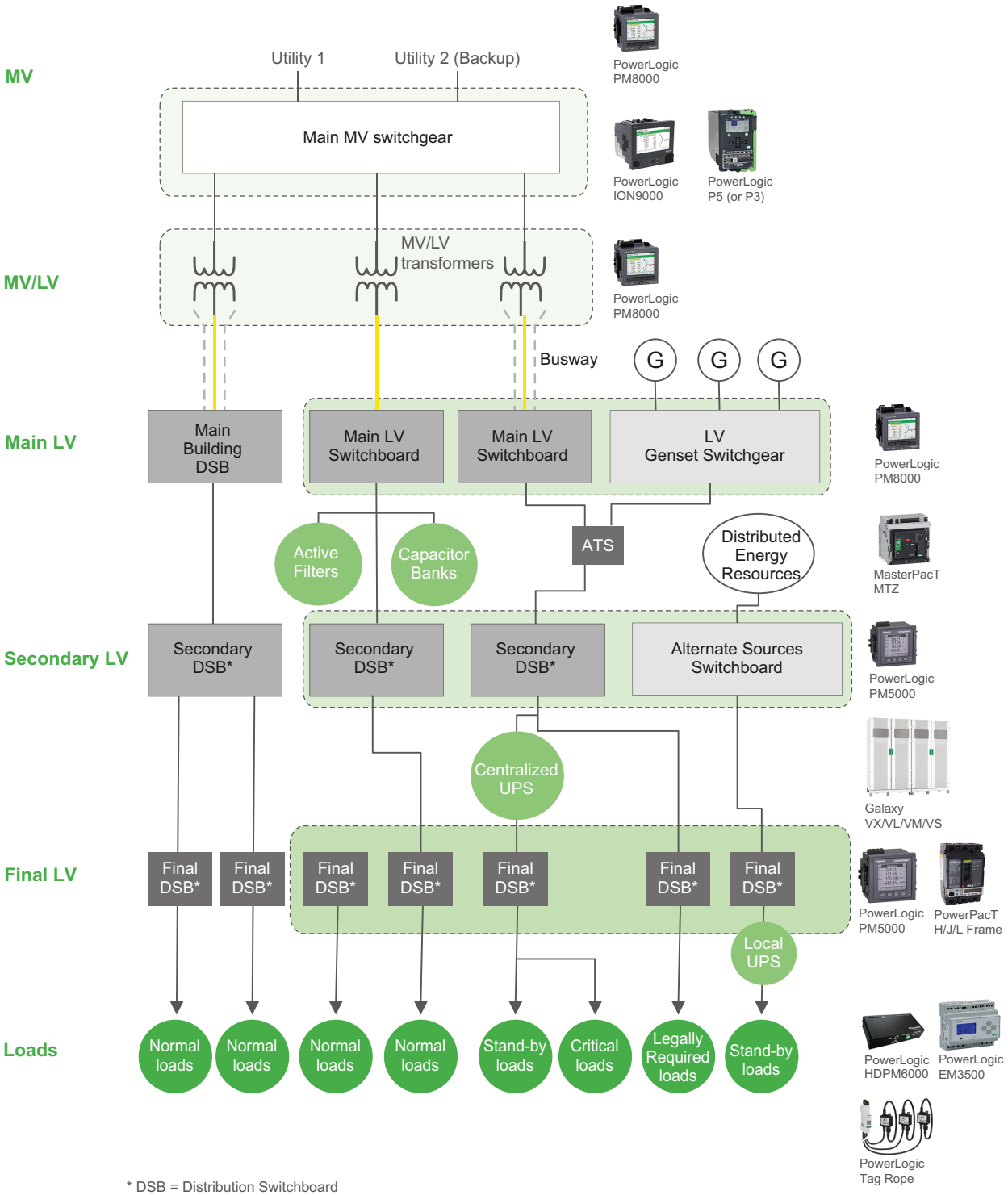


EcoStruxure Power Advisor Data Quality Report

1. For notifications in EcoStruxure Power Monitoring Expert and Power Operation, the Event Notification Module is required.

Electrical Architecture

The following diagram details the areas of the architecture where the connected products should be installed in order to implement the Energy Efficiency Compliance application, in accordance with the guidelines in standards such as ISO 50001, 50002, 50006, IEC 60364-8-1, and IEC 61557-12:



* DSB = Distribution Switchboard

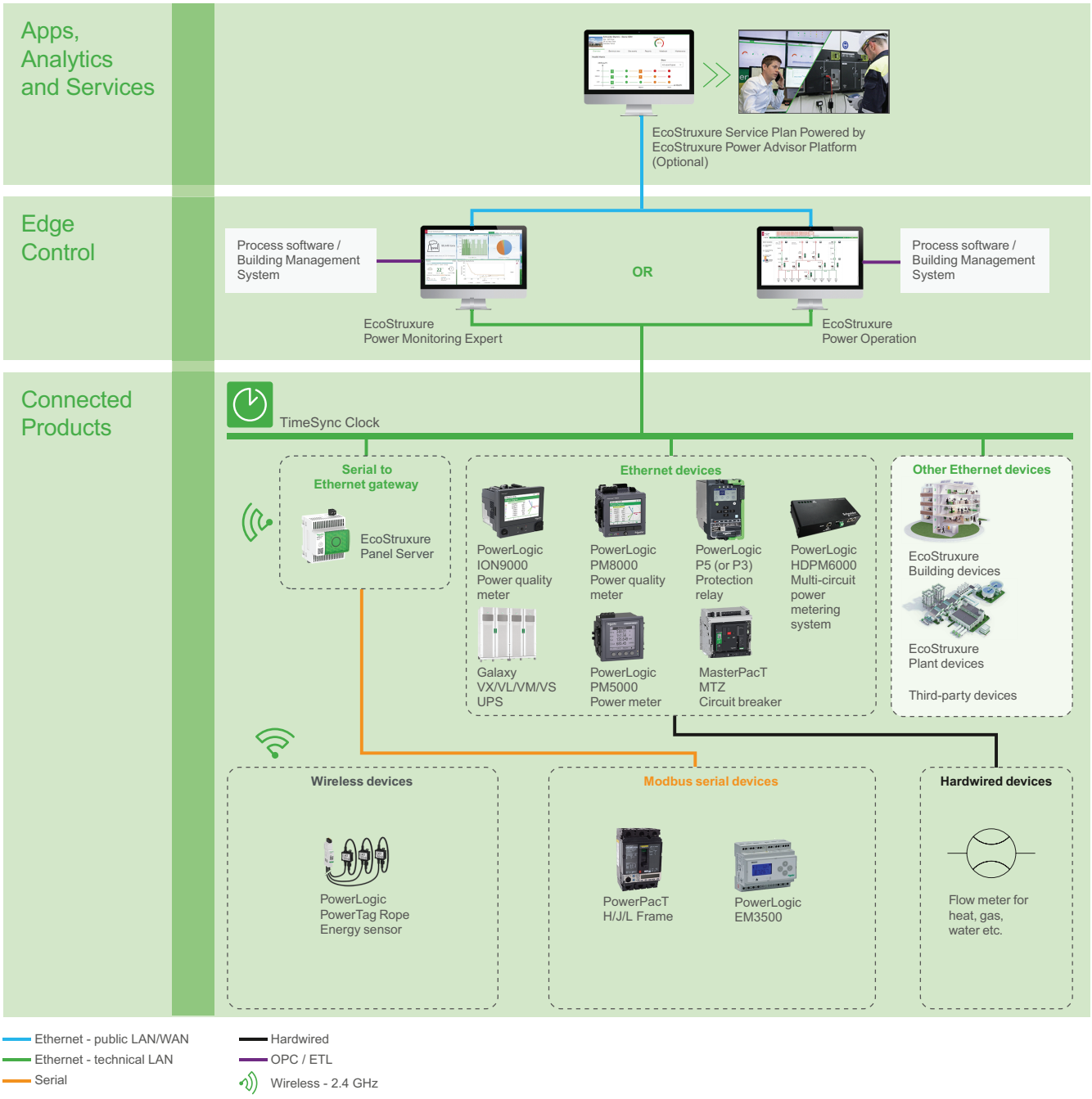
Digital Architecture

In this architecture, the data is collected from connected products either directly over Ethernet or via gateways (such as the EcoStruxure Panel Server). This data is then recorded and processed by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) for on-premise visualization, analysis, and reporting.

Other utility consumption inputs (WAGES) and equipment states can also be directly acquired via Ethernet, via serial communication, or through hardwired signals from basic meters and sensors.

As an option, data from EcoStruxure Power Monitoring Expert or Power Operation can be passed on to the EcoStruxure Power Advisor platform and analyzed by experts as part of the EcoStruxure Service Plan.

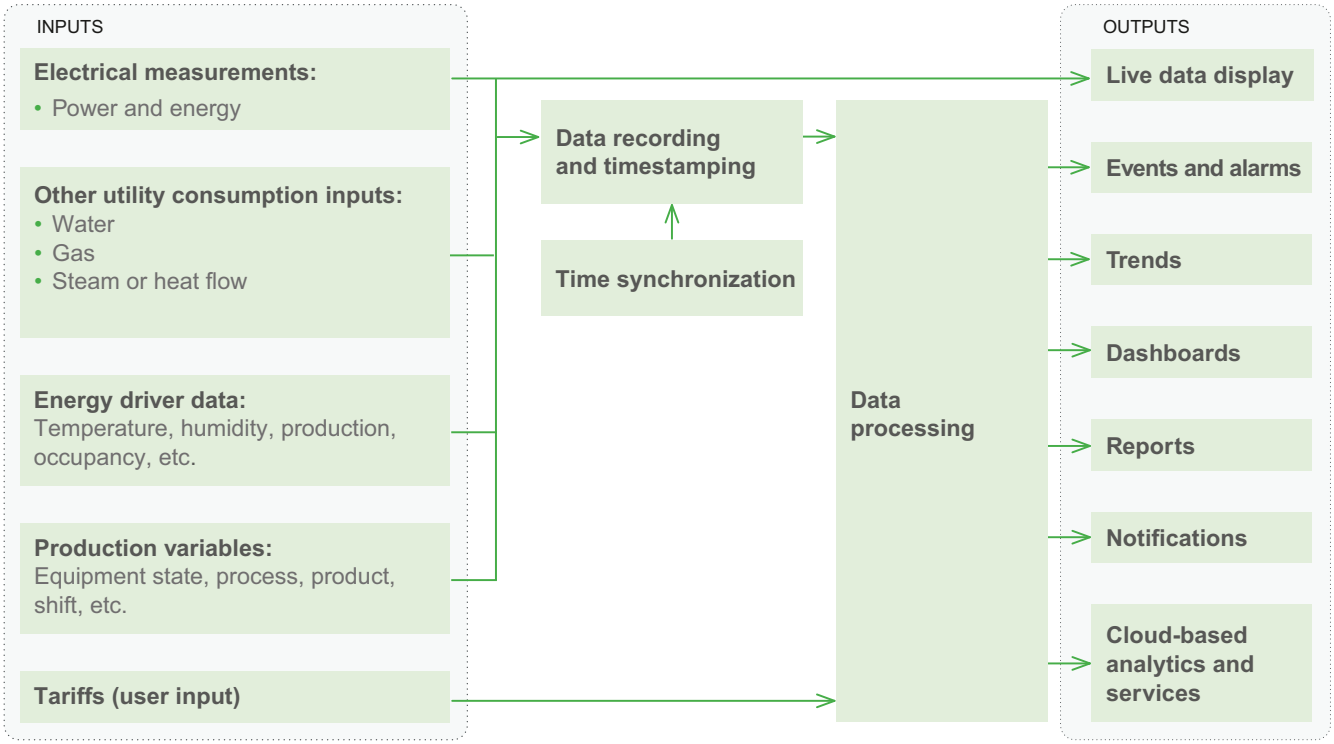
The recommended digital architecture for the application is shown below:



System Description

Data Flow

The Energy Efficiency Compliance application can be broken down as follows:



Inputs

The following data are required to implement the Energy Efficiency Compliance application.

Electrical Measurements

The following electrical measurements are collected at each point of interest in the electrical distribution, from Medium Voltage, to Low Voltage, down to Final Distribution.

- Power values (kW, kVAR, kVA)
- Energy values (kWh, kVARh, kVAh)

The following devices can provide these data in line with IEC 61557-12 and IEC 60364-8-1, as well as a measurement plan according to ISO 50001.

- **Class 0.1 or class 0.2 devices** (as per IEC 61557-12) such as PowerLogic ION9000 or PM8000 are recommended for high-accuracy applications.

PowerLogic ION9000

PowerLogic PM8000

- **Class 0.5 or class 1 metering devices** such as the embedded metering in the MasterPacT MTZ, PowerLogic PM5000, HDPM6000, Tag Rope, and EM3500 are recommended for low voltage feeders and sub-distribution to measure power and energy.


MasterPacT MTZ


PowerLogic PM5000


PowerLogic HDPM6000


PowerLogic Tag Rope


PowerLogic EM3500

- **Metering devices with an accuracy below performance class 1** (the embedded MicroLogic trip unit in the PowerPacT H/J/L circuit breaker, etc.) are acceptable for sub-distribution and load circuits for cost optimization purposes.


PowerPacT H/J/L

- **Other electrical equipment** such as MV protection relays (PowerLogic P5/P3, etc.), UPSs (Galaxy VX/VL/VM/VS, etc.), Power Factor controllers (PowerLogic PFC, AccuSine EVC+, etc.), can provide energy measurements that can contribute to an overall energy efficiency compliance program.


PowerLogic P5


PowerLogic P3


Galaxy VX/VL/VM/VS


PowerLogic PFC


PowerLogic AccuSine EVC+

Other Utility Consumption Inputs

The following utilities can be monitored:

- Water
- Air
- Gas
- Steam or heat flow

They can be acquired via digital/analog inputs on meters or directly via Modbus from third-party devices.

Energy Driver Data

Any data which might have an impact on energy consumption should be leveraged.

For example:

- Weather information (outside temperature, humidity, etc.)
- Production volumes (number of units, tons, etc.)
- Hours of operation and operation schedules (work hours, weekdays vs weekends, seasons, shifts, etc.)
- Base loads

- Building occupancy

These can be acquired via digital/analog inputs on meters or directly via Modbus from third-party devices. They can also be imported in EcoStruxure Power Monitoring Expert from customer systems through OPC [2] or ETL[3].

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Power Monitoring Expert

EcoStruxure
Power Operation

Production Variables

To correlate energy consumption with the different production variables such as equipment states, processes, production lines, products produced, shifts, etc., these production variables must be monitored, recorded, and used to normalize the respective energy consumption.

Examples:

- Process batch A/B/C/
- Product X/Y/Z produced on which machine during which shift
- Equipment in normal/maintenance mode
- Motor low/medium/high speed
- Generator starting/running/stopped
- ATS in normal/test/emergency mode

These can be imported in EcoStruxure Power Monitoring Expert or Power Operation from customer production systems through OPC[2] or ETL[3]

EcoStruxure
Power Monitoring Expert

EcoStruxure
Power Operation

Alternatively, these can be acquired via digital/analog inputs on meters or directly via Modbus from third-party devices.

Tariffs (User Inputs)

To convert energy consumption into cost, it is necessary to apply the relevant tariffs to the power/energy consumption values.

Data Recording and Timestamping

For the Energy Efficiency Compliance application, a timestamp accuracy of ±1 second is sufficient.

2. OPC: Open Platform Communications
3. The EcoStruxure Extract Transform Load (ETL) engine is a companion application for EcoStruxure Power Monitoring Expert or Power Operation. It is used to extract historical data from one application (Schneider Electric or third-party), then transform that data so it can be loaded into another application.

Advanced power meters such as the PowerLogic ION9000, PM8000, and some PowerLogic PM5000 models (PM53xx and PM55xx) can timestamp and record onboard energy measurements as well as connected equipment states. EcoStruxure Power Monitoring Expert or Power Operation can then retrieve the records with their original timestamp.


PowerLogic ION9000


PowerLogic PM8000


PowerLogic PM5000

For other devices (PowerLogic P5/P3, MasterPacT MTZ, entry-level PowerLogic PM5000 models, etc.) energy measurements and equipment states are acquired by the connected products and then recorded and timestamped by EcoStruxure Power Monitoring Expert or Power Operation.


PowerLogic P5


PowerLogic P3


MasterPacT MTZ


PowerLogic PM5000


EcoStruxure Power Monitoring Expert


EcoStruxure Power Operation

When acquiring data from other customer systems, timestamps can also be imported through OPC[4] or ETL[5].

For a comprehensive overview of device recording and timestamping capabilities, refer to Data Recording and Time Synchronization Capabilities of EcoStruxure Power Connected Products.

Time Synchronization

For consistent timestamping of all the data, the date and time should be accurately distributed to connected products and data loggers.

Time synchronization can be performed through various technologies (PTP, NTP, SNTP, etc.). An external master clock may be required and can be connected to a GPS antenna to reach the expected time precision.


TimeSync Clock

4. OPC = Open Platform Communications
5. ETL = The EcoStruxure Extract Transform Load (ETL) engine is a companion application for EcoStruxure Power Monitoring Expert and Power Operation. It is used to extract historical data from one application (Schneider Electric or third-party), then transform that data so it can be loaded into another application.

Data Processing

Energy data processing is embedded in the reporting engine and in the dashboards of EcoStruxure Power Monitoring Expert or Power Operation.

EcoStruxure
Power Monitoring Expert

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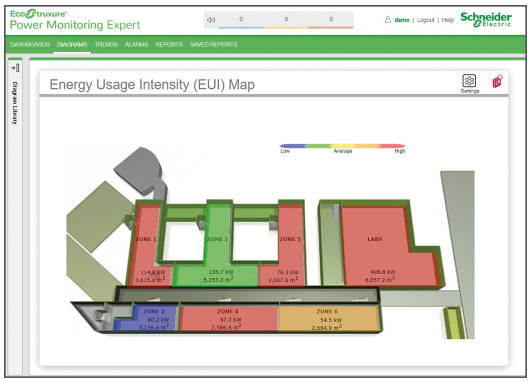
Power Operation

Outputs

Live Data Display

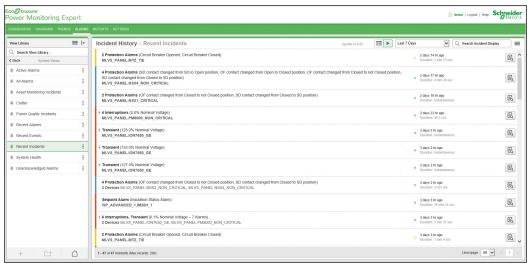
Measured energy values such as kWh and peak demand (kW) highlighted in ISO 50006 sub-standard of ISO 50001 can be displayed in dashboards, custom graphical diagrams, and live data tables in EcoStruxure Power Monitoring Expert or Power Operation (refer to Energy Monitoring application).



Live Data Display Example: Energy Usage Map

Events and Alarms

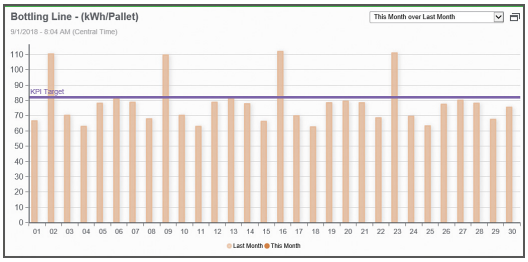
Smart alarms can be configured to alert energy managers or operations staff in case of energy-related events which require attention (imminent exceeding of peak demand threshold, etc.) (refer to Energy Monitoring application).



Events and Alarms

Trends

Measured energy values, ratios of measured values, or KPIs (kWh/unit of production, etc.) can be trended in the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation).



Peak Demand Trend

NOTE: To monitor ratios of measured values in trends, normalization data such as production, temperature, square meters, etc. must be integrated using ETL, OPC or .csv file export. In addition, the KPI Report must be configured to write KPI data into the database in EcoStruxure Power Monitoring Expert or Power Operation (refer to Energy Monitoring application).

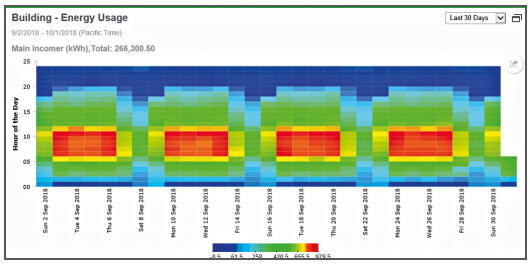
Dashboards

Dashboards to visualize, analyze, and communicate energy performance in accordance with an ISO 50001 management program can be configured (refer to Energy Monitoring application).

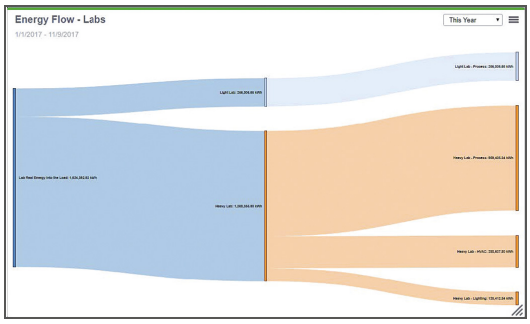
Some examples of dashboards include:

- Sankey diagram
- Energy heatmap
- Pareto chart
- Period over period
- Historical trends, bar chart, line chart with target line, pie chart
- KPI dashboards (Energy Intensity[6], etc.)

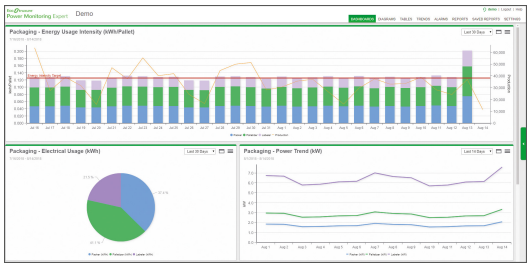
6. KPI dashboards require contextual data and configuration of the KPI Report available with the Energy Analysis module in EcoStruxure Power Monitoring Expert or Power Operation, etc.



Energy Heat Map Dashboard



Sankey Diagram

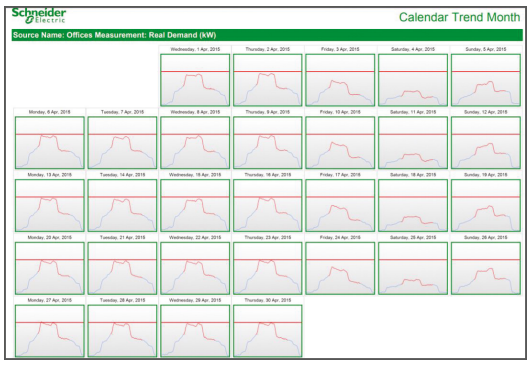


KPI Dashboard

Reports

Several reports are available to support Energy Efficiency Compliance:

- Consumption Ranking Reports
- Energy Comparison Reports
- Energy Modeling Reports
- Energy Usage Reports
- Calendar Trend Reports
- KPI Engine Reports
- Load Profile Reports
- Energy Cost Reports



Calendar Trend Report

These reports are described in detail in the Energy Monitoring application.

To help evaluate the effectiveness of energy saving initiatives, an energy model can be created to simulate the facility's energy baseline. This baseline can then be compared to energy drivers such as production, heating, or cooling degree days. It analyzes actual energy use compared to the model to track and forecast energy savings as a result of organizational or operational changes (refer to Energy Modeling and Verification application).

Notifications[7]

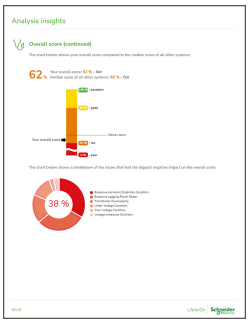
SMS or email notifications are sent on pre-alarm and alarm conditions described above to enable fast action.

Cloud-Based Analytics and Services

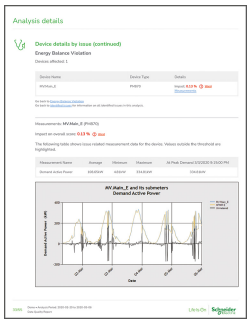
As an option, EcoStruxure Service Plan powered by EcoStruxure Power Advisor provides data quality analytics with recommendations from our Schneider Electric service experts.

For further information, refer to Data Quality Management.

EcoStruxure Service Plan Powered by EcoStruxure Power Advisor Platform



EcoStruxure Power Advisor Data Quality Report - Overall Score



EcoStruxure Power Advisor Data Quality Report - Device Details by Issue

7. For notifications in EcoStruxure Power Monitoring Expert and Power Operation, the Event Notification Module is required.

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