# **Energy Benchmarking (IEC)**

Benchmark the Efficiency of Energy Use Across Devices, Processes, Facilities, or Organizations

**EcoStruxure Power Digital Application** 

ESXP2GE022EN-05 11/2023

# Eco**G**truxure<sup>®</sup> Power





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### **Overview**

## **Context of Application**

Benchmarking is the practice of comparing the measured performance of a device, process, facility, or organization to itself, its peers, or established norms, with the goal of informing and motivating performance improvement. When applied to building energy use, benchmarking serves as a mechanism to measure energy performance of a single building over time, relative to other similar buildings, or to modeled simulations of a reference building built to a specific standard (such as an energy code)<sup>1</sup>

#### **Problem to Solve**

#### The facility manager needs to:

- Benchmark energy usage with respect to other comparable devices, processes, facilities, or departments managed from a single location (identify efficient facility vs inefficient facility).
- · Identify outliers and other levers to target energy savings programs.

### **Purpose of the Application**

#### Benchmark multi-site energy usages

- Multi-site visualization to enable benchmarking across multiple organizations, facilities, processes, or devices from a centralized location
- Comparison of energy usage by normalizing consumption with respect to area, production volume, or other drivers

The good performers could be used as a model to improve the poor performers.

#### Improve understanding

It improves understanding of what makes an efficient organization, facility, process, or device use less energy than an inefficient one.

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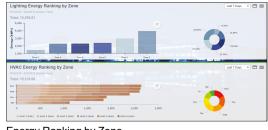
**Building Area Benchmarking** 

## **Application Outcomes**

#### Dashboards

- · Energy comparison and ranking dashboards
- Building energy rating gadget

<sup>1.</sup> Source: https://www.energy.gov/eere/slsc/building-energy-use-benchmarking



Energy Ranking by Zone

### Reports

- Consumption Ranking Report
- Energy Comparison Report
- Calendar Trend Reports for benchmarking energy usage by load type and day of the week

#### **Cloud-Based Analytics and Services**

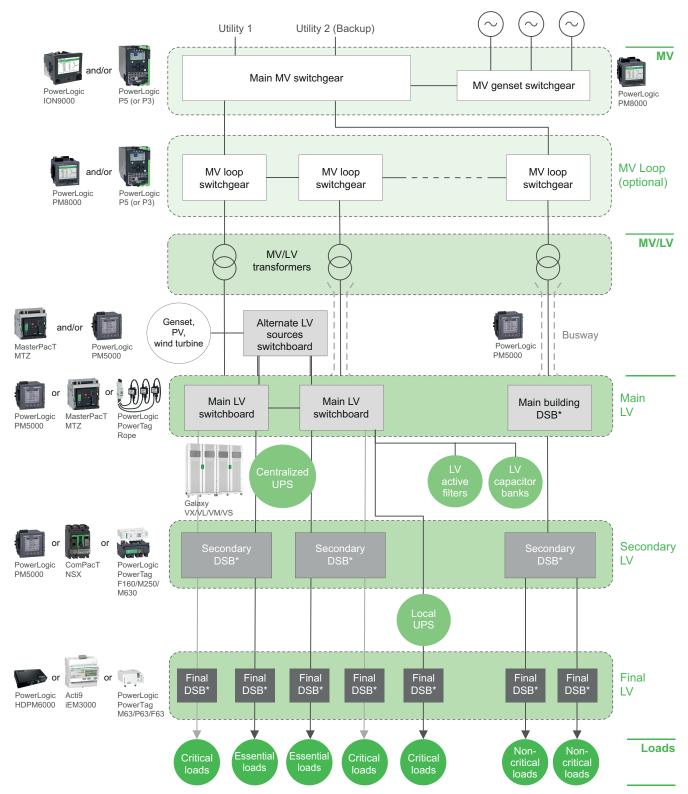
As an option, EcoStruxure Service Plan powered by EcoStruxure Power Advisor provides data quality analytics with recommendations from our Schneider Electric service experts.



EcoStruxure Power Advisor Data Quality Report

# **Electrical Architecture**

The following diagram details the areas of the architecture where the connected products should be installed in order to implement the Energy Benchmarking application:



\* DSB = Distribution Switchboard

# **Digital Architecture**

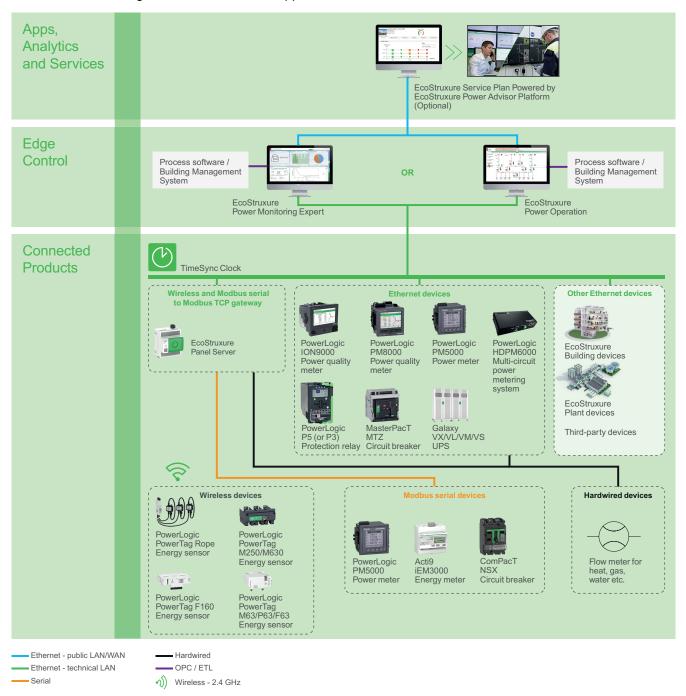
In this architecture, the data is collected from connected products either directly over Ethernet or via gateways (such as the EcoStruxure Panel Server). This data is then recorded and processed by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) for on-premise visualization,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

To include other process or equipment related data in the analyses, OPC or ETL can be used to acquire data from external process or building management software.

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.

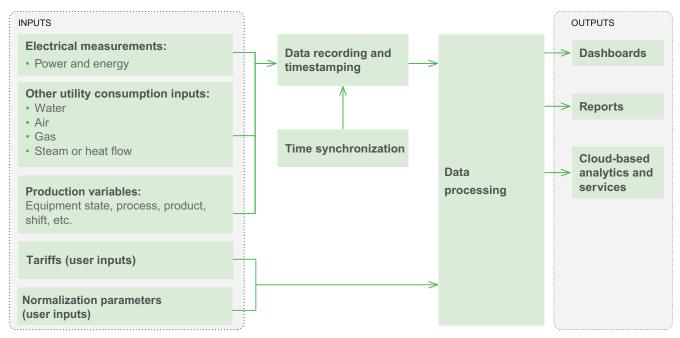
The recommended digital architecture for the application is shown below:



# **System Description**

# **Data Flow**

The Energy Benchmarking application can be broken down as follows:



# Inputs

The following data are required to implement the Energy Benchmarking 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)

These data may be acquired from:

 Power/energy meters such as PowerLogic ION9000, PM8000, PM5000, HDPM6000, PowerTag, Acti9 iEM3000





PowerLogic

PM8000



PowerLogic ION9000

PowerLogic PM5000





Acti9 iEM3000

PowerLogic PowerTag

• Devices with embedded metering such as PowerLogic P5/P3, MasterPacT MTZ, and ComPacT NSX protection devices, or Galaxy VX/VL/VM/VS UPS





MTZ





NSX



Galaxy VX/VL/VM/VS

Third-party devices (via Modbus)

P3

#### **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.

#### **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 •

These can be imported in EcoStruxure Power Monitoring Expert or Power Operation from customer production systems through OPC<sup>2</sup> or ETL<sup>3</sup>



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.

**OPC: Open Platform Communications** 2. 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.

## **Normalization Parameters (User Input)**

Normalize consumption with respect to comparable devices, processes, facilities, departments, or similar normalization parameters. These parameters are typically entered manually into the dashboards, reports, or calculation engine of EcoStruxure Power Monitoring Expert or Power Operation.



EcoStruxure Power Monitoring Expert



EcoStruxure Power Operation

## Tariffs (User Input, Optional)

Tariffs can be used to convert energy or water consumption into cost.

# **Data Recording and Timestamping**

For the Energy Benchmarking application, a timestamp accuracy of  $\pm 1$  second is sufficient.

Advanced power meters such as the PowerLogic ION9000, PM8000, HDPM6000, 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

PM8000





PowerLogic ION9000

PowerLogic HDPM6000

PowerLogic PM5000

**For other devices** (PowerLogic P5/P3, MasterPacT MTZ, Galaxy VX/VL/VM/VS, entry-level PowerLogic PM5000 models, Acti9 iEM3000, PowerLogic PowerTag, 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** MT7

PowerLogic

PowerTag



VX/VL/VM/VS

Galaxv





EcoStruxure Power Monitoring Expert



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**Power Operation** 

When acquiring data from other customer systems, timestamps can also be imported through OPC<sup>4</sup> or ETL<sup>5</sup>.

For a comprehensive overview of device recording and timestamping capabilities, refer to 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.



## **Data Processing**

This application focuses on comparing the measured performance of a device, process, facility, or organization with respect to its peers, but also with respect to some standards (such as building energy ratings).

The calculation engine in EcoStruxure Power Monitoring Expert and Power Operation provides the ability to normalize consumption data with respect to the normalization parameters described above.

This allows for meaningful benchmarking by comparing like to like.

OPC = Open Platform Communications 4

ETL = The EcoStruxure Extract Transform Load (ETL) engine is a companion application for EcoStruxure Power Monitoring Expert and 5 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.



EcoStruxure Power Monitoring Expert



# Outputs

Outputs are displayed by EcoStruxure Power Monitoring Expert or Power Operation.

#### **Dashboards**

The following gadgets ease visualization and interpretation of energy consumption data:

#### **Energy Equivalency Gadget**

Shows a single value that is equivalent to the aggregated consumption input data, over a selected time period. The value can be scaled or normalized to represent an equivalent consumption measurement. The information is shown as a numeric value with unit, a custom text, and a custom graphic.



Energy Equivalency Gadget

#### **Building Energy Rating (BER) Gadget**

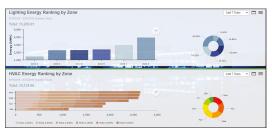
Displays a graphical representation of the energy performance of a building. It is similar to energy ratings commonly displayed on consumer products.



Building Energy Rating Gadget

#### Consumption Ranking Gadget <sup>6</sup>

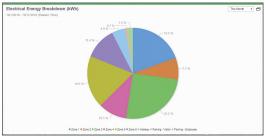
Compares the consumption of different loads, areas, processes, or buildings over a period of time.



**Consumption Ranking Gadget** 

#### **Consumption Comparison**

By creating several gadgets for each area, process, or building of interest, with normalized consumption details, it is possible to benchmark their consumption with respect to each other



Consumption Comparison

#### Reports

The following Energy Management reports can be displayed or automatically sent by email:

#### **Consumption Ranking Report**

- Displays the relative ranking of energy consumption for one or more source/ measurement pairs. Consumption data can be normalized to facilitate comparison.
- Intended to assist in building energy awareness through relative visualization.



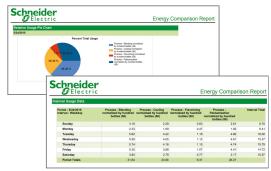
Consumption Ranking Report

#### **Energy Comparison Report**

- Compares different load types on a particular source to perform building benchmarking.
- Converts energy to a common energy unit and can normalize energy by criteria, such as area. Results are shown with either bar or pie charts.

<sup>6.</sup> The Energy Analysis Dashboards Module of EcoStruxure Power Monitoring Expert must be deployed to benefit from this gadget and other energy analysis visualizations.

Both reports can be used to benchmark the energy consumption of areas, processes, devices, or buildings with respect to each other.



**Energy Comparison Report** 

### **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

Schneider Electric 35 rue Joseph Monier 92500 Rueil Malmaison France

+ 33 (0) 1 41 29 70 00

www.se.com

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