

Energy Benchmarking (NEMA)

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

EcoStruxure Power Digital Application

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EcoStruxure™ 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)¹

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

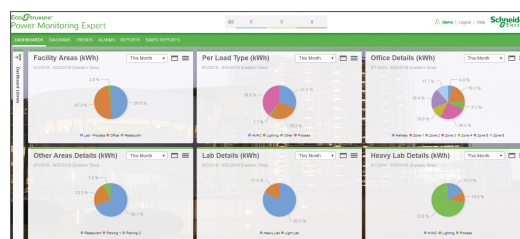
Benchmark multi-site energy usages

- 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.



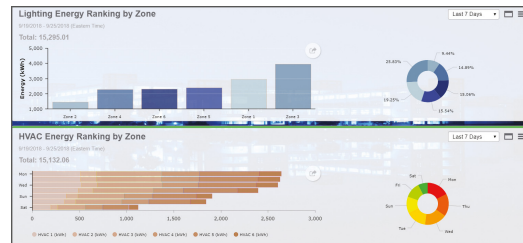
Building Area Benchmarking

Application Outcomes

Dashboards

- Energy comparison and ranking dashboards
- Building energy rating gadget

1. 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

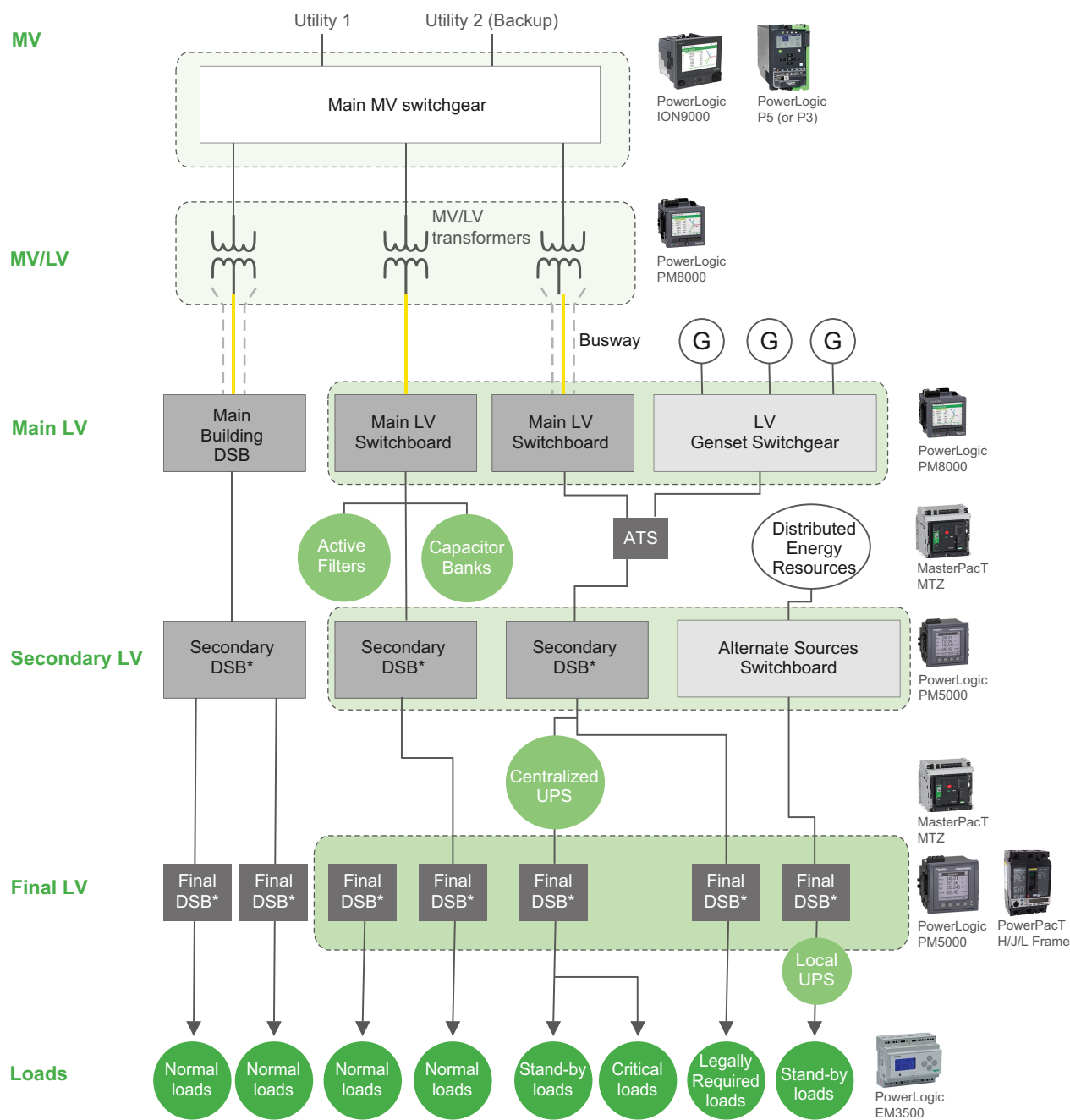
As an option, EcoStruxure Service Plan powered by EcoStruxure Power Advisor provides data quality analytics with recommendations from our Schneider Electric service experts.



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

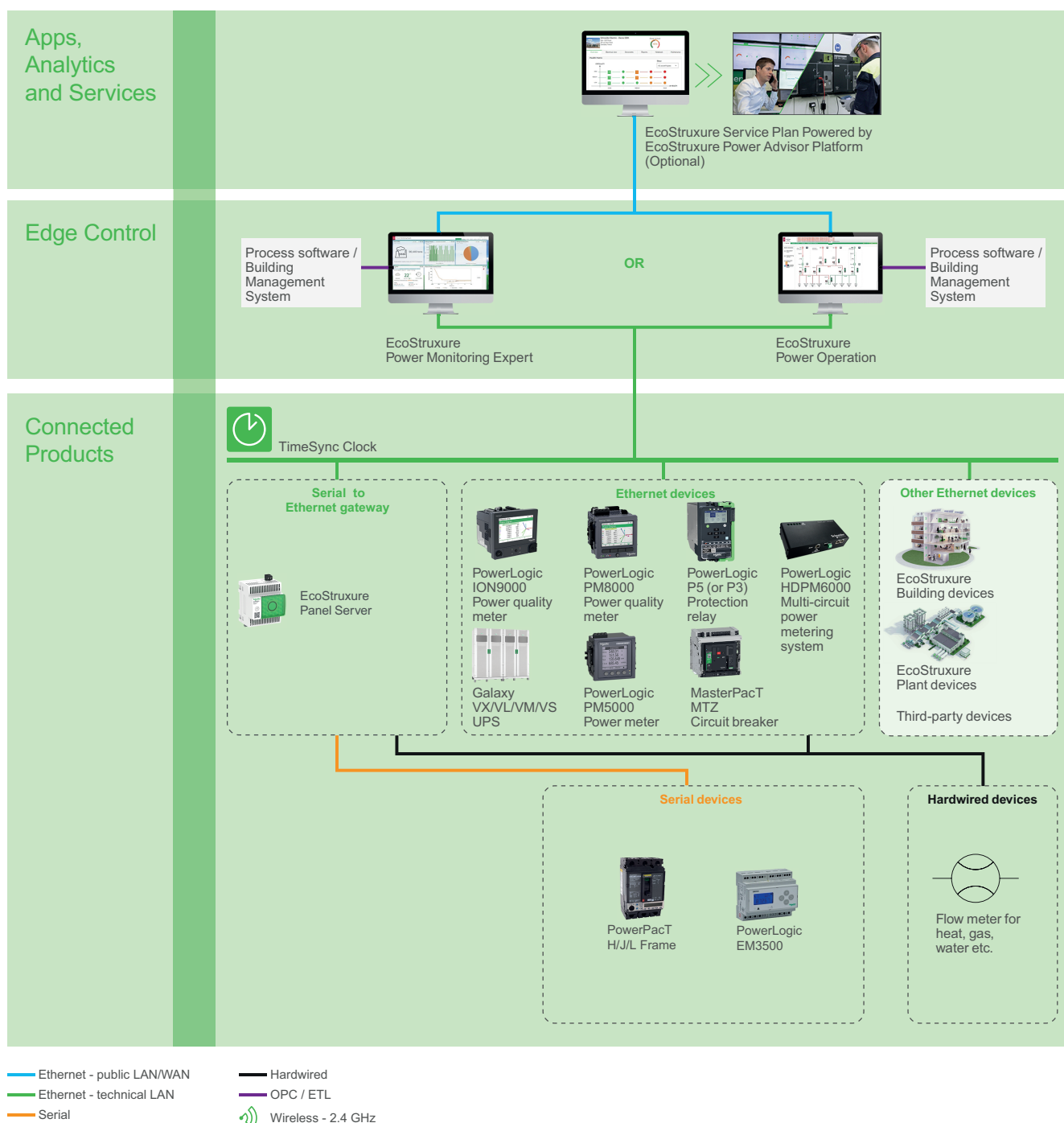
In this architecture, the data is collected from connected products either directly over Ethernet or via gateways (such as the EcoStruxure Panel Server). This data is then recorded and processed by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) for on-premise visualization,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

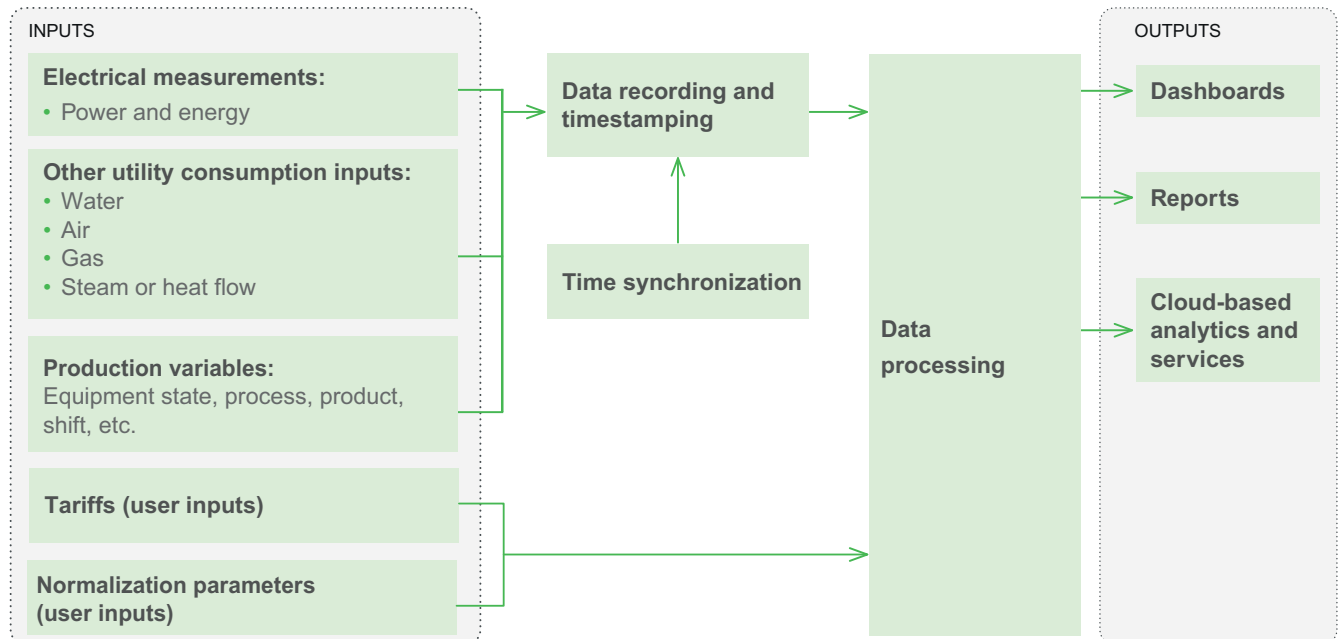
The recommended digital architecture for the application is shown below:



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, EM3500



PowerLogic
ION9000



PowerLogic
PM8000



PowerLogic
PM5000



PowerLogic
HDPM6000



PowerLogic
EM3500

- **Devices with embedded metering** such as PowerLogic P5/P3, MasterPacT MTZ, and PowerPacT H/J/L protection devices, or Galaxy VX/VL/VM/VS UPS

PowerLogic
P5PowerLogic
P3MasterPacT
MTZPowerPacT
H/J/LGalaxy
VX/VL/VM/VS

- **Third-party devices (via Modbus)**

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 OPC² or ETL³

EcoStruxure
Power Monitoring ExpertEcoStruxure
Power Operation

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

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.

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 ± 1 second is sufficient.

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 OPC⁴ or ETL⁵.

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

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.



EcoStruxure
Power Monitoring Expert



EcoStruxure
Power Operation

Outputs

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

Dashboards

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

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.

Energy Equivalency Gadget

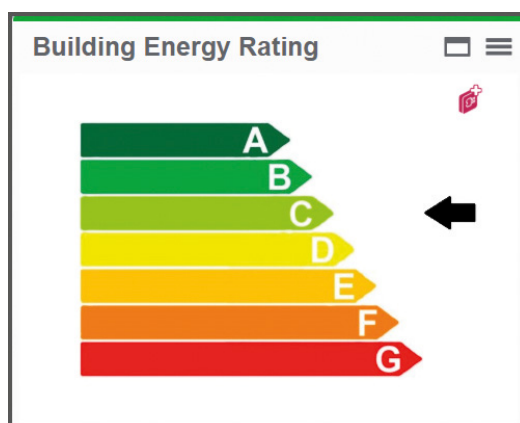
Shows a single value that is equivalent to the aggregated consumption input data, over a selected time period. The value can be scaled or normalized to represent an equivalent consumption measurement. The information is shown as a numeric value with unit, a custom text, and a custom graphic.



Energy Equivalency Gadget

Building Energy Rating (BER) Gadget

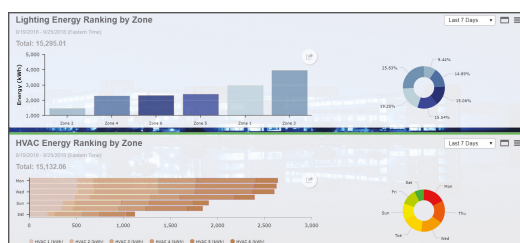
Displays a graphical representation of the energy performance of a building. It is similar to energy ratings commonly displayed on consumer products.



Building Energy Rating Gadget

Consumption Ranking Gadget ⁶

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

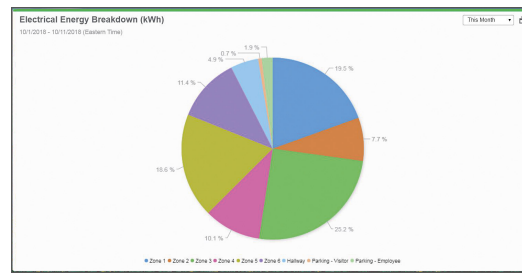


Consumption Ranking Gadget

Consumption Comparison

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

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



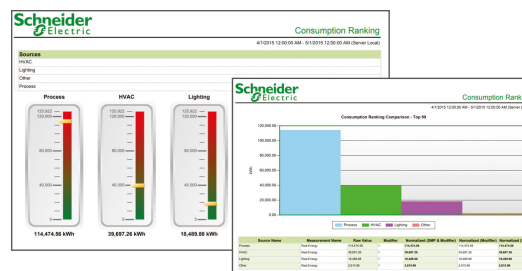
Consumption Comparison

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.

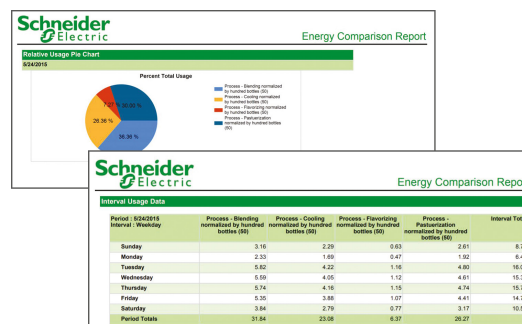


Consumption Ranking Report

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.

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



Energy Comparison Report

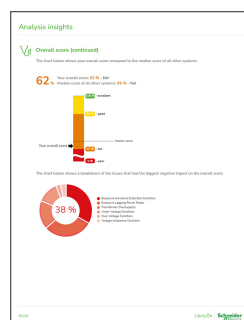
Cloud-Based Analytics and Services

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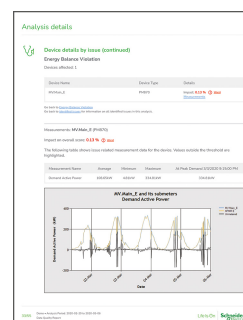
For further information, refer to [Data Quality Management](#).



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

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