Electrical Distribution Monitoring and Alarming (IEC)

Monitor Electrical Distribution Network and Receive Alarms in the Event of Detected Failures

EcoStruxure Power Digital Application

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EcoStruxure™ Power

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Overview

Context of Application

Just like any other process in a facility, electrical distribution systems are complex with many devices, and potential failures can occur at different locations. Considering the critical nature of the continuity of an electrical power supply, having the capacity to quickly view, analyze, and understand where the detected failure has occurred, like a car dashboard, is key for facility managers.

Problem to Solve

The facility manager needs to:

- Gain visibility of the status and relevant information of the entire electrical system.
- Receive alarms on abnormal conditions or events.
- Monitor and report on peak demand, loading of equipment such as breakers, UPSs, transformers, generators, etc.
- Know, analyze, and understand where issues of the electrical distribution network come from.

Purpose of Application

Provide real-time information about the electrical distribution system

- Real-time status
- Power availability
- Detailed information about each connected device: breakers, UPSs, transformers, generators, etc.

Identify anomalies and notify the right personnel

The Electrical Distribution Monitoring and Alarming application provides alarming in the event of any abnormal conditions and notifications based on alarm priority and shift schedule.

Aggregate onboard alarm data in an easy-to-understand way

To avoid alarm flooding and help with alarm interpretation, incidents are intelligently aggregated based on event type and time.

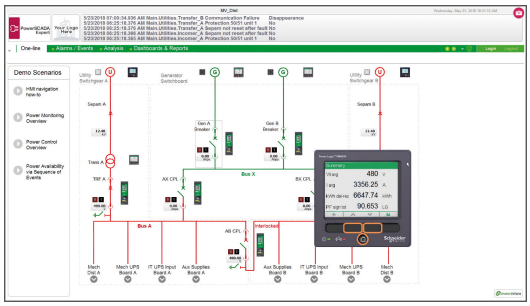
Native integration of connected products

Plug and play connectivity of devices provides rich contextual data that cannot be captured by BMS or generic SCADA applications.

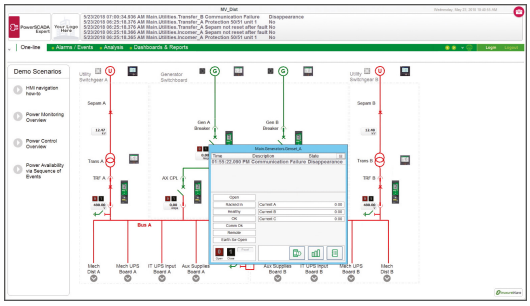
Application Outcomes

Live Data Display

- Native support for a wide range of devices and communication protocols
- Electrical network Single-Line Diagrams (SLDs)
- SLD color animation to distinguish energized/de-energized sections
- Elevation drawings
- Real-time data values of each connected device, such as electrical parameters, device settings, and status information



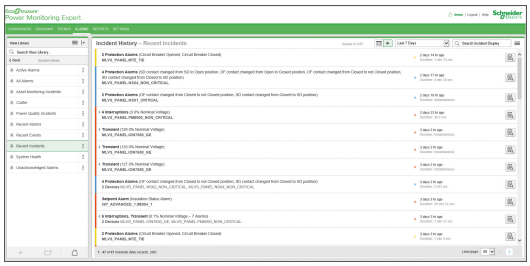
Electrical Network Single-Line Diagram (with color animation)



View of Device Data and Control

Events and Alarms

- Chronological display of events and alarms with sorting and filtering capabilities
- Intelligent alarm grouping into summary incidents



Alarm Viewer - Recent Incidents

Trends

- Real-time and historical data can be viewed on a trend viewer.

Dashboards

- Configurable dashboards for visualizing historical power system data

Reports

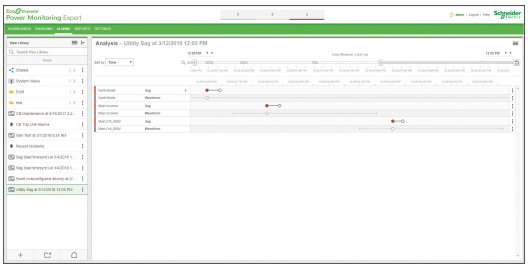
- Historical data reporting

Notifications

- SMS and/or email notifications can be sent for fast analysis and action.
- Email notifications are also available to send reports and non-critical information.

Analysis Tools

Display of incidents on the Power Event Analysis incident timeline (for more information, refer to the Power Event Analysis application).

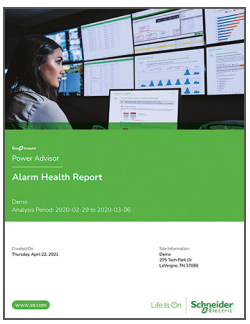


Power Events Incident Timeline

Display of electrical waveforms captured during arc flash event with a native waveform viewer in Edge Control software.

Cloud-Based Analytics and Services

As an option, EcoStruxure Service Plan powered by EcoStruxure Power Advisor provides electrical network and alarm health analytics with recommendations from our Schneider Electric service experts.



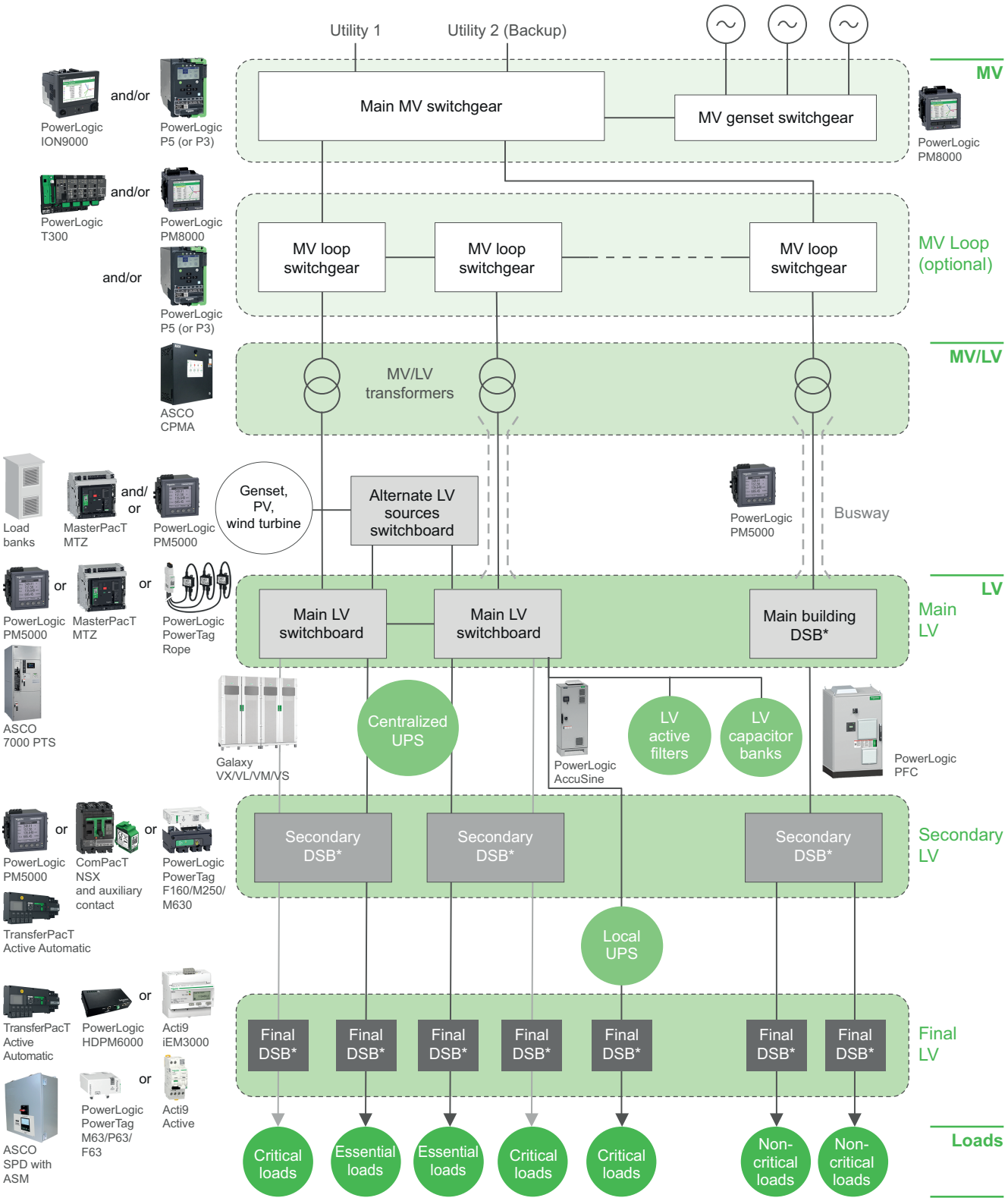
EcoStruxure Power Advisor Alarm Health Report

BMS Integration

EcoStruxure Power enables integration of electrical data and alarms at the Edge Control layer with BMS software such as EcoStruxure Building Operation.

Electrical Architecture

The following diagram details the areas of the architecture where the connected products should be installed in order to implement the Electrical Distribution Monitoring and Alarming application:



* DSB = Distribution Switchboard

Digital Architecture

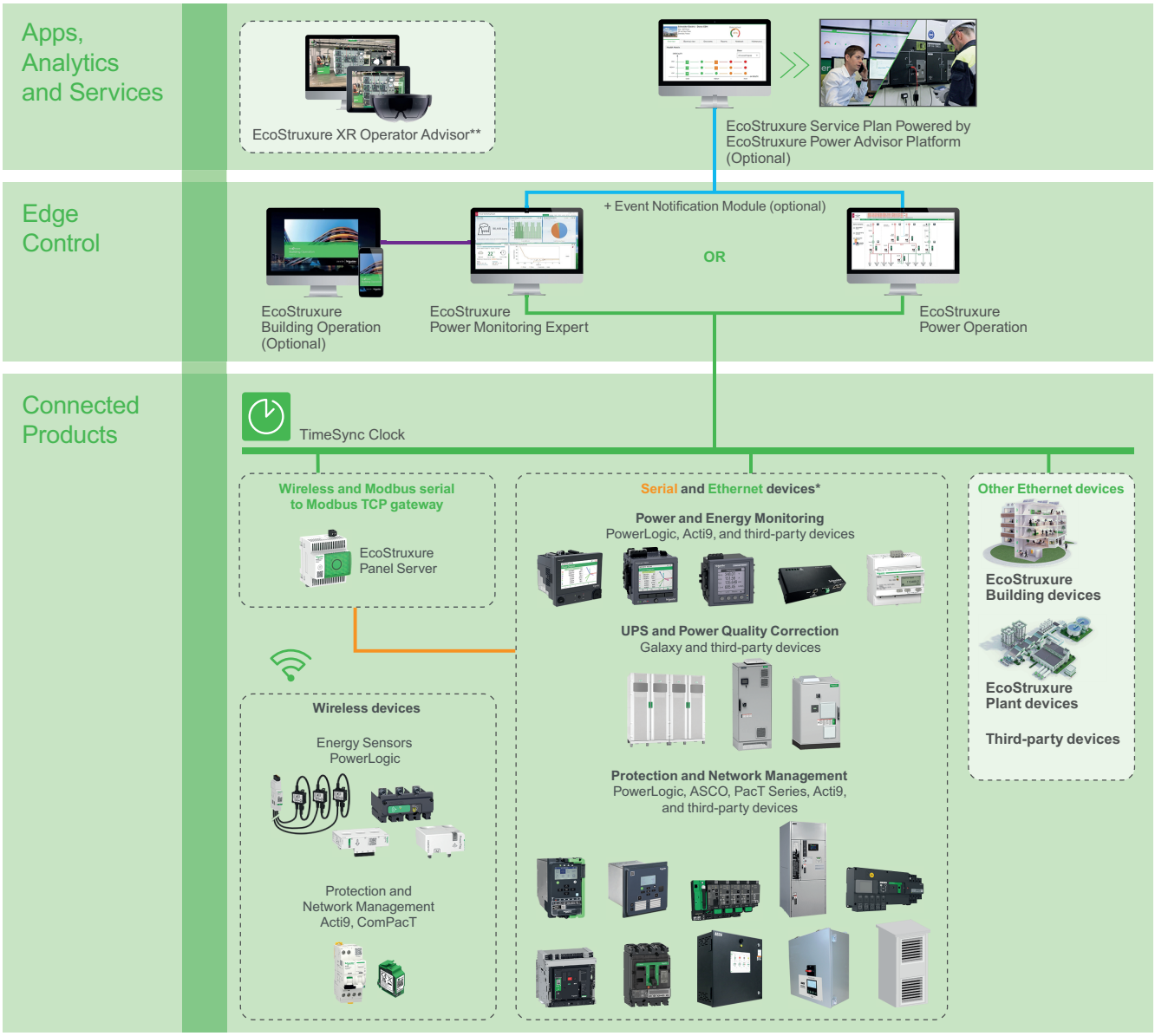
The digital architecture of the Electrical Distribution Monitoring and Alarming application involves collecting the input data from the different products, either directly over Ethernet or via gateways (such as EcoStruxure Panel Server). These data are then used by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) for on-premises visualization, analysis, and reporting.

The most important data from the electrical distribution can also be monitored with a Building Management System (BMS) such as EcoStruxure Building Operation, thanks to seamless integration with EcoStruxure Power Monitoring Expert or Power Operation.

As an option, EcoStruxure XR Operator Advisor Client can be used to enhance Electrical Distribution Monitoring and Alarming with virtually overlaid data on top of equipment and devices.

Data from EcoStruxure Power Monitoring Expert or Power Operation can be passed on to the EcoStruxure Power Advisor platform and interpreted by experts as a part of the EcoStruxure Service Plan.

The recommended digital architecture for the application is shown below:



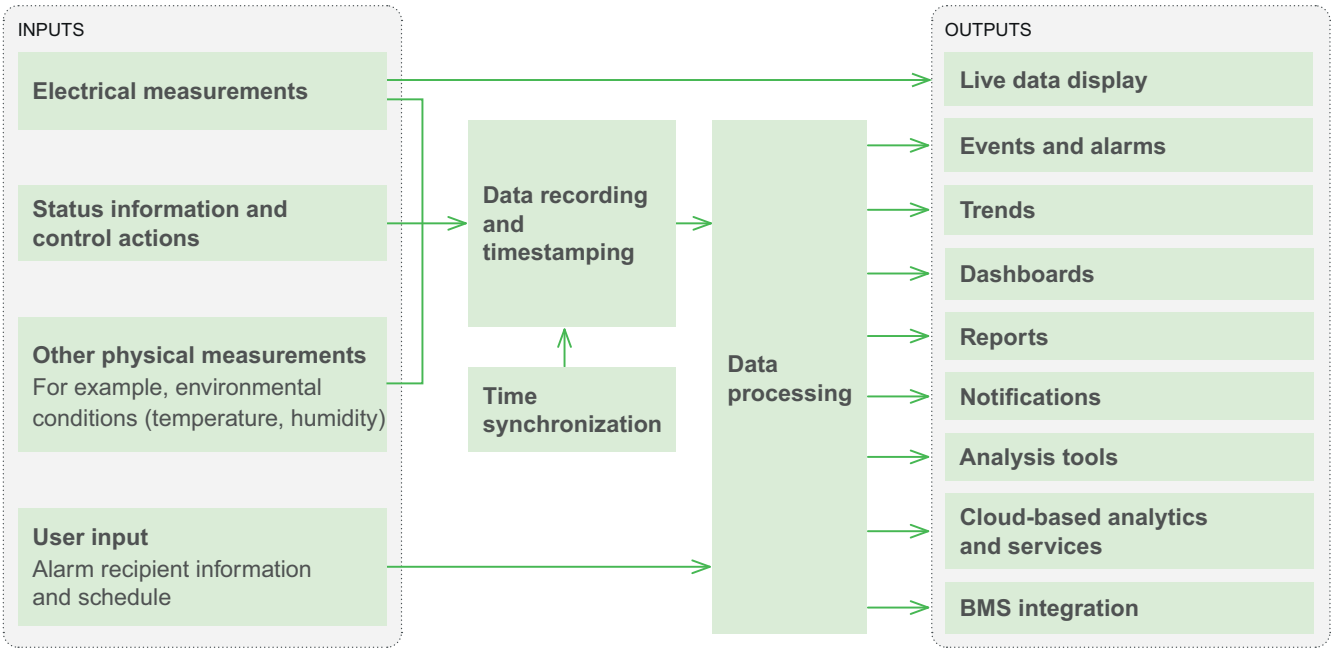
* Depending on the connected device chosen, communication protocols can be Ethernet or Serial / ** See digital architecture of Guided Procedures through Extended Reality to understand how you can leverage EcoStruxure XR Operator Advisor for this application

Ethernet - public LAN/WAN
Ethernet - technical LAN
EWS / ETL / HTML
Serial
Wireless - 2.4 GHz

System Description

Data Flow

The Electrical Distribution Monitoring and Alarming application can be broken down as follows:



Inputs

The Electrical Distribution Monitoring and Alarming application collects data from connected products to provide access to consolidated views of electrical measurements, status information, and individual device details. It also monitors remote control actions.

Electrical measurements and status information can be acquired from a wide range of connected products as well as third-party equipment through open communication protocols. Typical connected products include:

- **Energy/Power meters**, such as PowerLogic ION9000, PM8000, PM5000, HDPM6000, Acti9 iEM3000, PowerTag

PowerLogic ION9000

PowerLogic PM8000

PowerLogic PM5000

PowerLogic HDPM6000

Acti9 iEM3000

PowerLogic PowerTag

- **Protection devices**, such as PowerLogic P5/P3, MasterPacT MTZ, ComPacT NSX (including its wireless auxiliary contact), Acti9 Active


PowerLogic P5


PowerLogic P3


MasterPacT MTZ


ComPacT NSX and Auxiliary Contact


Acti9 Active

- **Other equipment**, such as UPS (Galaxy VX/VL/VM/VS), ATS/PTS (ASCO 7000 Series PTS, TransferPacT Active Automatic), ATS controller (PowerLogic T300), protective devices (ASCO SPD with ASM), power correction devices (PowerLogic PFC and AccuSine PCS+/PCSn/EVC/PFV+), Load Banks


Galaxy VX/VL/VM/VS


ASCO 7000 Series PTS


TransferPacT Active Automatic


PowerLogic T300


ASCO SPD with ASM


PowerLogic PFC


PowerLogic AccuSine PCS+/PCSn/ EVC/PFV+


Load Banks

Electrical Measurements

The following electrical measurements are collected from connected products (real-time values, the minimum, maximum, and average values):

- Current and voltage
- Power (Active, Reactive, Apparent)
- Frequency
- Power factor
- Energy
- Harmonic distortion
- Voltage and current unbalance

Status Information and Control Actions

From intelligent electrical devices such as circuit breakers, power quality correction equipment, ATSs, and other electrical distribution equipment:

- Circuit breaker position (open, closed, racked-in, racked-out, etc.)
- Circuit breaker trip status, protection status
- UPS status, motor status
- Other statuses, operating modes or conditions
- Control actions (operator or automatic)

Other Physical Measurements

Non-electrical measurements, such as environmental conditions (temperature, humidity, etc.), can also be integrated into the system.

User Input: Alarm Recipient Information and Schedule

For alarm/event notification and distribution, recipient delivery schedules need to be configured.

These schedules are configured to send notifications to the appropriate operators, taking into account shift schedules, holidays, and weekends.

Delivery mechanisms include SMS and SMTP (email).

Data Recording and Timestamping

For the Electrical Distribution Monitoring and Alarming application, data recording can occur at various levels. Connected products, depending on the level of sophistication, can record data as follows:

- **Analog and event data recorded and timestamped on board:** PowerLogic ION9000, PM8000, and some PowerLogic PM5000 models (PM53xx and PM55xx)


PowerLogic ION9000


PowerLogic PM8000


PowerLogic PM5000

- **Event data recorded and timestamped on board:** PowerLogic P5/P3, T300, MasterPacT MTZ, ComPacT NSX


PowerLogic P5


PowerLogic P3


PowerLogic T300


MasterPacT MTZ


ComPacT NSX

- **No onboard recording; real-time data only. Recording and timestamping is done by a data logger** (Cyber Sciences SER 3200/2408), **server** (ASCO CPMA) **or software** (EcoStruxure Power Monitoring Expert or Power Operation): entry-level PowerLogic PM5000 models, Acti9 Active, Acti9 iEM3000, PowerLogic PowerTag, TransferPacT Active Automatic, Galaxy UPS, PowerLogic AccuSine PCS+/ PCSn/EVC+/PFV+, PowerLogic PFC, and other equipment (including third-party)

PowerLogic
PM5000

Cyber Sciences
SER 3200/2408

ASCO
CPMA

EcoStruxure
Power Monitoring Expert

EcoStruxure
Power Operation

For the Electrical Distribution Monitoring and Alarming application, a time accuracy of ±10 milliseconds is recommended, in particular for highly critical applications. For less critical applications, 1 s is acceptable.

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.

TimeSync Clock

Data Processing

For the Electrical Distribution Monitoring and Alarming application, data processing is multi-faceted: it includes alarm evaluation, mathematical manipulation, converting status data from devices without onboard logging to events and alarms, etc.

Data processing is performed by EcoStruxure Power Monitoring Expert, Power Operation or onboard advanced devices.

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Power Monitoring Expert

EcoStruxure
Power Operation

Outputs

The Electrical Distribution Monitoring and Alarming application can provide the following suggested outputs in EcoStruxure Power Monitoring Expert and/or Power Operation.

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Power Monitoring Expert

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Power Operation

Live Data Display

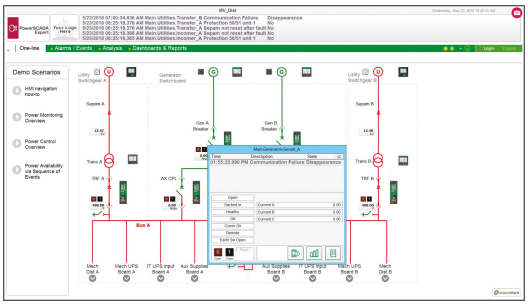
Single-Line Diagrams

The live status of the electrical distribution can be represented in the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) or in extended reality (EcoStruxure XR Operator Advisor Client) in various forms such as:

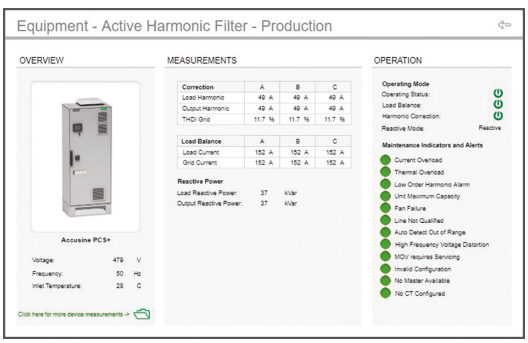
- Digital single-line diagrams, with real-time animation of the status of the electrical network
- Real-time electrical data and equipment status

Detailed Diagrams

- Custom data tables
- Default device diagrams (pre-configured along with native device drivers)
- Or real-time data in custom graphics (floor plans, elevation drawings)



Animated Single-Line Diagram with Dynamic Colorization in EcoStruxure Power Operation



Device Diagram in EcoStruxure Power Monitoring Expert

Events and Alarms

Event Log Viewers

Events and alarms are uploaded from devices or generated by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) and displayed in native event and alarm viewers.

Chronological views include:

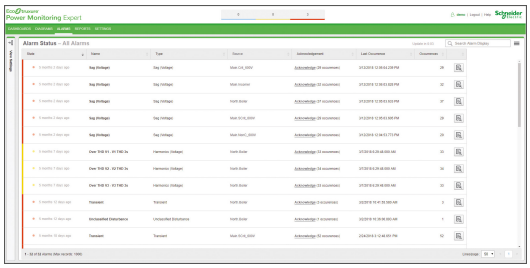
- All events and alarms, acknowledged or unacknowledged alarms, summary alarms or incidents
- High speed and high precision sequence of events to quickly locate the source of a power outage

Smart Alarming

Events or alarms can be intelligently grouped to be displayed as incidents and reduce the overall number of alarms in the viewer. Further analysis can be done through drill down into specific events (refer to Power Event Analysis Application).

In EcoStruxure Power Monitoring Expert and Power Operation, Smart Alarm categories include, among others:

- Asset Monitoring
- Power Quality
- System Health (diagnostics)



Alarm and Event Log Viewer in EcoStruxure Power Monitoring Expert and Power Operation

Trends

Historical and real-time electrical and other measured data can be displayed as trends in Edge Control software. Multiple measurements from selected devices can be viewed with dynamic scaling on a configurable time range. Additionally, target lines can be applied to trended data. Trended data can also be exported in . CSV format.

Real-Time Trending in EcoStruxure Power Monitoring Expert

Dashboards

In addition to specialized dashboards, any historical data from the system can be displayed in graphical dashboard gadgets in EcoStruxure Power Monitoring Expert or Power Operation:

- Bar chart
- Trend chart
- Grid (table)
- Pie chart
- Period over period

Additionally, information from the web (for example, weather feed) can be viewed as a dashboard.

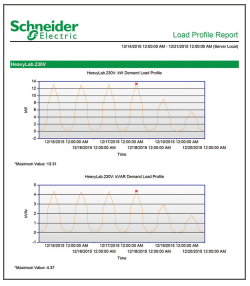
Dashboards

Reports

In addition to specialized reports, numerous general reports are available by default in EcoStruxure Power Monitoring Expert or with Power Operation based on historical electrical values or event data. These reports can be generated on-demand or automatically, and sent via email to configured recipients. General Reports include, among others:

- Trend/Multiple Trend Report
- Single/Multiple Equipment Operation Report
- Tabular Report
- Load Profile Report
- Event History Report

Data can also be exported into common file formats such as .CSV to import into other enterprise systems.



Load Profile Report

Event History Report

Notifications

Alarm notifications available with the optional Event Notification Module for EcoStruxure Power Monitoring Expert and Power Operation can be automatically sent via SMS or email to configured recipients on user-defined schedules.

Alarm notifications can be configured to delay sending notifications during a user-defined amount of time and to send a single notification for multiple events. This prevents flooding of notifications.

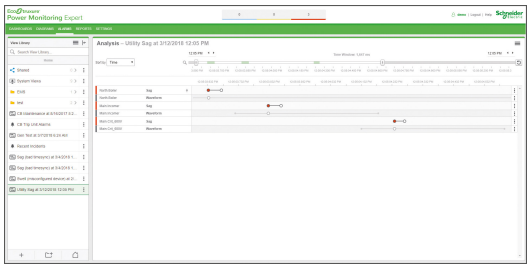
Alarm Notifications

Analysis Tools

Power Events Incident Timeline

This feature of EcoStruxure Power Monitoring Expert and Power Operation intelligently groups individual events and alarms as single comprehensive incidents during a given time period. It helps highlight the root cause and the consequences of an incident.

For more information, refer to the Power Event Analysis Application.



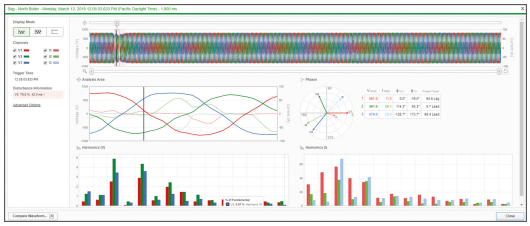
Power Events Incident Timeline

Waveform Viewer

Electrical signal waveforms can be visualized with a native waveform viewer in both EcoStruxure Power Monitoring Expert and Power Operation.

These viewers allow for the following:

- Toggle on/off voltage/current channels
- RMS calculation, zoom, pan, export to CSV
- Interactive phasor and harmonic (voltage and current) diagrams
- Multiple waveforms to be compared to each other



Waveform Viewer

Cloud-Based Analytics and Services

As an option, EcoStruxure Service Plan, powered by EcoStruxure Power Advisor, provides electrical network and alarm health analytics with recommendations from our Schneider Electric service experts. Issues and recommendations are shared with the user on a periodic basis. These analytics and recommendations include:

- Analyze Edge Control historical alarms according to guidelines in ISA 18.2 / IEC 62682
- Identify patterns and recommend actions to remove, repair or resolve alarms
- Analyze and recommend actions for transformer overcapacity
- Identify excessive voltage and current harmonics and recommend mitigation
- Measure and recommend improvements of poor power factor

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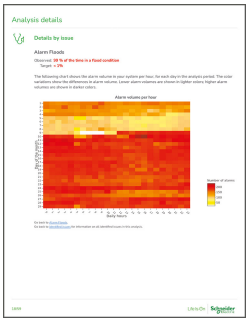
Service Plan Powered by EcoStruxure Power Advisor Platform

EcoStruxure
Power Advisor Alarm Health Report - Overall Alarm System Health



EcoStruxure
Power Advisor Alarm Health Report - Alarm Floods

BMS Integration

EcoStruxure Power Monitoring Expert and Power Operation can seamlessly integrate with EcoStruxure Building Operation to enable real-time monitoring, alarms, dashboards, and reporting on electrical data in the BMS.

This integration is done through use of:

- an EcoStruxure Web Services (EWS) interface
- an Extract, Transform and Load (ETL[1]) utility
- an HMTL web page interface

EcoStruxure Building Operation

1. 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.

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