Power Event Analysis (NEMA)

Analyze the Root Causes of Power Events

EcoStruxure Power Digital Application

EcoStruxure™ Power

Schneider Electric

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Overview

Context of Application

Various power events can affect your electrical installation:

- Motor startup sequences leading to voltage sags and current overloads

- Transient events such as capacitor switching and surge impulses

- Unsuccessful power transfers caused by incorrect Automatic Transfer Switch / Power Transfer Switch (ATS/PTS) operation, etc.

These events can cause damage to sensitive equipment and processes, and result in unexpected downtime.

Thanks to connectivity and embedded sensors on critical equipment, it is easy to receive alarms when such power events occur. However, it can be much more difficult to find the root cause of power events without the proper context and tools.

Problem to Solve

The facility manager needs to:

- Analyze potentially damaging power events to identify the root cause.

- Perform actions to avoid similar future events.

- Prioritize operator actions based on alarm priority.

Purpose of the Application

Provide a user-friendly graphical tool to simplify and save time in event analysis

- Smart alarm context automatically brings any relevant information into view, including disturbance direction detection (DDD) and loss of load detection (LLD).

- Events and alarms can be viewed by category, severity, alarm type, and status.

- Events can be visualized in the context of time across multiple devices.

- Analyses can be saved for later viewing.

- Power system events can be visually replayed using an animated electrical single line diagram, floor plan, or facility riser.
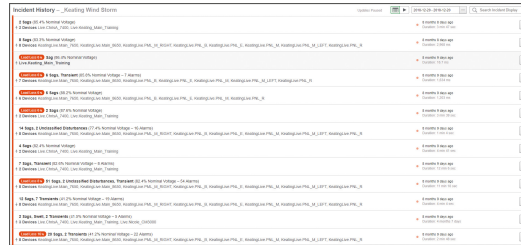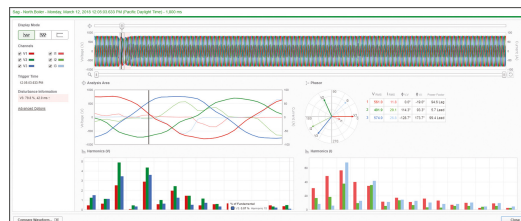
Smart Alarm View with LLD and DDD
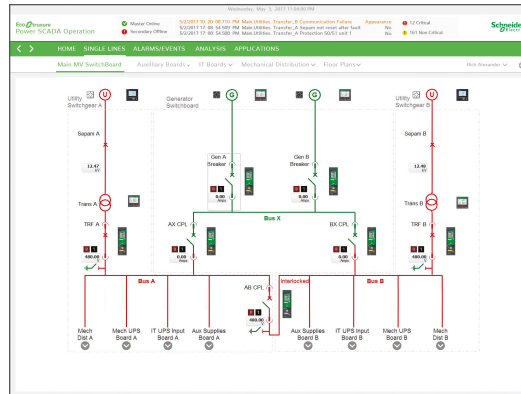
Animated Single Line Diagram

Provide an aggregated view of events in the same dashboard

- Power quality, circuit breaker trip, and other power incidents across multiple devices can be intelligently grouped and displayed.

- Events can be visualized on a chronological timeline with contextual data such as RMS data and waveforms.

Waveform Viewer

Enable root cause analysis

- High probability causes of selected Power Quality events can be displayed to operators.

Automated Root Cause Analysis

Application Outcomes

Events and Alarms

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

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

- **Power Event Incident Timeline:** helps identify the root cause and the consequences of an incident. This feature intelligently groups individual events and alarms as a single comprehensive incident during a given time period. Other data such as RMS waveforms and other electrical values are also accessible in a drill-down workflow.
- **Waveform Viewer:** power events can be visualized using the native waveform viewer in the Edge Control software.
- **Root Cause Analysis:** automated analytics built into the Edge Control software provide probable root cause of certain power events.
- **Power Event Playback:** if ASCO CPMA (Critical Power Management Appliance) is used to collect data in the system, power events can be recorded and replayed in dynamic one line diagrams.
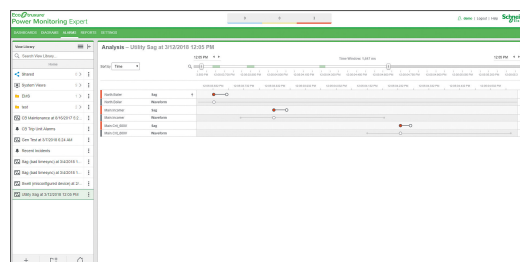
Timeline of Power Events

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.
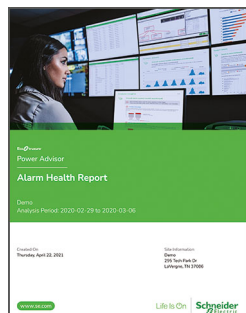
EcoStruxure Power Advisor Alarm Health Report

Electrical Architecture

The following diagram details the areas of the architecture where the connected products should be installed in order to implement the Power Event Analysis application:
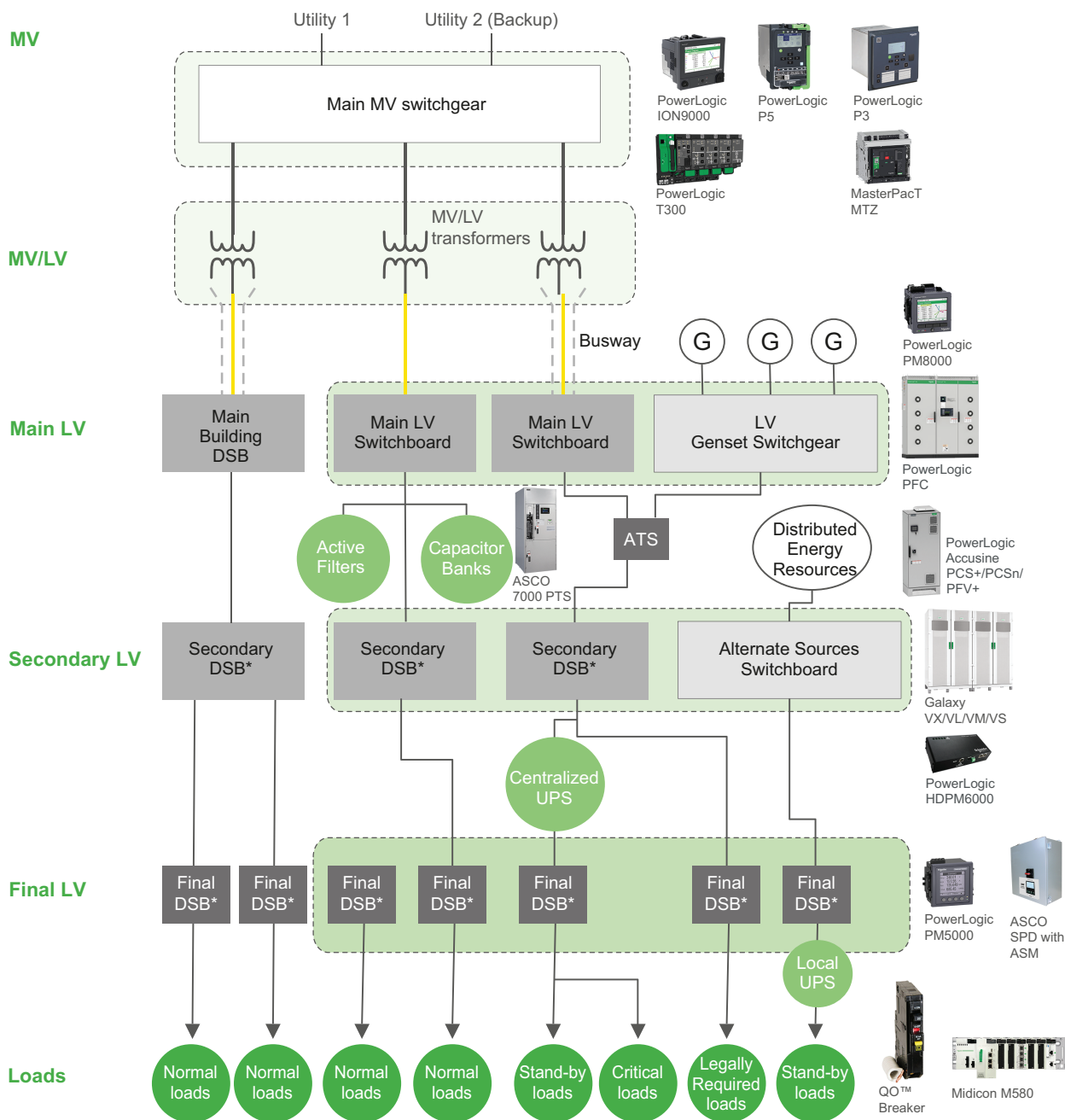
* DSB = Distribution Switchboard

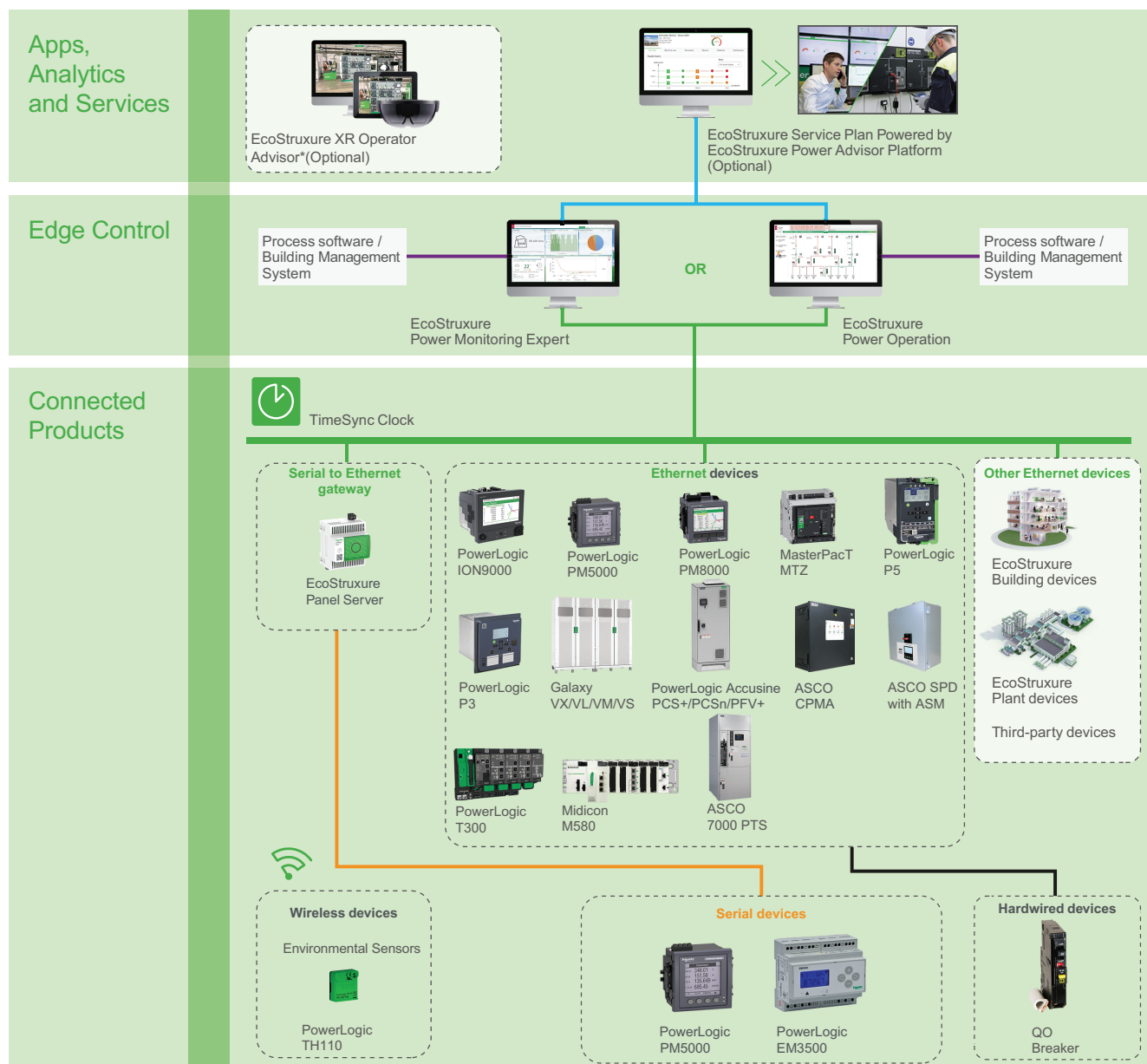# Digital Architecture

The digital architecture of the Power Event Analysis application involves collecting the input data from the different products, either directly over Ethernet or via gateways. This data is then used by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) for on-premise visualization analysis and reporting.

The most significant factors in the customer process can also be captured from external process software using the OPC standard or ETL tool.

As an option, EcoStruxure XR Operator Advisor Client can be used to enhance the Power Event Analysis application 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:

* 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	── Hardwired
── Ethernet - technical LAN	── OPC / ETL
── Serial	((• Wireless - 2.4 GHz

System Description

Data Flow

The Power Event Analysis application can be broken down as follows:
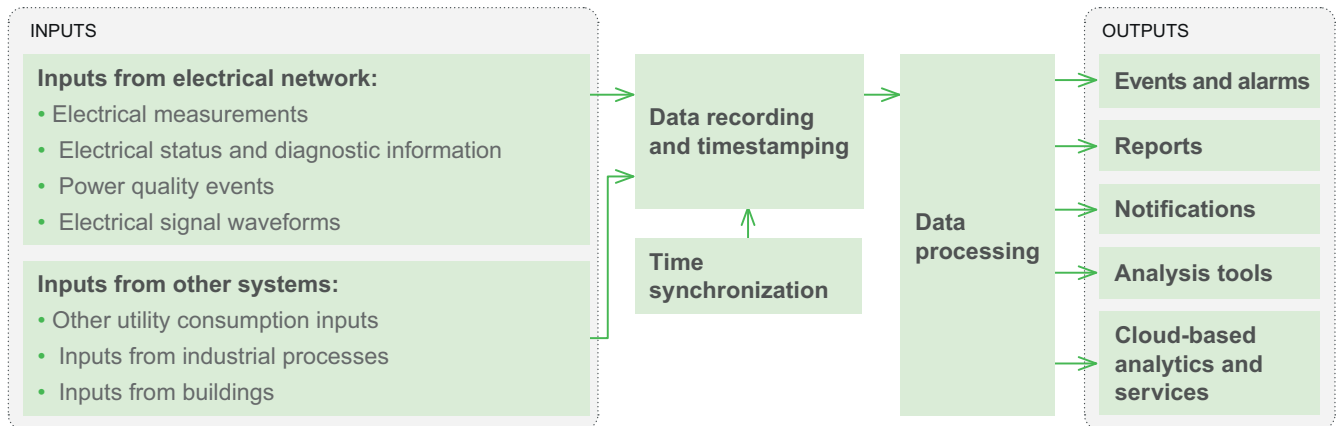
Inputs

Electrical Measurements

ThePower Event Analysis 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, EM3500

PowerLogic ION9000	PowerLogic PM8000	PowerLogic PM5000	PowerLogic HDPM6000	PowerLogic EM3500

- **Protection devices**, such as PowerLogic P5/P3, MasterPacT MTZ, PowerPacT H/J/L

PowerLogic P5	PowerLogic P3	MasterPacT MTZ	PowerPacT H/J/L

- **Other equipment**, such as UPS (Galaxy VX/VL/VM/VS), ATS/PTS (ASCO 7000 Series PTS), ATS controller (PowerLogic T300), protective devices (ASCO SPD with ASM), power correction devices (PowerLogic PFC and AccuSine PCS+/PCSn/PFV+), Load Banks, PLCs (Modicon M580), motor control (TeSys), environmental sensors (PowerLogic CL110/TH110)

Galaxy VX/VL/VM/VS	ASCO 7000 Series PTS	PowerLogic T300	ASCO SPD with ASM
PowerLogic PFC	PowerLogic AccuSine PCS+/PCSn/PFV+	Load Banks	Modicon M580 · TeSys
PowerLogic TH110	PowerLogic CL110		

Inputs from Other Systems

Other kinds of inputs can be used by the Power Event Analysis application:

- **Other utility consumption inputs:** water, gas, steam, etc.
- **Inputs from industrial processes:** motor, machine, or equipment status can be acquired from EcoStruxure Plant and Machine or third-party systems.
- **Inputs from buildings:** conditions in all facilities can be acquired from EcoStruxure Building Operation or third party systems.

EcoStruxure Building   EcoStruxure Plant and Machine

Data Recording and Timestamping

For highly critical applications, optimal chronological correlation is achieved with a time accuracy of ±1 millisecond (possible using PTP or GPS time synchronization).

For less critical applications, a time accuracy of ±100 milliseconds is adequate (with NTP and SNTP).

Time stamping and recording depends on the connected product type:

- **Advanced meters** such as the PowerLogic ION9000, PM8000, and some PowerLogic PM5000 models (PM53xx and PM55xx) can timestamp and record onboard input data.

PowerLogic
ION9000

PowerLogic
PM8000

PowerLogic
PM5000

- **For other connected products** (PowerLogic P5/P3, T300, MasterPacT MTZ, and entry-level PowerLogic PM5000 models) steady state disturbances and other data are measured by the connected products and recorded by software (EcoStruxure Power Monitoring Expert or Power Operation) or by a server (ASCO CPMA).

PowerLogic
P5

PowerLogic
P3

PowerLogic
T300

Master-
PacT
MTZ

PowerLogic
PM5000

EcoStruxure
Power Monitoring Expert

EcoStruxure
Power Operation

ASCO
CPMA

- **If data from these connected products require more accurate timestamping**, it should be relayed through another connected product or data recorder with better accuracy (like PowerLogic ION9000 power quality meter, Modicon M580 PLC, or Cyber Sciences SER 3200/2408).

PowerLogic
ION9000

Modicon
M580

Cyber
Sciences
SER 3200/
2408

When acquiring data from other systems, timestamps are imported through OPC[1] or ETL[2].

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 a consistent chronological view of all events that take place throughout the facility, the date and time should be accurately distributed to connected products and other management systems.

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1. OPC: Open Platform Communications;
2. 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.

Time synchronization can be performed through various technologies (PTP, NTP, SNTP, etc.). Time synchronization precision is essential to derive value from Power Event Analysis. An external master clock is required and can be connected to a GPS antenna to reach the expected time precision.

TimeSync Clock

Data Processing

Smart Clustering

Data processing consists of:

- Consolidation of events, alarms, waveforms, status changes, and other corresponding data from all connected products in chronological views
- Smart grouping of related data to help identify the root cause of incidents

Smart clustering is performed by EcoStruxure Power Monitoring Expert or Power Operation.

EcoStruxure
Power Monitoring Expert

EcoStruxure
Power Operation

Outputs

Outputs are displayed by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation).
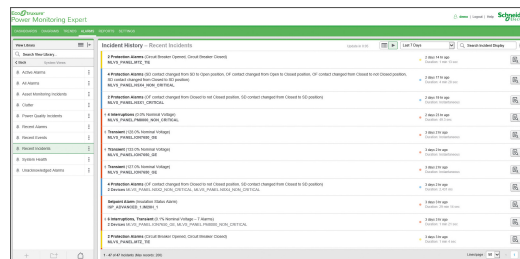

EcoStruxure
Power Monitoring Expert

EcoStruxure
Power Operation

Events and Alarms

Event/Alarm Log Viewers

These offer chronological display with sorting and filtering capabilities.

- EcoStruxure Power Operation offers high speed Sequence of Events Recording to quickly locate the source of any abnormal conditions. A time-quality flag indicates the accuracy of onboard clocks and the resulting accuracy of any events and alarms.

- EcoStruxure Power Monitoring Expert and Power Operation intelligently group related alarms, events, waveforms, and other associated data in an incident view to simplify the root cause analysis of an incident.

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

NOTE: Smart alarm views include relevant context acquired from smart power quality metering to indicate direction of a disturbance (upstream or downstream of the device capturing an event) and a percentage of nominal load lost as a result of an event such as a sag, transient, or interruption.

Reports

When EcoStruxure Power Monitoring Expert or Power Operation is installed, reports can be generated, such as the Event History Report.

Event History Report

Notifications

Notifications of events and alarms can be sent by EcoStruxure Power Monitoring Expert or Power Operation using the Event Notification Module.

Analysis Tools

Power Events Incident Timeline

The Power Events Incident Timeline helps identify the root cause and the consequences of an incident using the following advanced functions:

- Sorting of event and alarm data according to their date and time

- Detailed breakdown and sequence of alarms, waveforms, and trends involved in the incident

- Disturbance direction detection to locate upstream/downstream root cause of an incident
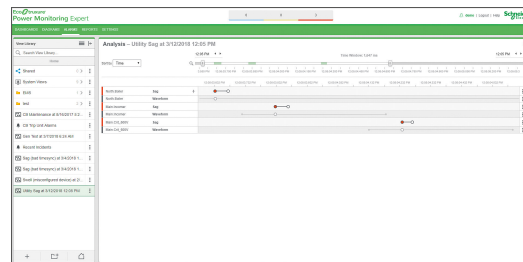
Power Events Incident Timeline

Waveform Viewer

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

These viewers allow for the following:

- Toggle on/off voltage and current channels

- RMS calculation, zoom, pan, export to CSV

- Interactive phasor and harmonic (voltage and current) diagrams

- Comparison of multiple waveforms with respect to each other
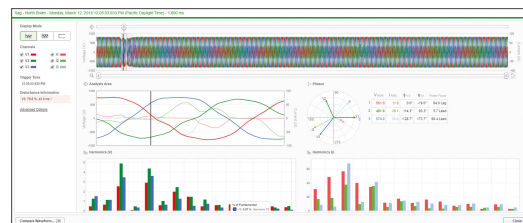
Waveform Viewer

Root Cause Analysis

Automated waveform analytics provide the probable root cause of certain power quality events including:

- Voltage sag
- Inrush event
- Load start
- Single-phase fault
- Subcycle fault
- Three-phase fault
- Two-phase fault

This detailed data enables appropriate actions to be identified.

Root Cause Analysis

Power Event Playback

If ASCO CPMA (Critical Power Management Appliance) is used to collect data in the system, power events can be recorded and replayed in dynamic one line diagrams

The playback tool offers comprehensive, easy-to-use capabilities:

- Continuously record all dynamic one line and floor plan control animations, sequence of events, and analog power data.
- Replay animated one line view of selected power events for better understanding of power event interdependency.
- Archive and share replayed animated one line events to improve collaboration and root cause analysis.

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. It helps categorize and reduce alarms.

EcoStruxure Service Plan Powered by EcoStruxure Power Advisor Platform

EcoStruxure Power Advisor Alarm Health Report - Overall Alarm System Health
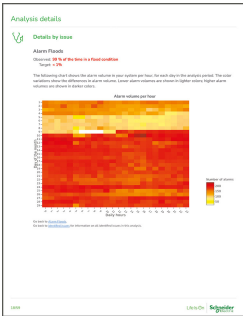
EcoStruxure Power Advisor Alarm Health Report - Alarm Floods

EcoStruxure Power Advisor Alarm Health Report - Details by Issue

As standards, specifications, and design change from time to time,
please ask for confirmation of the information given in this publication.

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