

TRANSVERSE | Topics Common to All the Digital Applications

EcoStruxure Power Digital Applications (NEMA)

Overview, system design considerations, application selection table, products contributing to digital applications, bibliography.

ESXP2-Transverse Draft01
09/2023

EcoStruxure™ Power



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Draft

Purpose of this Document

Target Audience

This design guide is intended for certified EcoXpert partners, System Integrators, Specifiers, electrical distribution designers, and other qualified personnel who are responsible for the design and configuration of projects.

Objective

The objective of EcoStruxure™ Power is to offer a range of digital applications to fulfill customers' needs in large buildings and critical facilities such as data centers, large hotels, healthcare, industrial facilities, etc.

This document details the system design considerations for the electrical installation that must be taken into account when designing a digital architecture.

Also, it explains how to select the most appropriate digital applications according to the end users' needs, and how to implement these applications to meet the system design considerations.

This technical guide provides a special focus on all the necessary building blocks required at each level, for each application.

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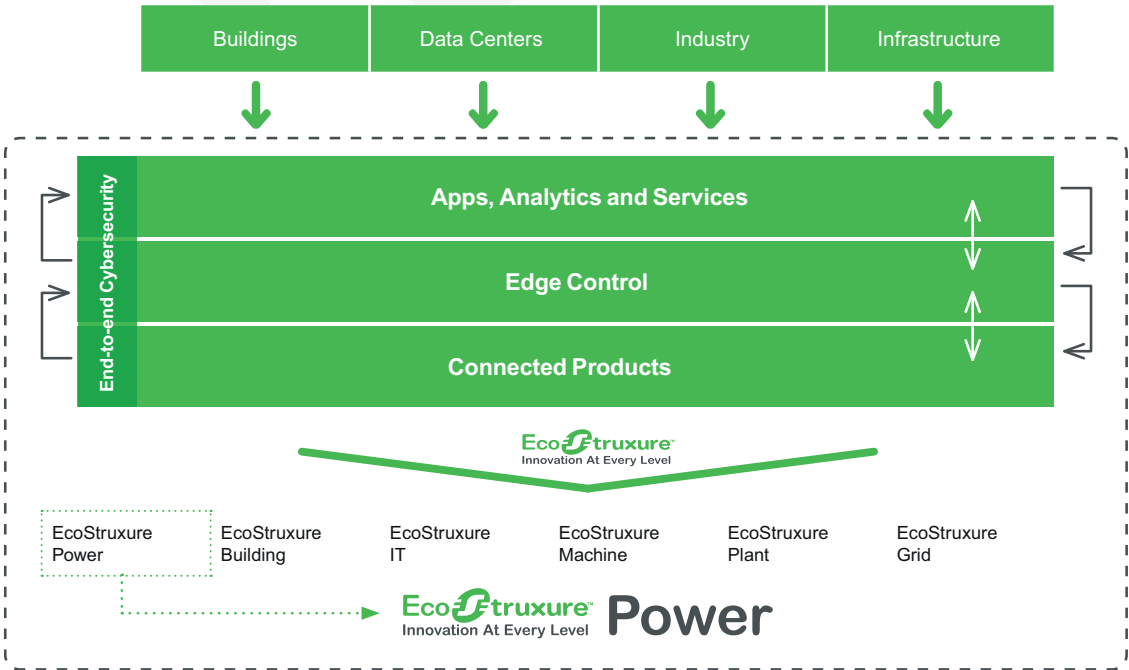
Introduction

As shown in the diagram below, and indicated by the green arrows, **EcoStruxure** Power is one of the six domains of **EcoStruxure**, our IoT-enabled architecture and platform.

EcoStruxure Power plays a key role in all four End-Markets (Buildings, Data Centers, Industry, and Infrastructure). This involves bringing the world of digitalized electrical distribution to those End-Markets.

4 End-Markets addressed >

6 EcoStruxure domains of expertise >



EcoStruxure's integrated architecture serves four End-Markets with its six domains of expertise.

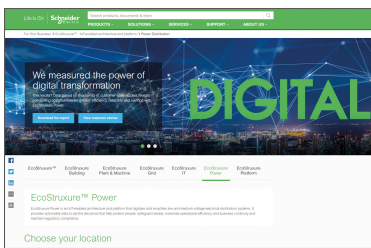
OUR VISION OF A NEW ELECTRIC WORLD

The world is becoming more electric and digital, and power is becoming more distributed, more complex to manage, and more integrated into our everyday lives. We envision a New Electric World where building staff and occupants are safer, with zero electrical safety incidents. Where power is 100% available, with zero unplanned downtime. Where energy and operations are more efficient, with zero energy waste. And where operational systems are resilient, with zero cyber intrusions.

We strive to make this vision a reality with our IoT-enabled **EcoStruxure** architecture and platform, which we deliver through our connected energy management ecosystem – a collective of partners and industry experts who are openly collaborating with us to push innovation, enhance productivity, reduce risk, and unlock new growth opportunities.

EcoStruxure Power Value Proposition

- **EcoStruxure Power digitalizes and simplifies low and medium voltage electrical distribution systems.** It provides essential data to aid the decisions that help protect people, safeguard assets, maximize operational efficiency and business continuity, and maintain regulatory compliance.
- **EcoStruxure Power is an open architecture and platform** designed with the intention of making it easy to add, upgrade, and swap components. The world is full of electrical distribution systems in various stages of maturity, produced by a variety of manufacturers. Interoperability with EcoStruxure Power is essential to making these power distribution systems future ready. The added benefit of a holistic Schneider Electric system is the plug-and-play connectivity to achieve faster and lower risk integration and commissioning.
- **EcoStruxure Power architectures are cost-optimized** to deploy, using only the right technology to deliver the desired business outcomes for our customers – no more, no less. However, customer needs or demands change over time.
- The **EcoStruxure Power system is scalable** from light commercial and industrial buildings to critical facilities such as hospitals, data centers, or infrastructure such as airports, rail, and energy and chemicals. The scalability of EcoStruxure Power means it also grows and evolves with changing needs or demands through its modular architecture.
- **EcoStruxure Power architectures are fully flexible power distribution systems** with the ability to adapt to dynamic and ever-changing conditions, such as balancing supply and demand by the hour or minute or adding and then scaling on-site renewable generation capabilities over time. Connecting IT and OT systems into a single, easy-to-manage Ethernet IP network is at the heart of our digitalization story. With EcoStruxure Power, facility managers can use the data they collect to make real-time decisions to maximize business continuity and optimize operations.
- **EcoStruxure Power architectures enable remote and on-site consultancy** to help maximize uptime, optimize maintenance costs, and improve operator efficiency while extending asset and system life expectancy.



EcoStruxure Power Landing Page

Learn more about EcoStruxure Power, Schneider Electric's digital solution for electrical distribution to help improve electrical safety, power availability, sustainability, and cybersecurity. Get access to customer testimonials, useful resources, and more!

<https://www.se.com/ww/en/work/campaign/innovation/power-distribution.jsp>



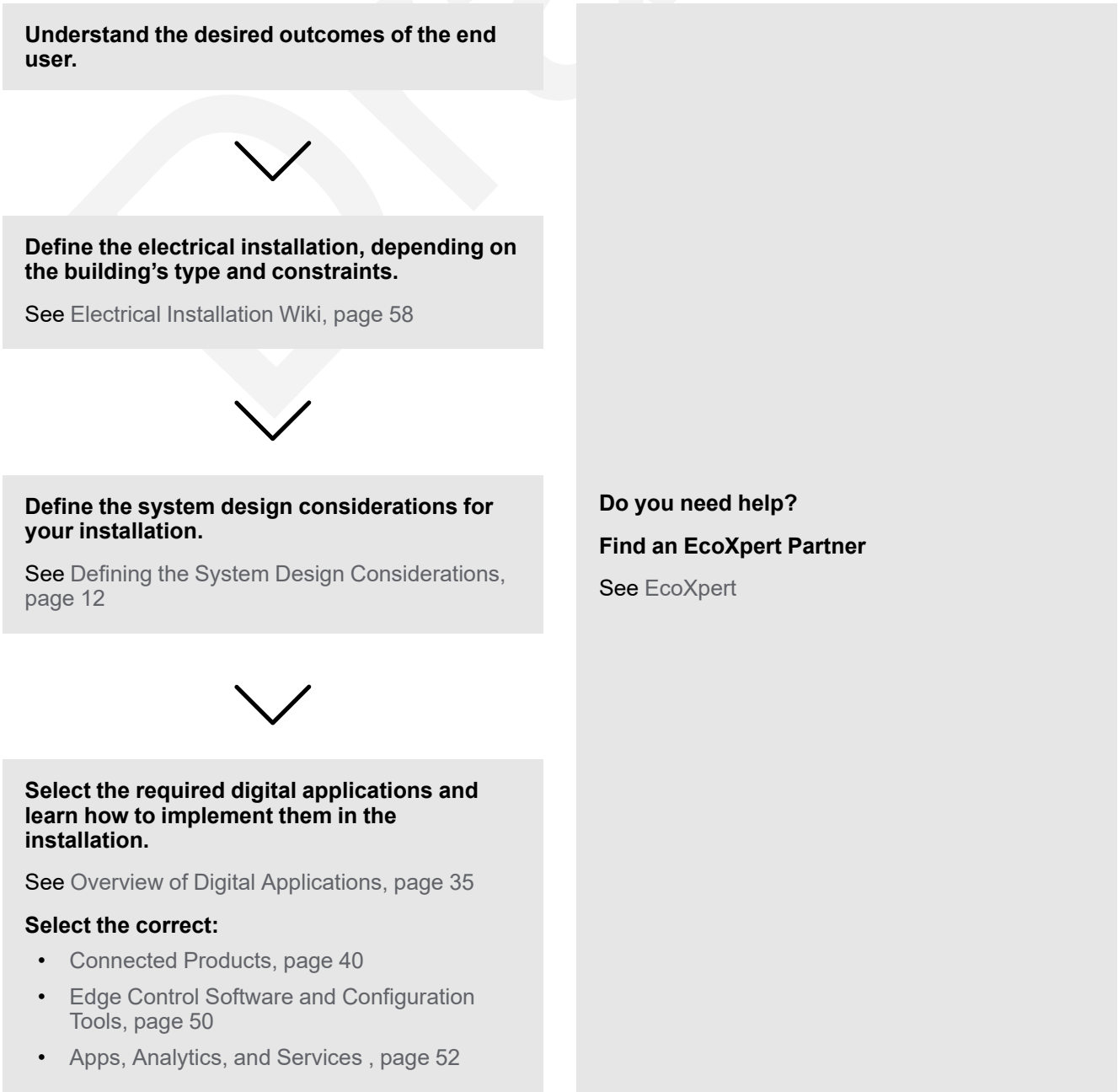
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General Methodology for Designing Digital Applications for Large Buildings and Critical Facilities

Building a digital electrical installation is much easier if you follow the steps below:



Structure of the Guide

Defining the System Design Considerations, page 12 addresses design considerations for the electrical installation in the context of system communications, data recording and timestamping, time synchronization, data processing, data quality management, and cybersecurity.

Selecting and Implementing the Digital Applications, page 33 outlines the values provided by all **EcoStruxure** Power applications and provides information on how to select the most appropriate applications according to the end user's needs. It also explains how to implement these applications in a defined electrical architecture to be compliant with the system design considerations. It identifies all necessary building blocks required at each level, for each application, and how to connect those building blocks to Edge Control software and/or to cloud-based Analytics and Services.

The **Appendix**, page 39 provides a brief description of all key connected products, Edge Control software, and cloud-based Services.

The **Bibliography**, page 54 provides links to useful documentation.

Information about our **EcoXpert** and **Green Premium** programs is available at the end of the guide.

Defining the System Design Considerations

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Introduction

Why Read This Part

The purpose of this part is to highlight elements to take into account when designing a digital power distribution system, that impact product and solution choices.

These considerations are important because they can help reduce the overall integration risk, improve compatibility, simplify installation and commissioning, and optimize system cybersecurity.

Contents of This Part

This part discusses the following system design considerations and their relevancy to the implementation of **EcoStruxure Power** applications in *Selecting and Implementing the Digital Applications*, page 33 [Check this cross reference.](#)

Communications	<p>EcoStruxure Power digital platform uses open communication protocols to aggregate data from connected products installed in MV/LV equipment, metering, and other sensors.</p> <p>This chapter presents those protocols and the supported drivers.</p>
Data Recording and Timestamping	<p>In the EcoStruxure Power digital platform, data recording can occur at various levels of the architecture.</p> <p>This chapter covers the various data recording options, which level of data recording and time accuracy is recommended for each application, and which time synchronization method can provide this time accuracy.</p>
Data Processing	<p>Data Processing in EcoStruxure Power can be carried out at three different levels.</p> <p>This chapter discusses the embedded, Edge Control, and cloud-based processing levels.</p>
Data Integration and Interoperability Between Systems	<p>Data Integration and Interoperability in the ESXP digital system occurs at the Edge Control level.</p> <p>This chapter discusses the integration with other EcoStruxure Systems and third party systems.</p>
Data Quality Management	<p>Data Quality is the basis for reliable digital power systems.</p> <p>This chapter explains how EcoStruxure Power Advisor contributes to data quality improvement</p>
Cybersecurity	<p>The demands of modern IoT applications increase the complexity of systems' infrastructure and put additional pressure on IT and OT security.</p> <p>This chapter discusses key aspects of cyber security related to EcoStruxure Power.</p>

Communications

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EcoStruxure Communication Protocols

EcoStruxure Power digital platform uses open communication protocols to aggregate data from connected products installed in MV/LV equipment, metering, and other sensors. These include:

- Modbus over serial line
- Modbus TCP
- Industry standard wireless communication
- Other standard protocols used in the electrical distribution domain such as IEC61850

The preferred method of system and device communications is direct Ethernet.

Modern sophisticated power system devices have rich data types that can generate large amounts of data, such as power quality data, which requires a high bandwidth connection to the monitoring software.

For devices with serial communication only, the connection is made via gateways through small serial daisy-chains with, typically, no more than eight devices.

EcoStruxure Communication Drivers

EcoStruxure Power supports two types of communication drivers:

- Native drivers for Schneider Electric devices, including legacy device drivers allowing modernization of systems with a step-by-step approach based on the life cycle of the assets
- Third-party device drivers using open protocols, such as Modbus, DNP3, IEC61850, BACnet, OPC DA, AE and UA can be easily created to capture real-time data using purpose-built productivity tools in EcoStruxure Power Monitoring Expert and Power Operation.

Data Recording and Timestamping

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Data Recording Options

In the EcoStruxure Power digital platform, data recording can occur at various levels of the architecture. Connected products, depending on their level of sophistication, can record data as follows:

- All data recorded and timestamped on board
- Only event and alarm data recorded and timestamped on board
- No onboard logging; real-time data only. Data recording and timestamping are performed by a data logger or Edge Control software.

Recommended Level of Data Recording

The time criticality of an application is defined by the recommended accuracy of data logged for the application to achieve its intended output.

The overall time accuracy level of a digital system will be derived both from the individual performance of the device timestamp and by the synchronization of all devices to a single, reliable, and accurate time reference.

Table to be updated with V4 and V5

Applications	Time Criticality	Recommended Time Accuracy [±]	Minimum Required Time Accuracy [±]
Continuous Thermal Monitoring	Low	1 min ¹	5 min ¹
Insulation Monitoring	Low	1 s	10 s
Electrical Distribution Monitoring and Alarming	Medium	10 ms	1 s
Capacity Management	Low	1 s	10 s
Backup Power Testing	Medium	10 ms	100 ms
Circuit Breaker Settings Monitoring	Low	1 s	10 s
Power Event Analysis	High	1 ms	10 ms
Power Control & Automation	Medium	10 ms	100 ms
Power Quality Monitoring and Compliance	Medium	10 ms	100 ms
Power Quality Correction	Low	1 s	10 s
Utility Bill Verification	Low	1 s	10 s
Energy Benchmarking	Low	1 s	10 s
Cost Allocation	Low	1 s	10 s
Energy Monitoring	Low	1 s	10 s
Energy Performance Analysis	Low	1 s	10 s
Energy Modeling and Verification	Low	1 s	10 s

1. For Continuous Thermal Monitoring application, considering the time constant of the physical phenomena observed (temperature rise of electrical conductors), time accuracy in the range of one minute is acceptable.

Applications	Time Criticality	Recommended Time Accuracy [±]	Minimum Required Time Accuracy [±]
Power Factor Correction	Low	1 s	10 s
Asset Performance	Low	1 s	10 s
Energy Efficiency Compliance	Low	1 s	10 s
Greenhouse Gas Reporting	Low	1 s	10 s
Power Quality Correction	Low	1 s	10 s
Regulatory Compliance	Medium	10 ms	100 ms

Time Synchronization

Purpose of Time Synchronization

When data is recorded and timestamped on board field devices, it is important to ensure that their internal clocks are accurate with respect to other devices and local time. The setting of devices to a single time reference is called time synchronization.

Time Synchronization Protocols

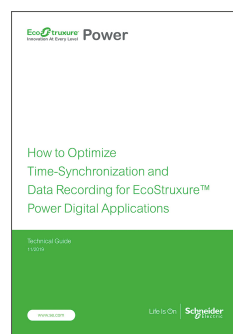
Various protocols and methodologies may be used to implement time synchronization.

Some of the most expensive, but most accurate time synchronization technologies rely on **non-Ethernet protocols** (for example **IRIG-B**, **DCF77**) linked to a GPS antenna, GPS receiver, and clock.

Ethernet-based protocols provide more economical solutions. The most cost-effective but less accurate approach is achieved with **Modbus-based (or ION-based) time synchronization** over an Ethernet or serial communications network.

Protocols such as **NTP/SNTP** are now commonly supported by a wide range of connected devices and can provide sufficient performances for non-critical applications, typically in the range of 1 s down to 10 ms, at an affordable cost.

A recent Ethernet-based protocol called **PTP (Precision Time Protocol)**, defined in IEEE 1588 and IEC 61588, can achieve even more accurate time synchronization, in the range of 1 ms or better, offering a strong alternative to serial line based protocols.



How to Optimize Time-Synchronization and Data Recording for EcoStruxure Power Digital Applications

Technical Guide
Ref: ESXP2TG001EN
11/2019

Time Synchronization Capabilities of EcoStruxure Power Connected Products

The table below highlights the supported time synchronization methods.

THE TABLE BELOW IS ACCORDING TO ESXP GUIDE V4 Content — KEEP IT LIKE THIS — WILL BE UPDATED FOR V5

recreated it by copy/paste so the content should be OK. Need to check the green bullets positions (as I had to re-create them manually) and the footnotes. Also note that I modified the look&feel of the 3 header rows and changed the dark gray “lines” with white text to light green with dark text (validated with Fleur)
The green bullet conrefs are already the right ones to use = using DEF_icons file already in Windchill

Connected Product	Product Category	Logging capabilities ²		Maximum reachable time synchronization accuracy / Compatible time synchronization protocols ^{2 3}							
				1 ms		10 / 100 ms	100 ms	1 s			
		Event log	Measure-ment log	PTP	IRIG-B	NTP	DCF 77	SNTP	1per10	Over Modbus	Over ION
PROTECTION, MONITORING and CONTROL DEVICES											
PowerLogic P5	Advanced High										
Easergy P3	Advanced High										
PowerLogic C5	Advanced High										
Easergy T300	Advanced High										
MasterPact MTZ(with IFE/eIFE)	Advanced Limited										
ComPacT NSX(with IFE)	Advanced Limited										
TransferPacT Active	Advanced Limited										
ASCO 7000 Series PTS - Group 5 Controller	Advanced Limited										
Acti9 Active ⁴	Standard										
Arc V121/V125 ⁴	Basic										
ASCO 7000 Series PCS - Modicon M580	Advanced High										
ASCO Load banks	Basic										
ASCO SPD with ASM	Standard										
ASCO CPMA	Advanced Limited										
INSULATION MONITORING and FAULT LOCATION DEVICES											
Vigilohm IM20-H	Advanced Limited										
Vigilohm IFL12-H / IFL12	Advanced Limited										
Vigilohm IM400	Advanced Limited										
POWER METERS											
PowerLogic ION9000	Advanced High										
PowerLogic PM8000	Advanced High										
PowerLogic PM5000	Advanced Limited										
PowerLogic HDPM6000	Advanced Limited										
Acti9 iEM3000	Advanced Limited										
PowerLogic PowerTag	Basic										
ASCO 5200	Advanced Limited										
PLC AND PAC											
Modicon M251 (SMD)	Advanced Limited										
Modicon M580	Advanced Limited										
Modicon M580 with ERT module	Advanced High										
Modicon M340	Advanced Limited										
POWER QUALITY MITIGATION, POWER FACTOR CORRECTION AND UPS DEVICES											
PowerLogic AccuSine PCS+ ⁴	Basic										
PowerLogic AccuSine PCSn ⁴	Basic										
PowerLogic AccuSine EVC+ ⁴	Basic										
PowerLogic AccuSine PFV+ ⁴	Basic										
PowerLogic PFC ⁴	Basic										
Galaxy VX	Advanced Limited										
Galaxy VL	Advanced Limited										
Galaxy VM	Advanced Limited										
Galaxy VS	Advanced Limited										
COMMUNICATION DEVICES, GATEWAYS AND DATA LOGGERS											
EcoStruxure Panel Server PaS600	Advanced Limited										
EcoStruxure Panel Server PaS800	Advanced Limited										
Acti9 Smartlink Modbus	Advanced Limited										
PowerTag Link	Advanced Limited										
Harmony Sologate ZBRN32 ⁴	Standard										
EcoStruxure Power Automation System Gateway ⁵	Advanced High										
Cyber Sciences SER 3200/2408	Advanced High										
Connexium Managed Switches	Advanced Limited										
SENSORS											
Easergy TH110 / CL110CL110 ⁴	Standard										
PowerLogic HeatTag ⁴	Standard										

For a definition of "product categories" and for more information on time synchronization and how to implement such a feature in a digital architecture, please refer to the dedicated [How to Optimize Time-Synchronization and Data Recording for EcoStruxure Power Digital Applications](#)

2. Product can acquire new capabilities. Capabilities to be confirmed when ordering
3. These are typical accuracies. Refer to product technical documentation for information on the maximum reachable accuracy
4. Time synchronization is performed by an upstream host
5. This product also supports time synchronization through DNP3 and IEC101/1

Data Processing

Data Processing Levels

Data processing in **EcoStruxure Power** is carried out at three possible levels:

- Onboard connected devices
- In Edge Control software
- In cloud-based applications

Typically, all devices perform some level of onboard processing. The remaining processing is done either in Edge Control or in cloud-based applications. More sophisticated devices typically perform more of the data processing on board versus in Edge Control.

Onboard Device Data Processing

Some **EcoStruxure Connected Devices** (**PowerLogic ION9000**, **PM8000**, **MasterPact MTZ**, etc.) provide significant onboard processing for sophisticated functionalities such as power quality event detection and recording and Disturbance Direction Detection (DDD). These features require high speed detection and processing which otherwise would not be possible over software to device communications.

Edge Control Software Data Processing

Secondary data processing is found in **EcoStruxure Power Monitoring Expert** and **Power Operation**. For features such as the reporting module, data processing is performed at the Edge Control level. It provides post processing of data for evaluation against regulatory standards or for converting data into easy to understand information.

Cloud-Based Applications Data Processing

Cloud-based data processing provides similar benefits to those found in Edge Control. It evaluates data using predictive asset maintenance algorithms and converts data into easy to understand information.

Data Integration and Interoperability Between Systems

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Why Integrate Operational Systems

With the considerable evolutions in IoT, capabilities of Power Management Systems (PMS) have evolved to enable greater levels of analysis of power systems' operations and maintenance. Thus, Power Management Systems such as **EcoStruxure Power Monitoring Expert** and **Power Operation** monitor, analyze, and report all types of data from the connected electrical distribution products.

Sometimes, to enhance operational intelligence and the efficiency of facility and maintenance teams, data can be exchanged between the PMS and some other systems like Building Management Systems (BMS; such as **EcoStruxure Building Operation**) or Industrial Automation platforms (IA; such as AVEVA System Platform or Citect SCADA).

For example:

- Environmental conditions provided by the BMS can be used in the PMS to make correlations with the energy consumption.
- Electrical data from the PMS can be used in the BMS for consolidation of global building information.
- Information about process conditions, provided to the PMS by the IA platform, can help identify the origin of a power event that affects the industrial process.

Traditionally, Power Management Systems, Building Management Systems, and Industrial Automation platforms are specified, designed, and commissioned separately, sometimes by specialized design consultants and through dedicated trade contractors (mechanical and electrical contractors). Each project stakeholder should consider the best way to deliver the end users' outcomes with the most optimal technical solution.

Integration of such systems with the user's outcomes in mind provides multiple advantages:

- Take advantage of the specialized capabilities of each platform such as acquisition of specialized data types like electrical waveforms.
- Improve user experience
- Help the project phase stakeholders deliver high quality systems at an optimized cost
- Take advantage of IP communications to optimize wiring between products and/or wiring from products to the automation controllers or enterprise server.

Integration With Other **EcoStruxure** Systems

This guide presents several applications where **EcoStruxure Power Monitoring Expert** or **Power Operation** can be integrated with other **EcoStruxure** or third-party systems.

Example of Integration with EcoStruxure Building Operation (EBO)

The goal of integrating EcoStruxure Power Monitoring Expert with EcoStruxure Building Operation (EBO) is to provide a single pane of glass for these two operational systems. This allows integrated mechanical and electrical facility management/maintenance teams to monitor both operational systems in a common interface.

Data acquisition

- Electrical and energy data (including real-time, historical data, and events) from metering devices, circuit breaker trip units, and other intelligent electrical devices (Schneider Electric or 3rd party) is acquired by PME (or PO – not shown in the diagram below).
- Mechanical data from Automation Servers and other mechanical field devices is acquired by EBO.

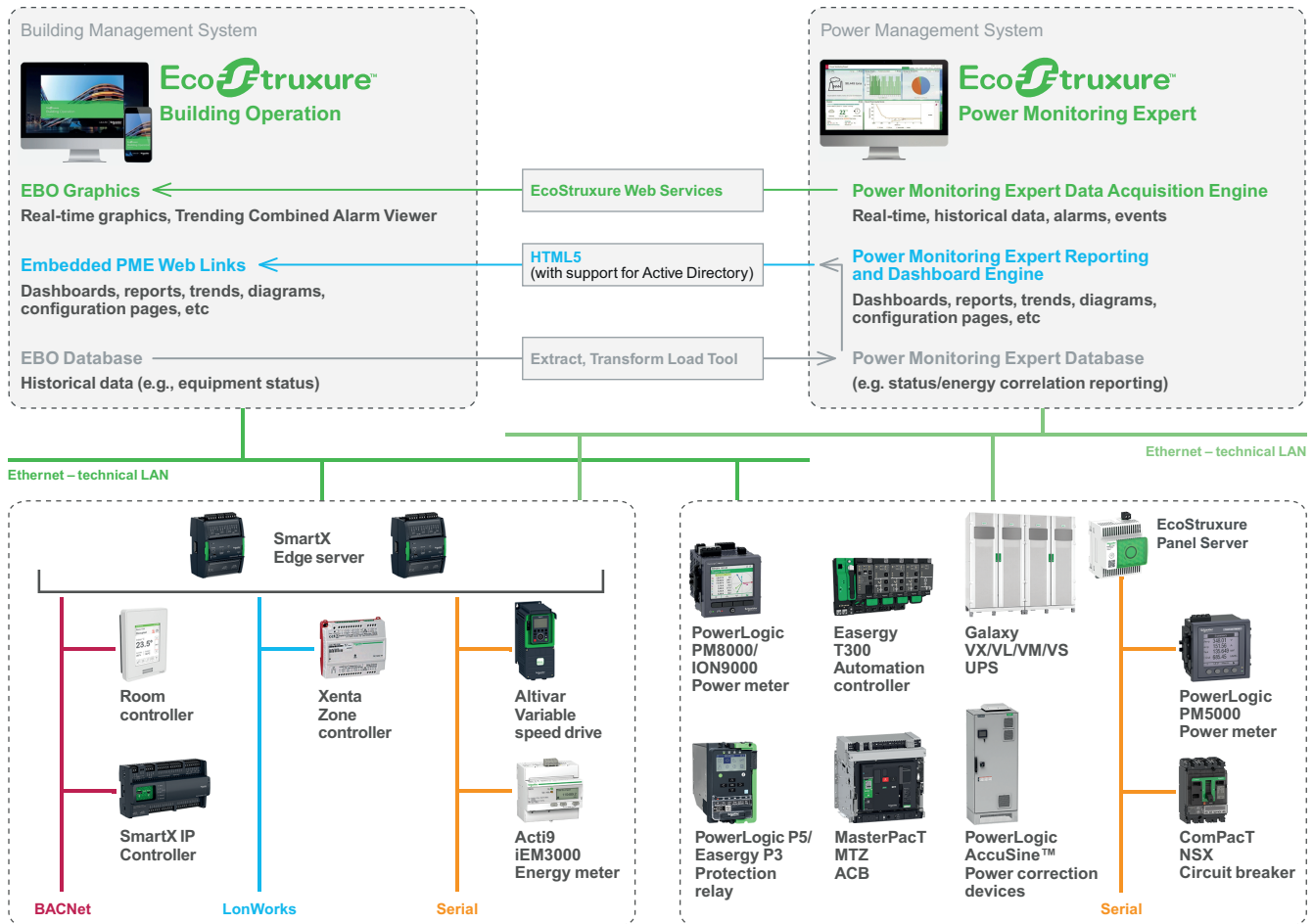
Integration of EcoStruxure Power Monitoring Expert data into EcoStruxure Building Operation

- Electrical and energy data from PME is transferred to EBO using EcoStruxure Web Services to be visualized in the EBO Web interface.
- HTML5 web applications from PME can also be integrated into the EBO web interface (diagrams, dashboards, reports, etc.).

Integration of EcoStruxure Building Operation data into EcoStruxure Power Monitoring Expert

- Historical data (such as equipment status) can be exchanged from EBO to PME using an ETL⁶ engine to enable normalization of energy data with operational data from the BMS.

6. 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 convert that data so it can be loaded into another application.



Example of Combined Solution with EcoStruxure Building Operation and EcoStruxure Power Monitoring Expert

Example of Integration with EcoStruxure Plant (AVEVA System Platform)

The goal of integrating EcoStruxure Power Monitoring Expert (PME) with EcoStruxure Plant is to improve plant operation. For example, to help identify the origin of a power event that affects the industrial process, or to analyze the energy usage correlation with production processes to help continuously improve energy efficiency of plant operations.

Data acquisition

- Electrical and energy data (including real-time, historical data, and events) from metering devices, circuit breaker trip units, and other intelligent electrical devices (Schneider Electric or third party) is acquired by PME (or PO – not shown in the diagram above)
- Process data from PLCs, drives, or other process field devices is acquired by the SCADA software such as AVEVA System Platform.

Integration of AVEVA System Platform data into EcoStruxure Power Monitoring Expert

Capture in PME/PO of the most significant factors in the customer process is done through the standard integration capabilities provided with PME/PO. This includes using:

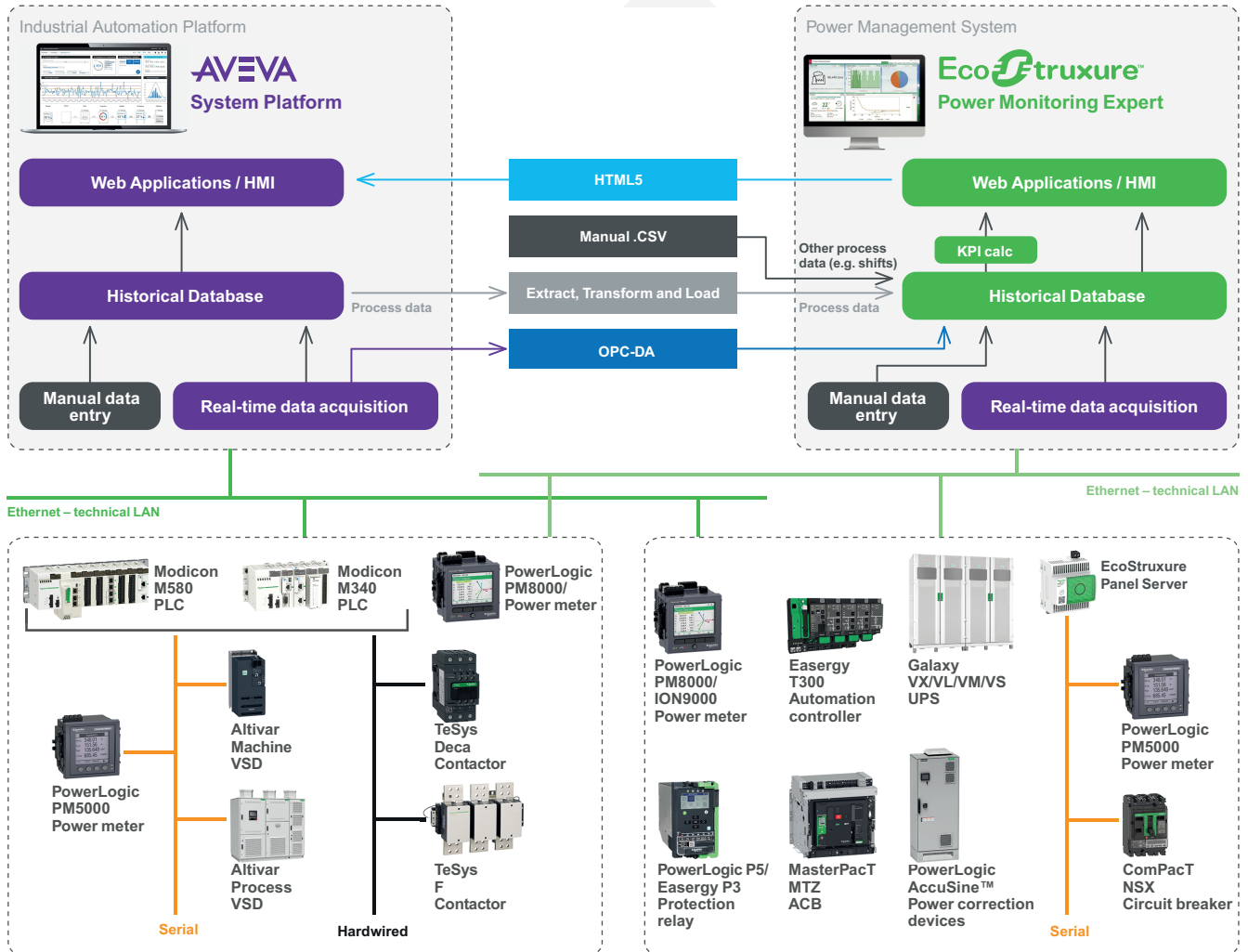
- OPC⁷ DA⁸ standard (EcoStruxure Power Operation also supports OPC AE⁹ Server and UA¹⁰ Client)

7. Open Platform Communications
8. Data Access
9. Alarms and Events
10. Unified Architecture

- ETL (Extract, Transform and Load) utility
- Other simple data exchange formats such as .CSV, which can be imported into the database of the process SCADA system

Integration of EcoStruxure Power Monitoring Expert data into AVEVA System Platform

- HMI integration can be done by integrating the HTML web pages of EcoStruxure Power Monitoring Expert inside EcoStruxure Plant's SCADA HMI to visualize normalized energy and process KPIs.



Example of Combined Solution with EcoStruxure Plant (AVEVA System Platform) and EcoStruxure Power Monitoring Expert

Interoperability With Third-Party Systems

For interoperability with third-party systems, EcoStruxure Power Monitoring Expert and Power Operation support OPC¹¹ DA¹² client and server functionality.

OPC is a set of open standards for connectivity and interoperability of industrial automation and the enterprise system. OPC provides a bridge between Windows-based applications and process control hardware, thereby eliminating the need for proprietary or custom interfaces and drivers for the various data types and sources residing in the corporate information network.

Additionally, EcoStruxure Power Operation provides extended OPC AE¹³ server and OPC UA¹⁴ client functionality.

11. Open Platform Communications
12. Data Access
13. Alarms and Events
14. Unified Architecture

Data Quality Management

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Purpose of Data Quality Management

Data quality is the basis for reliable digital power systems. It is the foundation for operational decision making. Studies have shown that 80% of digital electrical distribution systems have outdated configurations or data quality issues. The source of this bad data can originate from wiring mistakes in the panel shop, installation mistakes when the panel is connected on site, and commissioning mistakes when the panel is tied into the Edge Control software. Other sources of data quality errors result from maintenance activities, system expansions, or retrofits.

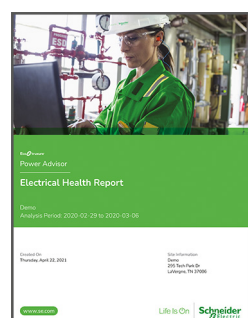
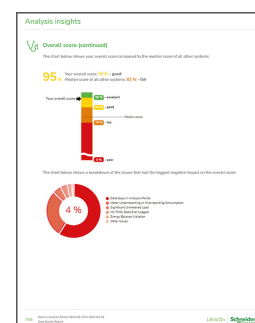
Poor data quality can result in organizations being unable to demonstrate appropriate actions and decision making for energy saving programs associated with the ISO 50001 certification program. It can also result in general ill-informed decision making related to the electrical distribution operation, and root cause analysis of events that occur.

Facility Managers, Energy Managers, and Operators need to be able to rely on 100% accurate electrical distribution monitoring data to make sound decisions about electrical safety, power availability, and sustainability. In addition, they often need to provide accurate data to external stakeholders or applications.

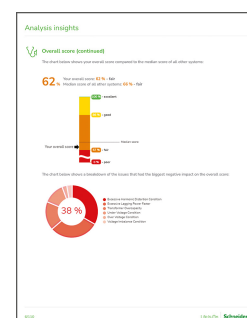
EcoStruxure Power Advisor and Service Plan are available to help address these issues.



EcoStruxure Power Advisor Data Quality Report - Overall Score



EcoStruxure Power Advisor Electrical Health Report - Overall Score



EcoStruxure Power Advisor and Service Plan

This cloud based analytics and services offer provides:

Regular system health checks to:

- Help ensure the power system is configured correctly
- Identify system wiring or installation issues
- Identify communication problems, data issues, and gaps
- Detect Electrical System Health issues (refer to [Power Quality Monitoring and Compliance](#) application)

Proactive expert guidance and decision support to:

- Find all system issues and performance problems using statistical interpretation
- List potential causes and recommended actions
- Understand the impact of leaving these issues unresolved

Data Quality Management in More Detail

[EcoStruxure Service Plan](#) powered by [EcoStruxure Power Advisor](#) provides data quality analytics with recommendations from our Schneider Electric service experts or our EcoXperts.

[EcoStruxure Power Advisor](#) is available with [EcoStruxure Power Monitoring Expert](#) or [Power Operation](#).

Data Quality Checks

[EcoStruxure Power Advisor](#) data quality checks are performed periodically using expert analytics based on electrical measurements and device diagnostic data from any metering device, embedded metering in circuit breakers, and third-party devices.

The data quality check includes the following analytics on the system:

- No data in the query period
- All zero values
- An energy balance violation (based on parent and submeter energy measurements)
- Some negative values
- Consistently negative values
- Unchanging values
- Irregular energy consumption (underreporting or overreporting)
- Irregular device logging periods
- Mismatched logging intervals
- Frequent logging (<1 minute intervals)
- Significant Unmetered Load (>20%)

Recommendations

Expert service engineers provide consultations and recommendations based on these analytics through direct and regular engagement with the end user on the following results of the data quality check:

- Overall system performance
- List of relevant issues
- System statistics per issue identified
- Description of issues
- List of potential causes and recommended actions

Cybersecurity

What's in This Chapter

Why Consider Cybersecurity when Designing an Electrical Architecture	27
ISA/IEC 62443 Standard	27
EcoStruxure Cybersecurity Commitment to ISA/IEC 62443	29
Alignment with IEC 2700x	31
Learn more about Cybersecurity Considerations	31

Why Consider Cybersecurity when Designing an Electrical Architecture

The demands of modern IoT applications increase the complexity of systems' infrastructure and put additional pressure on IT and OT security. As the frequency and sophistication of cyberattacks increase, operations must leverage industry standards to achieve consistent protection.

The challenges posed by operational technology are burgeoning regulations for cybersecurity, common protocols being increasingly exploited, the explosion of connected devices and growing numbers of attack surfaces. Because of this, operational technology security has three main priorities – availability, integrity, and confidentiality.

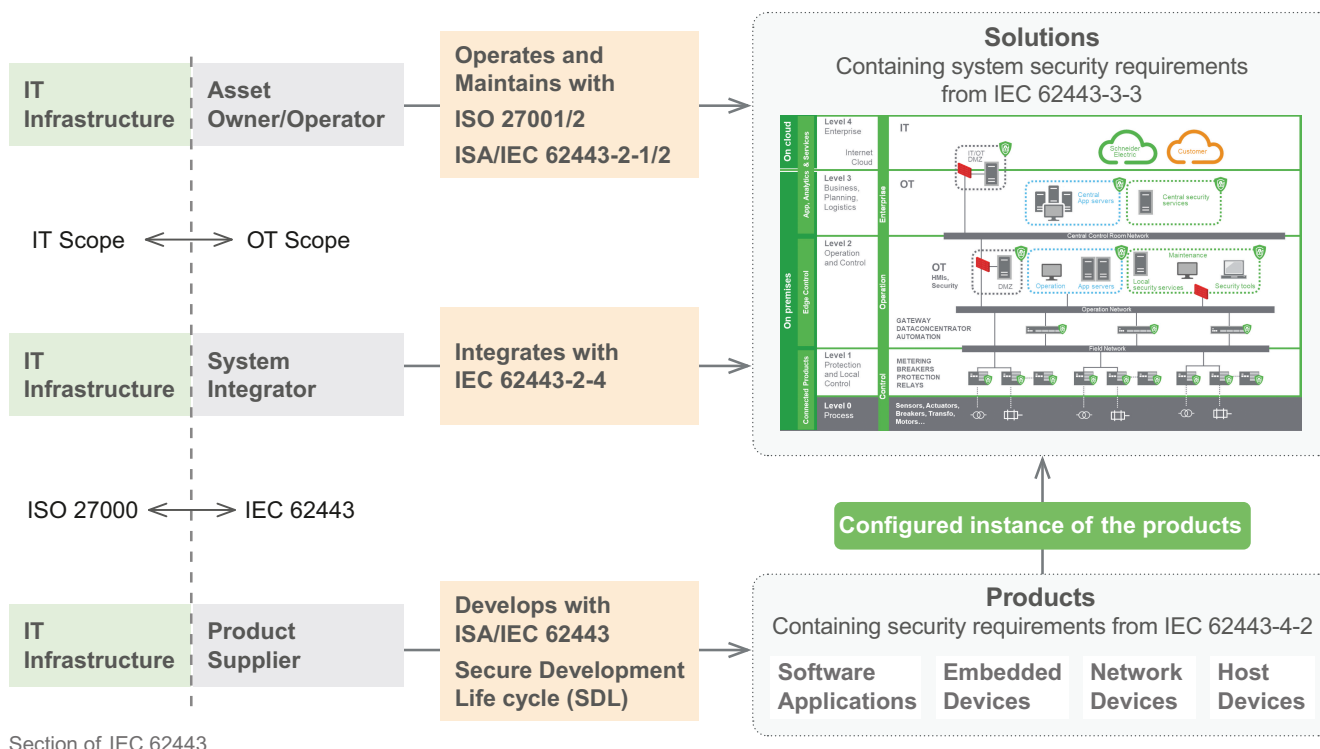
Firstly, operational systems in large buildings and critical facilities in particular require high availability of the applications or processes they support as a top priority. While availability of power is of utmost importance, ensuring high data integrity upon which decisions are made is also essential in the digital age. Finally, confidentiality of data that could be used to determine trade secrets based on operational data is the third leg of the OT security triad.

See our white paper for more background information: [Understanding cybersecurity for IoT-enabled electrical distribution systems](#)

ISA/IEC 62443 Standard

The ISA/IEC 62443 standard provides a comprehensive ecosystem of cybersecurity requirements for different actors involved in the life cycle of an electrical distribution or industrial control system. This involves a specific focus on the people, processes, and technology required by these systems.

We need separate IEC and NEMA versions of the graphic. For NEMA—references should be to ISA/IEC 62443; for IEC—references should be to IEC 62443.



ISA/IEC 62443 Security Levels

This includes the concept of security assurance levels. The specification defines a series of requirements designed to bring system security to one of the four defined levels. A summary of each level coupled with a characterization of the type of attacker the security level is designed to address is presented in the table below:

THE TABLE BELOW IS STILL BASED ON ESXP GUIDE V3 — NEEDS TO BE UPDATED AS V4 OR V5

Security Levels of ISA/IEC 62443

Security Level	Target	Skills	Motivation	Means	Resources
SL1	Casual or coincidental violations	No Attack Skills	Mistakes	Non-intentional	Individual
SL2	Cybercrime, Hacker	Generic	Low	Simple	Low (Isolated Individual)
SL3	Hackivist, Terrorist	ICS Specific	Moderate	Sophisticated (Attack)	Moderate (Hacker Group)
SL4	Nation State	ICS Specific	High	Sophisticated (Campaign)	Extended (Multi-disciplinary Teams)

Risk-Based Approach

ISA/IEC 62443 follows a risk-based approach and can be aligned with the methodology used for functional safety based on IEC 61508. Security assurance levels should be selected based on a risk assessment of the infrastructure and operations, as seen in the example risk matrix below:

THE TABLE BELOW IS STILL BASED ON ESXP GUIDE V3 — NEEDS TO BE UPDATED AS V4 OR V5

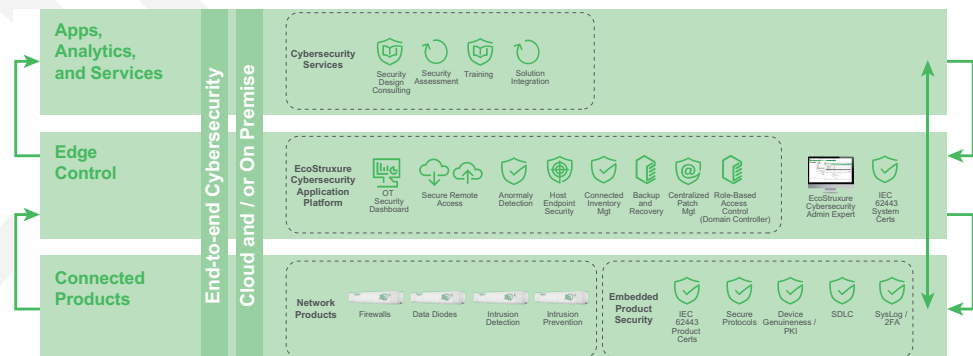
Example of Risk Matrix

IMPACT	LIKELIHOOD				
	Remote	Unlikely	Possible	Likely	Certain
Trivial	SL-0	SL-1	SL-1	SL-1	SL-1
Minor	SL-1	SL-1	SL-2	SL-2	SL-2
Moderate	SL-1	SL-2	SL-2	SL-3	SL-3
Major	SL-1	SL-2	SL-3	SL-4	SL-4
Critical	SL-1	SL-2	SL-3	SL-4	SL-4

EcoStruxure Cybersecurity Commitment to ISA/IEC 62443

EcoStruxure Cybersecurity provides end-to-end cybersecurity solutions across all layers from Connected Products and Edge Control to the Apps, Analytics and Services layer, which includes guidance from expert service advisors.

EcoStruxure Power embeds this concept into all of its system architectures.



Connected Products and Edge Control Software

Connected Products and Edge Control software are developed in accordance with ISA/IEC 62443-4-2. See the following product certifications.

- EcoStruxure Power Monitoring Expert ISA/IEC 62443-4-1 and 4-2 certification
- EcoStruxure Power Operation ISA/IEC 62443-4-1 and 4-2 certification
- PowerLogic P5 ISA/IEC 62443-4-1 and 4-2 certification

System Level

Schneider Electric also integrates and validates the cybersecurity requirements for the communicating system including connected products and Edge Control software. This system architecture is validated and certified by a third party according to the requirements of ISA/IEC 62443-3-3. For more information, visit the cybersecurity for EcoStruxure Power webpage: <https://www.se.com/ww/en/work/solutions/cybersecurity/power-cybersecurity.jsp>.

create a DEF file for this web portal?

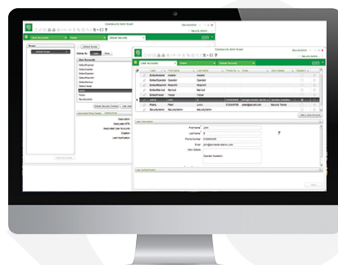
EcoStruxure Cybersecurity Admin Expert

In order to help secure the system in a consistent and efficient manner, Schneider Electric also offers free EcoStruxure Cybersecurity Admin Expert software for

configuring and deploying the cybersecurity policy to EcoStruxure Power Connected Products and Edge Control Software.

It provides a comprehensive and intuitive cybersecurity policy configuration tool for centralized user and password administration:

- Security policies definition
- Security parameters configuration
- Security logs retrieval and display
- Centralized administration of user accounts and roles



EcoStruxure Cybersecurity Admin Expert

For more information on Cybersecurity Admin Expert, visit our website: <https://www.se.com/ww/en/product-range/63515-ecostruxure-cybersecurity-admin-expert/#overview>.

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EcoStruxure Cybersecurity Application Platform

EcoStruxure Power provides a system cybersecurity management layer offering visibility and management of cybersecurity controls, allowing operations teams to manage and maintain their cybersecurity control points.

It helps to provide security management capabilities with real-time monitoring of cyberthreats to help mitigate operational risks. This enables the system to meet ISA/IEC 62443 standards as well as NIST/NERC-CIP requirements for central management functionalities.

The security platform offers modules that can be added as required, as shown below:



EcoStruxure Cybersecurity Application Platform

Cybersecurity OT Dashboard (COTD)	Enables centralized cybersecurity monitoring of OT assets, offering visibility of the current system security status via dashboards..
Anomaly Detection	Continuously and passively monitors the system network for anomalous behavior against a known system baseline helping users to detect, characterize, and report security breaches in a timely manner. The module records all activity for future playback and diagnosis as required for incident detection and response.
Secure Remote Access	Single interface that helps provide secure remote connectivity to external users for testing, maintenance, and support of the system. Security administrators have full visibility and control over third party and employee access.
Backup and Restore	Helps to minimize data loss and reduce downtime due to a component failure or cyber-attack (such as ransomware) through automated backups and provides disaster recovery through rapid restoration.

Schneider Electric Cybersecurity Services

Schneider Electric offers unique expertise in cybersecurity for operational technology systems with consulting, design, implementation, monitoring, and response services to support the entire life cycle of a connected system.

Schneider Electric's Cybersecurity Services provide support for new systems, existing or legacy systems, and integration of IT and OT networks. Cybersecurity service engineers are experienced and skilled in adapting the consultative approach to the end user's existing IT policies, risk tolerance, and budget.

These services are based on the four categories below:

Permit	Manage access to operations systems and information through network and physical controls.
Protect	Implement specific controls as part of the operations systems for ongoing protection.
Detect	Monitor the operating environment to detect and communicate threats.
Respond	Develop procedures and systems to help ensure a rapid response to cyber incidents to contain and mitigate attacks.

Learn more about Cybersecurity Services on our website: <https://www.se.com/us/en/work/solutions/cybersecurity/>.

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Alignment with IEC 2700x

With ISA/IEC 62443, **EcoStruxure** Power is also aligned with IEC 2700x for specifying an Information Security Management System (ISMS) used in most organizations for securing their IT infrastructure.

Learn more about Cybersecurity Considerations

The following white paper provides details to learn more about the practical implementation of the security levels: [Practical Overview of Implementing IEC 62443 Security Levels in Industrial Control Applications](#).

EcoStruxure Power recommends a "Defense in Depth" approach to system security. Defense in Depth is the coordinated use of security countermeasures to protect the integrity of information assets in a network. This ensures that if one

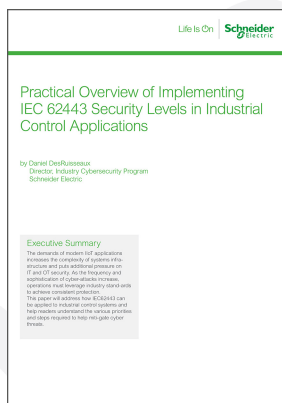
layer of security is compromised, other layers of security are still capable of protecting our most critical operations and infrastructure.

Find out more about how "Defense in Depth" and ISA/IEC 62443 can be used to improve the cybersecurity of systems in the following documents:

- [Understanding cybersecurity for IoT-enabled electrical distribution systems](#)
- [EcoStruxure Power Guide for Designing and Implementing a Cyber Secure Digital Power System](#)

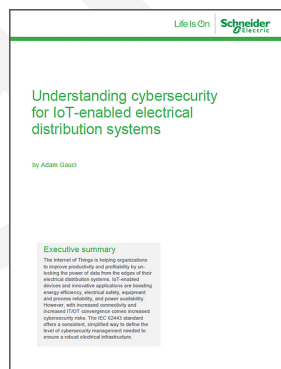
For more information on cybersecurity for **EcoStruxure Power**, visit the website:

<https://www.se.com/ww/en/work/solutions/cybersecurity/power-cybersecurity.jsp>.



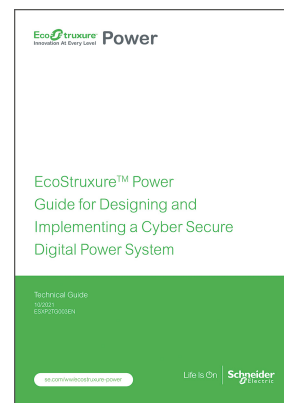
**Practical Overview of
Implementing IEC 62443
Security Levels in Industrial
Control Applications**

Technical Guide
Ref: 998-20186845
01/2018



**Understanding cybersecurity
for IoT-enabled electrical
distribution systems**

Technical Guide
Ref: 998-20677347
2019



**EcoStruxure Power Guide for
Designing and Implementing a
Cyber Secure Digital Power
System**

Technical Guide
Ref: ESXP2TG003EN
10/2021

Selecting and Implementing the Digital Applications

What's in This Part

Introduction	34
Overview of Digital Applications.....	35
What You Will Find in Each Application	36

Introduction

Why Read This Part

In Defining the System Design Considerations, page 12 **Check cross reference.**, the system design considerations were introduced to have all important information at hand when implementing the digital applications.

The objective of Selecting and Implementing the Digital Applications, page 33 **Check cross reference.** is to present all **EcoStruxure** Power digital applications, their key values, and implementation features to help you select and implement the appropriate applications according to the end user's needs. The part then describes how to implement the selected **EcoStruxure** Power digital applications within an electrical and digital architecture.

Contents of This Part

This part provides the following framework to understand and implement each **EcoStruxure** Power digital application:

- Context of the application
- Application outcomes
- System description (data flow with inputs, outputs, and operating steps)
- Electrical architecture
- Digital architecture

Overview of Digital Applications

Below is a summary of all the applications available in this guide. To ease selection, they have been grouped according to their end user benefits.

Click on any application below to navigate to it:

VALUE PROPOSITION	END USER BENEFITS	RELATED APPLICATIONS			
ELECTRICAL SAFETY ¹⁵	Help reduce the risk of electrical fires	Continuous Thermal Monitoring			
	Help protect staff and occupants	Arc Flash Protection	Insulation Monitoring	Guided Procedures Through Extended Reality new	
POWER AVAILABILITY	Enhance electrical asset management	Electrical Asset Life Cycle Management	Asset Performance		
	Reduce unplanned downtime due to electrical failure	Electrical Distribution Monitoring and Alarming	Capacity Management	Backup Power Testing	Power Event Analysis
		Circuit Breaker Settings Monitoring	Power Quality Monitoring and Compliance	Power Quality Correction	
		Power Source and Load Control	Advanced Protection and Automation		
	Gain resilience with distributed energy resources	Microgrid			
SUSTAINABILITY	Reduce energy, CO ₂ , and costs	Utility Bill Verification	Cost Allocation	Energy Monitoring	Energy Benchmarking
		Energy Performance	Energy Modeling and Verification	Power Factor Correction	
	Improve sustainability and compliance	Energy Efficiency Compliance	Greenhouse Gas Reporting		

15. This document presents general, non-binding information regarding the potential value that digitized power distribution products and solutions can bring to the user. Due to varying user situations and goals, Schneider Electric does not warranty or guarantee that the same or similar results represented in this document can be achieved. Please refer to Schneider Electric product and solution catalogs for actual specifications and performance.

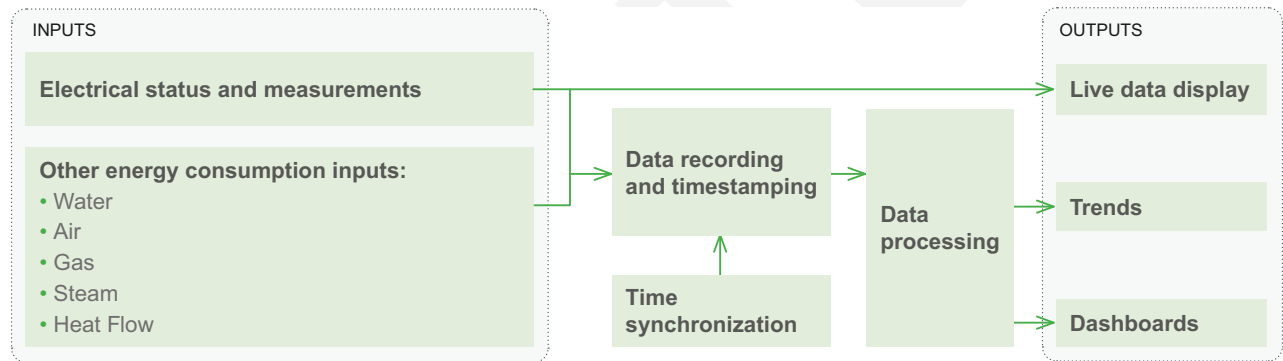
What You Will Find in Each Application

Embedded Information for Each Application

A system description is provided for each application using the following elements:

- Data flow

A data flow diagram (example below)



- Data flow in detail

A description of the sub-applications (typically, data recording and timestamping, data processing, etc.), as well as their inputs and outputs, is provided with all related products, software, and services which contribute to the sub-applications.

- Electrical architecture

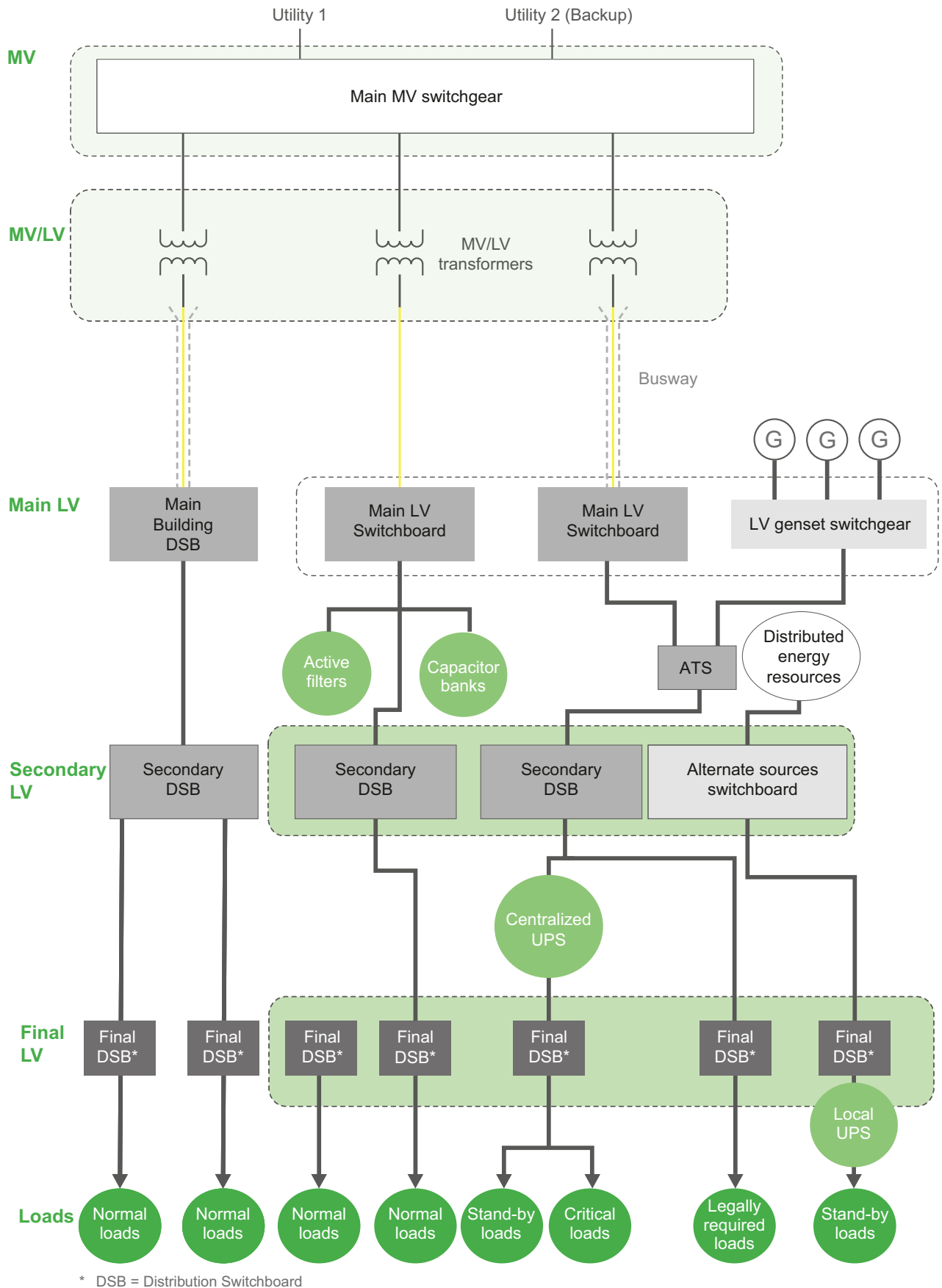
Electrical distribution architectures (example on the following page) show the devices required at each level of the electrical distribution hierarchy (from medium voltage to final low voltage distribution) to perform the appropriate function required for the application.

- Digital architecture

Digital architectures show how Connected Products are connected to each other, to the Edge Control, and to the cloud-based Apps, Analytics, and Services. This is broken down by Ethernet, serial, wireless, and hardwired devices.

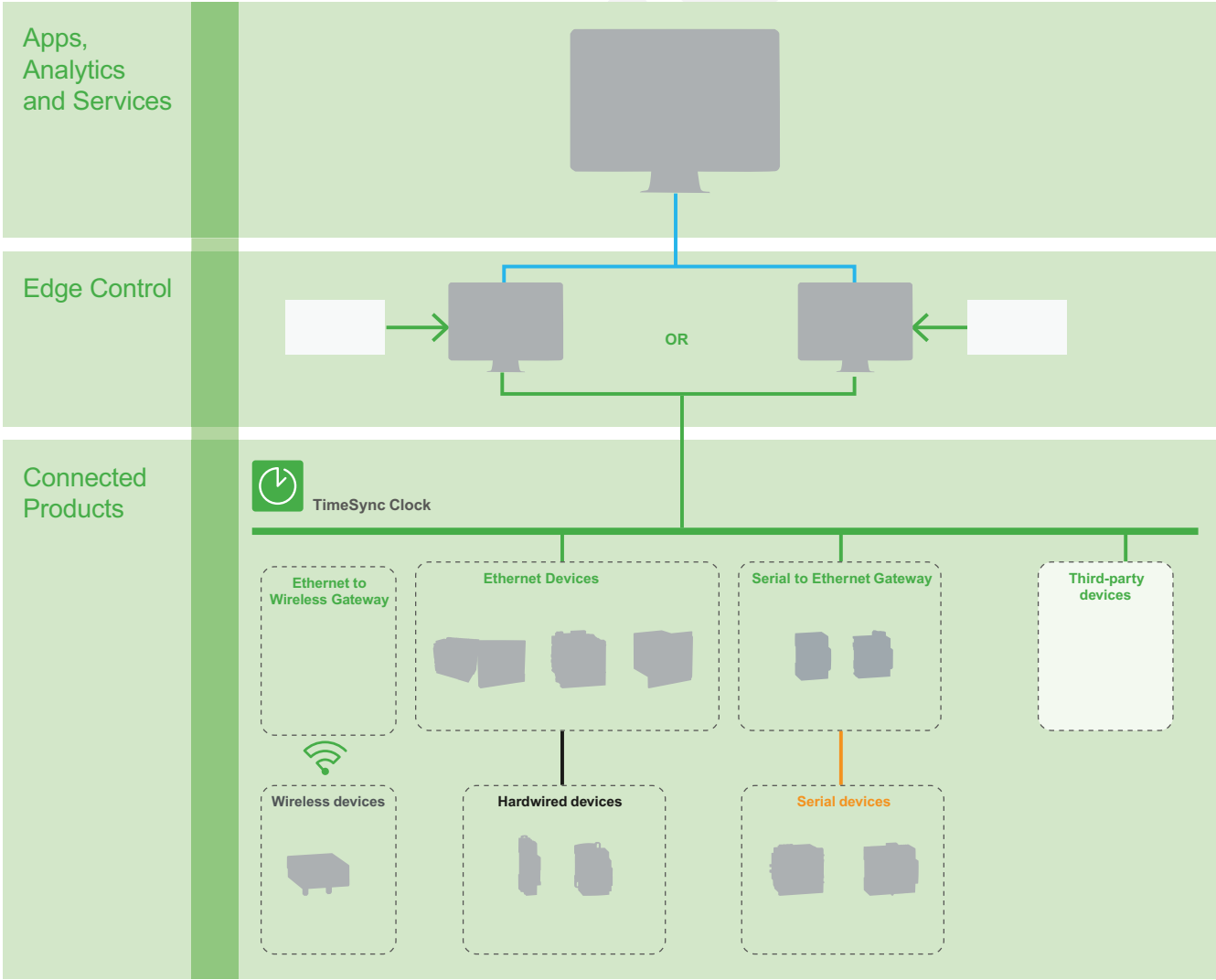
Generic Electrical Architecture Diagram

Below is a generic electrical architecture (for illustration purposes). For each application, the positioning of all connected products contributing to the application is shown. Where necessary, detailed views further explain relevant nuances.



Generic Digital Architecture Diagram

Below is a generic digital architecture diagram (for illustrative purposes only). The purpose of this diagram is to illustrate all connected products found in the electrical hierarchy with appropriate communication links.



- Ethernet - public LAN/WAN
- Ethernet - technical LAN
- Serial
- Hardwired
- Wireless - 2.4 GHz

Appendix

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Green Premium..... 60

Product Information

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Edge Control and Configuration Tools	50
Apps, Analytics, and Services	52

Connected Products

Protection, Monitoring and Control Devices



PowerLogic P5

Medium voltage network protection relay



PowerLogic P5 is a protection relay for demanding medium-voltage applications. It offers users industry-leading dedicated protection relay functionality to reduce risk and improve reliability, all with advanced connectivity. Additionally, it can be used with a range of digital tools that make everyday operations simpler for users.



Easergy P3

Medium voltage network protection relay



Easergy P3 is a range of easy-to-use protection relays for medium voltage applications. With fast delivery, it is an ideal way for panel builders, contractors, and partners to save time. **Easergy P3** has been designed to meet customer's needs including overcurrent and arc flash protection and latest connectivity.



PowerLogic C5

Medium voltage automation controller



PowerLogic C5 is a scalable and interoperable solution for large buildings and critical facilities that brings software intelligence to automation schemes to help operate electrical distribution systems automatically and promote energy efficiency, power reliability, and continuity of services across a multitude of applications.



Easergy T300

Distribution network management for MV and LV applications



Easergy T300 is a modular platform for hardware and firmware, and an application building block for medium voltage and low voltage distribution network management. It offers a single solution for control and monitoring, from a simple pole-top device to a large MV/LV substation. It is a powerful Remote Terminal Unit for feeder automation.



EvoPacT

MV Digital Vacuum Circuit Breaker up to 24 kV



EvoPacT circuit breakers are equipped with digital technology that unlocks state-of-the-art capabilities, providing insight into electrical distribution systems, combining sensors, apps, services, and a digital logbook. Utilizes embedded sensors to provide direct measurements for 24/7 continuous equipment health monitoring.

There is no DEF_P file using this image (MPact with MicroLogic on the right).
Change MPact DEF file to use this image (rather than just MPact)? Also, there is
no link on the image at the moment, we should add one (after deciding if we
modify the MPact MTZ DEF_P file to use this image, or not)



MasterPact MTZ

High current air circuit breakers up to 6300 A embedding advanced digital technologies for LV applications



Future Ready **MasterPact MTZ** is a comprehensive range of air circuit breakers designed to help protect electrical systems from damage caused by overloads, short circuits, and equipment ground faults.

MasterPact MTZ embeds advanced digital technologies and **MicroLogic X** control units help contribute to safety and energy efficiency.



MasterPact NW

High current air circuit breakers up to 6300 A for LV applications



MasterPact NW is a comprehensive range of air circuit breakers designed to help protect electrical systems from damage caused by overloads, short circuits, and equipment ground faults. The embedded **MicroLogic** control unit helps contribute to safety and energy efficiency. The range covers ratings from 800 to 6300 A in two different sizes.

Replace with img-xref-large conref.

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Change ComPacT DEF file to use this image (rather than just the NSX)? Also,
there is no link on the image at the moment, we should add one (after deciding if
we modify the ComPacT NSX DEF_P file to use this image, or not)



PowerPacT H/J/L

Molded case circuit breakers up to 600 A for LV applications



PowerPacT H/J/L frame circuit breakers are designed to help protect electrical systems from damage caused by overloads and short circuits. H- and J-frame circuit breakers are available with either thermal-magnetic or **MicroLogic** electronic trip units. L-frame circuit breakers are available with **MicroLogic** electronic trip units only.



ASCO 7000 Series PTS

Power transfer switch and controls for LV and MV applications

ASCO 7000 Series PTS are the industry standard for power switching and control. They are offered in single transfer switch or redundant bypass configurations. Automatic controls are available in open, delayed, closed, and soft load transfer transition modes.

Change the link in the description = use the first occurrence of TeSys, rather than the second one?



TeSys

Contactors for LV applications



As the largest selling line of contactors in the world, the **TeSys** range offers high reliability with long mechanical and electric life across the entire range of accessories for motor and load control. **TeSys** contactors are available for both IEC and NEMA applications and are certified by major standards around the world.

Add image-xref-large.

Square D QO and QOB Miniature Circuit Breakers

Missing sub title



QO(B) circuit breakers **Add range-sp-product-xref** come in plug-on or bolt-on options and with a complete range of amperages and interrupting ranges to fit into various QO distribution panels. A full line of factory installed accessories, such as shunt trips, auxiliary switches, and alarm switches, is also available.



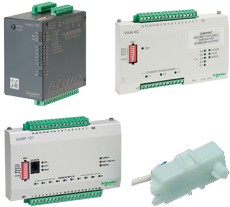
PowerLink G4 Intelligent Panelboards



Overcurrent protection, automated lighting controls, and plug load control from a standard sized panelboard

With overcurrent protection, automated lighting controls, and energy measurement capabilities in one standard panelboard, **PowerLink** is an energy management powerhouse. This smart panel allows you to remotely monitor and control circuits, panels, and lighting from one centralized location. Get energy savings, convenience, and control from a single compact solution. Enjoy automated and schedule-based lighting control and plug load control. Remotely monitor and control lighting, circuits, and panels, and receive instant alerts with remote email alarming from native Modbus TCP or BacNet IP.

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Add img-xref-large confref.

Arc V125 and Accessories (VA1DA, VAM4C)

Arc flash mitigation by optical detection

Arc flash protection devices which help eliminate or minimize costs resulting from arc flash damage - downtime, repair time, interruption of processes and equipment. Arc flash protection devices help avoid personal injury due to arc flash events.



ASCO 7000 Series PCS

Advanced power control system (PCS) for LV and MV applications

ASCO 7000 Series PCS is the electrical industry's most advanced power control automation systems for facility power sources, load, and electrical distribution. They provide configured and engineered-to-order autonomous control sequences for maximum value and flexibility.



ASCO Load Banks

Possibly remove. Project to decide.

Intelligent load banks for LV and MV engine-generator and UPS testing applications

ASCO Load Banks are designed for outdoor operation and can intelligently generate resistive, capacitive, and inductive loads for power testing applications. They incorporate intelligent Sigma control and dynamically adjust loads to help protect power sources. Available in genset radiator, permanent, and trailer-mounted configurations.

Missing link in the description. Add one (= review text)?



ASCO SPD with ASM

Surge protective device with active surge monitor

ASCO Active Surge Monitors offer industry-leading surge protection with intelligent surge monitoring, detection, and logging technologies.



ASCO CPMA

Critical power management appliance

ASCO CPMA solutions can monitor and control everything from single-generator backup power systems to critical power across multi-building and multi-site applications. Sophisticated event logging features and automated compliance reporting provide advanced forensic insight and streamline compliance testing.

Insulation Monitoring and Fault Location Devices



Iso-Gard Line Isolation Monitor (LIM)

Insulation monitoring device for hospital applications

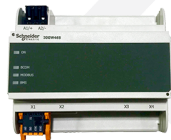
The electric Iso-Gard Line Isolation Monitor (LIM) is in compliance with NFPA 99 requirements for testing and monitoring isolation power panels. It continually measures the balanced and unbalanced impedance from line-to-ground on each line of an ungrounded electrical system. Automatic self-test with data logging reduces time required to perform periodic testing, and the communications bus provides centralized monitoring of LIM installations to improve predictive maintenance.



EDS461 Fault Location Device

Insulation fault location detection for hospital applications

If a ground fault is detected, up to twelve separate channels are checked simultaneously via a measurement signal to identify the circuit. Fault location takes place automatically and while the system remains online, so there is no need to open branch circuit breakers or disconnect equipment.



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Communication Gateway (IGGW465IP)

Missing sub title

The communication gateway Replace with range-sp-product-xref conref. is an integrated gateway with visualization and data logging. The intuitive user interface provides a system overview and allows simple and intuitive display of all connected devices. The gateway also enables all isolated Power Panel Devices with communication capability, such as the Iso-Gard Line Isolation Monitor (LIM) and EDS461 Fault Location Device, to be integrated into a Modbus TCP or SNMP system.



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Remote Indicator (IG2000CBM)

Remote indicator for Line Isolation Monitor in hospital applications

Provides remote indication of the visible and audible alarms and digital mA reading from an Iso-Gard Line Isolation Monitor (LIM).

Power Meters



PowerLogic ION9000 Series

Power quality meters for utility incomers or highly critical applications

PowerLogic ION9000 series is a range of advanced power quality meters, designed for high accuracy, energy cost, network management, and power quality requirements.



PowerLogic PM8000 Series

Power quality meters for critical applications

PowerLogic PM8000 series is a range of high-performance power meters for cost and network management applications on feeders and critical loads. It simplifies power quality and maximizes versatility.





PowerLogic PM5000 Series

Power meters with basic power quality functionality

PowerLogic PM5000 series is a range of high-end, cost-effective, and compact power meters which enable energy cost and basic network management applications.

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PowerLogic HDPM6000

Multi-circuit power metering system

High-density, multi-circuit busway and panelboard power meters for cost and network management in large and critical power applications.



PowerLogic EM3500 Series

Compact, affordable series of DIN-mounted meters

PowerLogic EM3500 Series DIN rail meter combines exceptional performance and easy installation to deliver a cost-effective solution for power monitoring applications. The Modbus and BACnet output options offer added flexibility for system integration. The data logging capability protects data in the event of a power failure. Modbus, pulse output, and phase alarms are all provided to suit a wide variety of applications. Additional pulse inputs on EM3500 provide an easy way to incorporate simple flow sensors to track gas, water, steam, or other energy forms using a BACnet system, in addition to full monitoring of electrical energy. The EM3500 model adds a bidirectional monitoring feature designed expressly for renewable energy applications, allowing measurement of power imported from the utility grid as well as power exported from the renewable energy source (for example, solar panels). This enables users to track all energy data to ensure accuracy in billing and crediting.



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PowerLogic EM4900

Simplify energy monitoring and drive savings

Save on the cost of both equipment and installation. Add multiple revenue-grade metering points without having to purchase, mount, wire, and commission individual energy meters.



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ASCO 5200 Series

Power manager transducer

The ASCO 5200 Series Power Manager collects real-time power system information from ASCO Power Control Systems and 7000 Series Power Transfer Switch products (which utilize the Group 5 Controller). It transmits data serially to a remote network management product for collection and analysis.



PLC and PAC

No link on the image because it's not the same image as used in DEF_P file (and applications). Change that? Add a link manually on the image, here?



Substation Monitoring Device (SMD)

Local and/or remote monitoring for MV or LV applications

The Substation Monitoring Device (SMD) performs analytics on temperature and environmental data for monitoring and alarming via a local HMI or SCADA system. The Substation Monitoring Device (SMD) consists of an M251 PLC and optional Magelis HMI. It is factory-configured and automatically integrates into the Edge Control software. The Substation Monitoring Device (SMD) can also send SMS messages in case of alarms. The optional color display provides SLD representation with overlaid temperature values.

**Modicon M580**

Ethernet Programmable Automation Controller (ePAC) and safety PLC for process, availability and safety solutions

Modicon M580 high-end ePAC features redundant controllers, new stand-alone safety controllers (safety PLC) with native Ethernet and cybersecurity embedded in its core.

**Modicon M340**

Mid range PLC for industrial process and infrastructure

Modicon M340 Programmable Automation Controller (PAC) is built to suit the needs of the process industry and a wide range of demanding automation applications such as a multitasking system for optimal reflex time.



Power Quality Correction, Power Factor Correction, and UPS Devices

to be managed later

**PowerLogic AccuSine PCSn**

Active Harmonic Mitigation for commercial buildings

PowerLogic AccuSine PCSn provides a scalable and flexible, high-performance active harmonic filtering solution capable of mitigating harmonics in neutral circuits for improved electrical system reliability and efficiency resulting in less downtime and a longer equipment life.

**PowerLogic AccuSine PCS+**

Active Harmonic Mitigation for industrial applications

PowerLogic AccuSine PCS+ is a high-performance, scalable active power correction solution for stabilizing electrical networks by providing harmonic mitigation, as well as providing power factor correction and load balancing.

**PowerLogic AccuSine EVC+**

Electronic VAR Compensation for commercial and light industrial applications

PowerLogic AccuSine EVC+ is a high-speed, stepless reactive power compensation system that helps keep power networks efficient, reliable, and healthy. It is designed to help you keep your power factor stable and voltage balanced even with fast changing loads, unlike capacitor banks that tend to over- or under-compensate in dynamic environments. Built on the award-winning **PowerLogic AccuSine** active correction platform, the **AccuSine EVC+** offers superior performance for power factor correction, phase balancing, and harmonic mitigation and is well suited to modern electrical networks with a lot of digital loads and distributed power sources.



to be reviewed later

**PowerLogic AccuSine PFV+**

Electronic VAR Compensation for specific and high-performance applications

PowerLogic AccuSine PFV+ addresses power quality issues via simple, effective correction of leading or lagging power factors and reduction of voltage fluctuations. Its unique design helps extend equipment operating life and improve system power performance, and offers multiple features in one complete package.





PowerLogic PFC

LV capacitor bank for power factor correction



PowerLogic PFC is a complete range of high-quality power factor correction solutions engineered to compensate reactive power and harmonic distortion. These are easy and flexible solutions that can immediately boost a facility's energy efficiency and productivity. Thanks to **PowerLogic PFC**, your power factor is maintained at an ideal level for optimal power system efficiency and cost reduction.

To be reviewed later



Used
image for Galaxy_VX_
VL_VM_VS.

Galaxy VX

3-phase uninterruptible power supply (UPS)

Galaxy VX is a scalable, high-performance extension of the **Galaxy V-Series** solutions. It is designed for large data centers and industrial applications.

To be reviewed later



Used
image for Galaxy_VX_
VL_VM_VS.

Galaxy VL

3-phase uninterruptible power supply (UPS)

Galaxy VL is a 3-phase UPS for 200 to 500 kVA/kW. Its modular, redundant design and low total cost of ownership serve medium to large data centers and other mission critical facility applications.



Used
image for Galaxy_VX_
VL_VM_VS.

Galaxy VM

3-phase uninterruptible power supply (UPS)

Galaxy VM is a 3-phase UPS power protection that seamlessly integrates into medium data center, industrial, or facilities applications.

To be reviewed later



Used
image for Galaxy_VX_
VL_VM_VS.

Galaxy VS

3-phase uninterruptible power supply (UPS)



Galaxy VS is a highly efficient 3-phase UPS from 20 to 100 kVA (400 V/480 V) and 10 to 50 kVA (208 V) for edge, small, and medium data centers and other business-critical applications.

Communication Devices, Gateways, and Data Loggers



EcoStruxure Panel Server

IoT gateway for an intelligent power network



EcoStruxure Panel Server is a high performance, modular gateway with enhanced cybersecurity that offers quick and easy connection to multiple concurrent edge control or cloud applications. It is able to collect and store data from wireless and wired devices using a variety of protocols including Zigbee, Modbus TCP, and Modbus RTU.



Enderlin'X IFE, EIFE, and IFM

Communication interfaces for MasterPact and PowerPacT circuit breakers

IFE: Ethernet interface for MasterPact and PowerPacT circuit breakers. Also includes Modbus serial to TCP functionality. EIFE: Ethernet interface for drawout MasterPact MTZ air circuit breakers. IFM: Modbus Serial interface for MasterPact and PowerPacT circuit breakers.



Harmony ZBRN32

Data concentrator for wireless sensors and serial Modbus gateway

Each Zigbee concentrator has 60 inputs. A sensor is paired with one input of the Zigbee concentrator, meaning the sensor's ID is associated with the concentrator input and all information concerning the sensor can be read in a Modbus table using the input index.



EcoStruxure Power Automation System Gateway

Protocol converter, data concentrator, automation and microgrid controller

EcoStruxure Power Automation System Gateway is a scalable and interoperable rugged communication gateway that helps to remotely monitor and operate electrical processes, contributing to a more connected and efficient digital power system. The gateway application software also supports automation and microgrid controller capabilities. Extra functions to reconcile the main drivers of power grid transformation: energy transition, distributed generation, and renewables.



Cyber Sciences SER 3200/2408

Sequence of events recorder (SER) for high time accuracy applications

Cyber Sciences SER 3200/2408 records status changes of 32 channels, timestamped to 1 ms. Time synchronization is achieved via PTP (IEEE 1588), IRIG-B, DCF77, NTP, Modbus TCP, or an RS-485 signal from another sequence of events recorder (SER). One CyTime™ SER serves as PTP primary "primary" was originally "master." I changed it to primary. Please check, and all other CyTime SER devices sync automatically within 100 microseconds – without special Ethernet switches. <https://www.cyber-sciences.com/product/sequence-of-events-recorder-ser/>

This is not as in INDD V4, where the text is "5100 series". Done like this by Expléo to use the related DEF_P file. Keep like this? Change the DEF_P file so that the product name used is "5100 series"?



ASCO 5112 Series

Quad-ethernet module for ASCO applications

The ASCO 5112 series Quad-Ethernet Modules (QEM) are a line of protocol gateways that provide users with communication interfaces to ASCO transfer switches, meters, and input/output devices.

Sensors



Easergy TH110

Wireless thermal sensor for critical connections

The Easergy TH110 is a battery-free wireless temperature sensor used to perform the continuous thermal monitoring of critical connections made in the field.



Easergy CL110

Wireless thermal sensor for ambient temperature

The Easergy CL110 is a wireless temperature and humidity sensor with a battery for continuous ambient temperature monitoring.



Remote Display

There is no link here because Magelis iPC is not shown anywhere else in INDD V4



Magelis iPC

Industrial PC

Sleek all-in-one 10 in., 15 in., and 19 in. iPCs with an optimized industrial design.

LV/MV Switchgear, Switchboards, and Panelboards



SureSeT

Medium voltage (MV) switchgear for ANSI Metal Clad applications

SureSeT provides a new generation of integrated connectivity you can trust with space savings and innovative digital control features that enhance a facility's energy, and operational efficiency. It is designed with the latest technology allowing you to digitize your day-to-day operations. Using a new HMI and mobile apps, control and monitor remotely from outside of the arc-flash zone.



Masterclad MV Arc Resistant Metal-Clad Switchgear

Air-insulated, arc resistant drawout switchgear with vacuum circuit breakers for large, complex power distribution and control.



PremSet Medium Voltage Switchgear

The new generation of MV switchgear

This medium-voltage switchgear features the Shielded Solid Insulation System (2SIS).



PremSet Medium Voltage Switchgear

The new generation of MV switchgear

PremSet medium-voltage switchgear features the Shielded Solid Insulation System (2SIS).

LV Distribution



Replace with img-xref-large conref.

I-Line Combo Panelboard Replace with range-product-name conref.

Combines I-Line and lighting sections in one panelboard

The I-Line Combo Panelboard saves time and space by combining I-Line and NQ/NF sections in one panelboard. The I-Line Combo Panelboard features a space-saving design for fast installation and a smaller footprint.



Power-Zone 4 Front Accessible

Low Voltage Drawout Switchgear in 42-inch deep sections

Greater footprint flexibility with reliable ANSI-rated power distribution.



QED-2 LV Switchboards

Select a standard design that features popular options or a custom option switchboard

QED-2 switchboards contain the quality, features, and innovations that allow for easier installation. Greater footprint flexibility with reliable ANSI-rated power distribution.



Replace with img-xref-large conref.

Model 6 Motor Control Center

Standard and Industrial LV MCC (NEMA, ANSI, UL 845)

Model 6 MCCs offer an efficient, economical solution for grouping electrical motor control, automation, and power distribution in a compact design that meets industry safety standards.

Microgrid



Energy Control Center

Microgrid energy distribution

The Energy Control Center (ECC) system is the "brains behind the operation." Information is constantly moving into and out of the ECC so it can make decisions based on current electrical availability. The ECC uses advanced algorithms to assess available power sources and their condition, as well as analyze load priority and energy requirements to determine when and what Distributed Energy Resources (DER) to engage. The ECC has the ability to make critical decisions and physically make adjustments to power sources and loads to ensure energy reliability. Unlike most installed PV systems, the ECC is able to operate even during a grid outage by using one of the other DER as an anchor resource to be grid forming.

Edge Control and Configuration Tools



EcoStruxure Power Monitoring Expert

Power Management software

EcoStruxure Power Monitoring Expert helps maximize system reliability and optimize operational efficiency to increase your profitability.



EcoStruxure Power Operation

High-performance software system for electrical distribution monitoring and control

With its high availability, redundancy, high speed data acquisition, and alarming, **EcoStruxure Power Operation** is aimed at very large sites with many devices and high availability requirements. The software gives operators exceptional knowledge and control of their network through an intuitive, interactive, and customizable interface. With fast, consistent access to actionable information, **Power Operation** operators are more effective at protecting and optimizing their electrical distribution network, improving both its efficiency and productivity.



EcoStruxure Building Operation

Integrated system for monitoring and optimization of building performance

EcoStruxure Building Operation is a one-stop solution combining building operation software and field-level control devices and hardware with engineering, installation, services, and analytics to create seamlessly connected buildings. **EcoStruxure Building Operation** integrates any building management application and provides native support for open protocols including LON, BACnet, Modbus, and web services.



EcoStruxure Microgrid Operation

Microgrid Controller Solution

EcoStruxure Microgrid Operation is a complete microgrid controller solution associated with an ergonomic HMI. It provides network balancing features and protection adaptation for stable and optimized microgrids. **EcoStruxure Microgrid Operation** synchronizes load voltage and frequency to preserve customers' microgrid power supply, enabling grid continuity and stability when disconnecting and reconnecting to the grid.

There is no DEF_P file for this software, create one in the future? Also, currently there is no link to a web page (no link on image, no link in the description)

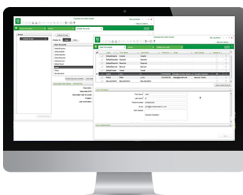


EcoStruxure Cybersecurity Application Platform

Cybersecurity defense strategy software

EcoStruxure Cybersecurity Application Platform provides OT infrastructure with a full package of essential security features to help protect assets against cyber-threats such as intrusion detection, system authentication and authorization proxy, and security dashboards with system logs.

There is no DEF_P file for this software, create one in the future? Also, currently there is no link to a web page (no link on image, no link in the description)



EcoStruxure Cybersecurity Admin Expert

Centralized user, password and security policies management software

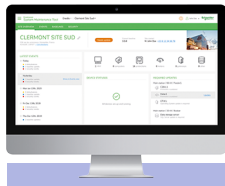
A comprehensive and intuitive cybersecurity configuration and policy tool for your operational technology environment.



EcoStruxure Power Automation System Engineering

System Design, Specification and Configuration Tool

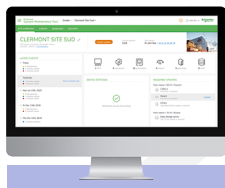
EcoStruxure Power Automation System Engineering is an easy to use, vendor independent engineering workbench, which can be used to design and configure a future-proof Protection Automation and Control System compliant with IEC 61850 standards enabling application standardization and engineering efficiency.



EcoStruxure Power Automation System Management

System lifecycle management software

EcoStruxure Power Automation System Management tool is a vendor agnostic inventory baseline management software, which can be used to perform maintenance on connected equipment in a heterogenous multi-vendor solution with a focus on cybersecurity.



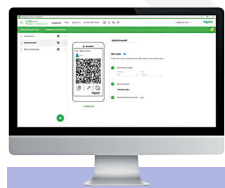
EcoStruxure Power Automation System UI (EcoSUI)

There was a note to check the status with Anton Kieling for V5.

Local HMI for digital substations and critical electrical networks

EcoStruxure Power automation System User Interface (EcoSUI) is a user-friendly local SCADA/HMI, based on IEC 61850, that helps operators supervise, monitor and control large and open electrical networks with embedded cybersecurity.

To be reviewed later

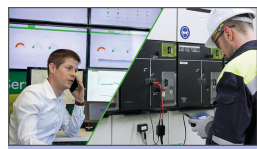


EcoStruxure Power Commission

Digital-enabled switchboard commissioning software

EcoStruxure Power Commission is an intuitive software tool that offers easy configuration, testing methodologies, and integrated reporting for all smart devices connected to your switchboard - all in one program. It's the simplest way to set up, test, commission, and manage the smart devices and systems within your switchboard.

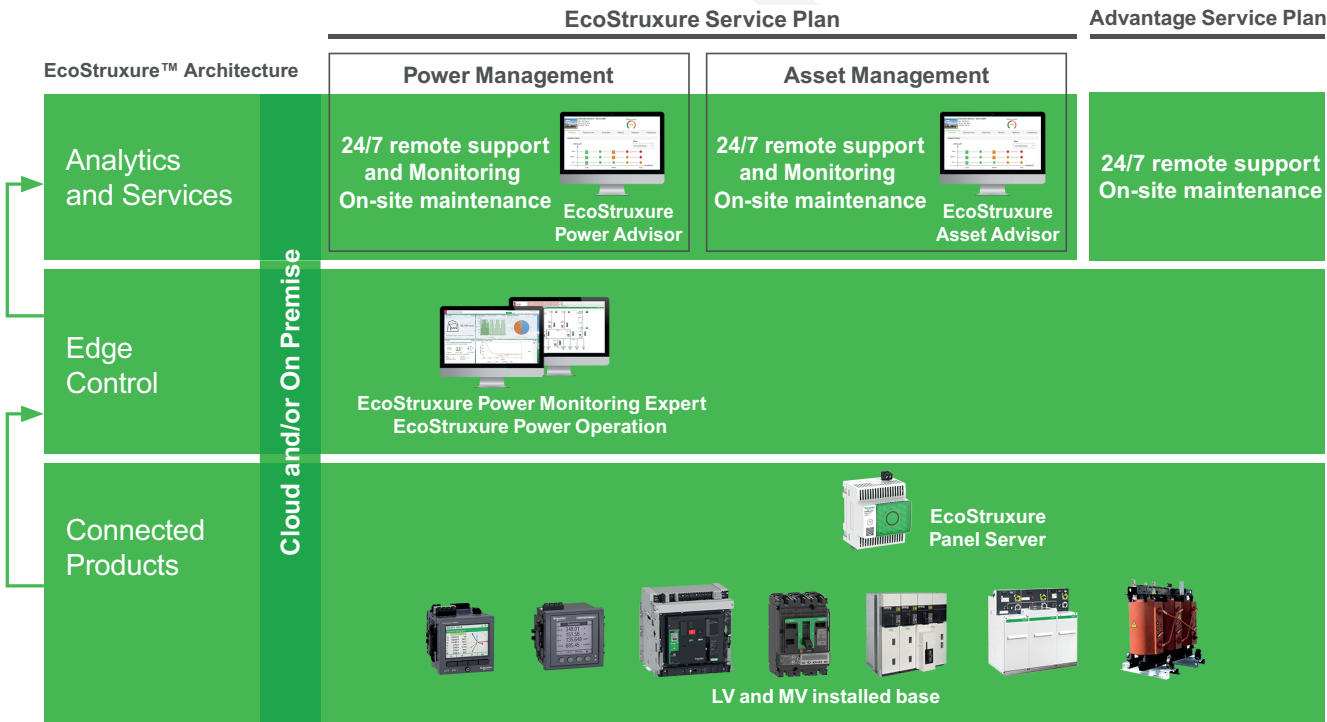
Apps, Analytics, and Services



EcoStruxure Service Plan

Remote and on-site services

From essential support to advanced expertise, **EcoStruxure Service Plan** is a set of tailored service contracts that combine the power of **EcoStruxure Power platform (EcoStruxure Asset Advisor and Power Advisor)** with remote and on-site consultancy. It helps maximize uptime, optimize maintenance costs, improve operator efficiency while extending asset and system life expectancy.



Overview of EcoStruxure Service Plan

Table to be reviewed

Functionality	Improve your electrical asset management				Optimize your power management	
	Prevent	Predict	Plus	Prime	Prime	Ultra
Asset monitoring and alarming						
24/7 technical support						
On-site emergency support						
Asset/System data analytics, reports, asset/power management consultancy						
Preventive maintenance						
Condition-based maintenance with Maintenance Index						
Labor repair						
Spare parts				Option		

EcoStruxure Service Plan Packages

To be reviewed
_newpage added here — not ideal but should be OK as this topic normally always starts on top of a new page



EcoStruxure Asset Advisor

Cloud-based asset monitoring service for predictive and preventive maintenance

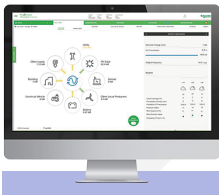
EcoStruxure Asset Advisor brings a proactive approach to electrical distribution and critical data center assets, combining IoT and cloud-based technologies with Schneider Electric's experts and services for business continuity. **EcoStruxure Asset Advisor** evaluates live data from your critical connected assets and uses advanced analytics to identify potential threats. With this data, **Asset Advisor** gives you the power of choice for critical decisions, either to take action yourself or to leverage Schneider Electric's service experts to act on your behalf.



EcoStruxure Power Advisor

Cloud-based data quality and power quality monitoring service

EcoStruxure Power Advisor raises metering diagnostics from device-based troubleshooting to full system analysis. It combines expert advice with advanced algorithms (applying it to data from your Power Monitoring Expert system) to identify gaps or issues in your power management system, as well as power quality issues within your larger electrical distribution system.



EcoStruxure Microgrid Advisor

Microgrid Forecasting and Optimization

EcoStruxure Microgrid Advisor enables you to dynamically control on-site energy resources and loads to optimize your facility's performance. The software seamlessly connects to your distributed energy resources to automatically forecast and optimize how and when to consume, produce, and store energy. The web-based user interface makes it easy to understand your real-time savings, earnings, and CO2 emissions data.



EcoStruxure Facility Expert

Cloud-based software for asset maintenance and improved collaboration

Based on the latest technology evolution of mobile App, Web platform, and IoT, **EcoStruxure Facility Expert** helps you optimize field operations, reduce energy consumption, and ensure business continuity.

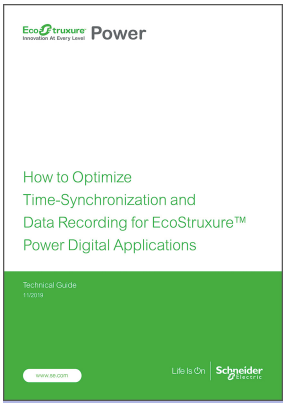
Bibliography

What's in This Chapter

Useful Documentation	54
Useful Links	58

Useful Documentation

Technical Guides



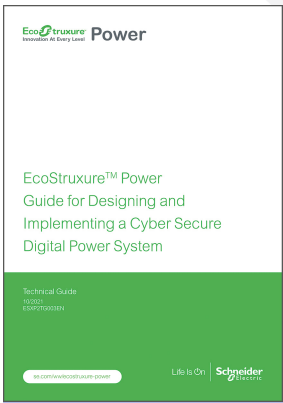
How to Optimize Time Synchronization and Data Recording for EcoStruxure Power Digital Applications

This technical guide details how to define the digital architecture to implement proper timestamping of the collected data depending on the selected digital applications. It provides a special focus on the various methods used to time synchronize the internal clocks of advanced devices such as power meters, trip units, protective relays, PLCs, UPS controllers, harmonic filters, etc.



Technical Guide
Ref: ESXP2TG001EN
11/2019

<https://www.se.com/ww/en/download/document/ESXP2TG001EN/>



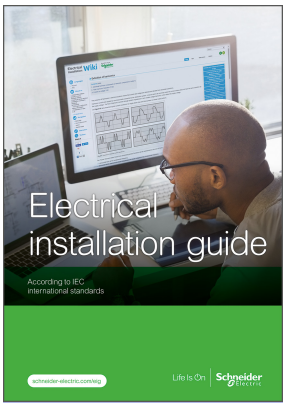
EcoStruxure Power Guide for Designing and Implementing a Cyber Secure Digital Power System

This document is intended to give an understanding of cybersecurity for IoT-enabled electrical distribution systems. It discusses how increased connectivity and increased IT/OT convergence come with increased cybersecurity risks and how to effectively mitigate these risks. The IEC 62443 standard is used as a consistent, simplified way to define the level of cybersecurity management needed to help ensure a robust electrical infrastructure. This document also supports and complements the EcoStruxure Power Design Guide (Digital Applications for Large Buildings and Critical Facilities).



Technical Guide
Ref: ESXP2TG003EN
10/2021

<https://www.se.com/ww/en/download/document/ESXP2TG003EN/>



Electrical Installation Guide

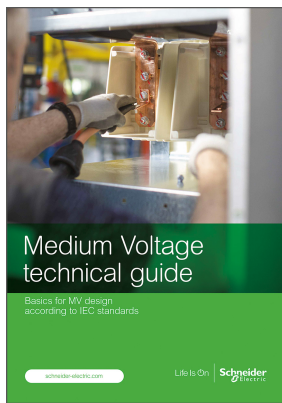
The Electrical Installation Guide is written for professionals who design, install, inspect, and maintain low-voltage electrical installations in compliance with the standards published by the International Electrotechnical Commission (IEC), such as the IEC 60364 series. Our experts share their industry-leading knowledge about new and updated electrical installation standards and technological evolutions so that you can have the most up-to-date and relevant information.

For the most up-to-date content, check the online version of this guide, the Electrical Installation Wiki.



Technical Guide
Ref: EIGED306001EN

<https://www.se.com/ww/en/work/products/product-launch/electrical-installation-guide/>



Medium Voltage Technical Guide

Whatever your involvement in medium voltage power - specifying, designing, operating, maintaining, or learning as a student - our guide covers what you need to know to make safer and more reliable switchboards using the latest IEC standards.

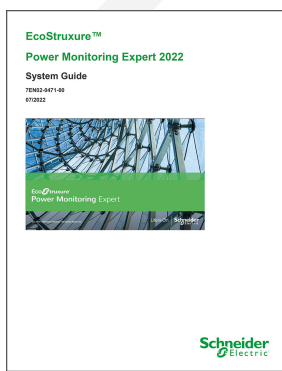


Technical Guide
Ref: AMTED300014EN
03/2022

<https://www.schneider-electric.com/en/work/products/product-launch/medium-voltage-technical-guide/>

Selection Guide

System Guides



Power Monitoring Expert 2022 System Guide

This guide is intended for Application Engineers, System Integrators, or other qualified personnel who are responsible for designing, installing, configuring, maintaining, and using EcoStruxure Power Monitoring Expert software.

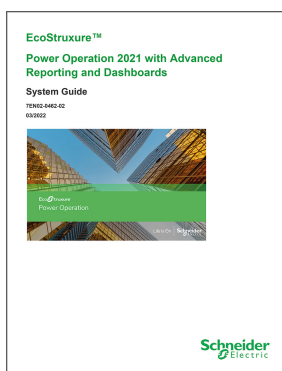
This document is not a tutorial; it was written with the assumption that you have been trained in the deployment and use of EcoStruxure Power Monitoring Expert.

Online help: <https://digital-energy-help.se.com/pme/content/home.htm>



Technical Guide
Ref: 7EN02-0471
07/2022

<https://www.se.com/ww/en/download/document/7EN02-0471/>



Power Operation 2021 System Guide

This guide is intended for Application Engineers, System Integrators, or other qualified personnel who are responsible for designing, installing, configuring, maintaining, and using EcoStruxure Power Operation software with Reporting and Dashboards.

This document is not a tutorial; it was written with the assumption that you have been trained in the deployment and use of EcoStruxure Power Operation.

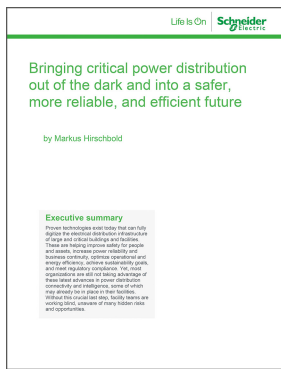
Online help: <https://digital-energy-help.se.com/po/content/home.htm>



Technical Guide
Ref: 7EN02-0462
03/2022

<https://www.se.com/ww/en/download/document/7EN02-0462/>

White Papers



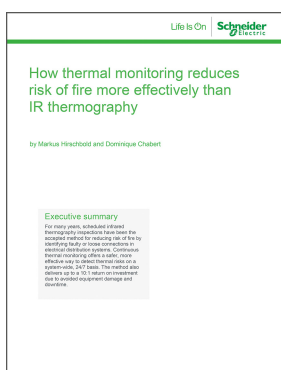
Bringing critical power distribution out of the dark and into a safer, more reliable, and efficient future

Proven technologies exist today that can fully digitize the electrical distribution infrastructure of large and critical buildings and facilities. These are helping improve safety for people and assets, increase power reliability and business continuity, optimize operational and energy efficiency, achieve sustainability goals, and meet regulatory compliance. Yet, most organizations are still not taking advantage of these latest advances in power distribution connectivity and intelligence, some of which may already be in place in their facilities. Without this crucial last step, facility teams are working blind, unaware of many hidden risks and opportunities.



Technical Guide
Ref: 998-20329038
2019

https://go.schneider-electric.com/WW_201904_Critical-power-distribution-WP_EA-LP-EN.html?source=Content&sDetail=Critical-power-distribution-WP_WWW&



How thermal monitoring reduces risk of fire more effectively than IR thermography

For many years, scheduled infrared thermography inspections have been the accepted method for reducing risk of fire by identifying faulty or loose connections in electrical distribution systems. Continuous thermal monitoring offers a safer, more effective way to detect thermal risks on a system-wide, 24/7 basis. The method also delivers up to a 10:1 return on investment due to the equipment damage and downtime avoided.



Technical Guide
Ref: 998-20425658
2018

https://go.schneider-electric.com/WW_201903_How-thermal-monitoring-reduces-risk-of-fire-more-effectively-than-IR-thermography-A09341_EA-LP-EN.html?source=Advertising-Online&sDetail=How-thermal-monitoring-reduces-risk-of-fire-A09341_WWW&



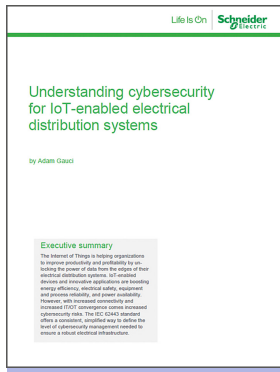
Do more with less: Moving power and building management to the cloud

Building owners and operators are facing growing demands for buildings that are more sustainable, resilient, efficient, and people-centric. New cloud-hosted power and building management applications can help meet these business, regulatory, and occupant requirements with a scalable solution that minimizes the costs of onsite IT services, computing hardware, and software. Additionally, cloud-hosting helps secure data storage, simplifies remote operations and cross-team collaboration, and enables facilities with limited resources to engage expert advisory services.



Technical Guide
Ref: 998-21143435_GMA
2021

https://go.schneider-electric.com/WW_202103_GMA-cloud-based-building-and-power-management_EA-LP.html?source=Content&sDetail=GMA-cloud-based-building-and-power-management_WW



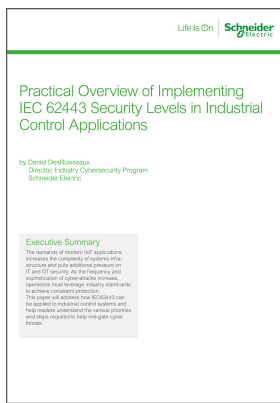
Understanding cybersecurity for IoT-enabled electrical distribution systems

The Internet of Things is helping organizations to improve productivity and profitability by unlocking the power of data from the edges of their electrical distribution systems. IoT-enabled devices and innovative applications are boosting energy efficiency, electrical safety, equipment and process reliability, and power availability. However, with increased connectivity and increased IT/OT convergence comes increased cybersecurity risks. The IEC 62443 standard offers a consistent, simplified way to define the level of cybersecurity management needed to ensure a robust electrical infrastructure.



Technical Guide
Ref: 998-20677347
2019

https://go.schneider-electric.com/WW_201909_Understanding-Cyber-security-for-IoT-White-Paper-Content_EA-LP-EN.html?source=Content&sDetail=Understanding-Cyber-security-for-IoT-White-Paper_WW



Practical Overview of Implementing IEC 62443 Security Levels in Industrial Control Applications

This paper will address how IEC 62443 can be applied to industrial control systems and help readers understand the various priorities and steps required to help mitigate cyberthreats.

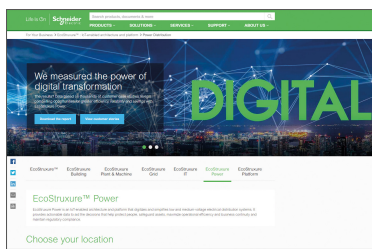


Technical Guide
Ref: 998-20186845
01/2018

<https://www.se.com/ww/en/download/document/998-20186845/>

Useful Links

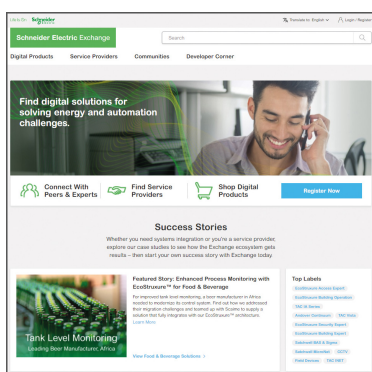
Web Portals



EcoStruxure Power Landing Page

Learn more about EcoStruxure Power, Schneider Electric's digital solution for electrical distribution to help improve electrical safety, power availability, sustainability, and cybersecurity. Get access to customer testimonials, useful resources, and more!

<https://www.se.com/ww/en/work/campaign/innovation/power-distribution.jsp>



Schneider Electric Exchange

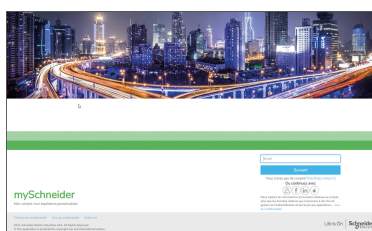
An open ecosystem for IoT energy management and automation solutions.

Create: With integrated efficiency solutions across all domains in energy management and automation, Schneider Electric Exchange is a space for innovation. Use Shop resources to develop new applications and APIs. Tackle challenges, promote your ideas, and gain global input on your work.

Collaborate: We celebrate the diversity of global communities where you can interact in your niche or with the industry at large. Network and find experts to co-create solutions, find answers to your toughest business challenges, and offer your insights as an industry leader.

Scale: Effectively and efficiently scale your business by promoting your expertise, publishing new products, and learning about the latest innovations.

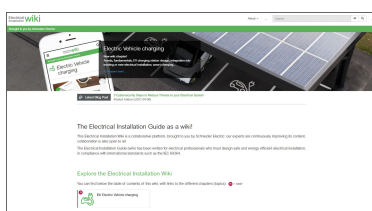
<https://exchange.se.com/>



mySE Partner Portal

Login or register for the mySE Partner to get a personalized portal with easy access.

<https://www.se.com/myschneider/>



Electrical Installation Wiki

This Electrical Installation Wiki is the live on-line version of the Electrical Installation Guide. It is the reference to check for the most up-to-date content. Recent updates include a new chapter on Electric Vehicle charging, updated content on photovoltaic self-consumption, and new content on the choice and coordination of RCDs in the presence of DC earth leakage currents. Since 2020, the Wiki also has a new responsive look and feel, making it easier to read and navigate, in particular on mobile phones.

<https://www.electrical-installation.org/>



EcoXpert Partner Program

Draft

Green Premium

Draft

Draft

Schneider Electric
35 rue Joseph Monier
92500 Rueil Malmaison
France

+ 33 (0) 1 41 29 70 00

www.se.com

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