



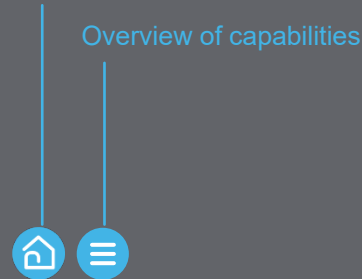
EcoStruxure™ Power for Semiconductor Fabs

Utilizing a Digital Twin for Electrical Distribution to Drive Efficient Facilities

01/2023



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Purpose of the Document

Target Audience

This document is intended to address End User Engineering, Operations and Maintenance, Consultants, EPCs (Engineering, Procurement, and Construction) and Service teams and other qualified personnel.

Objective

To understand the challenges of designing and operating a Semiconductor Fab with an efficient and sustainable electrical distribution strategy.

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SECTION 1 – Introduction to the Semiconductor Fab Industry

SECTION 2 – How EcoStruxure Power Can Support the Semiconductor Fab

SECTION 3 – Digital Solutions and Services

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SECTION 1: Introduction to the Semiconductor Fab

Introduces the context and the challenges of
a Semiconductor Fab.

SECTION 2: How Schneider Electric Can Support the Semiconductor Fab Industry with EcoStruxure Power

Describes the solutions that EcoStruxure Power
provides for Semiconductor Fabs, with typical
electrical and digital architectures.

SECTION 3: Digital Solutions and Services

Gives information about EcoStruxure Power capabilities for
Semiconductor Fabs, sorted by value proposition:

- [Transverse Lifecycle Capabilities](#)
- [Capabilities to Improve Time To Market](#)
- [Capabilities to Increase Efficiency](#)
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Contains useful documents to find out more about
capabilities.

Provides details about Green Premium.



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Semiconductor Fab Industry

Semiconductor Fab Industry Challenges

SECTION 2 – How EcoStruxure Power
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SECTION 1

Introduction to the Semiconductor Fab Industry

WHY READ THIS SECTION?

The objective
of this section is to:

- Introduce the **growth, trends** and **challenges** of the Semiconductor Fab industry
- Present the **4 pillars** to meet the Semiconductor Fab challenges.



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Semiconductor Fab Industry Challenges

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Semiconductor Fab Market

An industry driven by the growth of new technology



Strong Robust Growth

+7% Robust growth till 2030.



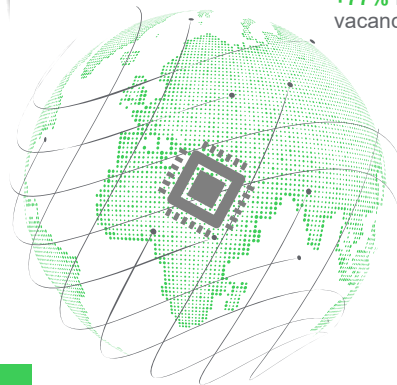
Chip Shortages Continue

17% Annual growth in chip demand from 2020-2022, while supply grew at only 6% per year.



Acceleration of Digital Transformation

+52% Increased use of cloud / automation in 2021.



Hunt for Talent Intensifies

+77% Rise in chip-related job vacancies from 2020.



Focus on Sustainability

+36% Semiconductor companies reinforced ESG* practices (2021 reporting).



Geopolitical Impacts

65% Global share of value chain activities based in Asia, creating high supply chain risk.



* ESG = Environmental, Social, and Governance



Sources

Strong Robust Growth:

<https://www.mckinsey.com/industries/semiconductors/our-insights/the-semiconductor-decade-a-trillion-dollar-industry>

Hunt for Talent Intensifies:

<https://asia.nikkei.com/Business/Business-Spotlight/Chip-talent-war-Taiwan-faces-critical-staffing-shortage>

Focus on Sustainability:

<https://arstechnica.com/science/2022/04/can-semiconductor-makers-meet-surg-ing-demands-sustainably/>

Geopolitical Impacts:

<https://www.voanews.com/a/race-for-semiconductors-influences-taiwan-conflict-/6696432.html>

Acceleration of Digital Transformation:

<https://quixy.com/blog/top-digital-transformation-statistics-trends-forecasts/#:~:text=According%20to%20Markets%20and%20Markets,by%205.1%25%20according%20to%20Gartner.>

Chip Shortages Continue:

<https://www.mynewsdesk.com/rolandberger/pressreleases/global-semiconductor-shortage-to-persist-for-several-years-beyond-2022-3151267>

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Semiconductor Fab Market

The market trends: a changing landscape

Significant **investment** for expansions and modernization



A growing focus on **efficiency** and **sustainability**

High demand for **power** and **water** to meet semiconductor production capacity



Cybersecurity

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Semiconductor Fab Industry Challenges

Four pillars to drive efficiency, resiliency and sustainability KPIs

The strong growth of the semiconductor industry leads to an increase in fabrication capacity. Creating or expanding this capacity is not without its challenges. Four pillars must be addressed:

Improve Time to Market



How can we accelerate the design & build of new semiconductor fabs?

Increase Efficiency



How can we reduce our operational costs?

Improve Resiliency



How can we improve power quality and minimize downtime?

Grow Sustainability



How can we reduce our carbon footprint and integrate more renewable, sustainable energy sources?



SECTION 1 – Introduction to the
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Solutions to Address the Four Pillars

EcoStruxure Power Value Proposition

Example of Electrical & Digital Architectures

SECTION 3 – Digital Solutions
and Services

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SECTION 2

How EcoStruxure Power Can Support the Semiconductor Fab Industry

WHY READ THIS SECTION?

The objective
of this section is to:

- Present the **solutions to address the four pillars** to meet the Semiconductor Fab industry challenges
- Explain how **Schneider Electric EcoStruxure™ Power** can **support** this industry
- Give an **example** of electrical and digital architectures.



Solutions to Address the Four Pillars of Semiconductor Fabs

The four pillars can be addressed by the following solutions:

Improve Time to Market



Use Standardized Architectures

Use standardized electrical distribution and digital tools to speed up the design, build and commissioning of new fabs.

Increase Efficiency



Improve Facility Performance

Turn data into business intelligence and leverage a digital twin to provide actionable insights to drive efficiency.

Improve Resiliency



Minimize Downtime

Help assure optimum power quality and reliability while improving safety for your staff and guarding against cyber attacks

Grow Sustainability



Meet Sustainability KPIs

Engage consultancy services to strategize, digitize and decarbonize.

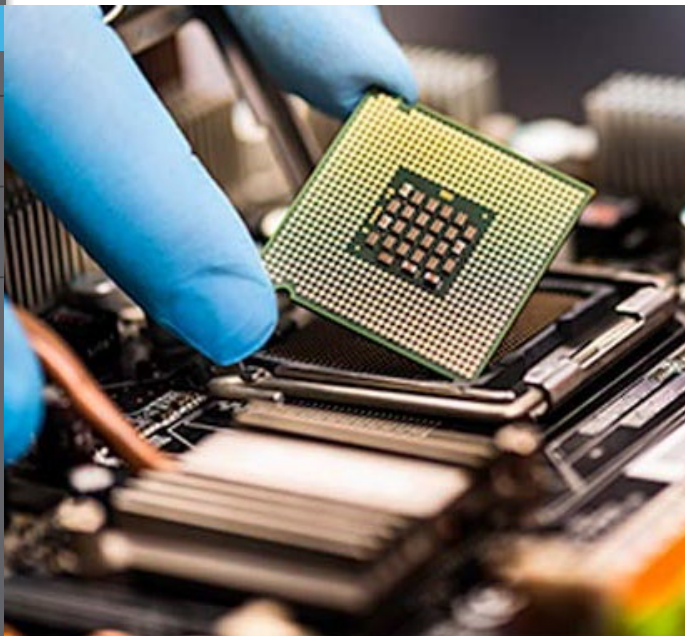
This guide describes the solutions developed by EcoStruxure Power to address these four pillars.





EcoStruxure Power Value Proposition

EcoStruxure Power for Semiconductor Fabs



From **electrical design** to
operations and maintenance

We are your **end-to-end digital partner** to design, build, operate and maintain semiconductor fabs with the utmost **efficiency** and **resiliency** towards a **sustainable** future.

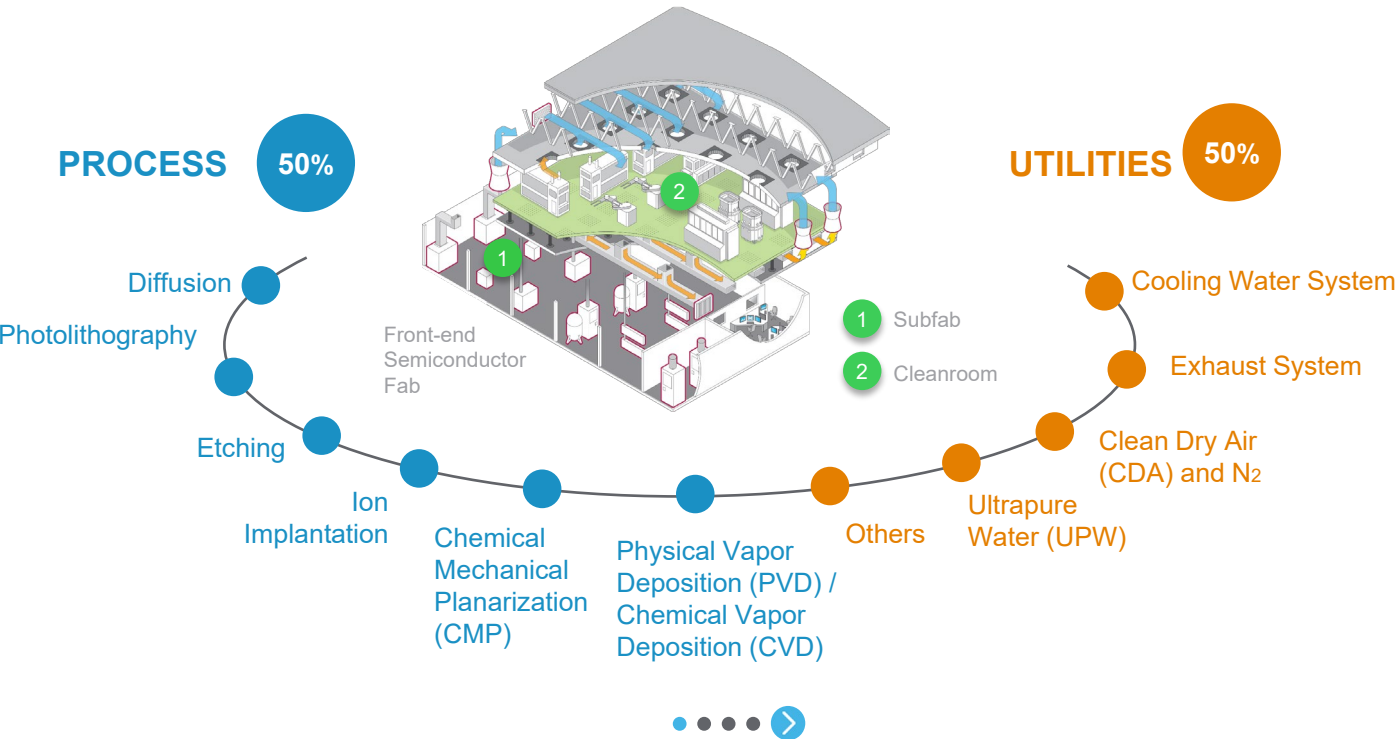
Our **collaborative environments**, enhanced by the Electrical Distribution **Digital Twin** of your fab, enable **high productivity operations**.



Example of Electrical and Digital Architectures

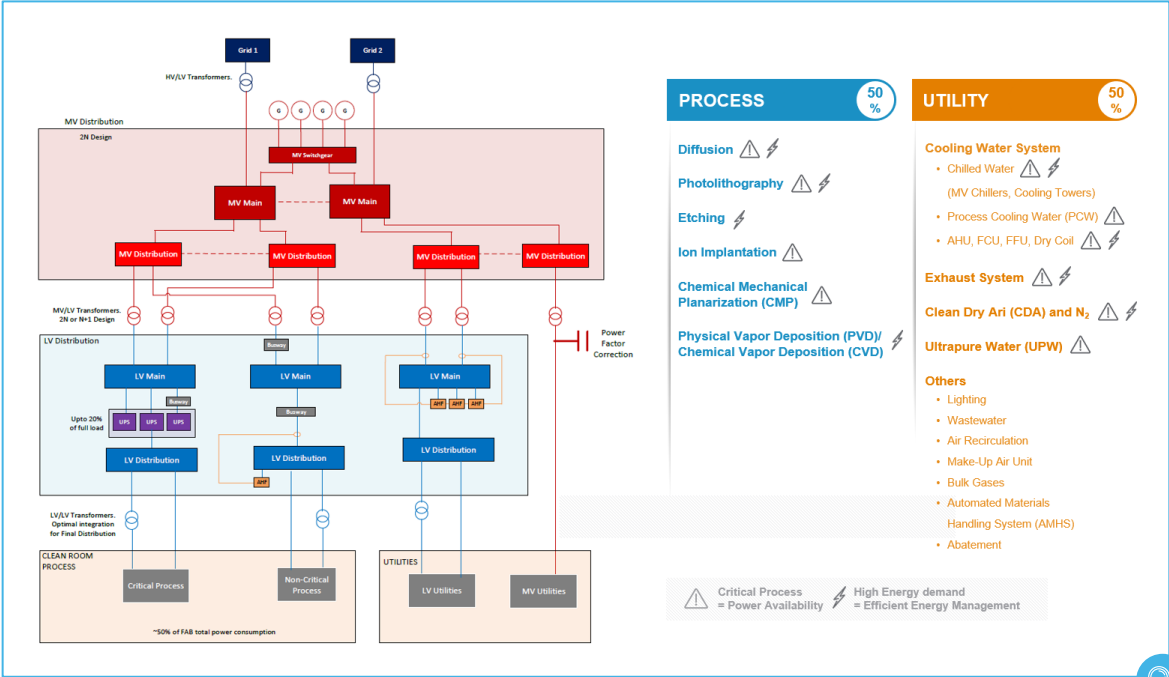
Typical front-end Semiconductor Fab

Energy is key, whether for processes or for utilities: specific attention must be given to the design of the electrical architecture and associated digital architecture which will enable digital solutions and services.



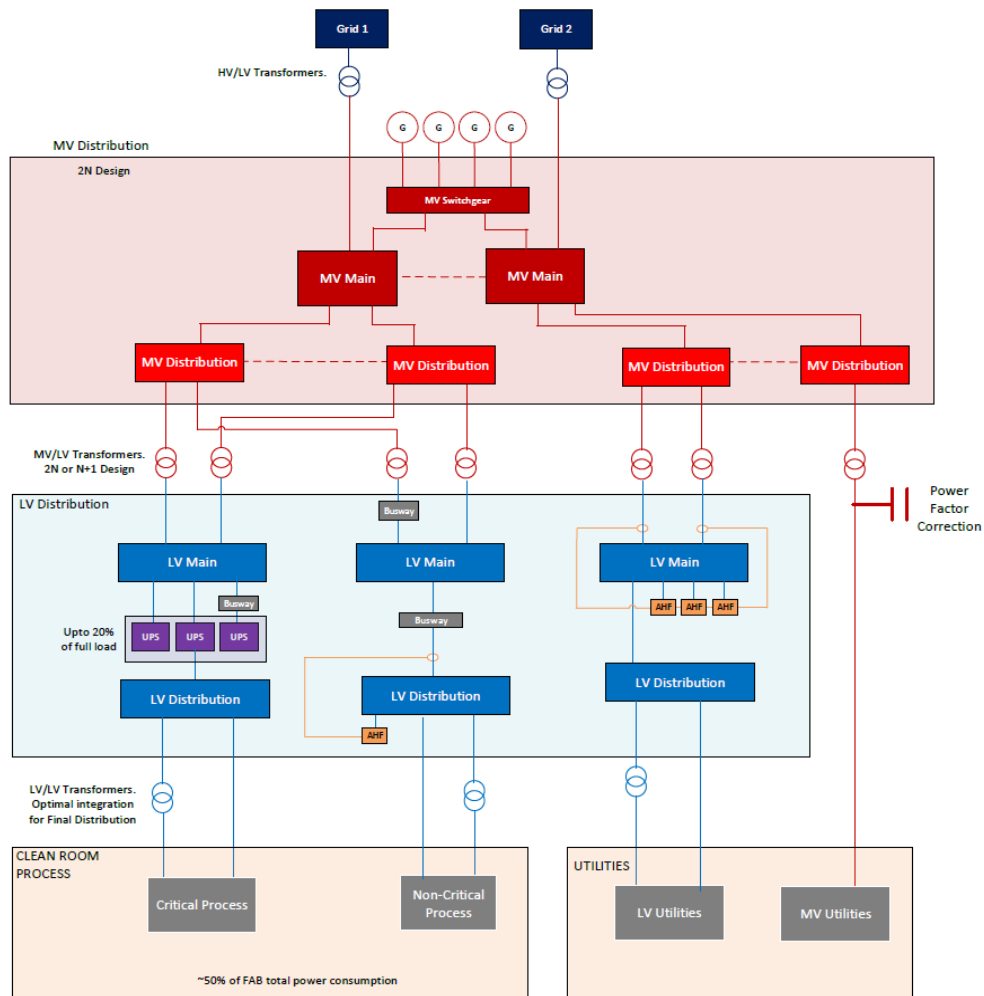
Example of Electrical and Digital Architectures

Typical electrical architecture for a Semiconductor Fab



Example of Electrical Architecture





PROCESS

50
%

Diffusion ⚠ ⚡

Photolithography ⚠ ⚡

Etching ⚡

Ion Implantation ⚠

Chemical Mechanical Planarization (CMP) ⚠

Physical Vapor Deposition (PVD)/
Chemical Vapor Deposition (CVD) ⚡

UTILITY

50
%

Cooling Water System

- Chilled Water ⚠ ⚡
(MV Chillers, Cooling Towers)
- Process Cooling Water (PCW) ⚠ ⚡
- AHU, FCU, FFU, Dry Coil ⚠ ⚡

Exhaust System ⚠ ⚡

Clean Dry Air (CDA) and N₂ ⚠ ⚡

Ultrapure Water (UPW) ⚠

Others

- Lighting
- Wastewater
- Air Recirculation
- Make-Up Air Unit
- Bulk Gases
- Automated Materials Handling System (AMHS)
- Abatement



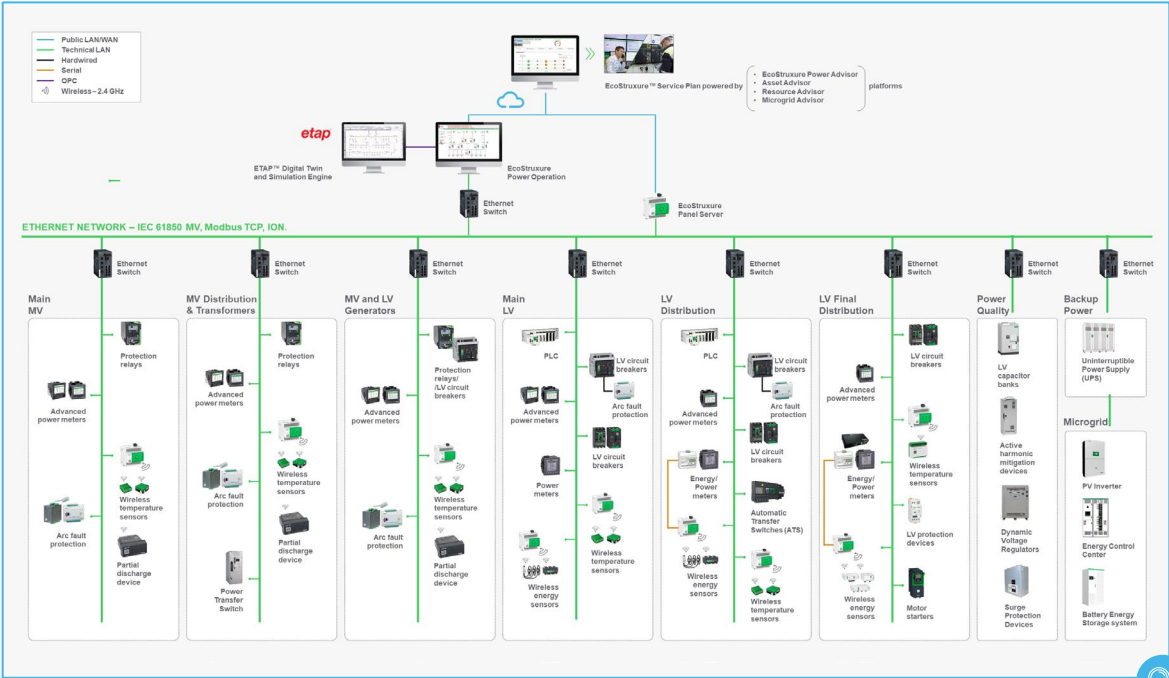
Critical Process
= Power Availability



High Energy demand
= Efficient Energy Management

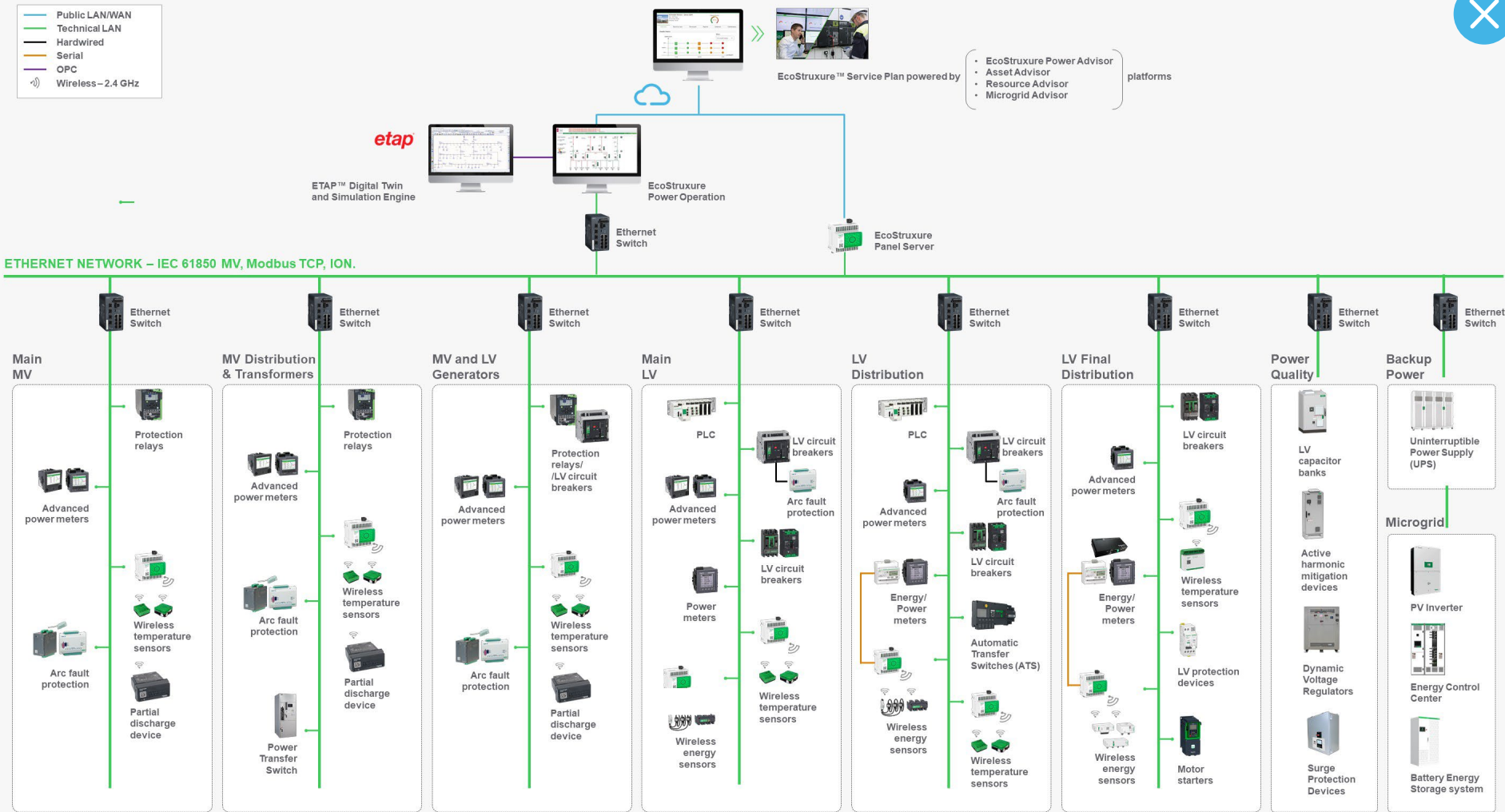
Example of Electrical and Digital Architectures

Suggested digital architecture (high-level view) for a Semiconductor Fab



Example of Digital Architecture (High-Level View)

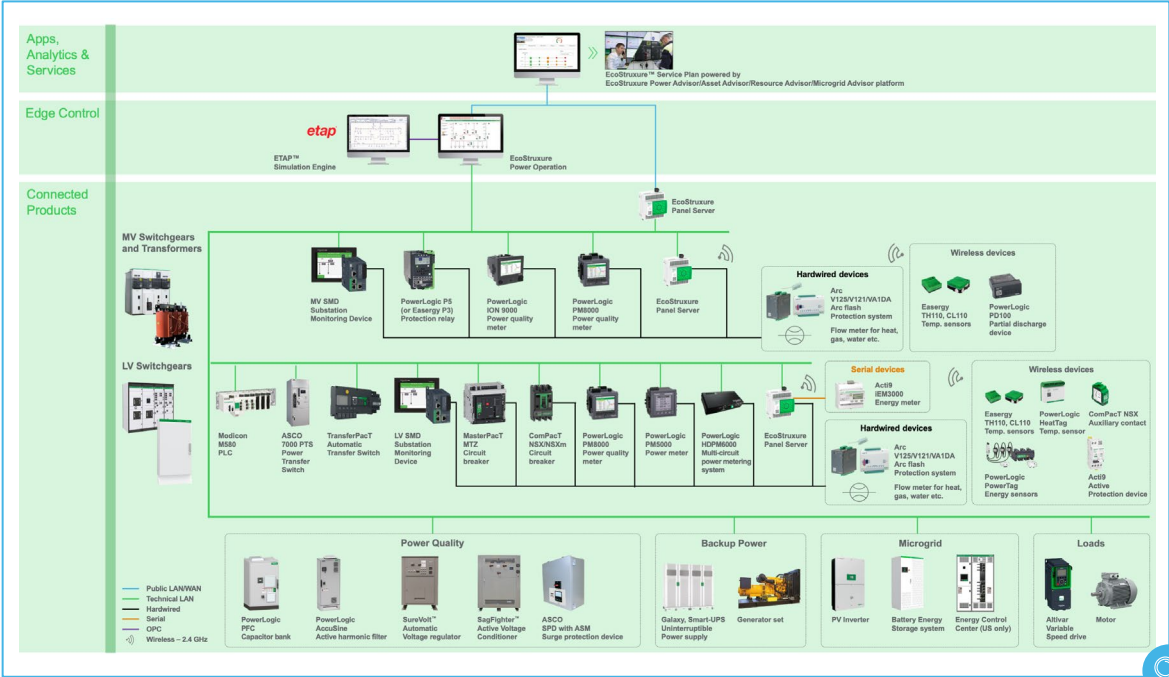




Example of Digital Architecture (High-Level View)

Example of Electrical and Digital Architectures

Corresponding detailed digital architecture for a Semiconductor Fab



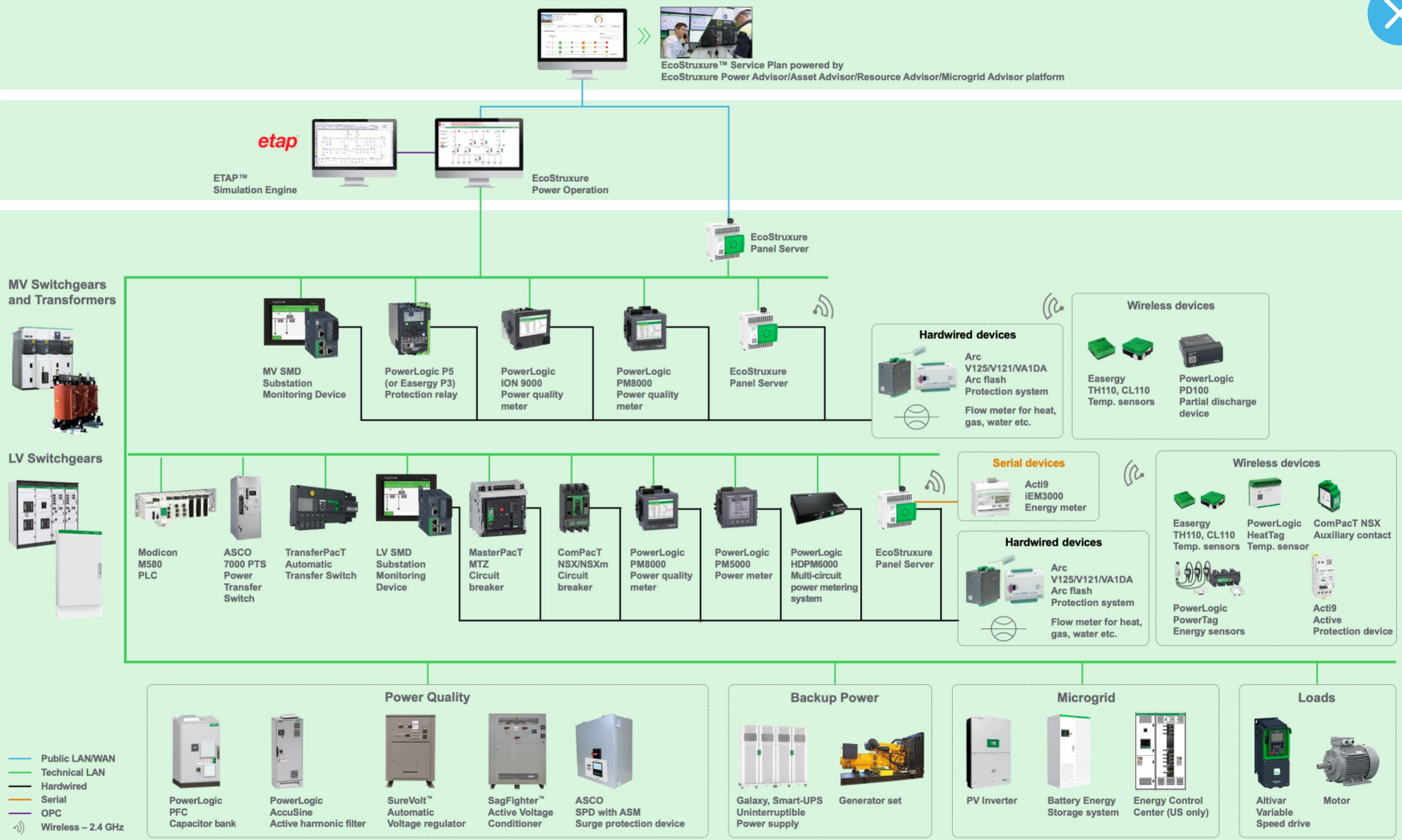
Example of Digital Architecture (Detailed View)



Apps,
Analytics &
Services

Edge Control

Connected
Products



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Capabilities to Improve Your Process

Capabilities to Improve Resiliency

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SECTION 3

Digital Solutions & Services

WHY READ THIS SECTION?

This section gives information about **EcoStruxure™ Power capabilities** for Semiconductor Fabs aligned to the **industry challenges**.

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Life Is On

Schneider
Electric

Introduction

EcoStruxure Power provides capabilities to support the challenges of Semiconductor Fabs throughout their lifecycle

**Design, Build, Commission**
(Consultants & EPC)**Operate & Maintain**
(Operators, maintenance team, service teams)**Improve
Time to Market**

These capabilities provide standardized designs and digital architectures, and enable easy simulation, to reduce cost of design and ownership.

**Increase
Efficiency**

These capabilities use digitization to provide intelligent information to the workforce, allowing them to make smart decisions that reduce operating costs and increase efficiency.

**Improve
Resiliency**

These capabilities use digitization to reduce unplanned downtime, increase reliability, and thus reduce production waste.

**Grow
Sustainability**

These capabilities help track energy consumption and carbon emissions to meet sustainability requirements.

Transverse Lifecycle Capabilities

Digital Solutions that support your project from the Design, Build, Commission to Operate & Maintain phases.

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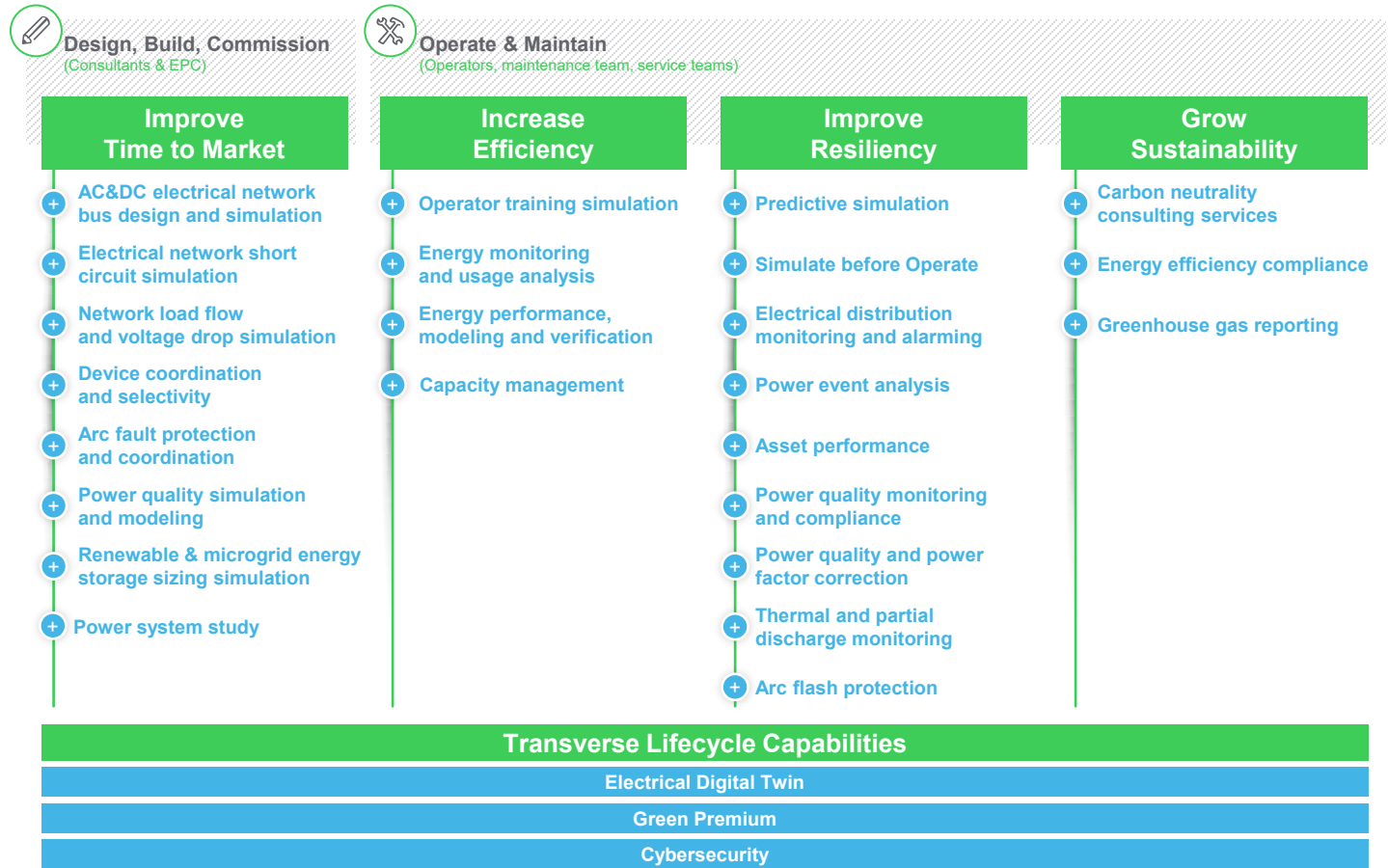
Capabilities to Improve Resiliency

Capabilities to Grow Sustainability

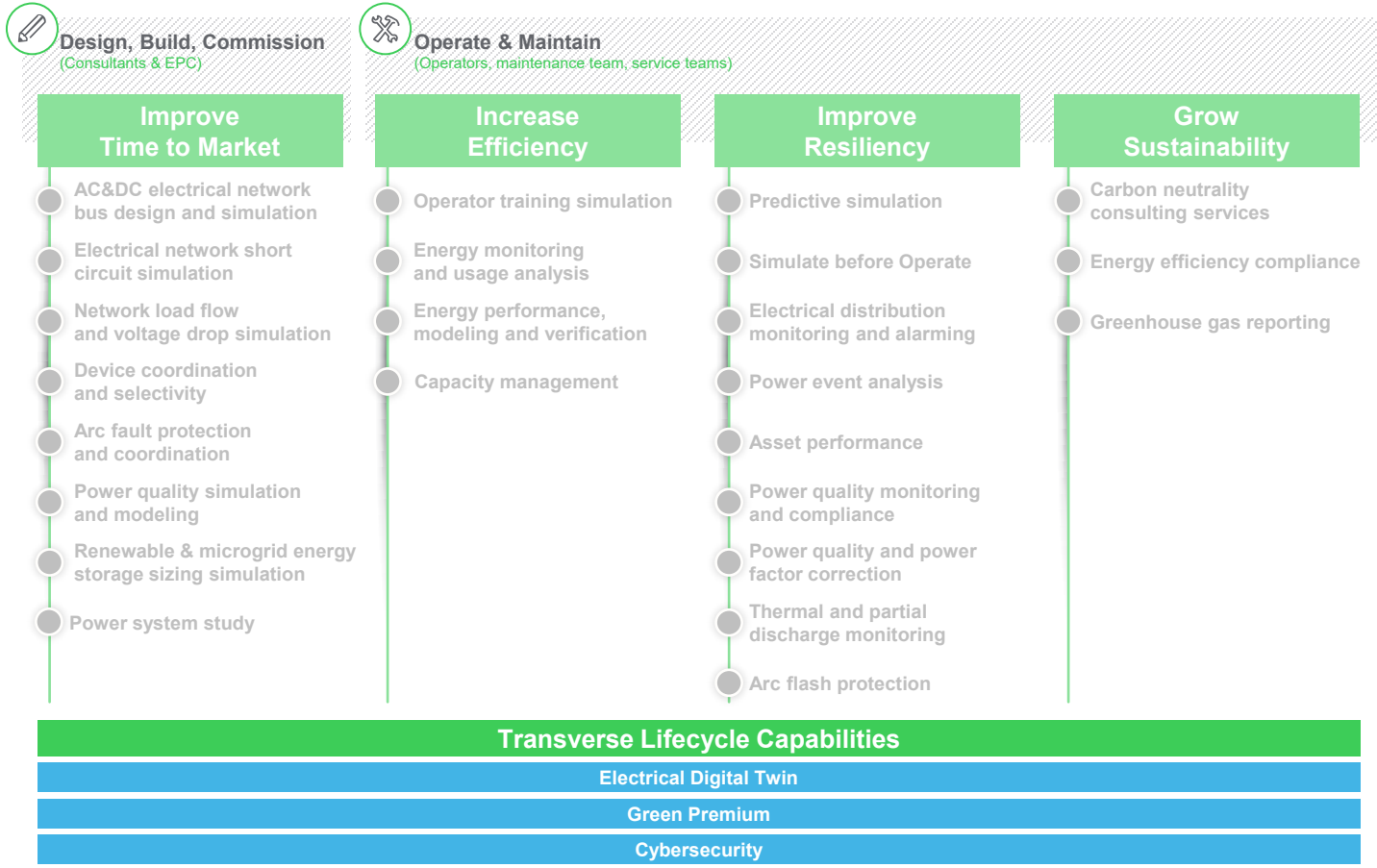
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Overview of Digital Solutions and Services



Transverse Lifecycle Capabilities



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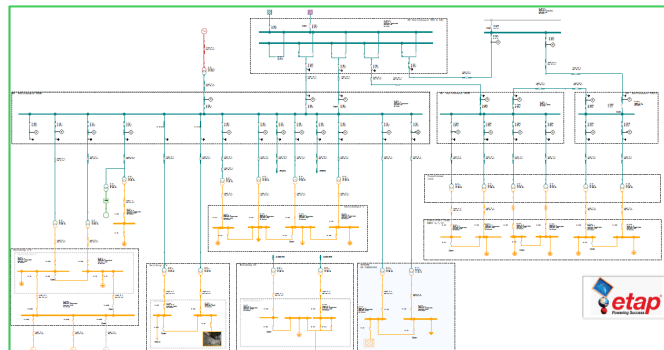
Electrical Digital Twin

etap

Maintain a Digital Twin of your electrical distribution

Benefits

- Provides an intelligent user-interface for all levels of AC and DC networks
- Enables users, from the design to operate phases, to model, simulate, analyze and validate electrical power systems to predict their electrical network behavior
- Takes the day-to-day system modeling and design tasks to a new level of speed, accuracy and ease



Electrical Digital Twin

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Life Is On

Schneider
Electric

Green Premium

Manage sustainability from design to end of life

Benefits

- Provides products delivering sustainable value



ZOOM ON SF6-FREE MV SWITCHGEAR

For decades, SF6 (sulfur hexafluoride) has been trusted for use in MV switchgear, but it is the most potent greenhouse gas.

At Schneider, we have decided to move away from SF6 and to switch to the best sustainable gas: pure air.

The new SM AirSeT MV switchgear is powered by air and digital: while using established air and vacuum technology to preserve the planet, it keeps the original functionalities and connectivity of our renowned switchgear for optimum efficiency.

**enerTIC**
Awards**DESIGN**
AWARD
2020**ICEF**
Innovation for Cool Earth Forum

SF6-free SM AirSeT Medium Voltage Switchgear



Learn more about
Green Premium

EcoStruxure™ Power for Semiconductor Fab

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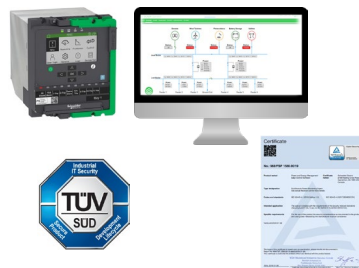
Cybersecurity

Help secure the digital power distribution system

Benefits

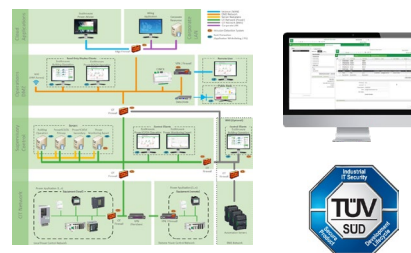
- Provides a selection of cybersecurity certified products
- Provides certified system architectures and solutions
- Delivers lifecycle services

Certified products



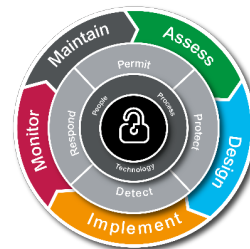
Certified products developed according to IEC 62443 functional requirements with Secure Development Lifecycle processes.

Certified systems & solutions



Certified secure system architecture according to IEC 62443-3-3 with documented processes and solutions for a secure system. Cybersecurity system configuration software for consistent security policy deployment.

Lifecycle services



Consulting services from design, implementation, operations and maintenance to tailor your security solutions to your strategy and budget.



SECTION 1 – Introduction to the Semiconductor Fab Industry

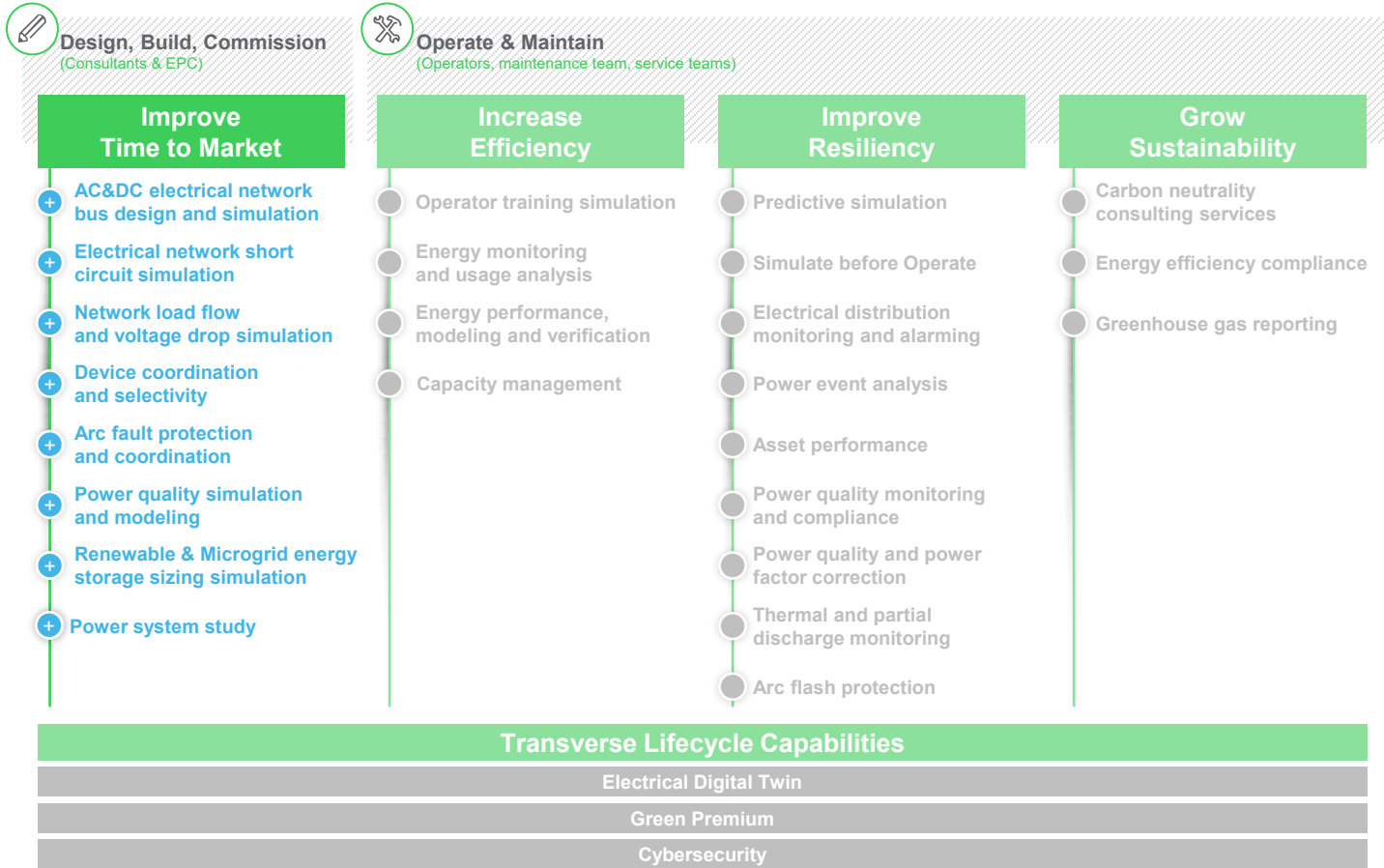
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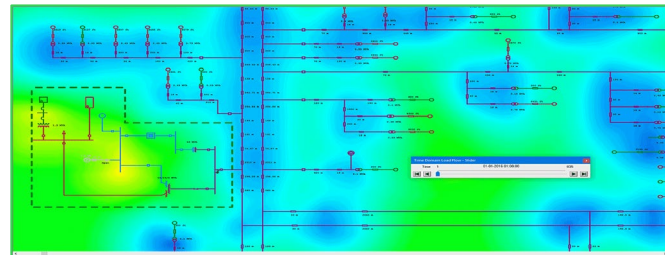
Optimize bus design allocation and simulation

Primary Department

- Design
- Construction

Benefits

- Single solution/environment
 - Unified AC & DC solution from HV to LV
 - One unique platform and one database
- Efficient profile management
 - User-defined loading and generation profiles
 - External data profile based on field measurements
- Scalability
 - Load growth study for future planning
- Event simulations within the calculation period



ETAP Electrical Network Model



Electrical Network Short Circuit Simulation



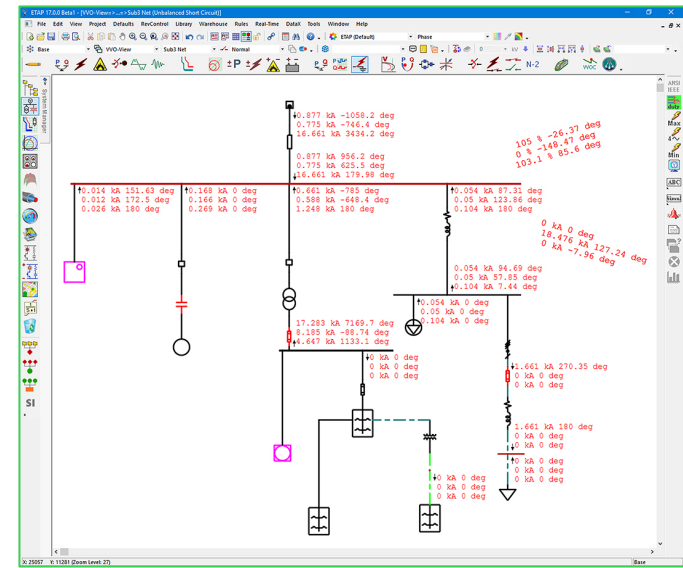
Design and simulate unbalanced short circuits

Primary Department

- Design
- Construction

Benefits

- Expedite design studies with a wide range of calculation scenarios, including advanced fault analysis
 - IEC & ANSI duty calculation for balanced and unbalanced faults
 - Simultaneous fault at selected nodes
 - Inclusive 3-Phase and 1-Phase fault analysis
 - Pre-Fault system loading consideration



Electrical Network Short Circuit Simulation in ETAP

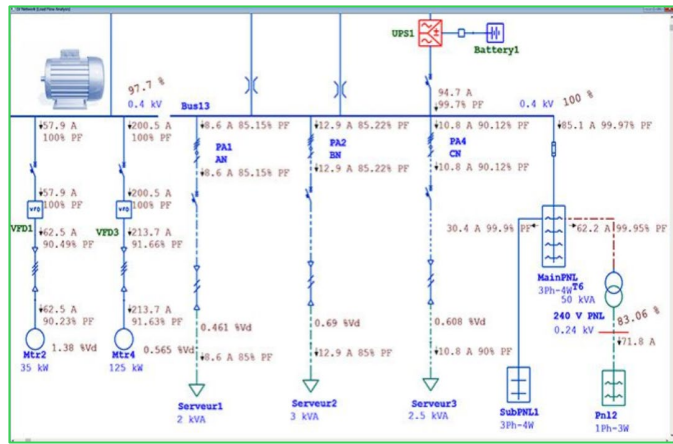
Perform power flow analysis and voltage drop calculations

Primary Department

- Design
- Construction

Benefits

- Simulation of bus voltages, branch power factors, currents, system losses, power generation versus loading
- Use of ETAP Electrical Digital Twin model with powerful calculation engines and user-friendly interface
- Simulation using multiple loading and generation conditions



Network Load Flow and Voltage Drop Simulation in ETAP



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Device Coordination and Selectivity



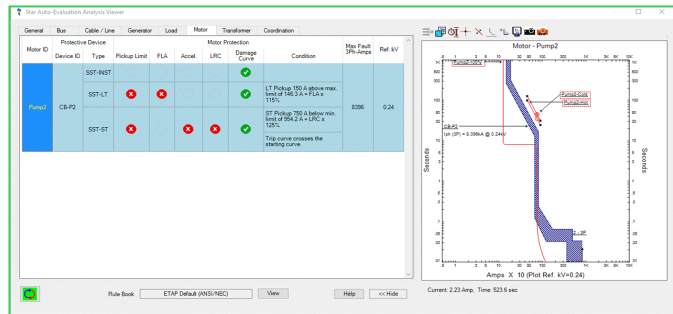
Automatically detect and evaluate the system protection and coordination/selectivity

Primary Department

- Design
- Construction

Benefits

- Verified and validated libraries
- Graphically adjustable device settings
- Detailed device settings reporting
- Continuous synchronization with one-line and integrated equipment database



Device Coordination and Selectivity in ETAP

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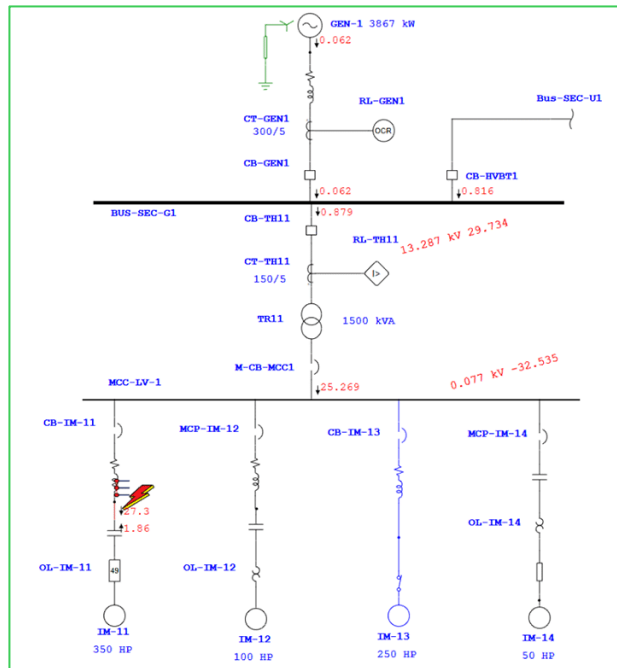
Perform sequence of operation for arc fault and bolted fault

Primary Department

- Design
- Construction

Benefits

- Evaluate, verify, and confirm the operation and selectivity of the protective devices for various types of faults for any location directly from the single-line diagram
- Animation displayed on the single-line diagram
- 3-phase / 1-phase sequence of operation



Arc Fault Protection and Coordination in ETAP

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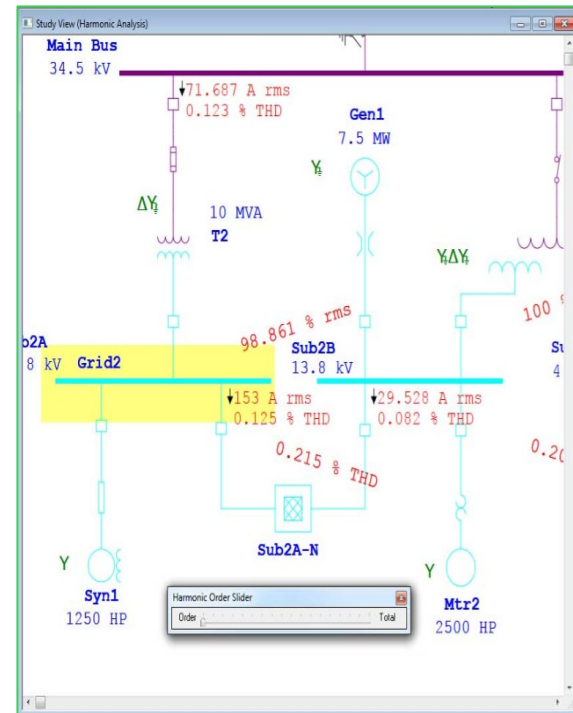
Evaluate and validate distortion due to harmonics

Primary Department

- Design
- Construction

Benefits

- Simulate harmonic current and voltage sources:
 - To identify potential harmonic problems (report of harmonic voltage and current distortion limit violations)
 - To identify the need for a harmonics filter
- Simulate and analyze the size of the harmonics filter your system will need to optimize performance and reduce nuisance trips



Power Quality Simulation and Modeling in ETAP



Renewable and Microgrid Energy Storage Sizing Simulation



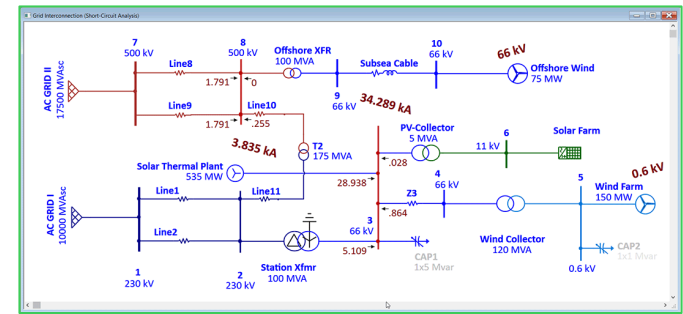
Design and optimize the microgrid system

Primary Department

- Design
- Construction

Benefits

- Build renewable energy models combined with full spectrum power system analysis calculations for:
 - Accurate simulation
 - Predictive analysis
 - Equipment sizing
 - Field verification of wind, solar farms and other DERs
- Enable designers and engineers to conceptualize the collector systems, determine wind penetration and perform grid interconnection studies



Microgrid Energy Storage Sizing Simulation in ETAP

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Power System Study

Work with engineering experts to provide Power System Studies

Primary Department

- Design
- Construction
- Facilities Electrical Department

Benefits

- Partner with a global team of experts, engaged with industry standards committees, to develop common safety standards and practices.
- Create a standardized approach to Power System Studies to support multisite deployments with consistent results



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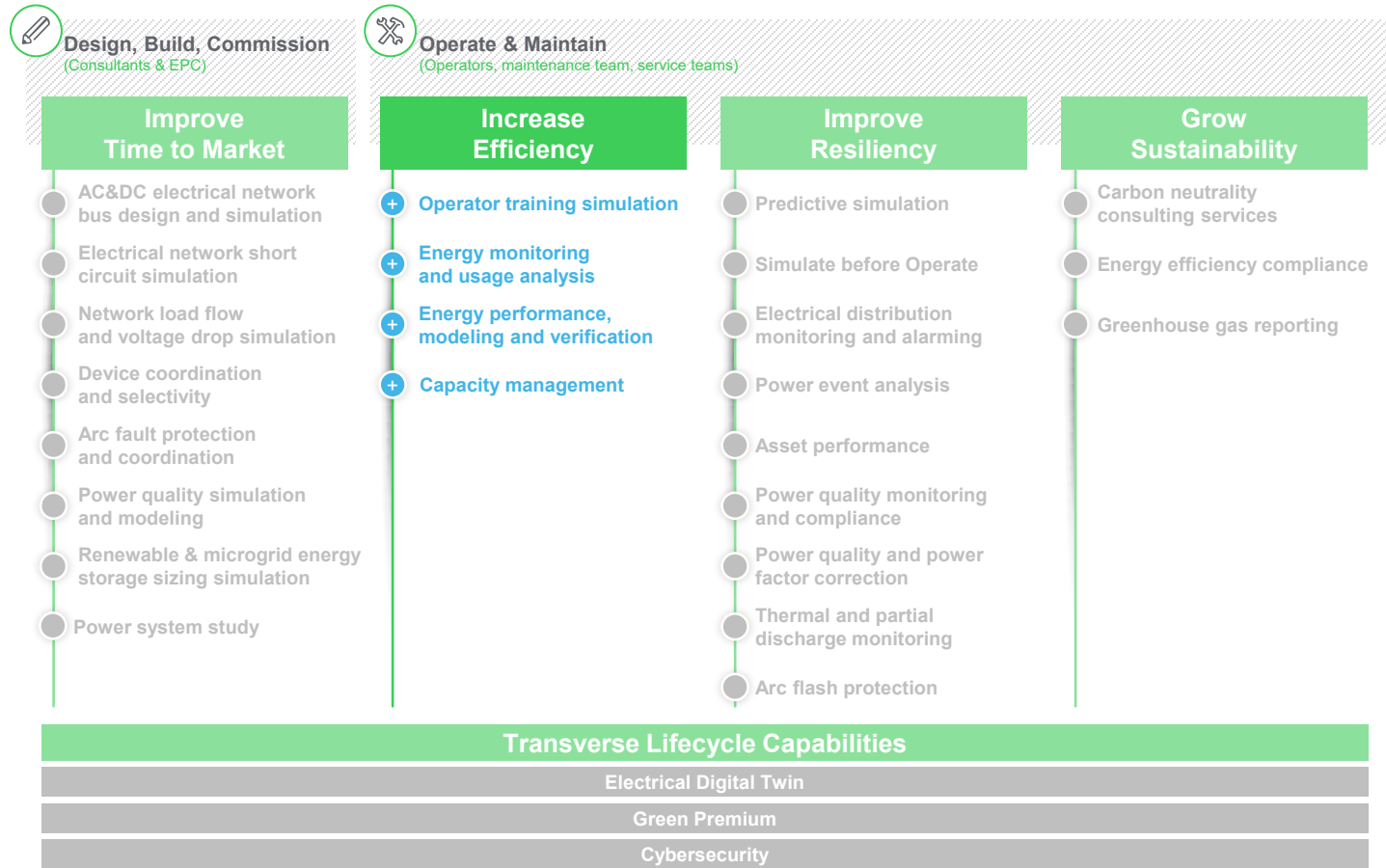
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Capabilities to Increase Efficiency



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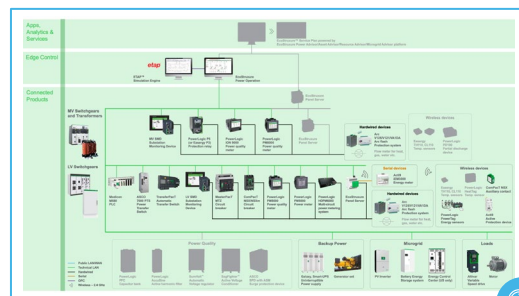
Train new employees and build confidence on new systems

Primary Department

- Facility Operations & Maintenance

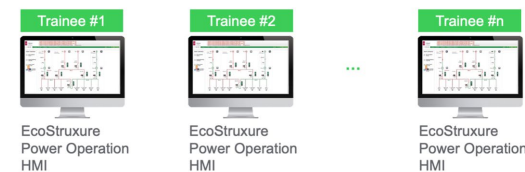
Benefits

- Practice operation within a simulated but highly realistic environment to enhance safety and operational efficiency
- Track and review trainee actions to analyze and challenge them

Operator Training Simulation
Reference Architecture

3 Training of Operators

Trainees can test actions and procedures, using backups of the EcoStruxure Power Operation production system with actual graphics.



2 Simulation of the Installation

ETAP Simulation Engine:

- Collects real data of the electrical installation from EcoStruxure Power Operation
- Simulates the consequences of trainees' actions

1 Data Acquisition
(from field devices)

Principle of Operator Training Simulation Application

Apps,
Analytics &
Services

Edge Control

Connected
Products

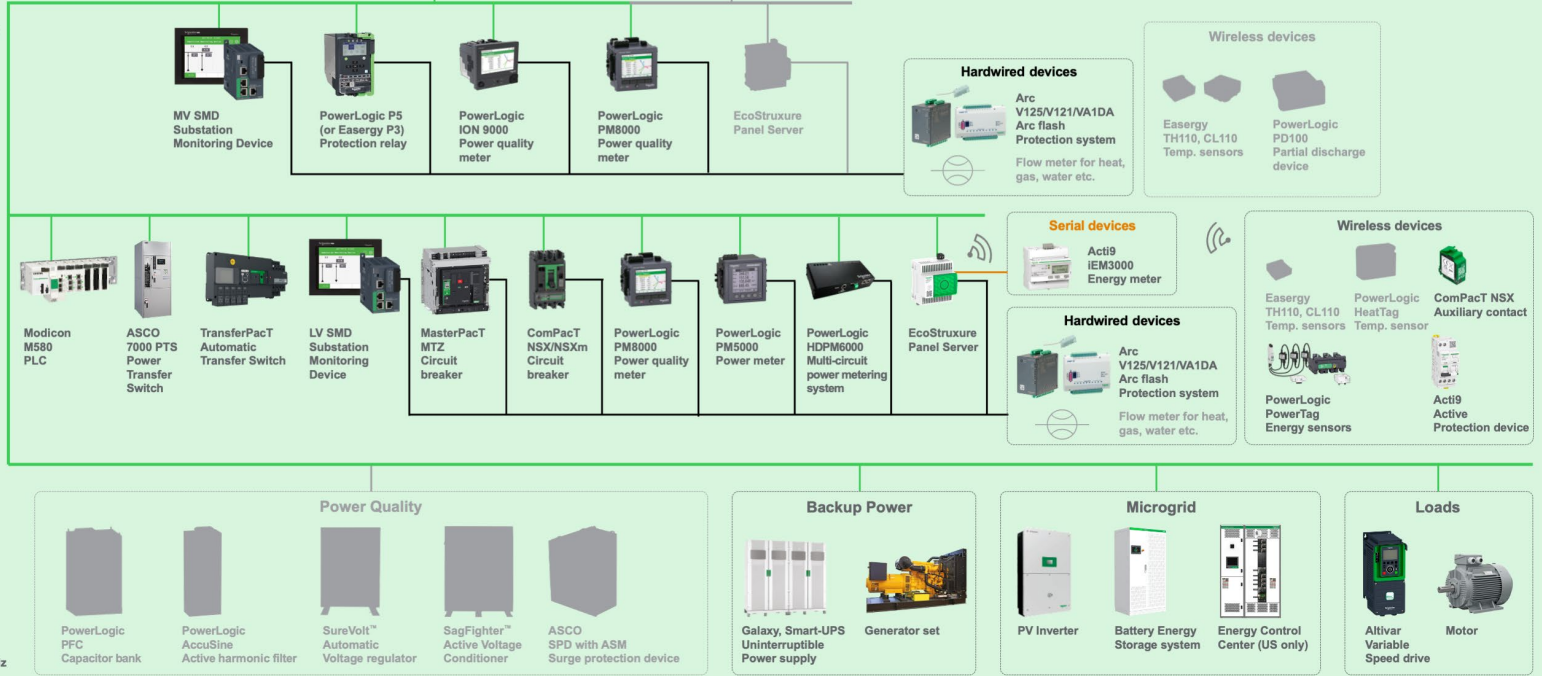
MV Switchgears
and Transformers



LV Switchgears



- Public LAN/WAN
- Technical LAN
- Hardwired
- Serial
- OPC
- Wireless – 2.4 GHz





Energy Monitoring and Usage Analysis



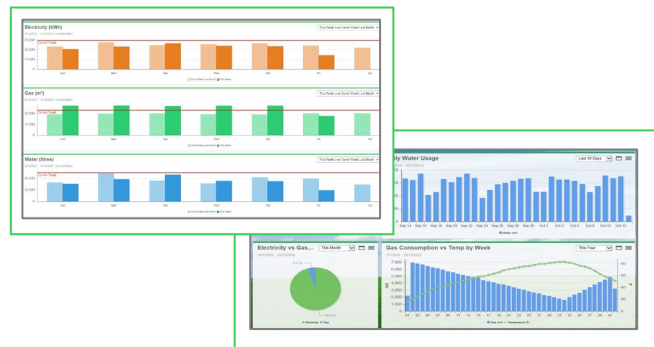
Determine where to focus energy conservation initiatives

Primary Department

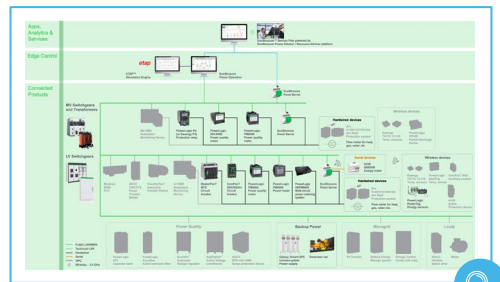
- Facility Operations & Maintenance

Benefits

- Bring awareness to utility consumption
 - Turn data into easy-to-interpret graphical dashboards and reports to raise awareness amongst key stakeholders
- Identify “quick-win” opportunities for energy savings
 - By comparing and visualizing energy usage and cost for different utilities over different time periods
 - By identifying and prioritizing which areas lend themselves to a high energy-saving return on investment



Energy Usage Analysis Dashboards in EcoStruxure Power Operation

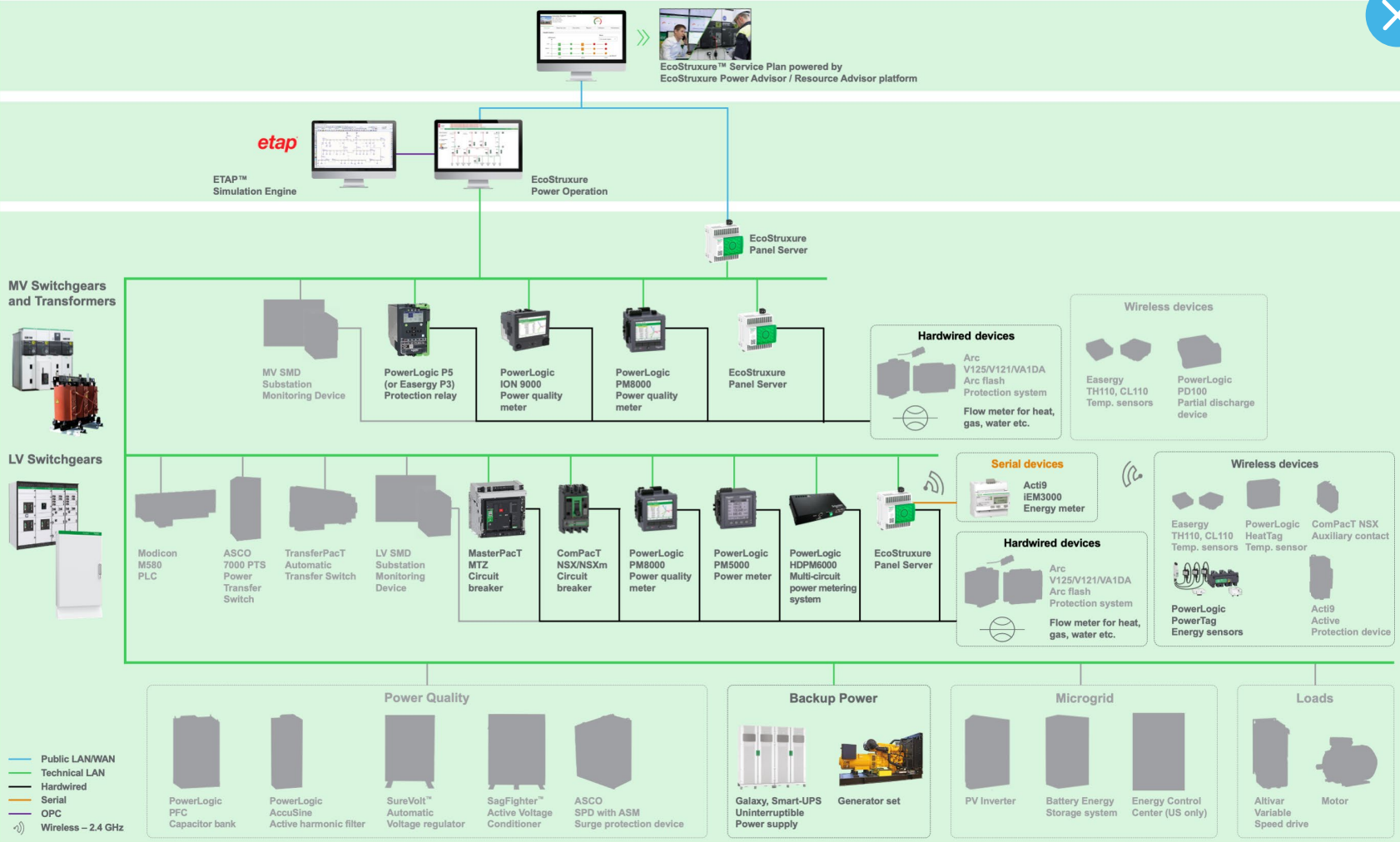


Energy Monitoring and Usage Analysis Reference Architecture

Apps, Analytics & Services

Edge Control

Connected Products





Energy Performance, Modeling and Verification



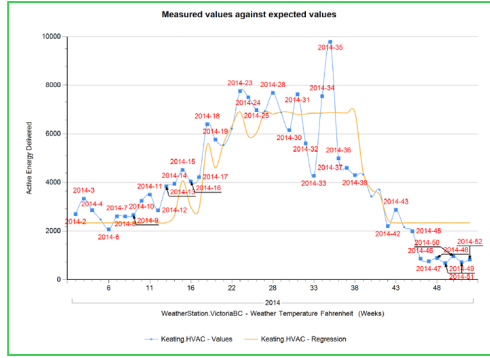
Analyze the energy performance of a plant against a model baseline

Primary Department

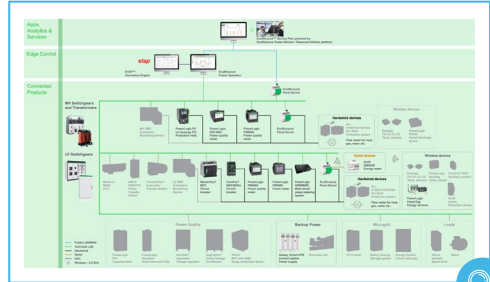
- Facility Operations & Maintenance

Benefits

- Provide energy usage information based on equipment and processes
- Compare model versus actual consumption
- Compare pre-retrofit versus post-retrofit energy consumption to track improved performance and savings as a result of energy conservation initiatives



Energy Performance, Modeling and Verification Output in EcoStruxure Power Operation

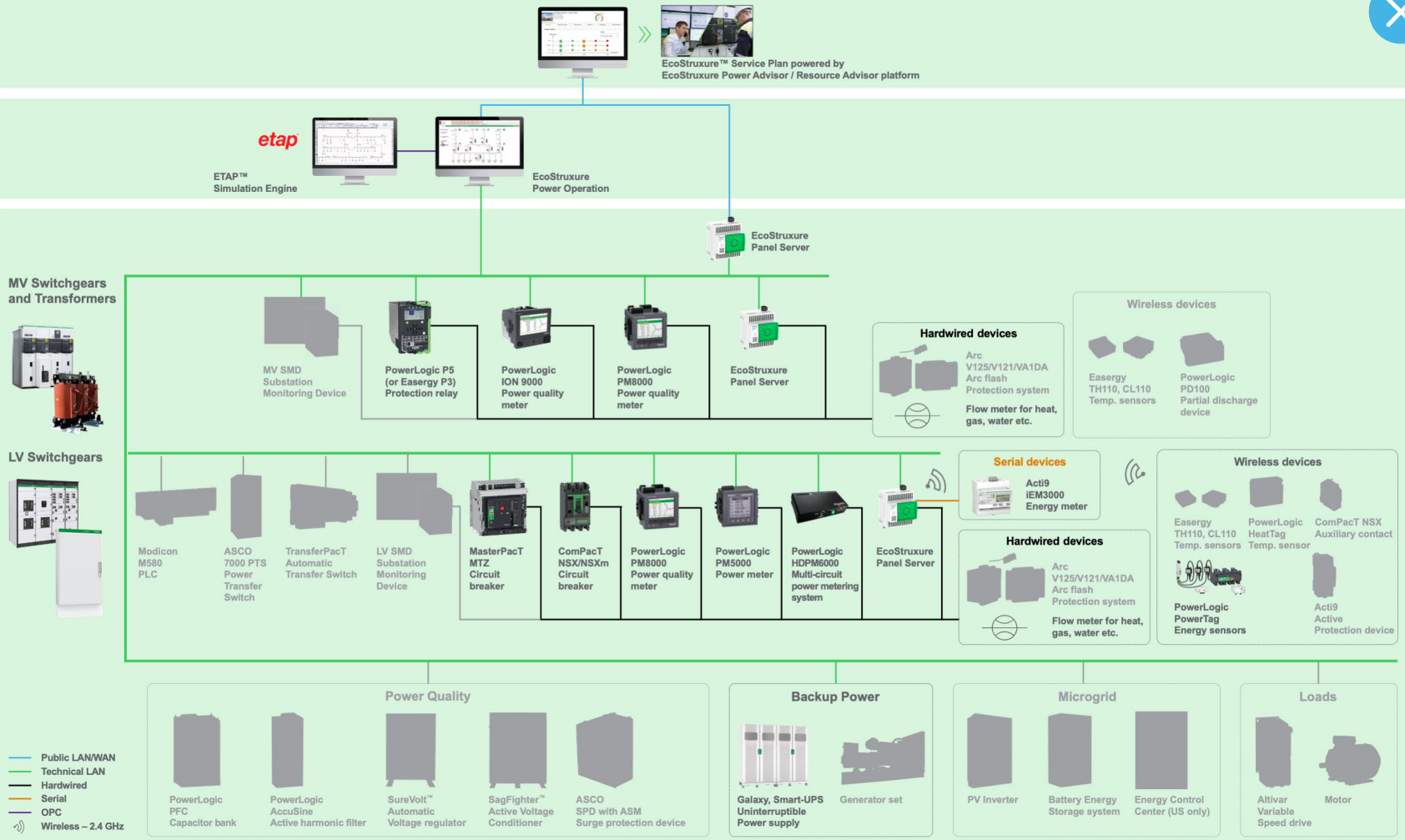


Energy Performance, Modeling and Verification Reference Architecture

Apps,
Analytics &
Services

Edge Control

Connected
Products



Capacity Management



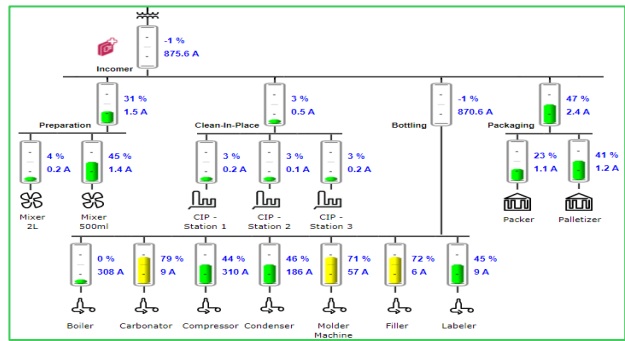
Monitor the capacity of electrical distribution

Primary Department

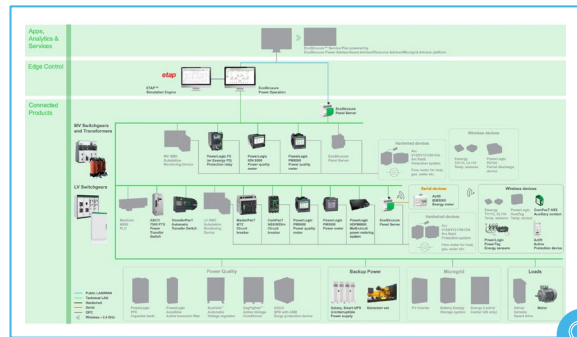
- Facility Operations & Maintenance

Benefits

- Monitor electrical network capacity
- Track and review capacity efficiency
- Minimize downtime by tracking the capacity of transformers, circuit breakers, UPSs, generators, etc.



Breaker Capacity Single-line Diagram in EcoStruxure Power Operation

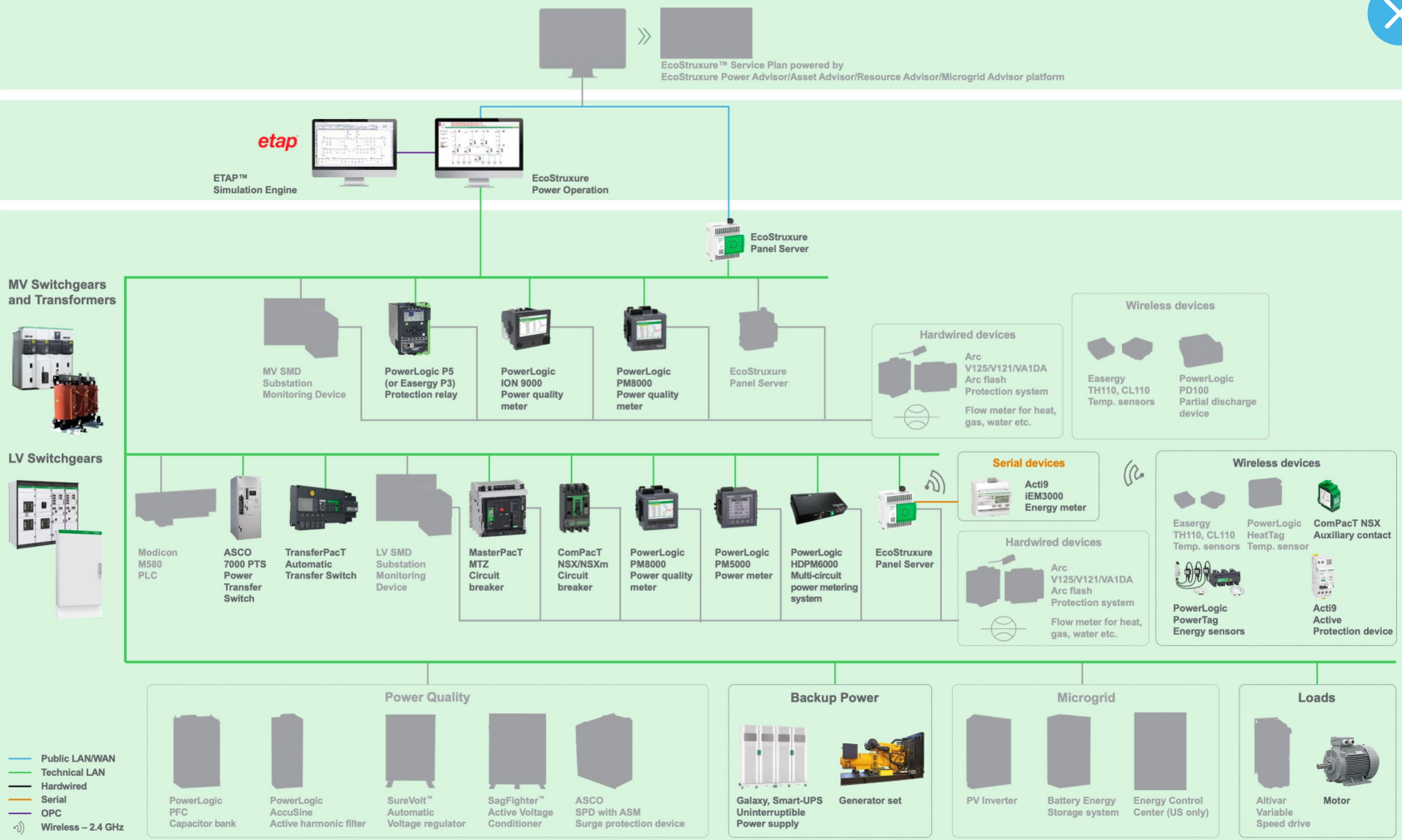


Capacity Management Reference Architecture

Apps,
Analytics &
Services

Edge Control

Connected
Products



SECTION 1 – Introduction to the
Semiconductor Fab IndustrySECTION 2 – How EcoStruxure Power
Can Support the Semiconductor FabSECTION 3 – Digital Solutions
and Services

Introduction

Overview of Digital Solutions and Services

Transverse Lifecycle Capabilities

Capabilities to Improve Time to Market

Capabilities to Increase Efficiency

Capabilities to Improve Resiliency

Capabilities to Grow Sustainability

BIBLIOGRAPHY



Life Is On

Schneider
Electric

Capabilities to Improve Resiliency

**Design, Build, Commission**
(Consultants & EPC)**Improve
Time to Market**

- AC&DC electrical network bus design and simulation
- Electrical network short circuit simulation
- Network load flow and voltage drop simulation
- Device coordination and selectivity
- Arc fault protection and coordination
- Power quality simulation and modeling
- Renewable & microgrid energy storage sizing simulation
- Power system study

**Operate & Maintain**
(Operators, maintenance team, service teams)**Increase
Efficiency**

- Operator training simulation
- Energy monitoring and usage analysis
- Energy performance, modeling and verification
- Capacity management

**Improve
Resiliency**

- + Predictive simulation
- + Simulate before Operate
- + Electrical distribution monitoring and alarming
- + Power event analysis
- + Asset performance
- + Power quality monitoring and compliance
- + Power quality and power factor correction
- + Thermal and partial discharge monitoring
- + Arc flash protection

**Grow
Sustainability**

- Carbon neutrality consulting services
- Energy efficiency compliance
- Greenhouse gas reporting

Transverse Lifecycle Capabilities

Electrical Digital Twin

Green Premium

Cybersecurity

SECTION 1 – Introduction to the Semiconductor Fab Industry

SECTION 2 – How EcoStruxure Power Can Support the Semiconductor Fab

SECTION 3 – Digital Solutions and Services

Introduction

Overview of Digital Solutions and Services

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BIBLIOGRAPHY



Life Is On

Schneider
Electric

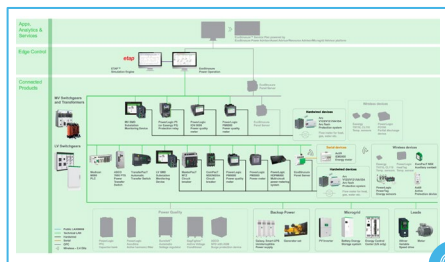
Help employees make better decisions

Primary Department

- Facility Engineering
- Design Engineering

Benefits

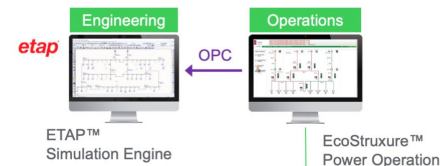
- Reduce safety risks by practicing emergencies and high-risk situations
- Enhance operational efficiency by running “what-if” scenarios
- Provide faster analysis response to incidents



Predictive Simulation Reference Architecture

2 Simulation of the Installation

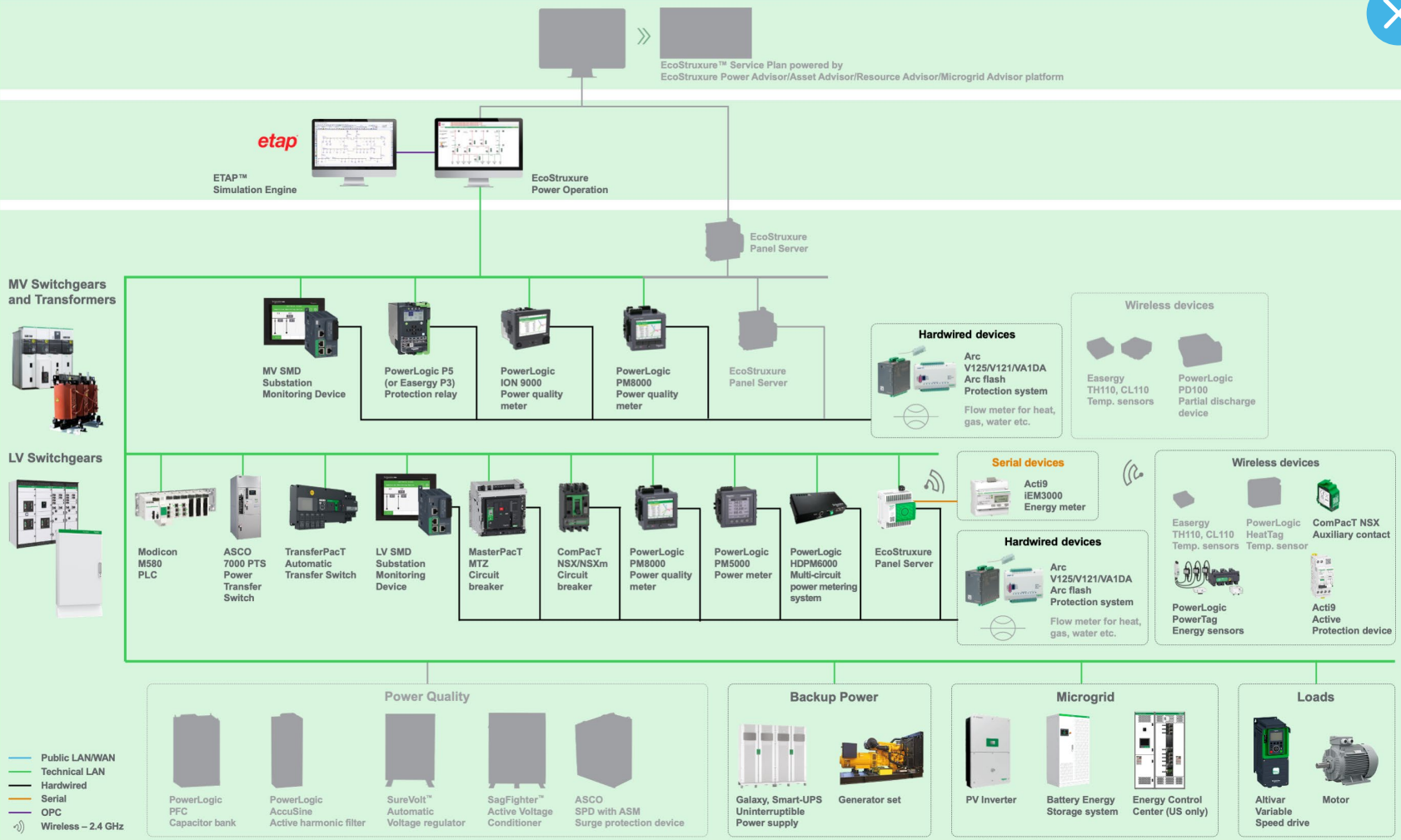
- ETAP Simulation Engine collects real data of the electrical installation from EcoStruxure Power Operation
- Design Engineers can test electrical modifications of the installation with ETAP calculation platform



1 Data Acquisition (from field devices)



Principle of Predictive Simulation Application





Simulate Before Operate

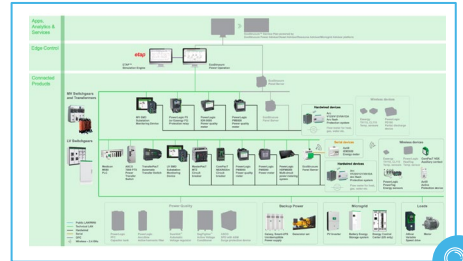
Empower operators with predictive outcomes

Primary Department

- Facility Operations & Maintenance

Benefits

- Provide operators with a list of potential side effects, prior to executing a command
- Empower employees to feel more confident when operating their facilities by providing real time guidance
- Reduce human error that could lead to outages or safety concerns



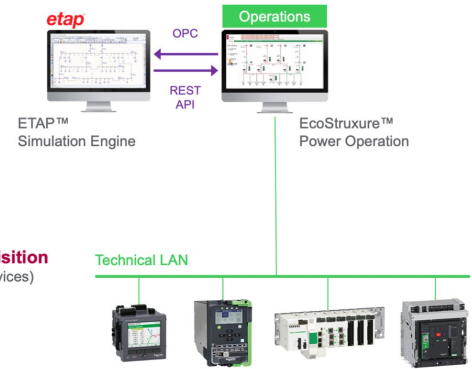
Simulate before Operate Reference Architecture

2 Simulation of the Operation Test

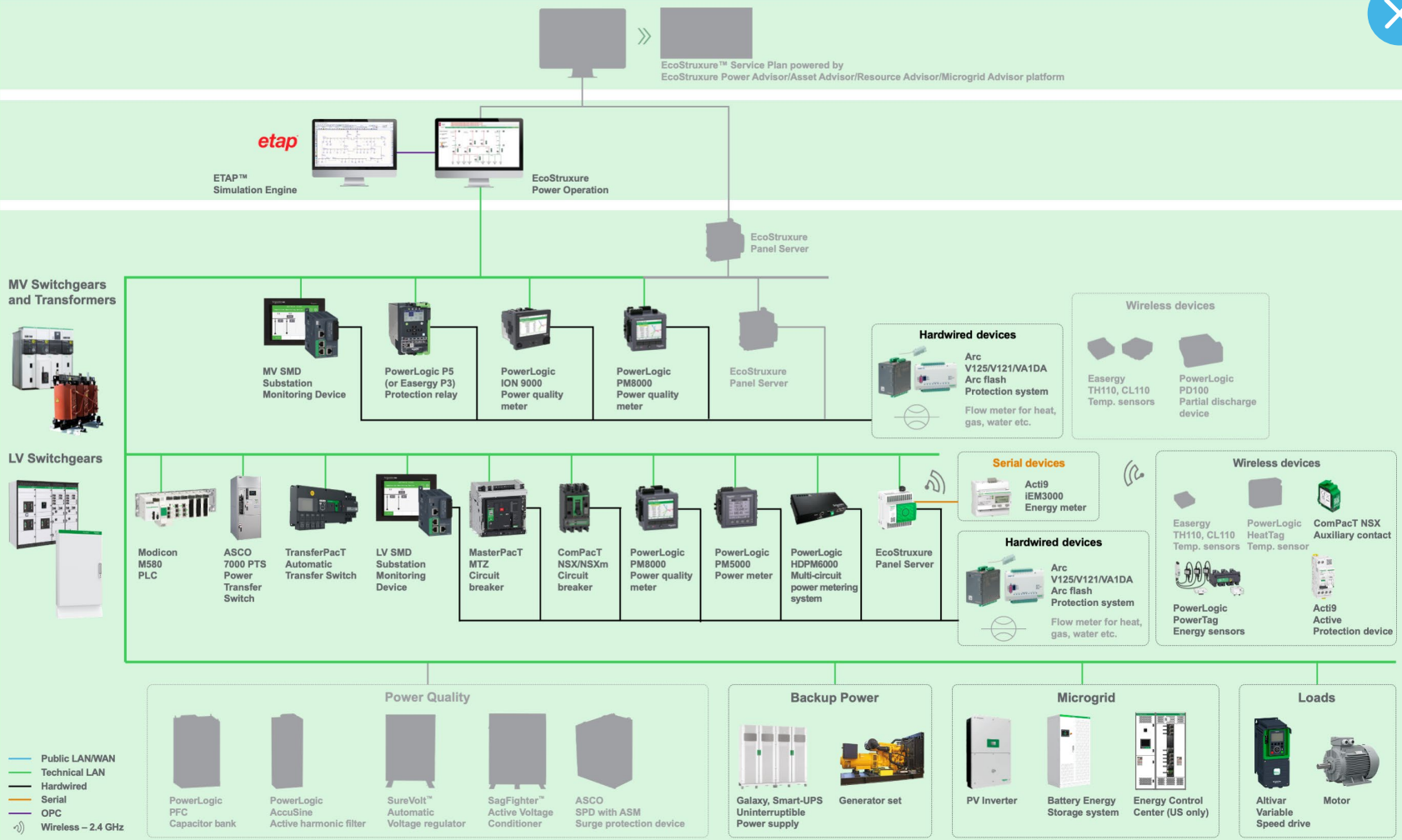
- Operator defines in EcoStruxure Power Operation the action to be simulated prior to execution
- ETAP Simulation Engine simulates action using live data from EcoStruxure Power Operation

3 Delivery of Simulation Results

- Operator receives in EcoStruxure Power Operation real time simulated results of proposed actions
- Based on the results, operator decides to execute action or not



Principle of Simulate before Operate Application



Electrical Distribution Monitoring and Alarming



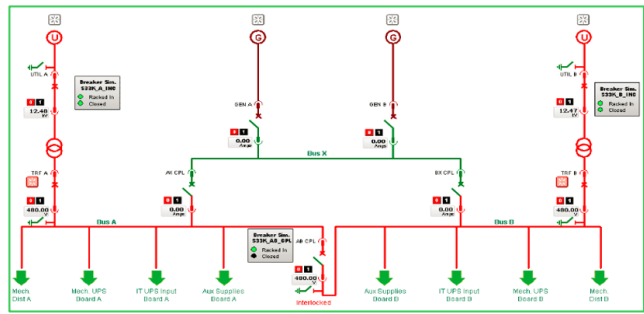
Monitor and control electrical network

Primary Department

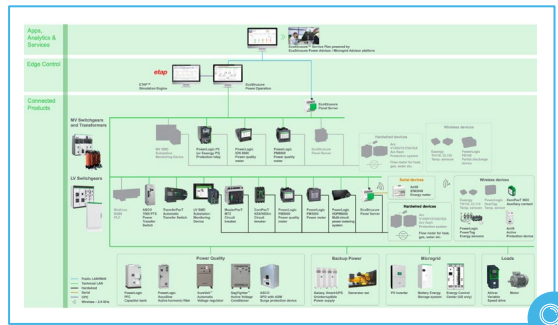
- Facility Operations & Maintenance

Benefits

- Show real-time status of the power distribution
- Customized single-line diagram
- 24/7 power monitoring and alarm notification



Electrical Distribution Monitoring and Alarming Single-line Diagram in EcoStruxure Power Operation

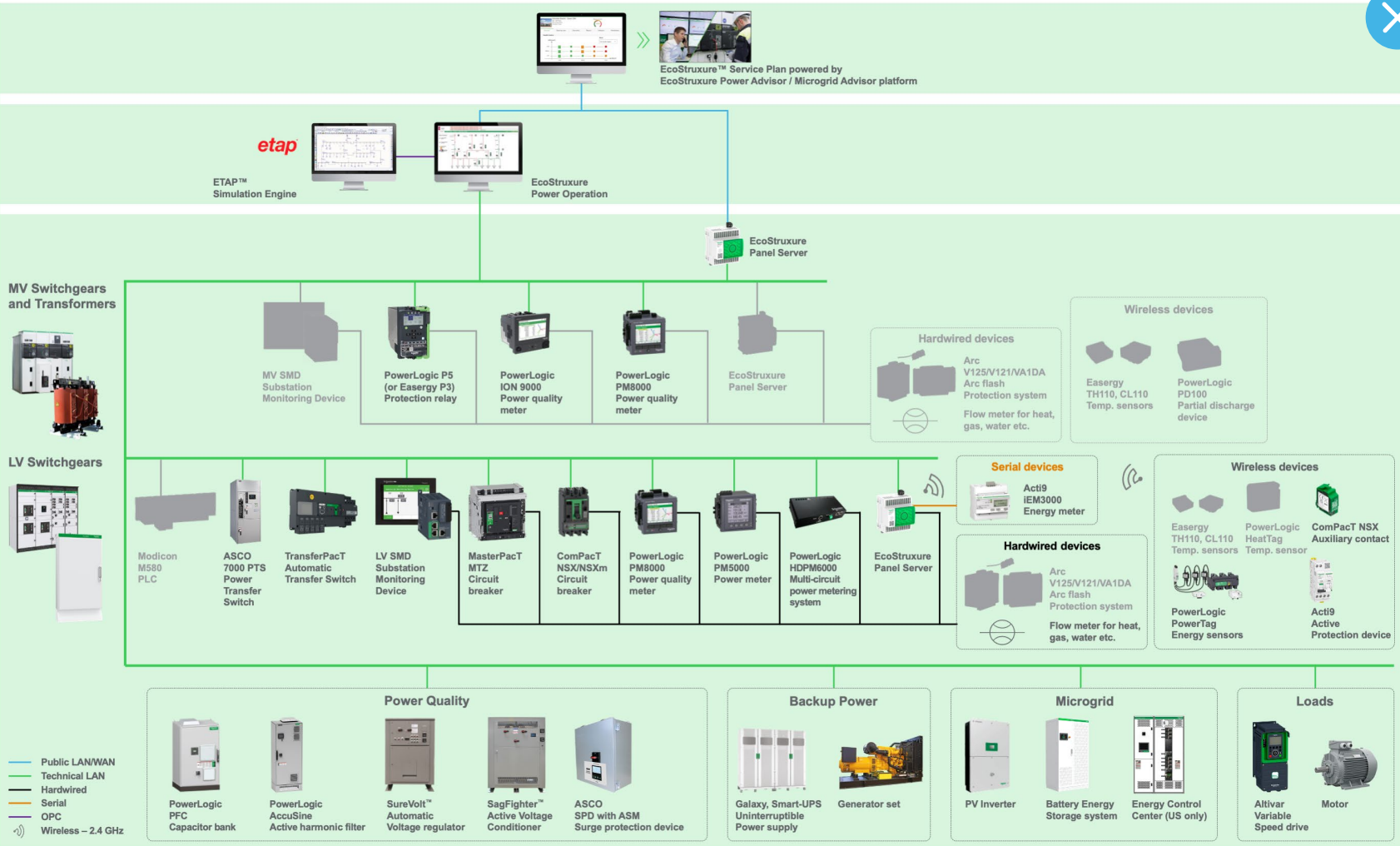


Electrical Distribution Monitoring and Alarming Reference Architecture

Apps, Analytics & Services

Edge Control

Connected Products





Power Events Analysis



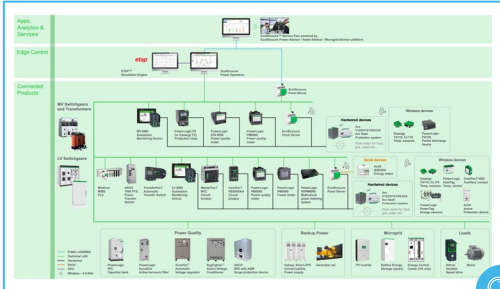
Analyze the root causes of electrical events

Primary Department

- Facility Operations & Maintenance

Benefits

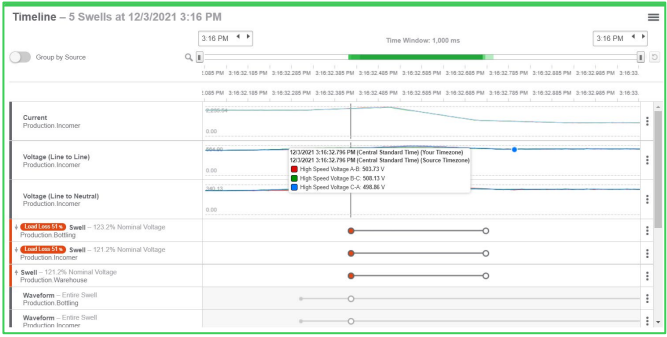
- Automatically classifies and describes any electrical events
- Uses system intelligence to determine root cause and location of events
- Shows context and sequence of events using the timeline analysis interface



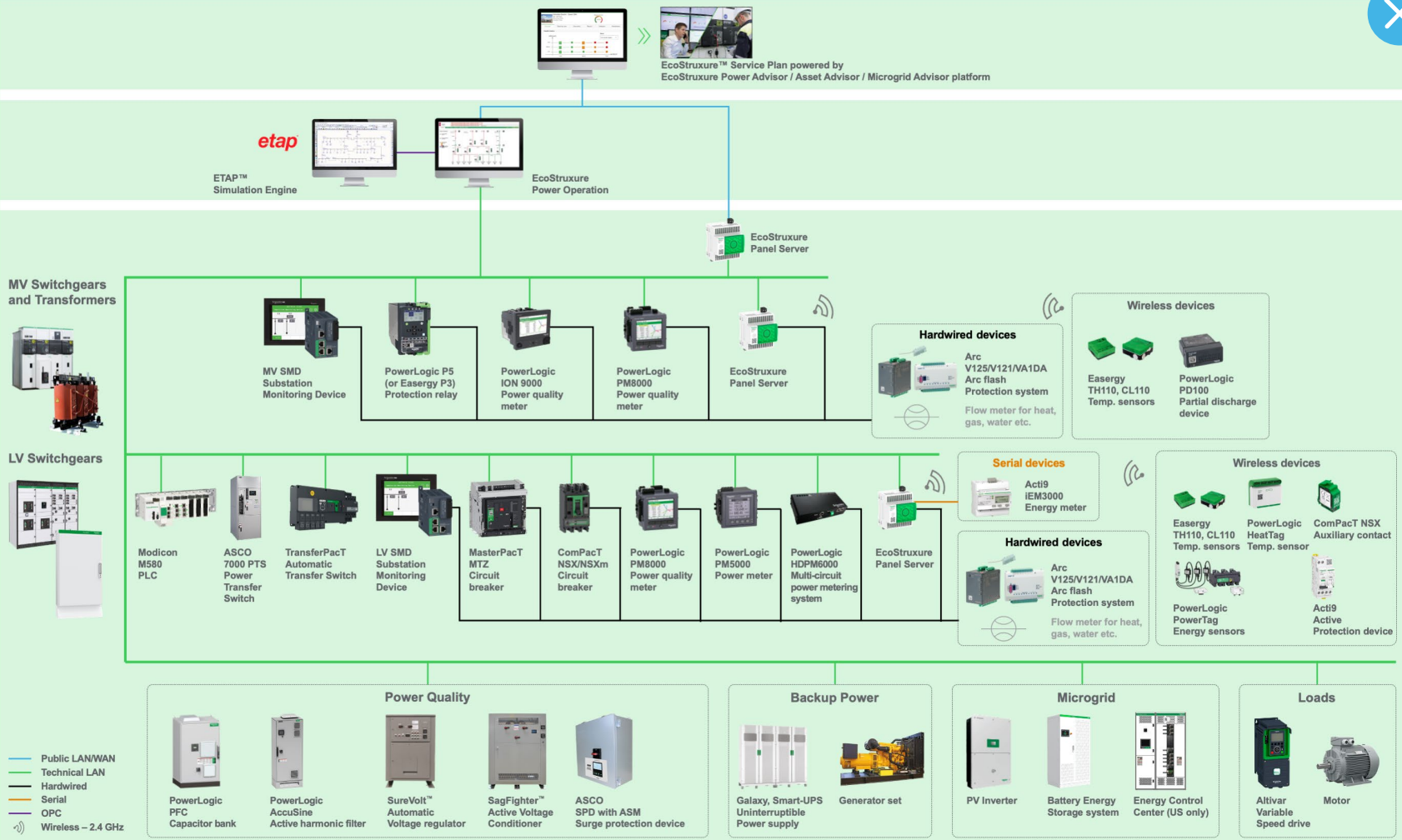
Power Events Analysis Reference Architecture

Alarm Status – All Alarms						Update in 14:37	Search Alarm Display
State	Name	Type	Source	Last Occurrence	Occurrences		
3 days 22 hr ago	Transient	Transient	Production Inciner	12/4/2021 5:38:19:176 PM	10		
5 days 1 hr ago	Swell (Voltage)	Swell (Voltage)	Production Preparation	12/3/2021 3:16:32:442 PM	1		
5 days 1 hr ago	Swell (Voltage)	Swell (Voltage)	Production CleanInPlace	12/3/2021 3:16:32:422 PM	1		
5 days 1 hr ago	Swell (Voltage)	Swell (Voltage)	Production Bottling	12/3/2021 3:16:32:421 PM	1		
5 days 1 hr ago	Swell (Voltage)	Swell (Voltage)	Production Warehouse	12/3/2021 3:16:32:421 PM	1		
5 days 1 hr ago	Swell (Voltage)	Swell (Voltage)	Production Inciner	12/3/2021 3:16:32:421 PM	1		
5 days 1 hr ago	Process Impact Alarm – Current Avg	General Setpoint	Bottling Boiler	12/3/2021 3:16:29:000 PM	1		
9 days 0 hr ago	Switchgear Monitoring – Transformer 01 Pre-Alarm	Thermal Monitor	MY SMD	11/29/2021 4:04:43:000 PM	1		

Event and Alarm Status view in EcoStruxure Power Operation



Event and Alarm Status Timeline in EcoStruxure Power Operation





Asset Performance



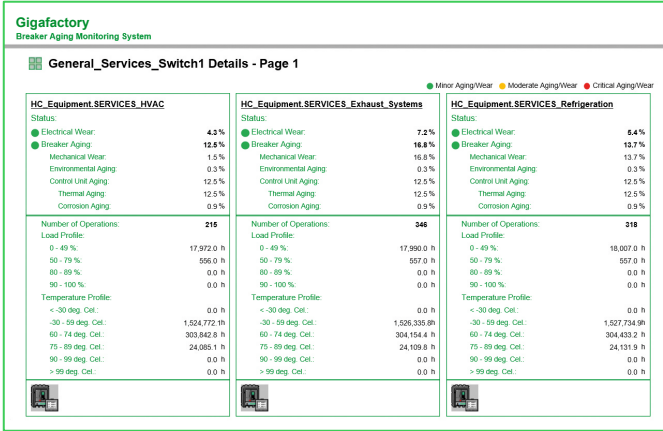
Benefit from a strategic maintenance approach

Primary Department

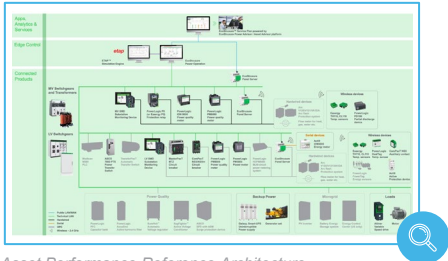
- Facility Operations & Maintenance

Benefits

- Move from reactive or preventive to condition-based (predictive) maintenance strategies for critical assets like circuit breakers, gensets, transformers, etc.
- Provide event details and notification to the operator if a protection setting has been changed
- Receive notifications and diagnostics reports from expert service engineers with recommendations to optimize maintenance by asset or site



Aging Diagram for Circuit Breakers in EcoStruxure Power Operation

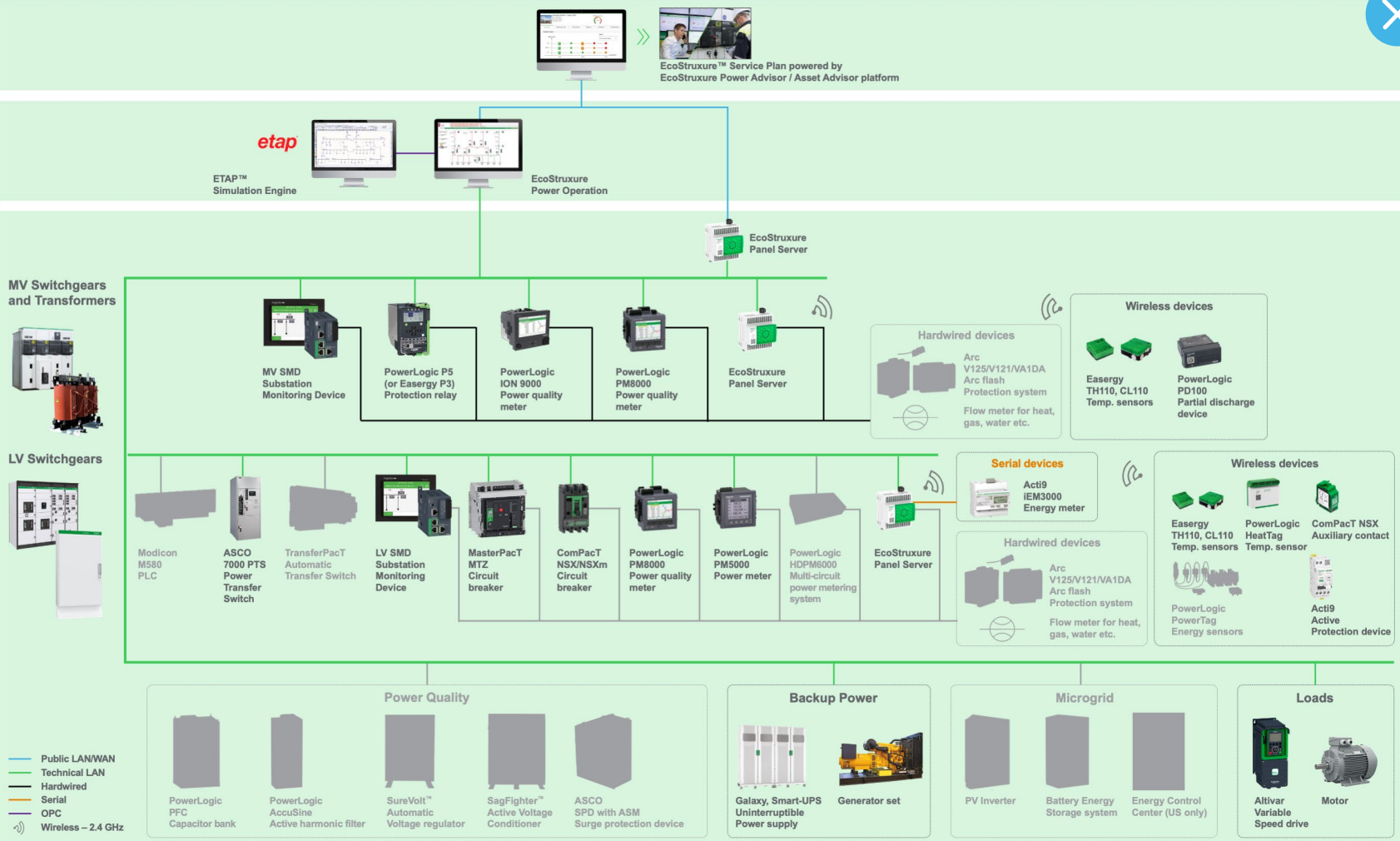


Asset Performance Reference Architecture

Apps,
Analytics &
Services

Edge Control

Connected
Products





Power Quality Monitoring and Compliance

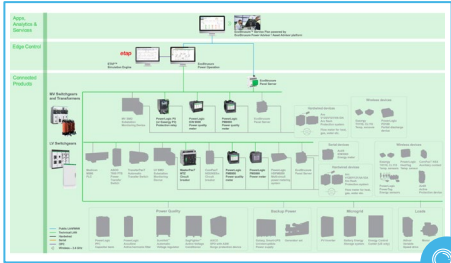
Gain insights to improve power quality and comply with standards

Primary Department

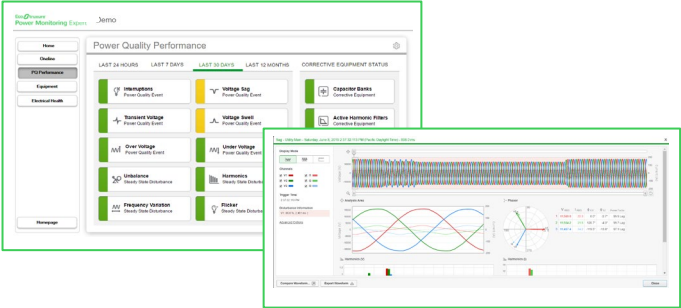
- Facility Operations & Maintenance

Benefits

- Bring awareness of power quality
- Enhance operational efficiency by making sure clean power is fed to sensitive process equipment
- Help protect sensitive equipment by tracking power quality problems before they arise



Power Quality Monitoring and Compliance Reference Architecture



Power Quality and Compliance Dashboards in EcoStruxure Power Operation

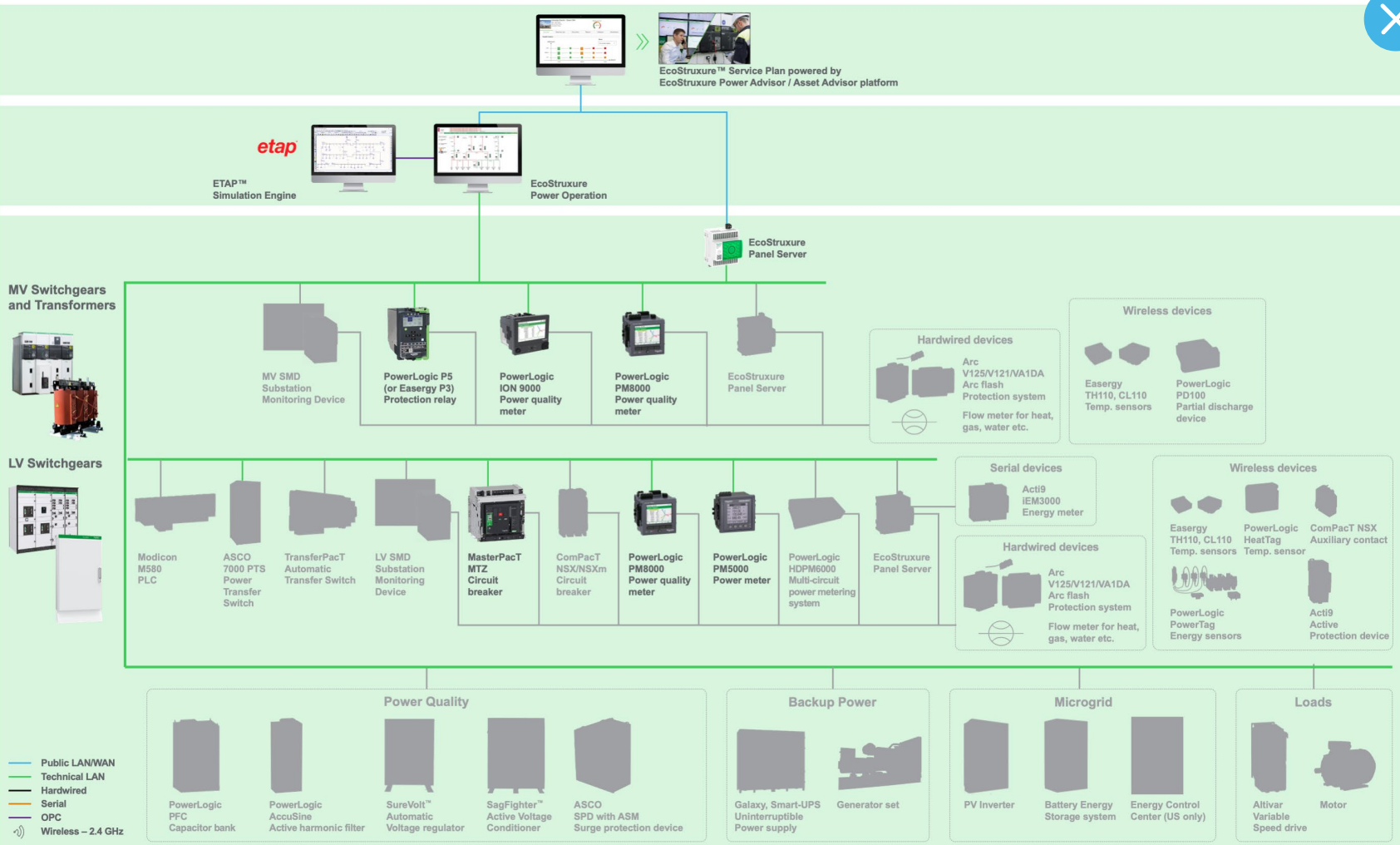
Schneider Electric		EN50160									
		4/12/2016 12:00:00 AM - 5/12/2016 12:00:00 AM (Server Local)									
Complete Compliance in this Summary?		No									
Vi	tram.DataCent	Power Frequency	Supply Voltage Magnitude	Flicker	Supply Voltage Dips	Short And Long Interruptions	Temporary Overvoltages	Supply Voltage Unbalance	Harmonic Voltage	Inharmonic Voltage	
er_Lab											
Observation 1	4/16/2016	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	
Observation 2	4/23/2016	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	
Observation 3	4/30/2016	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	
Observation 4	5/7/2016	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	

Power Quality and Compliance Report in EcoStruxure Power Operation

Apps,
Analytics &
Services

Edge Control

Connected
Products





Power Quality and Power Factor Correction



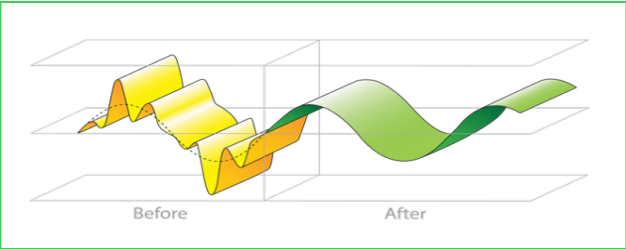
Help protect sensitive equipment from power quality issues

Primary Department

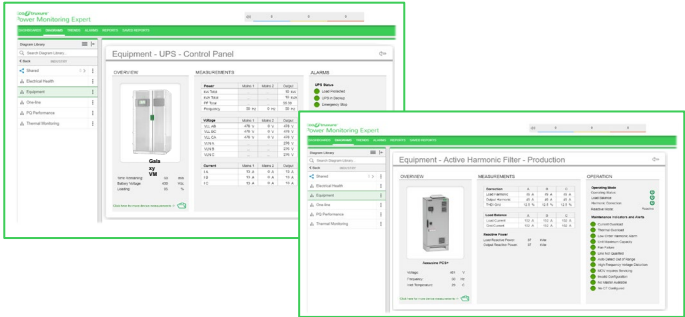
- Facility Operations & Maintenance

Benefits

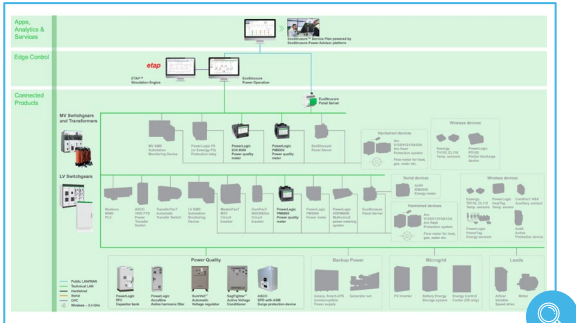
- Monitor sensitive process lines and busbars
- Provide clean power to sensitive process equipment
- Track Power Quality problems to help avoid downtime
- Reduce financial impact of power factor on energy bill



Before and After Power Quality Correction Implementation



Power Quality Information in EcoStruxure Power Operation

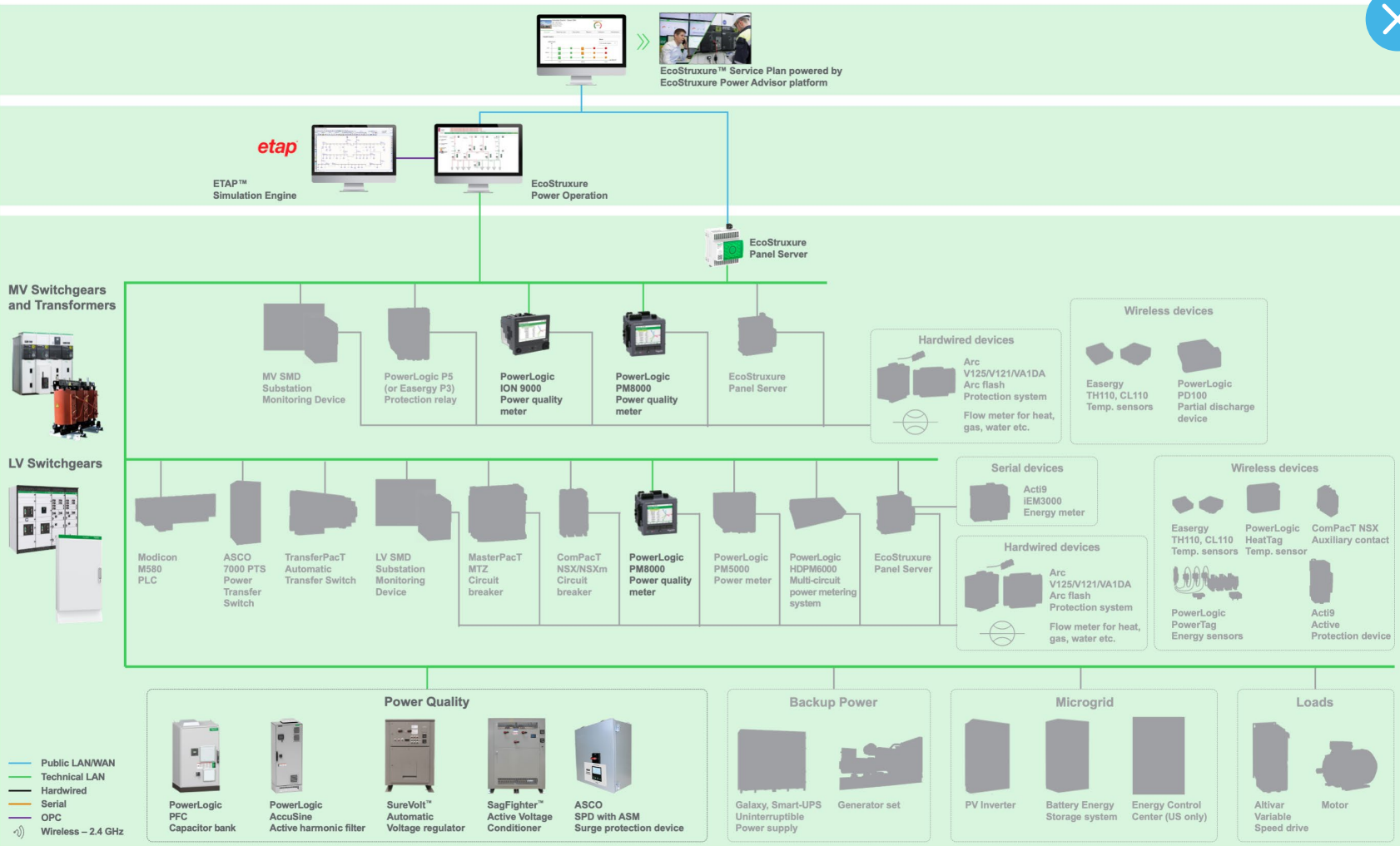


Power Quality and Power Factor Correction Reference Architecture

Apps, Analytics & Services

Edge Control

Connected Products





Continuous Thermal Monitoring & Partial Discharge Monitoring EcoStruxure™

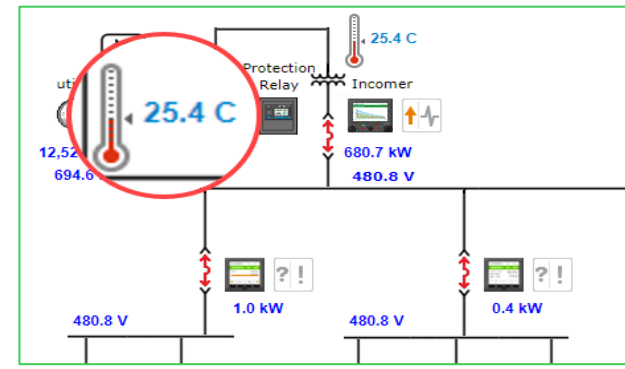
Help prevent electrical fires and help protect employees and equipment

Primary Department

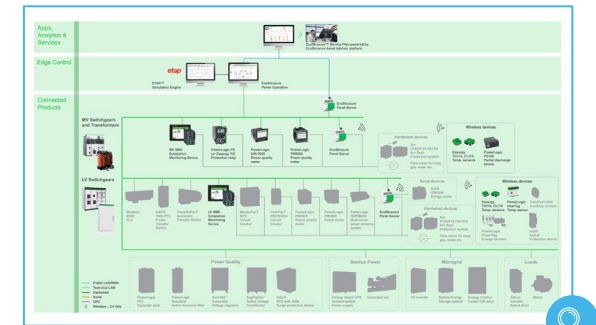
- Facility Operations & Maintenance

Benefits

- Provide early detection of internal arcing or temperature abnormalities in equipment that can cause damage
 - To help reduce the risk of equipment and electrical room damage
 - To improve service continuity
- Enable optimized maintenance schedules by providing continuous monitoring vs calendar-based service



Continuous Thermal Monitoring in the Single-line Diagram of EcoStruxure Power Operation

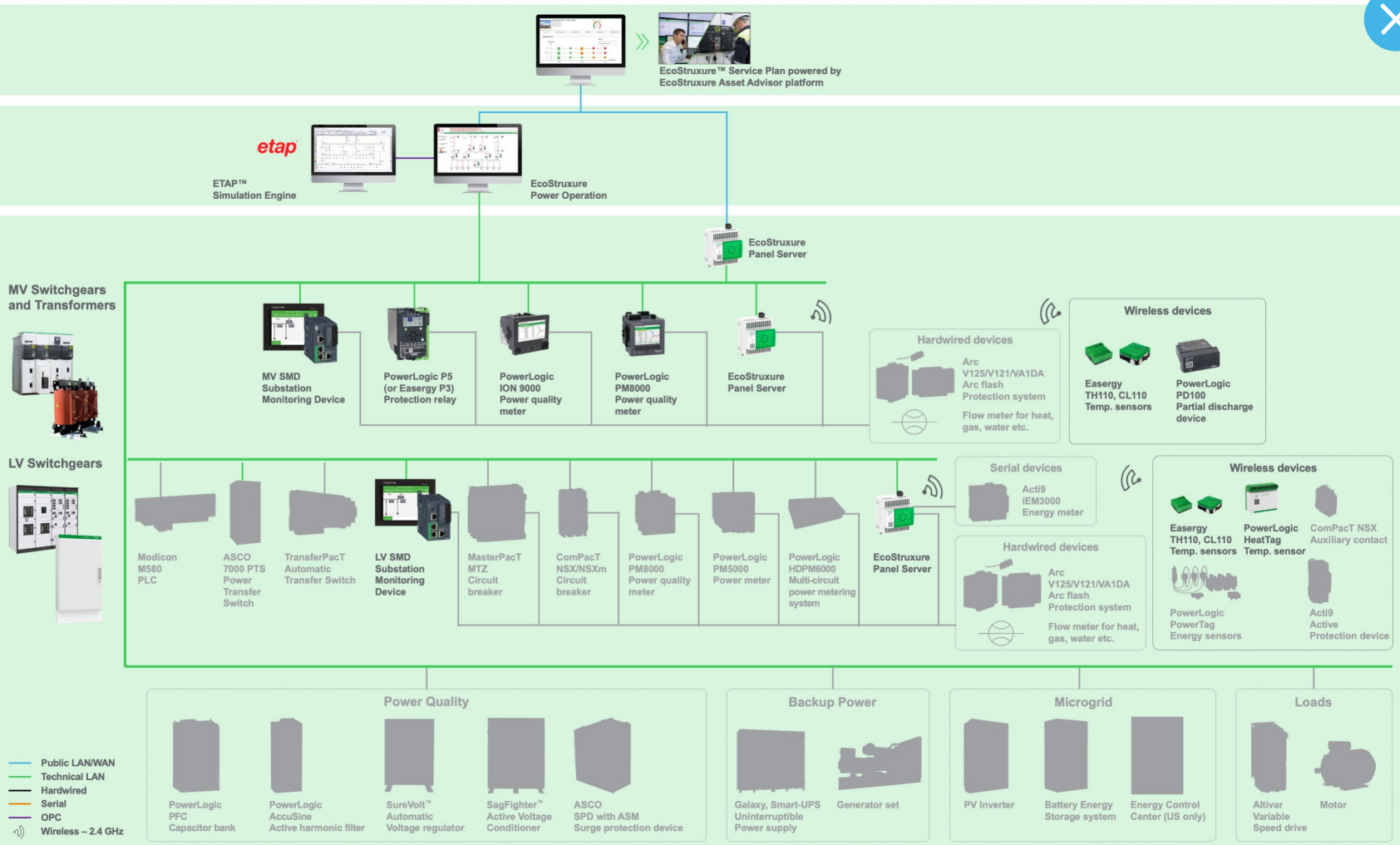


Continuous Thermal Monitoring & Partial Discharge Monitoring Reference Architecture

Apps,
Analytics &
Services

Edge Control

Connected
Products





Arc Flash Protection

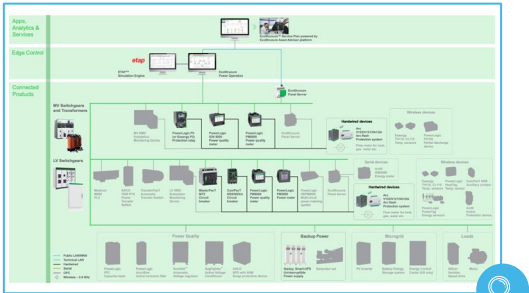
Help protect employees and equipment

Primary Department

- Facility Operations & Maintenance

Benefits

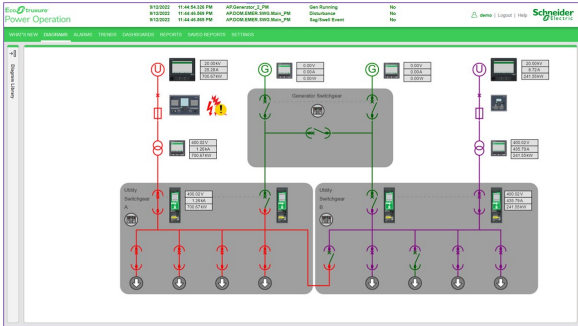
- Help prevent loss of life and reduce the risk of equipment and electrical room damage
- Improve maintenance team awareness to help troubleshoot and identify the root cause of arc flash events



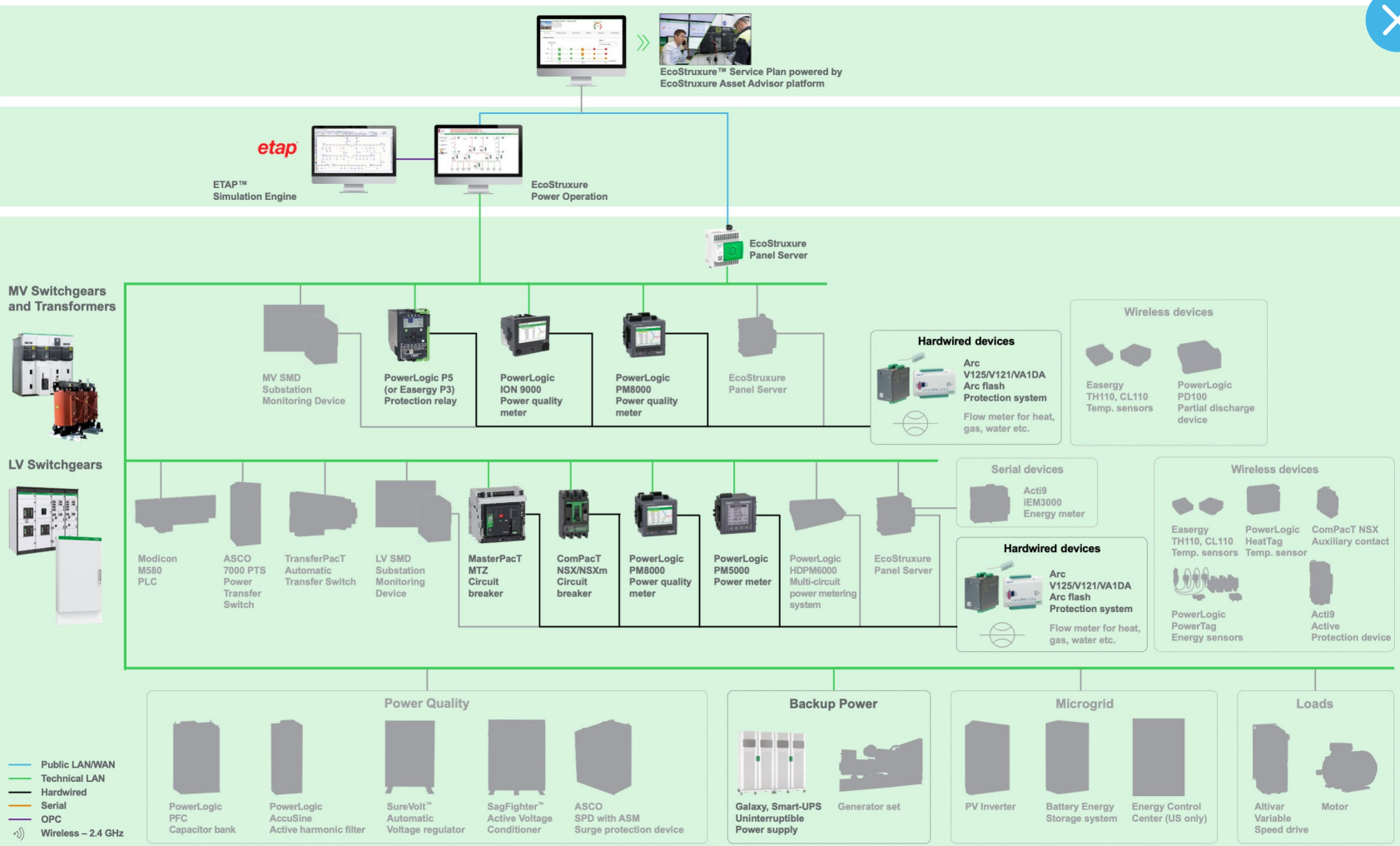
Arc Flash Protection Reference Architecture



Arc Flash in a Switchboard

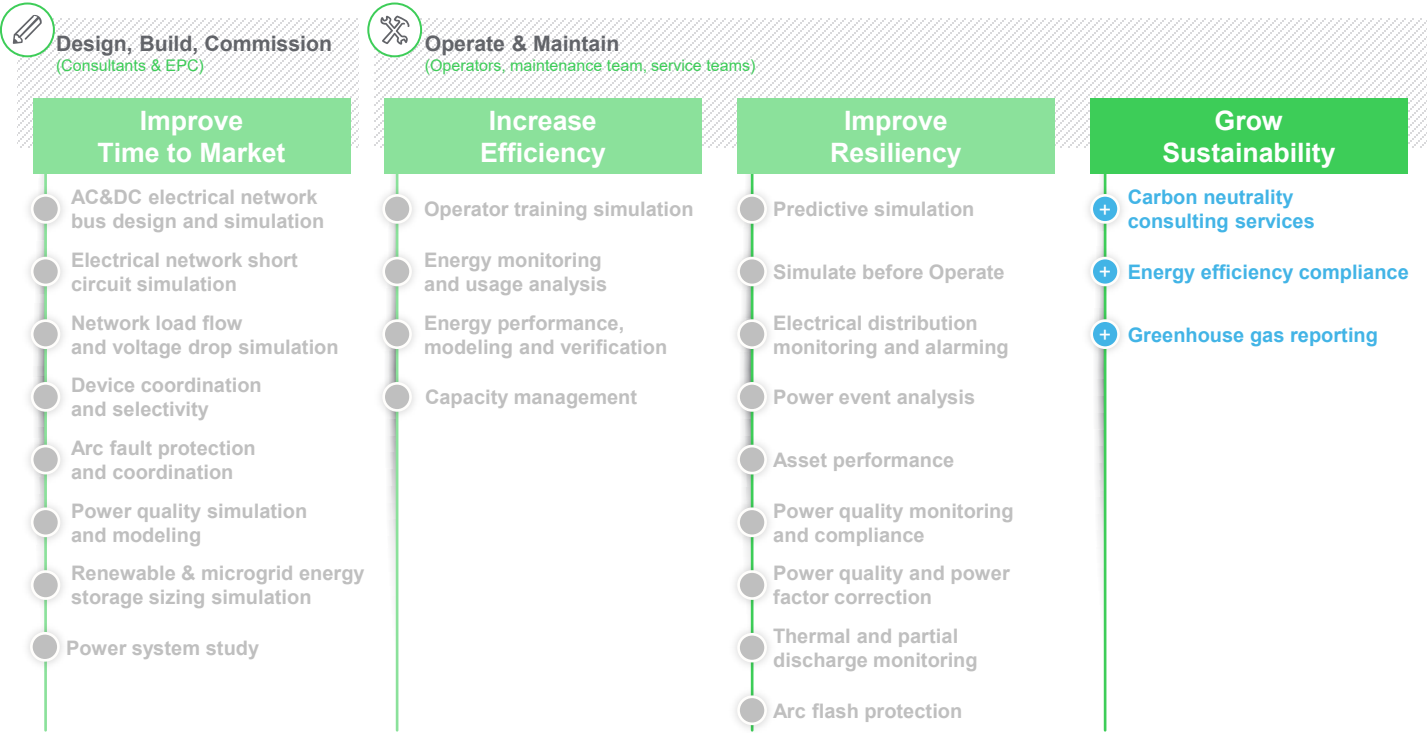


Arc Flash Alert and Location in EcoStruxure Power Operation





Capabilities to Grow Sustainability



Transverse Lifecycle Capabilities
Electrical Digital Twin
Green Premium
Cybersecurity

Carbon Neutrality Consulting Services

Track and reduce carbon emissions to demonstrate the carbon neutrality of the company

Primary Department

- Facility Operations & Maintenance
- Sustainability Office

Benefits

- Get support from our consulting services to define your strategy for achieving carbon neutrality

Carbon neutrality		
1 Reduce Carbon Emissions	2 Produce Renewable Energy	3 Purchase Renewables/Offsets
Energy Efficiency <ul style="list-style-type: none">• Sustainable building design & operations<ul style="list-style-type: none">– HVAC Efficiency– Lighting Efficiency– Operational Efficiency	Behind-the-Meter Renewables <ul style="list-style-type: none">• Solar Panels / Heating• Wind• Geothermal Supporting Technologies <ul style="list-style-type: none">• Microgrid with Smart Management• Battery Storage• Fuel Cells	Purchase Renewables <ul style="list-style-type: none">• Renewable Power Purchasing Agreements (PPA)• Renewable Energy Certificates (REC)• Biofuels Purchase Offsets <ul style="list-style-type: none">• Carbon Credits<ul style="list-style-type: none">– Carbon Capture– Tree Planting



Energy Efficiency Compliance



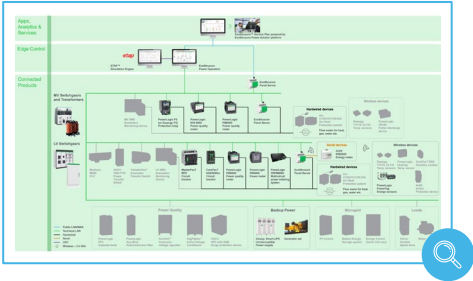
Comply with standards related to energy management systems

Primary Department

- Facility Operations & Maintenance
- Sustainability Office

Benefits

- Report and show facility compliance to local sustainability requirements
 - To benefit from tax credits
 - To gain credibility to participate in new projects



Energy Efficiency Compliance Reference Architecture



Sustainable Organizations and Standards



EcoStruxure Resource Advisor Dashboard in EcoStruxure Power Operation

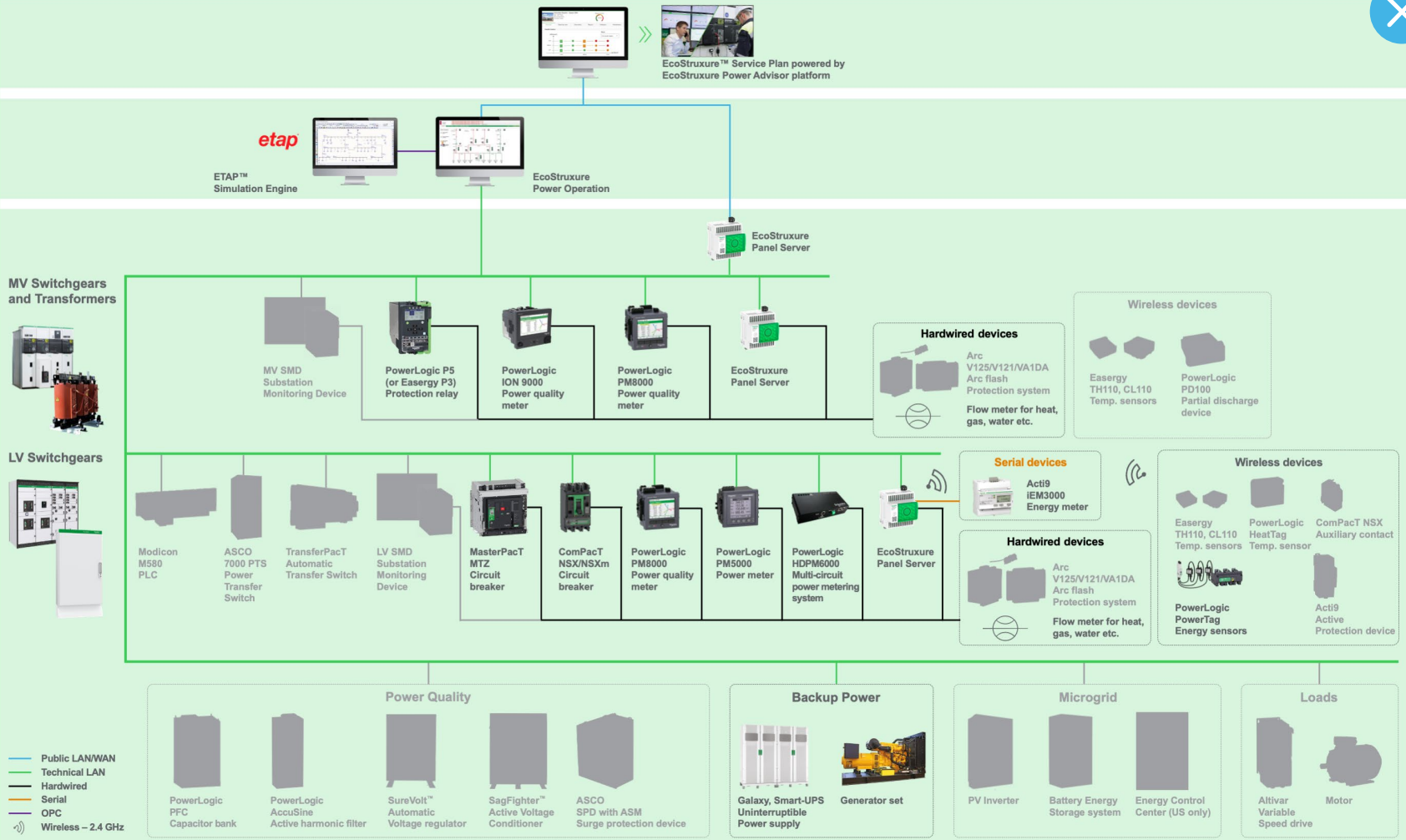


EcoStruxure Power Operation Energy Star Compliance Dashboard

Apps,
Analytics &
Services

Edge Control

Connected
Products





Greenhouse Gas Reporting



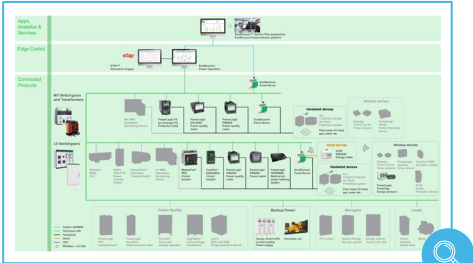
Track and report carbon emissions

Primary Department

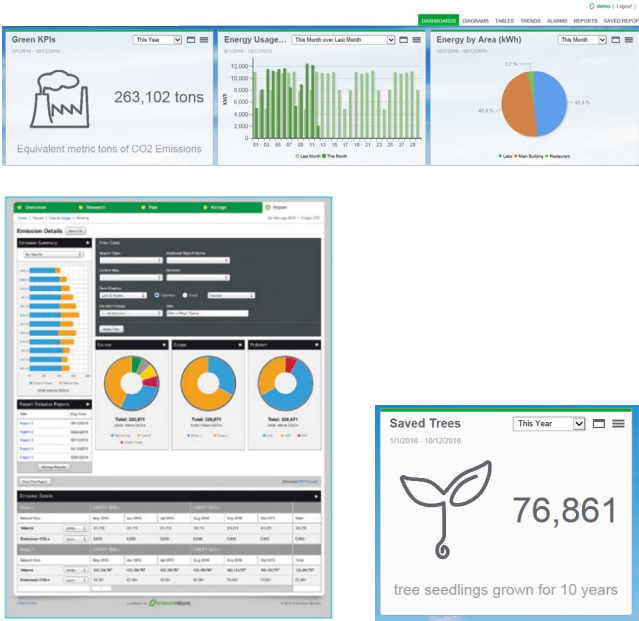
- Facility Operations & Maintenance
- Sustainability Office

Benefits

- Track and report carbon emissions and waste (e.g., water) in one single place
- Provide period-over-period usage comparison to detect a drift



Greenhouse Gas Reporting Reference Architecture

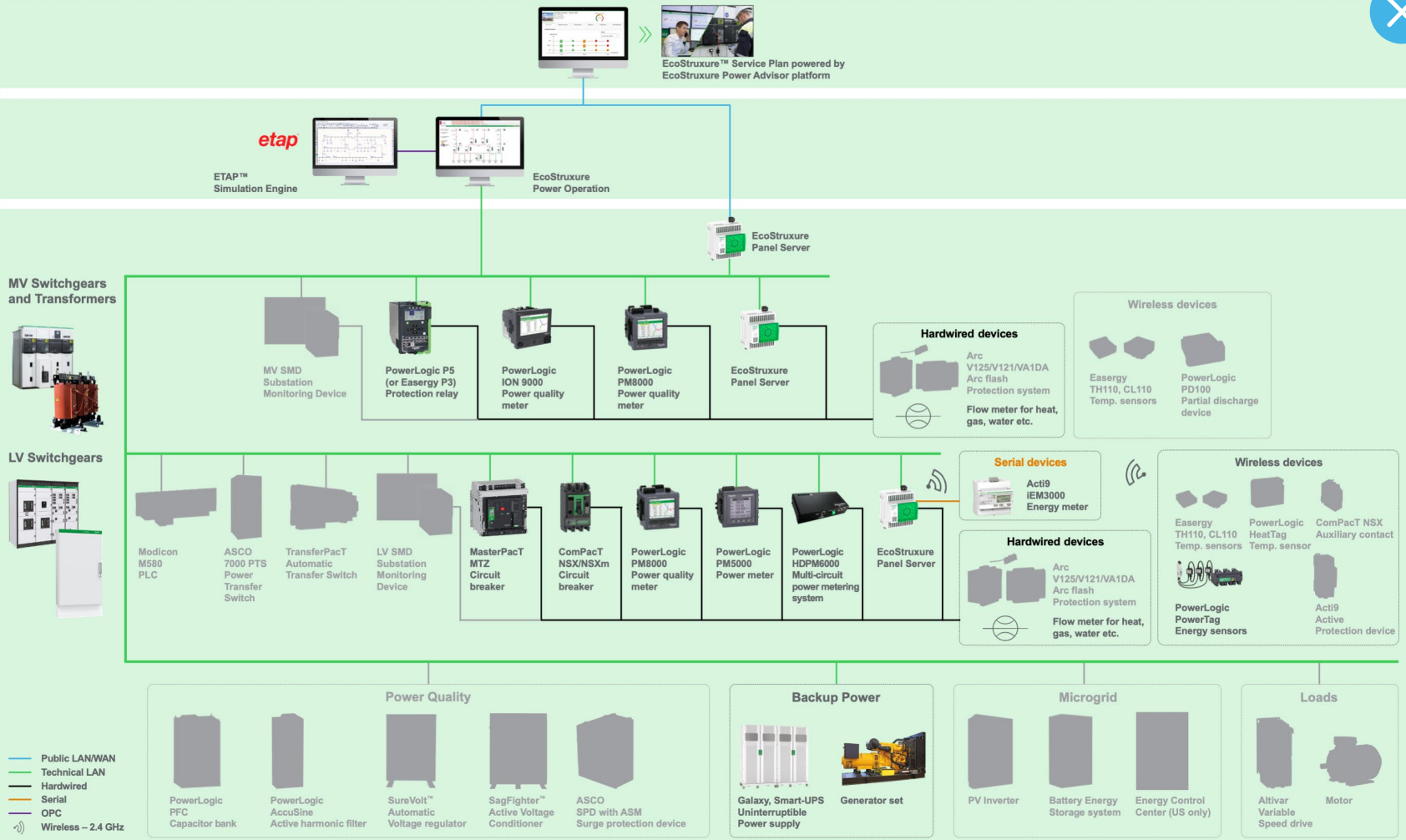


Greenhouse Gas Reporting and Dashboard Examples in EcoStruxure Power Operation

Apps,
Analytics &
Services

Edge Control

Connected
Products



SECTION 1 – Introduction to the
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SECTION 2 – How EcoStruxure Power
Can Support the Semiconductor Fab

SECTION 3 – Digital Solutions
and Services

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Life Is On



BIBLIOGRAPHY



Reference Documents

Design Guide



Digital Applications for Large Buildings and Critical Facilities

The Digital Applications Design Guide provides comprehensive details on the building blocks of EcoStruxure™ Power: the IoT applications are driven by a software layer to control the traditional electrical distribution infrastructure.

Developed to help engineering consultants and designers, this guide is an invaluable resource for specifying, designing and prescribing EcoStruxure Power architectures capable of performing one or more of the business-driven applications described within.



IEC EcoStruxure Power Design Guide

Ref: ESXP2G001EN

09/2022

<https://www.se.com/ww/en/download/document/ESXP2G001EN/>



NEMA EcoStruxure Power Design Guide

Ref: 0100DB1802

09/2022

<https://www.se.com/us/en/download/document/0100DB1802/>

Reference Documents

Selection Guide



Digital Applications by Market Segment for Large Buildings and Critical Facilities

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, and industrial facilities. Those applications are presented in the EcoStruxure Power Design Guide, sorted by value proposition. The current document is a supplementary guide to the EcoStruxure Power Design Guide. It proposes a selection of the most appropriate applications, depending on the targeted segment.



IEC EcoStruxure Power Selection Guide
Ref: ESXP2G001EN
09/2021

<https://www.se.com/ww/en/download/document/ESXP2G002EN/>



**SECTION 1 – Introduction to the
Semiconductor Fab Industry****SECTION 2 – How EcoStruxure Power
Can Support the Semiconductor Fab****SECTION 3 – Digital Solutions
and Services****BIBLIOGRAPHY**

Reference Documents

Legal Information ▶

Legal Information

The information provided in this document contains general descriptions and/or technical characteristics of the performance of the described products or services. For detailed specification, performance and instruction of use, refer to corresponding Catalogs and user guides if available.

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Schneider
 **Electric**