3.72 MW, Tier III, IEC, Chilled Water, Liquid-Cooled AI Clusters (NVIDIA B-300)

Design Overview

Data Center IT Capacity
3.72 MW

Target Availability
Tier III

Annualized PUE at Max operating state
Taiwan 1.24

Racks and Density
Total Racks: 56
Rack Power Density:
Networking racks up to 25 kW/rack
Management rack 15kW/rack
AI racks up to 100 kW/rack

Data Center Overall Space
2004 m^2

Regional Voltage and Frequency
380V, 60Hz

About this Design

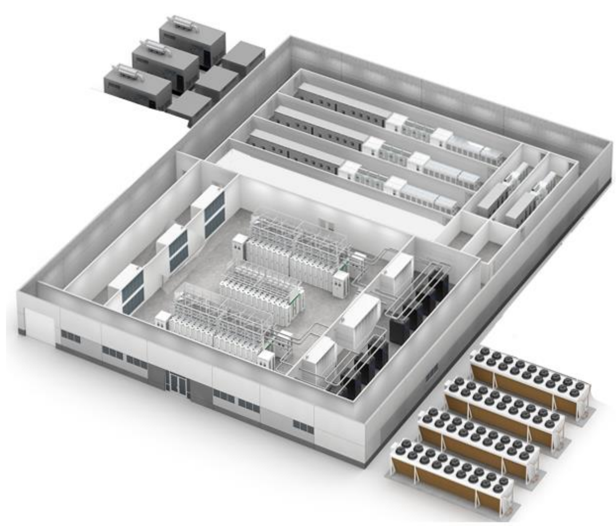
- IT space and power distribution designed to accommodate AI clusters with a density up to 100 kW per rack
- Design optimized to support liquid-cooled racks, with liquid-to-liquid coolant distribution units (CDUs) and Air-Cooled chillers
- Chilled water systems optimized for high water temperatures using *Uniflair FWCV* fan walls and *Uniflair XCAF* air-cooled packaged chillers
- Redundant design for increased availability and concurrent maintainability

Introduction

AI factories and liquid cooling bring new challenges to data center design. Schneider Electric's data center reference designs help shorten the planning process by providing validated, proven, and documented data center physical infrastructure designs to address such challenges. This design focuses on deploying AI infrastructure for AI factories, specifically within a single data hall.

The IT room is purpose-built and optimized for thirty-two B300-like server racks, using *Motivair* floor-mounted liquid-to-liquid CDUs with an Air-cooled chiller. Facility power and cooling design are optimized for capital cost, efficiency, and reliability.

Reference Design 89 includes information on four technical areas: facility power, facility cooling, IT space, and lifecycle software. These areas represent the integrated systems required to meet the design's specifications provided in this overview document.



Facility Power

The facility power system supplies power to all components within the data center. In this concurrently maintainable electrical design, power to the IT space is supplied through three 2 MW powertrains. The three powertrains provide 2+1 distributed redundant UPS power to the IT space, backed up by diesel generators. Each powertrain consists of a 4000-amp *OKKEN* main switchboard feeding two 1000 kW *Galaxy VXL* UPS with 5 minutes of runtime in parallel and a 4000-amp *OKKEN* distribution section. Downstream, these powertrains feed I-Line busways that power the AI racks with 2+1 redundancy and the networking and management racks with 1+1 redundancy. Separately, two 2 MW powertrains feed the chillers with 2N redundancy. They also feed a 500 kW *Galaxy VL* UPS that provides critical power to fan walls, liquid-to-liquid cooling distribution units (CDUs), and facility water system pumps.

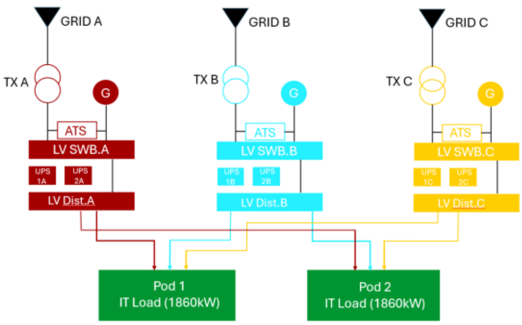
The facility power system is designed to support integrated peripheral devices like fire panels, access control systems, and environmental monitoring and control devices. Power meters in the electrical path monitor power quality and allow for predictive maintenance & diagnostics of the system. These meters also integrate with *EcoStruxure™ Power Monitoring Expert*.

Every component in this design is built and tested to the applicable IEC standards.

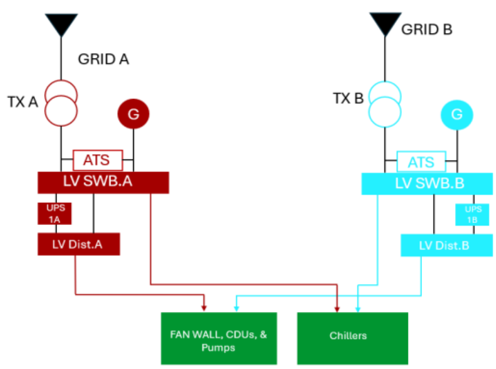
Further design details, such as dimensions, schematics, and equipment lists, are available in the engineering package.

Facility Power Block Diagram

IT Powertrain



Mechanical Powertrain



Facility Power Attributes

Name	Value	Unit
Total facility peak power (N, IT and cooling)	5762	kW
Total amps (IT main bus, each)	4,000	A
Input voltage (IT main bus)	380	V
Switchboard kAIC (IT main bus)	65	kA
Generator redundancy (IT main bus)	Distributed Redundancy	
IT power path	Distributed Redundancy	
IT space UPS capacity, per powertrain	2000	kVA
IT space UPS redundancy	N+1	
IT space UPS runtime @ rated load	5	minutes
IT space UPS output voltage	380	V
Total amps (Facility cooling bus, each)	2,500	A
Input voltage (Facility cooling bus)	380	V
Switchboard kAIC (Facility cooling bus)	42	kA
Generator redundancy (Facility cooling bus)	2N	
Facility cooling UPS capacity	500	kW
Facility cooling UPS redundancy	2N	
Facility cooling UPS runtime @ rated load	5	minutes

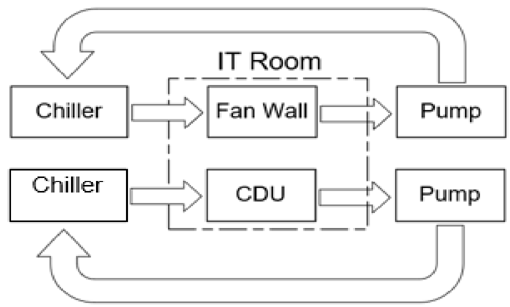
Design Options

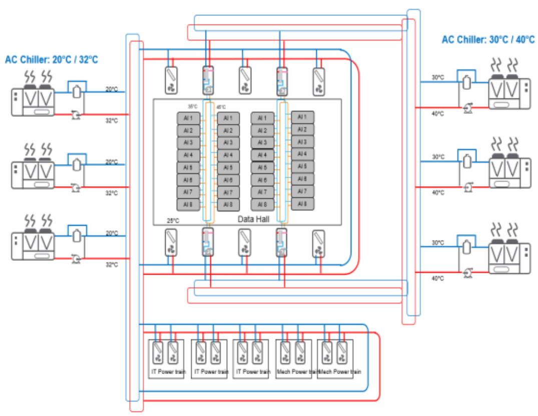
This reference design can be modified as follows without a significant effect on the design's performance attributes:

- Provision for load bank
- Change UPS battery type & runtime
- Add/remove/change standby generators:
  - Location & tank size

Facility Cooling Block Diagrams

Facility Water System Flow





Facility Cooling

The facility cooling design features a bi-directional ring piping system optimized for data center efficiency. A chilled water loop integrates *Uniflair XCAF* chillers with free-cooling capability to deliver 20°C chilled water to six fan walls in an N+2 configuration. The outdoor heat rejection for this loop is supported by *Uniflair XCAF1213A* chillers. Eight 100 kW AI racks are placed in the middle of the aisle. The racks share a 2m wide hot aisle to allow for proper airflow. Ducted hot aisles and a common ceiling plenum return hot air to the fan walls for cooling.

The bidirectional ring circuit provides an alternate path for chilled water during cooling equipment maintenance. The lower-temperature water loop handles the air-cooling needs of the data center. The liquid-cooled racks remove 80% of the heat via liquid, while 20% requires air. A separate high-temperature water loop supplies 30°C water to *Motivair Floor-Mounted Liquid to Liquid MCDUs* used to cool *NVIDIA's B300* liquid-cooled racks. Two *Motivair Floor-Mounted Liquid to Liquid* MCDU-70 CDUs, each with a design capacity of 1400kW, support the liquid cooling system required for one POD with 2N redundancy. Outdoor heat rejection for this loop is supported by *Uniflair XCAF1913A* chillers. With CDU coolant temperatures approaching 35°C, they become useful heat rejection units in a wide range of climates. They can also help reduce energy and capital costs compared to common chillers.

An integrated thermal storage system provides 5 minutes of continuous cooling, in case of a power outage, to allow the chillers to restart. The CDUs, fan walls, and facility pumps are on UPS power. More information on the fan wall and CDU cooling architecture is detailed in the IT Space section of this document.

This design is instrumented to work with *EcoStruxure™ Building Operation* and

Facility Cooling Attributes

Name	Value	Unit
Total max cooling capacity (N)	4536	kW
Input voltage	380	V
Heat rejection medium	Water & Air	
Chiller redundancy	N+1 for both CDU & FWU	
Outdoor heat exchange	Air Cooled Chiller	
Chiller CW supply temperature to Fan Wall	20	°C
Chiller CW return temperature from Fan Wall	32	°C
Storage tank size for fan wall Chillers	7100	Liters
Storage tank size for CDU Chillers	13500	Liters
Ride-through time	5	minutes
Outdoor ambient temperature range	2.7 to 39.5	°C
CW supply temperature to the CDU	30	°C
CW return temperature from CDU	40	°C

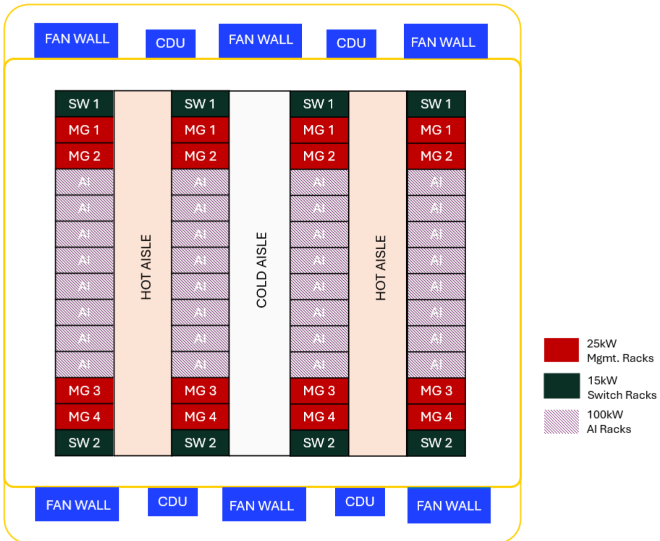
Design Options

This reference design can be modified as follows without a significant effect on the design's performance attributes:

- Change storage tank size

IT Space

IT Space Diagrams



The IT space of this design consists of a single data hall. The data hall features up to thirty-two 100 kW liquid-cooled IT racks, sixteen 25 kW air-cooled management racks, and eight 15 kW air-cooled switch racks organized into two pods.

Each AI pod is deployed with a *Prefabricated Modular EcoStruxure™ Pod Data Center* to provide a 2m wide ducted hot aisle containment for proper airflow, busway and cabling support, and TCS piping for the AI pods. Ducted hot aisles and a common ceiling plenum return hot air to the fan walls for cooling,

Six *Uniflair FWCV* chilled water fan walls supply conditioned air to the data hall in an N+2 configuration. Four *Motivair Floor-Mounted Liquid to Liquid MCDUs* provide precise liquid cooling to each AI pod with 2N redundancy. Piping system across the IT room provides an alternate path for chilled water in case of cooling equipment maintenance.

Equipment such as CDUs, fan walls, pumps, actuators, and motorized valves is powered by a separate 500 kVA UPS system, independent from the UPS supplying the IT racks.

The 25 kW and 15 kW management and networking racks are *NetShelter SX* racks configured with 1+1 63A *NetShelter Rack PDU* rack-mount power distribution units (rPDUs). The 100 kW AI racks are *NetShelter SX racks* configured with 3+3 34.6 kW PDU. The 100 kW AI racks have a pair of 63 A feeds coming from each of the 1000 A *I-Line track* busway, for a total of six power feeds per rack from the busway – two PDUs for each 1000A I-line. The 25 kW management racks have a pair of 63 A feeds from the *I-Line* track busway for 2N redundant feeds. The 15 kW switch racks have a pair of 32 A feeds from the *I-Line* track busway for 2N redundant feeds.

This design is instrumented to work with *EcoStruxure™ Building Operation* and *EcoStruxure™ IT Expert.*

Design Options

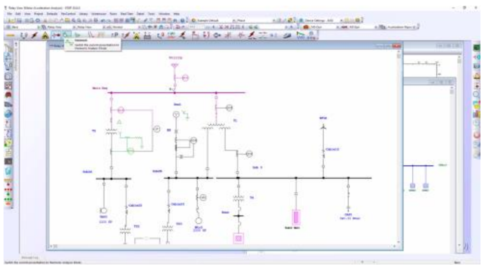
This reference design can be modified as follows without a significant effect on the design's performance attributes:

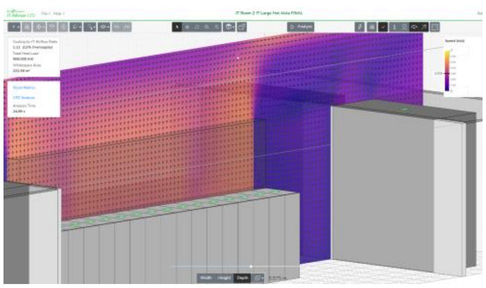
- Use *Uniflair FWCV* fan walls
- Use *NetShelter Aisle Containment*
- Variations in AI cluster configuration
- Use TCS loop surge tank to ensure TCS supply temperature stability

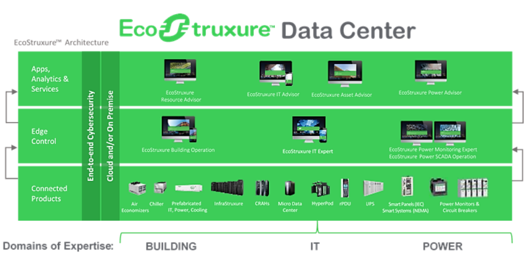
IT Space Attributes

Name	Value	Unit
IT load	3,720	kW
Supply voltage to IT, AI racks	380	V
Supply voltage to IT, networking racks	380	V
Rack power feed redundancy	2N	
Number of 100 kW liquid-cooled racks	32	racks
Number of 25 kW Management racks	16	racks
Number of 15 kW Switch racks	8	racks
IT floor space	179.5	m^2
CRAC/CRAH type	Fan wall	
CRAC/CRAH redundancy	N+2	
CRAC/CRAH supply air temperature	25.64	°C
Containment type	Ducted hot aisle	
CDU type	L2L	
CDU redundancy	2N	
TCS Coolant supply temperature	35	°C
CDU CW return temperature	40	°C
CDU supply temperature	30	°C

Lifecycle Software







Visit *EcoStruxure™ for Data Center* for more details.

High-density AI clusters push the limits of data center facility infrastructure, so it's critical to leverage advanced planning and operation tools to ensure safe and reliable operations.

Planning & Design

Electrical Safety and Reliability: Due to the high amount of power supplied to an AI cluster, design specifications such as available fault current, arc flash hazards and breaker selectivity must be analyzed in the design phase. Applications like *Ecodial* and *ETAP* simulate the electrical design and reduce the chance of costly mistakes or even worse, injury.

Cooling: AI clusters are pushing the limits of what can be done with air-cooling. Modeling the IT space with computational fluid dynamics (CFD) helps spot issues including high pressure areas, rack recirculation, and hot spots. This is especially true when retrofitting an existing data center with an AI cluster. Schneider Electric's *EcoStruxure™ IT Design CFD* can quickly model airflow, allowing rapid iteration to find the best design and layout.

Operations

EcoStruxure™ is Schneider Electric's open, interoperable, integrated Internet of Things (IOT)-enabled system architecture and platform. It consists of three layers: connected products, edge control, and applications, analytics, and services.

EcoStruxure™ Data Center is a combination of three domains of *EcoStruxure™:* Power, Building, and IT. Each domain is focused on a subsystem of the data center: power, cooling, and IT. These three domains combined will reduce risks, increase efficiencies, and speed operations across the entire facility.

- *EcoStruxure™ Power* monitors power quality, generates alerts, while protecting and controlling the electrical distribution the electrical distribution system of the data center from the MV level to the LV level. It uses any device for monitoring and alerting, uses predictive analytics for increased safety, availability, and efficiency, while lowering maintenance costs.
- *EcoStruxure™ Building* controls cooling effectively while driving reliability, efficiency, and safety of building management, security, and fire systems. It performs data analytics on assets, energy use, and operational performance.
- *EcoStruxure™ IT* makes IT infrastructure more reliable and efficient while simplifying management by offering complete visibility, alerting and modelling tools. It receives data, generates alerts, predictive analytics, and system advice on any device to optimize availability and efficiency in the IT space.

There are several options for supervisory visibility and control. *AVEVA Unified Operations Center* can provide visibility at a site or across an entire enterprise.

Design Attributes

OVERVIEW	Value	Unit
Target availability	III	Tier
Annualized PUE at Max operating state	1.24	Taiwan
Data center IT capacity	3720	kW
Data center overall space	2004	m2
Maximum rack power density	100	kW/rack

FACILITY POWER	Value	Unit
Total facility peak power (N, IT and cooling)	5762	kW
Total amps (IT main bus, each)	4,000	A
Input voltage (IT main bus)	380	V
Switchboard kAIC	65	kA
Generator redundancy (IT main bus)	Distributed Redundant	
IT Power path	2+1	
IT space UPS capacity, per powertrain	2000	kW
IT space UPS redundancy	Distributed Redundant	
IT space UPS runtime @ rated load	5	minutes
IT space UPS output voltage	380	V
Total amps (facility cooling bus, each)	2,500	A
Input voltage (facility cooling bus)	380	V
Switchboard kAIC (facility cooling bus)	42	kA
Generator redundancy (facility cooling bus)	2N	

FACILITY COOLING	Value	Unit
Total max cooling capacity	4536	kW
Input voltage	380	V
Heat rejection medium	Water & Air	
Chiller redundancy	N+1	
Outdoor heat exchange	Air Cooled Chiller	
Chiller CW supply temperature to FWU	20	°C
Chiller CW return temperature from FWU	32	°C
Storage tank size for Fan wall Chillers	7100	Liters
Storage tank size for CDU chillers	13500	Liters
Ride-through time	5	minutes
Outdoor ambient temperature range	2.7 to 39.5	°C
Free cooling switchover temperature	35 (Taiwan)	°C
CDU CW supply temperature	30	°C
CDU CW return temperature	40	°C

Design Attributes continued

IT SPACE	Value	Unit
IT load	3720	kW
Supply voltage to IT, AI racks	380	V
Supply voltage to IT, networking racks	380	V
Maximum rack power density	100	kW/rack
Number of racks	56	racks
IT floor space	179.5	m^2
Rack power feed redundancy	2N	
CRAC/CRAH redundancy	N+2	
Containment type	Ducted hot aisle	
CDU Type	L2L	
CDU redundancy	2N	
CRAC/CRAH supply air temperature	25.64	°C
CW supply temperature	20	°C
CW return temperature	32	°C
TCS Coolant loop supply temperature	35	°C
TCS Coolant loop return supply temperature	44	°C

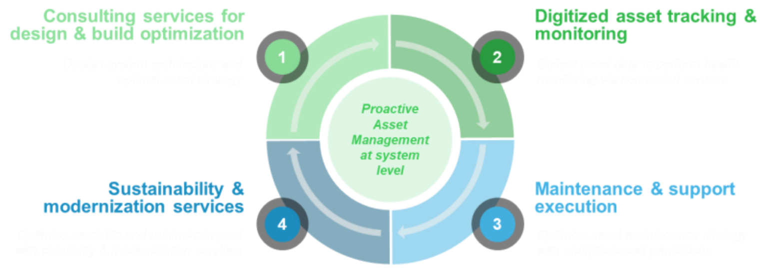
Schneider Electric Lifecycle Services

High-density AI clusters push the limits of data center facility infrastructure, so it's critical to leverage advanced planning and operations tools to ensure safe and reliable operations. To ensure cost-competitive and reliable data center operation over the data center's lifecycle, data center operators must adopt new ways of adapting to mounting operational complexity.

While AI Factories represent new opportunities for data centers, AI Factories will also bring about many challenges to data center operators. Data centers today are facing increasing OpEx burdens driven by maintaining critical power, cooling, and IT infrastructure. Meanwhile, staffing qualified engineers and technicians to oversee and service that infrastructure has gotten highly competitive, and all pieces of this infrastructure are set to be pushed to the cutting edge by AI workloads and variability. It is critical to build intelligent, reliable infrastructure and systems that can meet the challenges ahead and adapt to the next generation of data center computing.

Design and Build for the Entire Lifecycle of the AI Factory

Intelligent infrastructure starts at the design phase. While digitizing and monitoring critical assets is essential at every phase of a data center's lifecycle, ensuring digital-ready infrastructure at the outset of data center design avoids costly, disruptive shutdowns that may likely leave gaps in monitoring coverage. Designing with digital services in mind leads to a seamless system ready to deliver real-time insights from day one – meaning, a data center designed for the future.



EcoConsult

Whether a data center operator is using a brand-new facility, upgrading an existing facility, or repurposing a non-data center facility to be equipped to support an AI Factory, it is critical to leverage advanced planning and operations tools to ensure safe and reliable operations. EcoConsult is a comprehensive portfolio of best-in-class data center solutions, from hardware to software & services. Continuous reevaluation as the next generation of technology enters data centers is critical to ensuring success in the next phase of the data center evolution. Schneider Electric delivers an integrated engineering approach purpose-built for AI and high-density data centers, where power density, thermal constraints, and operational risk are amplified. **Design** and **system studies** validate electrical and thermal architectures upfront to support high-density GPU clusters, ensuring safety, power quality, coordination, and resilience before deployment. **Audits** establish a clear baseline of readiness for existing facilities being retrofitted for AI workloads, identifying risks tied to capacity, protection, and operational continuity. The **Electrical Digital Twin** connects design intent with real-world operations, providing a living model of the electrical network to manage rapid load growth, enable scenario analysis, and maintain reliability as AI demand scales.

Future Ready Data Center Life Extension with EcoFit

After evaluating existing infrastructure, addressing any outdated equipment should be a key priority. Outdated equipment and installations waste energy and increase operating costs, reducing efficiency. EcoFit helps data center operators solve these problems and modernize equipment and installations at the level needed to ensure a future ready data center. It enables high-performance digital technologies and supports your decarbonization journey by leveraging circularity services.

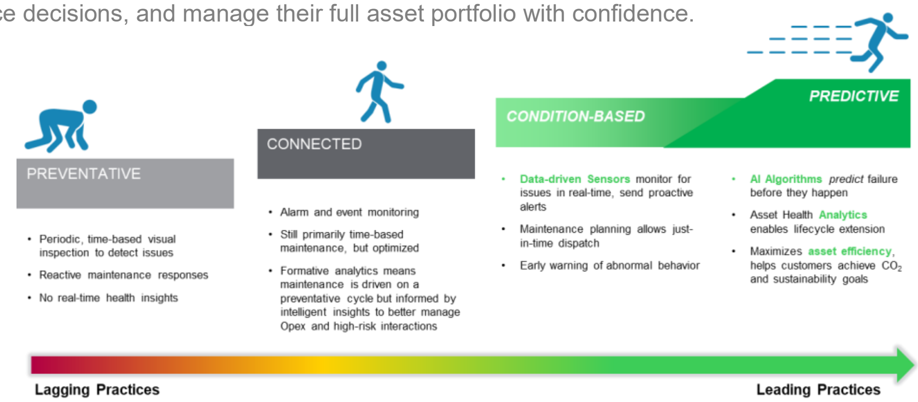
- *EcoFit Essential:* Upgrade your existing equipment with new features.
- *EcoFit Advanced:* Replace the core components with active and natively connectable new components.
- *EcoFit Replacement:* Get a comprehensive replacement with one of our latest equipment products/platforms/solutions.

Operate and Maintain with EcoCare

Get the most out of equipment installation through its entire lifecycle with EcoCare service plans for next-level predictive, preventive, and onsite maintenance. EcoCare from Schneider Electric is a subscription-based service plan offering 24/7 proactive remote monitoring, AI-powered predictive analytics through EcoStruxure, and expert on-site and remote support for electrical equipment and building management systems. EcoCare enables operators to revolutionize how they maintain their critical assets through condition-based maintenance.

Systemic AI-Driven Condition-Based Maintenance

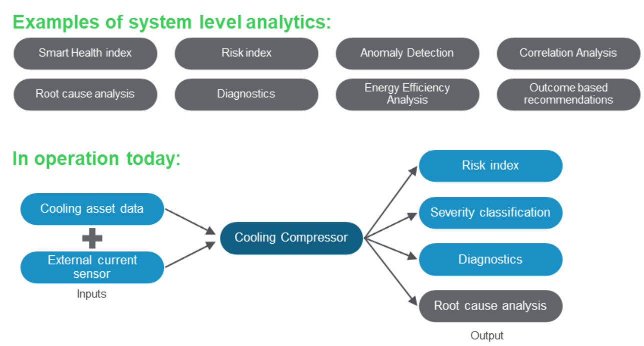
Traditional time-based maintenance approaches are poorly suited for AI and high-density environments, where load profiles, thermal behavior, and failure modes change rapidly. Because time-based maintenance is disconnected from real-time asset health, it often results in over-maintenance, unnecessary interventions, and increased risk of human error. In contrast, AI-enabled condition-based maintenance is designed around continuous visibility into critical power and cooling infrastructure, using real-time data, advanced analytics, and strategic sensor placement to detect early failure indicators. This design-led approach enables proactive intervention before faults occur, reducing unplanned downtime, and allowing maintenance to be executed based on actual equipment condition rather than fixed intervals. A condition-based strategy leads to improving resilience, lowering risk, and optimizing operational efficiency in high-density AI data centers. The Health Index in EcoStruxure translates real-time asset data, AI analytics, and deep domain expertise into a single, intuitive view of equipment health across the entire data center. By combining simple, at-a-glance visibility with the ability to drill into asset-level detail, the Health Index enables engineers and technicians to prioritize risk, make informed maintenance decisions, and manage their full asset portfolio with confidence.



What are system-level analytics?

A data center is made up of systems within systems. Any solution monitoring critical assets within a data center needs to not only understand the performance of each individual asset but also the performance of its surrounding systems. Considering the entire system unlocks deeper understanding of critical data center infrastructure.

While this does mean evaluating enormous amounts of data, AI is enabling the change from an asset level approach to an end-to-end systemic approach. Schneider Electric's AI Hub is a global center of excellence that combines data science expertise with Schneider Electric's domain expertise to create valuable insights to data center systems. This leading hub looks to continue its intense growth to match pace with the need for technological & operational advancements within Data Centers.



Data Aggregation and Collection

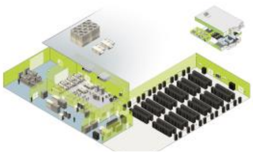
At the asset level, EcoStruxure aggregates data from a variety of intelligent sensors, including, thermal and environmental sensors for switchgear, partial discharge sensors, CDU controllers, oil transformer condition sensing, and leak detection for liquid cooling. Critical asset data can be collected through a variety of methods on-site. Schneider Electric solution architects and subject matter experts work with end users to ensure the necessary data is aggregated from the customer's BMS, EPMS, DCIM, and/or a corporate data lake. Collected data is then reviewed by AI-driven models and validated by Schneider Electric's subject matter experts, bringing decades of experience across power and cooling systems

Cybersecurity & Connectivity

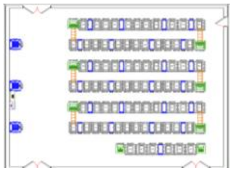
Cybersecurity is embedded by design across Schneider Electric's AI-ready CBM and analytics architecture, ensuring that the massive volumes of operational and performance data generated by high-density AI infrastructure can be securely collected, transported, and analyzed. From intelligent devices and sensors to edge and cloud platforms, security controls are integrated across every layer to protect system integrity, data availability, and performance.

All connected components and digital services are designed and maintained in accordance with ISO/IEC 27001 information security management practices and SOC 2 Type II compliance requirements for cloud-hosted CBM platforms. These frameworks govern our access control, data governance, & incident response methodologies to ensure protection of operational and performance data.

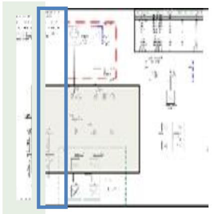
Get more information for this design:



3D spatial views



Floor layouts



One-line schematics

Bill of materials

Engineering Package

Every reference design is built with technical documentation for engineers and project managers. This includes engineering schematics (CAD, PDF), floor layouts, equipment lists containing all the components used in the design and 3D images showing real world illustrations of our reference designs.

Documentation is available in multiple formats to suit the needs of both engineers and managers working on data center projects.

Please email at referencedesigns@se.com for the engineering package of this design.

Email referencedesigns@se.com **for further assistance**