

# 1000 kW, 12 Racks, Liquid-Cooled & Air-Cooled, Modular All-in-One AI Solution

## Design Overview

**Data Center IT Capacity**  
1000 kW

**Target Availability**  
Tier I+

**Annualized PUE at 100% Load**  
St. Louis 1.14  
(Scenario dependent)

**Racks and Density**  
Total Racks: 12  
Rack Density: 88 kW/rack

**Data Center Internal Floor Space**  
525.28 sq ft (48.8 m<sup>2</sup>)

**Regional Voltage and Frequency**  
480V, 60 Hz

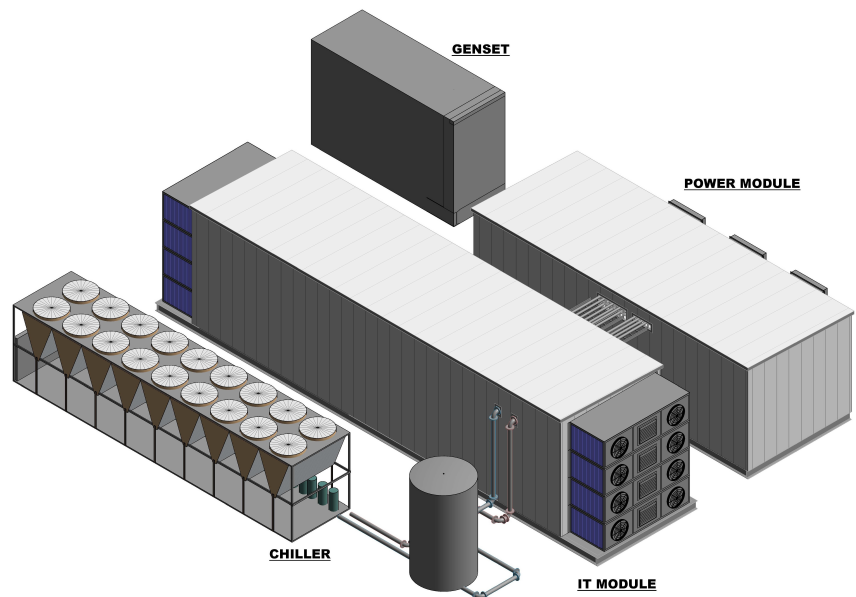
## About this Design

- IT space and power distribution designed to accommodate AI clusters with density up to 88 kW per rack.
- Liquid cooling IT thermal management approach utilizing Uniflair air cooled chillers with integrated economizer and liquid-to-liquid coolant distribution unit (CDU). Air cooling IT load and environmental heat load is cooled by Packaged Wall Mount Air Conditioners with integrated economizer.
- High-performance power system that integrates switchboard, UPS with Li-Ion battery cabinets, PDUs, and optional backup generation set.

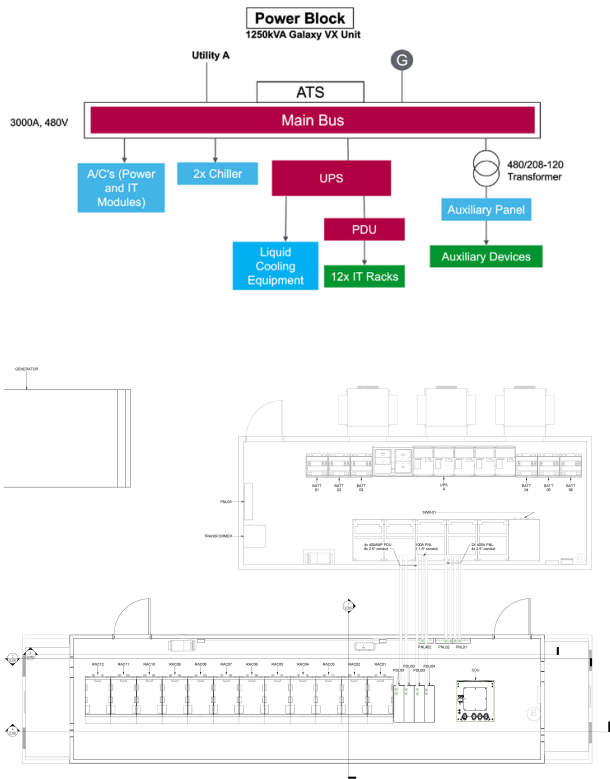
## Introduction

Artificial Intelligence brings with it enormous opportunity for businesses to develop and deploy new and exciting capabilities along with creating new challenges in how to deploy the supporting IT technology. Extreme power and thermal management, instantaneous load ramps, complex IT rack solutions combined with ease of scalability are but a few of the challenges facing AI data center designers. This is leading to the adoption of liquid cooling, server racks with liquid cooling manifolds and other forward-thinking technologies to enable AI.

This reference design will highlight some of these hardware improvements and how a modular data center can be used to deploy repeatable clusters wherever organizations need rapid, adaptable, scalable infrastructure to fully leverage AI technology and become more competitive.



### Facility Power Block Diagram



# Modular Power

The facility power system supplies power to the critical and non-critical components within the modular data center. The electrical architecture used in this design is a single path with UPS. The utility feed and backup generator in parallel delivers power to a 3,000 amp QED-2 Switchboard in the power module, which then feeds the cooling equipment, auxiliary devices, and a 1250 kVA Galaxy VX UPS that provides critical power to the IT room with 7.8 minutes of battery runtime. The UPS system consists of a Galaxy VX with 5 250kW power cabinets, maintenance bypass, and Galaxy lithium-ion batteries all housed together in a power module. The critical load is transformed and distributed by modular power distribution units located alongside the racks in the IT module. The facility power system is designed to support additional peripheral devices like a fire suppression system, access control systems, and environmental monitoring and control devices. This system integrates with StruxureWare Power Monitoring Expert. Every component in this design is built and tested to the applicable ANSI, NEMA, UL or IEEE standards.

### Design Options

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

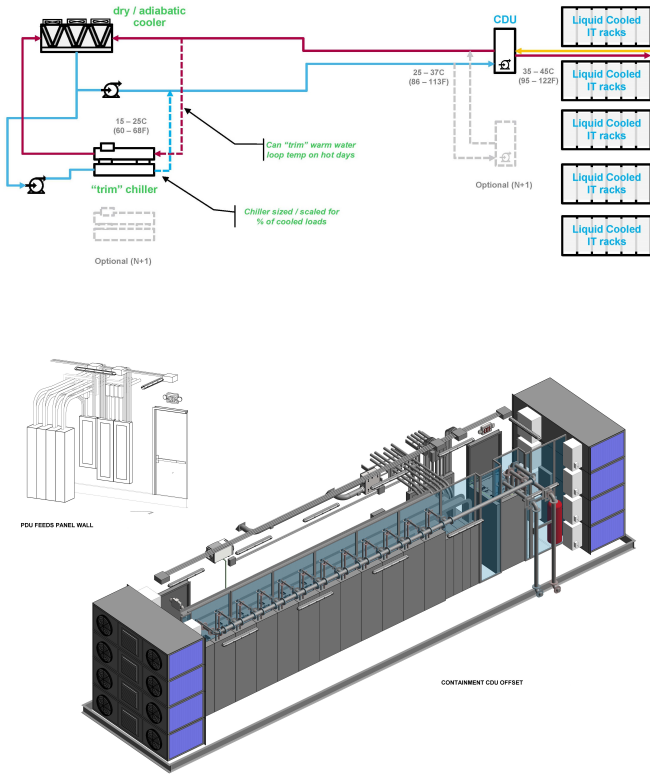
- Add EcoStruxure Power Monitoring Expert
- Provision for load bank
- Change UPS batteries
- Add/change standby generator options:
  - Location
  - Tank size
  - Fuel type

### Modular Power Attributes

Name	Value	Unit
Total facility peak power (IT & cooling)	1940	kW
Total amps (IT main bus/each)	2330	A
Input voltage (IT main bus)	480/277	V
Switchboard kAIC	65	kA
Generator redundancy (IT main bus)	N	
IT power path	Single	
IT space UPS capacity	1000	kW
IT space UPS redundancy	N	
IT space UPS runtime @ rated load	7.8	Minutes
IT space voltage	415/240	V
Total amps (modular cooling bus/each)	433	A
Input voltage (modular cooling bus)	480/277	V
Switchboard kAIC (modular cooling bus)	65	kA

# Modular Cooling

## Facility Cooling Diagrams



Servers designed for AI not only feature multiple processors in proximity, but also incorporate advanced chipsets that enhance processing power and efficiency. This kind of density generates massive amounts of heat, which require advanced thermal management.

Liquid cooling technology is introduced to dissipate processor heat. Water or another liquid is routed to the chips through a Coolant Distribution Unit (CDU) to absorb the heat. The liquid from the primary loop is then piped to a chiller unit and back to the CDU. The CDU and chilled water pump are backed up by the UPS so cool water will continue to flow to the servers during a utility power loss. In addition, the Packaged Wall Mount Unit fans will run in economizer mode during an outage. There is an impact on infrastructure, requiring more pipes and manifolds to move the liquid through the racks and out of the building. The structural support needed for a separate technical water loop, in addition to the usual cables for power and fiber, need to be included in the space of this data center.

In addition, the packaged wall mount units are utilized in the external Power Module.

## Modular Cooling Attributes

Name	Value	Unit
Cooling power supply	460/3/60	V/ph/Hz
IT liquid cooling module CDU type	Positive pressure/indoor	
IT liquid cooling module CDU qty	1	
IT liquid cooling module CDU redund.	N	
IT air cooling module type	Packaged wall mount air conditioner/outdoor	
IT air cooling module qty	8	
IT air cooling module redundancy	N+1	
Power module cooling type	Packaged wall mount air conditioner/outdoor	
Power module cooling qty	3	
Power module cool redundancy	N+1	

## Design Options

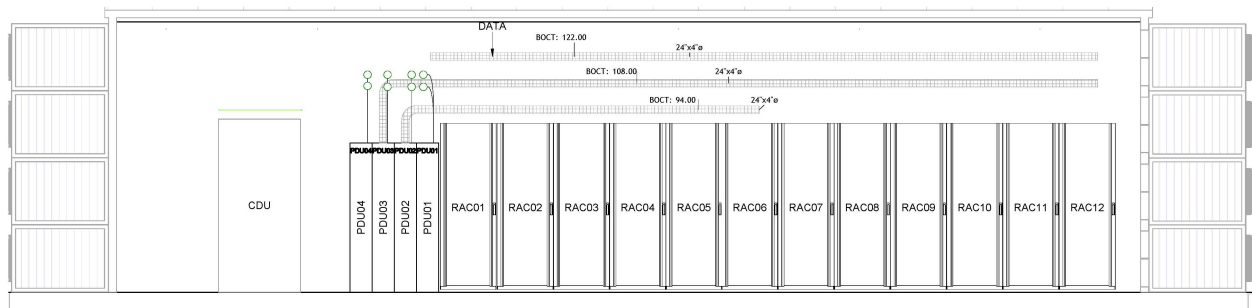
This reference design can be modified as follows without a significant effect on the design's performance attributes:

- Add EcoStruxure IT Expert
- Change storage tank size

# Modular IT Space

The IT capacity of this design is 1000 kW. The IT space design specifies all the physical infrastructure systems and respective spacing arrangements required to meet the overall design’s performance attributes. This includes racks, PDUs, rack power distribution, packaged wall mount units, service panel and the hot-aisle containment system. The IT space supports power densities up to 88 kW per rack and the modular power distribution unit. Each rack is configured with a metered rack-mount PDU to enable remote monitoring of the units for efficiency and capacity management. The security of the room can be maintained at multiple points. For example, at the rack level, access can be controlled by a door lock and sensor. At the room level, security cameras can be utilized for monitoring.

## IT Space Diagrams



## Modular IT Space Attributes

### Design Options

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

- Add environmental and security management
- Change rack options (tall, wide, deep)
- Change power distribution options (rack PDU type: basic, switched)
- Change from 16A, 3-phase to 32A, 1-phase tap-off units to racks
- Add isolation transformer
- Add EcoStruxure IT Expert

Name	Value	Unit
IT load	1000	kW
Supply voltage to IT	415/240	V
Maximum density	88	kW/rack
Number of racks	12	racks
Containment type	Hot aisle containment	

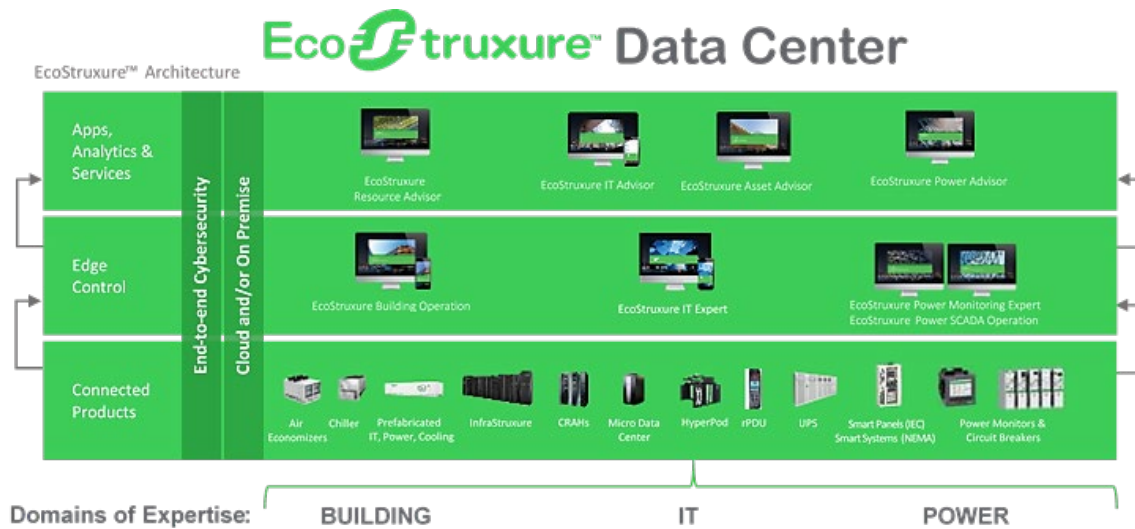
# EcoStruxure Data Center

EcoStruxure™ is Schneider Electric’s open, interoperable, integrated Internet of Things (IoT)-enabled system architecture and platform. EcoStruxure delivers enhanced value around safety, reliability, efficiency, sustainability, and connectivity for our customers. EcoStruxure leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity to deliver Innovation at Every Level. It consists of three layers: connected products, edge control, and applications, analytics, and services. This includes Connected Products, Edge Control, and Apps, Analytics & Services. EcoStruxure™ has been deployed in 480,000+ sites, with the support of 20,000+ system integrators and developers, connecting over 1.6 million assets under management through 40+ digital services.

The connected products layer communicates with the edge control layer, which allows users to remotely monitor and control the connected products in real time. The edge control layer communicates with the application, analytics, and services, which will translate data into actionable intelligence and better business decisions. All three layers are secured with end-to-end cybersecurity. EcoStruxure can either be located on-premise (this will only consist of the connected products and edge control layers) or the cloud.

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



Visit [EcoStruxure for Data Center](#) for more details.

## Design Attributes

Overview	Value	Unit
Target availability	Tier 1+	Tier
Annualized PUE at 100% load	1.1	
Data center IT capacity	1000	kW
Data center internal floor space	525.28	sq ft
Maximum rack density	88	kW/rack
Liquid cooling IT load	80	%
Total nominal liquid cooling IT load	845	kW
Air cooling IT load	20	%
Total nominal design air cooling IT load	211	kW
Air cooling IT load delta T	20	°F
Nominal design ambient temperature	115	°F
Max operating ambient temperature	122	°F
Min operating ambient temperature	-40	°F

Modular Power	Value	Unit
Total facility peak power (IT & cooling)	1940	kW
Total amps (IT main bus/each)	2330	A
Input voltage (IT main bus)	480/277	V
Switchboard kAIC	65	kA
Generator redundancy (IT main bus)	N	
IT power path	Single	
IT space UPS capacity	1000	kW
IT space UPS redundancy	N	
IT space UPS runtime @ rated load	7.8	Minutes
IT space voltage	415/240	V
Total amps (modular cooling bus/each)	433	A
Input voltage (modular cooling bus)	480/277	V
Switchboard kAIC (modular cooling bus)	65	kA

## Design Attributes

IT Module Liquid Cooling System	Value	Unit
TCS secondary loop supply water	86	°F
TCS secondary loop return water	104	°F
TCS secondary loop fluid	Propylene glycol 25%	
FWS primary loop supply water	77	°F
FWS primary loop return water	95	°F
FWS primary loop fluid	Propylene glycol 35%	
CDU power supply	460/3/60	V/ph/Hz
CDU type	Positive pressure/indoor	
CDU qty	1	
CDU redundancy	N	
CDU TCS pump redundancy	N+1	
CDU nominal capacity	1010	kW
Chiller power supply 1 (utility for comp.)	460/3/60	V/ph/Hz
Chiller power supply 2 (UPS for Ctrl, Pump, Fans)	460/3/60	V/ph/Hz
Chiller type	Air cool/outdoor	
Chiller qty	1	
Chiller redundancy	N	
Chiller FWS pump redundancy	N+1	
Chiller nominal capacity	1019	kW
FWS economizer	Full economizer integrated in chiller	
FWS buffer tank size (optional)	1725	Gallons
FWS buffer tank support time	5	Minutes

## Design Attributes

IT Module Air Cooling System	Value	Unit
Cooler power supply 1 (utility for comp.)	460/3/60	V/ph/Hz
Cooler power supply 2 (UPS for Ctrl, Pump, Fans)	460/3/60	V/ph/Hz
Cooler type	Packaged wall mount air conditioner/outdoor	
Cooler qty	8	
Cooler redundancy	N+1	
Single cooler nom. net sensible capacity	33	kW
Single cooler nom. design airflow	5290	°F
Single cooler electrical heater capacity	6	kW
Economizer	Direct air economizer integrated	
Max operating temperature	127	°F
Min operating temperature	DX = -22 Economizer = -40	°F

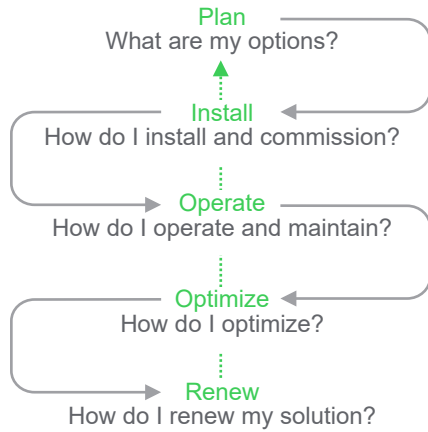
Power Module Air Cooling System	Value	Unit
Cooler power supply	460/3/60	V/ph/Hz
Cooler type	Packaged wall mount air conditioner/outdoor	
Cooler qty	3	
Cooler redundancy	N+1	
Single cooler nom. design net sensible capacity	32.6	kW
Single cooler nom. design airflow	4400	°F
Single cooler nom. design capacity	9	kW
Economizer	Direct air economizer integrated	
Max operating temperature	125	°F
Min operating temperature	DX = -30 Economizer = -40	°F

## Design Attributes continued

IT Space	Value	Unit
IT load	1000	kW
Supply voltage to IT	415/240	V
Maximum density	88	kW/rack
Number of racks	12	racks
Containment type	Hot aisle containment	

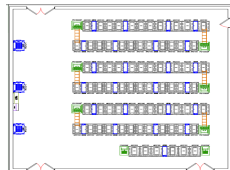
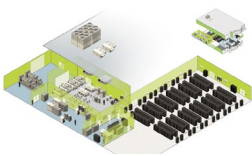
# Schneider Electric Life-Cycle Services

## Life Cycle Services



- 1** Team of **over 7,000 trained specialists** covering every phase and system in the data center
- 2** Standardized, documented, and validated **methodology** leveraging automation tools and repeatable processes **developed over 45 years**
- 3** **EcoCare provides complete portfolio of services** to solve your technical or business challenge, simplify your life, and reduce costs

## Get more information for this design:



### 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. For the engineering package of this design please email us at [referencedesigns@se.com](mailto:referencedesigns@se.com)