440 kW, Tier 3, Chilled Water, Prefabricated, 9315 sq ft

DESIGN OVERVIEW

Data Center IT Capacity
440 kW
Adaptable from 100 kW to 1320 kW

Target Availability
Tier 3

Annualized PUE at 100% Load
1.53 in Miami, FL USA
1.31 in Montreal, Canada
1.39 in St. Louis, MO USA

Total Racks and Average Density
44 racks at 10 kW/rack

Data Center Overall Space
Min. 9315 ft^2

Regional Voltage and Frequency
480V, 60Hz

ABOUT THIS DESIGN

- **Highly scalable and adaptable with Prefabricated IT, Power, and Cooling Modules**

- **Chilled water system using air-cooled packaged chillers with water-side economizer to save energy during favorable outdoor conditions**

- **Integrated row-based air distribution**

- **Energy savings through water-side economizer during favorable outdoor conditions**

INTRODUCTION

The planning process of most projects can be iterative and thereby expensive. Data center projects are burdened with these challenges and can benefit greatly from simplification and time savings. Schneider Electric's data center reference designs help optimize the planning process by providing validated, proven, and documented data center physical infrastructure designs. The use of these designs has a positive impact on not just the project itself, but also on the performance, reliability, and efficiency of the data center over its lifetime.

Reference Design 26 includes design information for three spaces: facility power, facility cooling and IT space. The data center is constructed of prefabricated modules, comprising the integrated power, cooling and structural systems required to meet the design's specifications published in this overview document.
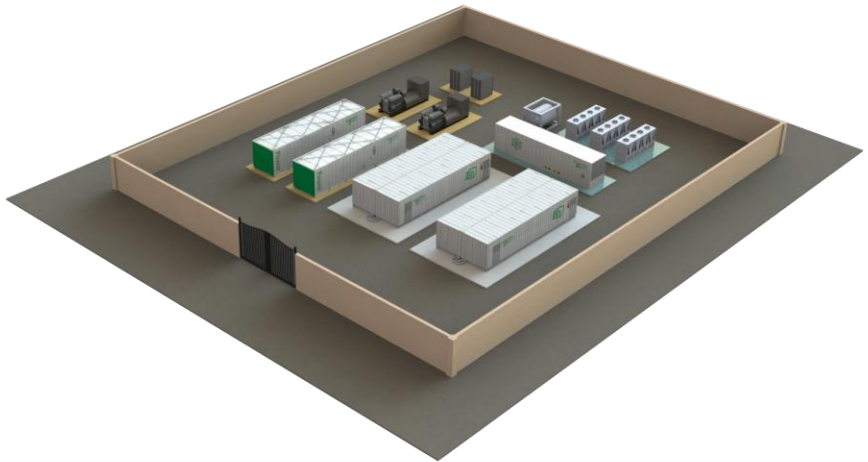
Facility Power

FACILITY POWER BLOCK DIAGRAM
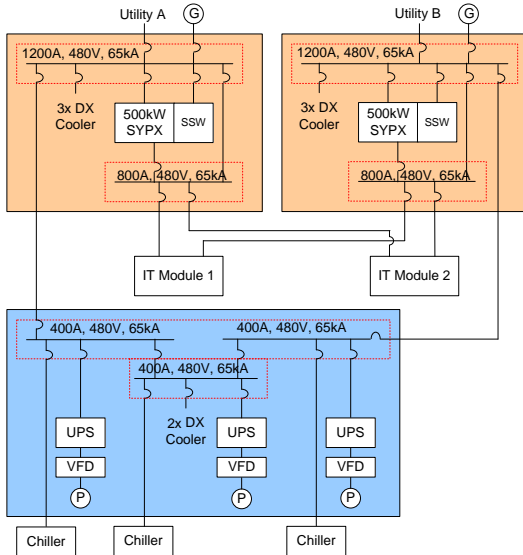
The facility power system supplies energy to the critical and non-critical components within the data center. In this Tier 3 design, power is supplied through two 500kW power modules. The two modules provide 2N UPS power to the IT space, all together backed up by a 2N generator configuration. Inside each power module, a 1200 amp bus feeds *QED-2* electrical switchboards and a 500kW *Symmetra PX* UPS with 5 minutes of runtime. In both power modules, the main bus also feeds an *I-Line* panelboard, to provide energy to the cooling system. Within the hydronics module, pumps are supplied with 2N protected power through an N+1 configuration of *Smart-UPS VTs*. The 2N power distribution architecture from the electrical room to the IT space utilizes a combination of LV panels and power distribution units (PDUs).

The facility power system is designed to support integrated peripheral devices like fire panels, access control systems, and environmental monitoring and control devices. Additional low-voltage transformers are included in the design to support lighting and other building loads. Power meters in the electrical path monitor power quality and allow for predictive maintenance & diagnostics of the system. These meters also integrate with *StruxureWare Power Monitoring Expert*.

Every component in this design is built and tested to the applicable ANSI, NEMA, UL or IEEE standards.

Further design details and schematics are available in the engineering package.

DESIGN OPTIONS

This reference design can be modified as follows without a significant effect on the design's performance attributes:
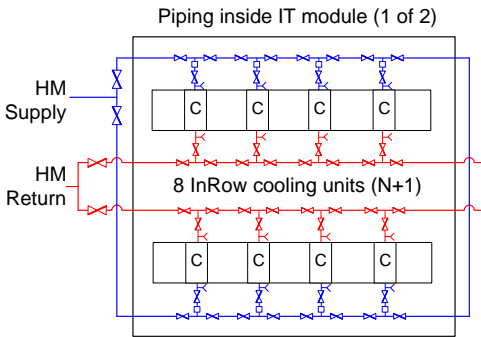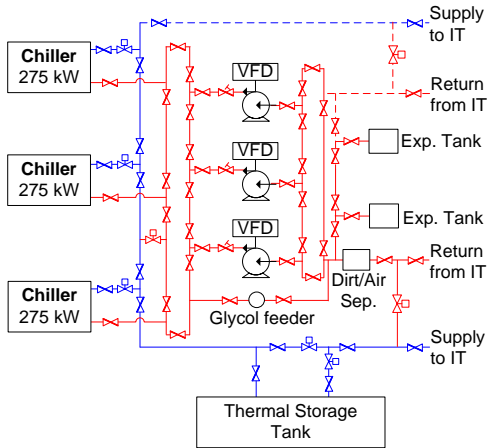
- Add *StruxureWare Power Monitoring Expert*
- Provision for load bank
- Change UPS batteries
- Add/change standby generator options:
    - Location
    - Tank size
    - Fuel type

FACILITY POWER ATTRIBUTES

Name	Value	Unit
Total amps (main bus)	1200	A
Input voltage (main bus)	480	V
Switchboard kAIC	65	kA
Power path	Dual	
Generator redundancy	2N	
IT space UPS capacity	500	kW
IT space UPS redundancy	2N	
IT space UPS runtime @ rated load	5	minutes
IT space UPS output voltage	480	V
Facility cooling UPS capacity	32	kW
Facility cooling UPS redundancy	N+1	
Facility cooling UPS runtime @ rated load	5	minutes

Facility Cooling

FACILITY COOLING BLOCK DIAGRAM

Piping inside IT module (1 of 2)

HM Supply

HM Return

8 InRow cooling units (N+1)

DESIGN OPTIONS

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

- Add *StruxureWare Cooling Monitoring Expert*

The facility cooling design is comprised of a chilled water cooling system in the IT space, integrated with a hydronics module and three packaged chillers. The hydronics module includes pumps, valves, controls, and instrumentation necessary to provide cooling in a Tier 3 redundant architecture.

This module is accompanied by a set of three air-cooled chillers with free-cooling in an N+1 configuration. Economization is achieved with dry coolers integrated within each chiller, to save energy during favorable outdoor conditions. A thermal storage system is offered to provide 5 minutes of continuous cooling after a power outage or chiller restart.
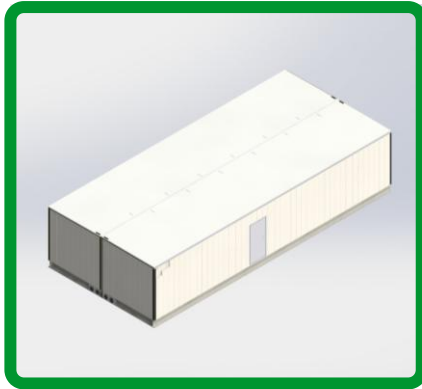
The piping architecture of the mechanical system feeds row-based *InRow RC* Chilled Water Cooling units in the IT space. More information on the coolers' configuration is provided in the IT space section of this document.

This design is instrumented to work with *StruxureWare Cooling Monitoring Expert*.

Further design details such as dimensions, equipment placement, temperature set points, pipe sizing, flow rates, and pressure drops are available in the engineering package.

FACILITY COOLING ATTRIBUTES

Name	Value	Unit
Total cooling capacity	550	kW
Input voltage	480	V
Heat rejection medium	Chilled water	
Mechanical redundancy	N+1	
Outdoor heat exchange	Packaged chiller with free-cooling	
Coolant supply temperature	59	F
Coolant return temperature	69	F
Storage tank size	2509	gallons
Ride-through time	5	minutes
Economizer type	Water-side	

IT Space

Two Dual Bay IT modules make up the IT space of this design. Each of the modules houses 22 *NetShelter* racks capable of 10 kW for a total of 220 kW. All together this provides 440kW worth of IT capacity

In this Tier 3 design, the power distribution within each module provides 2N power to individual IT racks and other loads, including cooling units.

The design is highly scalable and adaptable; it can be configured to support IT loads from 100 kW to 1320 kW. Smaller starting loads can be supported by making adjustments such as reducing the number of prefabricated IT and power modules. Likewise, this design can be used as a baseline for larger loads by using a step and repeat approach to the design. This flexibility drives efficiency and defers capital expenditure until needed.

Each module is powered by redundant (2N) floor mount factory-configured power distribution units (PDUs) with isolation transformers. Every rack is configured with redundant (2N) metered rack-mount PDU to enable remote monitoring of the units for efficiency and capacity management.

Each module includes hot-aisle containment and is cooled by N+1 redundant chilled water-based *InRow RC* CRAHs that control the supply of cool air by monitoring temperature variation at the rack level. In order to ensure Tier 3 reliability, this design includes redundant valves and piping.

The security of the room is maintained at multiple points. At the rack level, access is controlled by a door lock and sensor. At the room level, security cameras are utilized for monitoring.

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)
- Add *StruxureWare Data Center Expert*

IT ROOM ATTRIBUTES

Name	Value	Unit
IT load	440	kW
Input voltage	480	V
Supply voltage to IT	240	V
Average density	10	kW/rack
Number of racks	44	racks
IT floor space	3985	ft^2
Single or dual cord	Dual	
Heat rejection medium	Chilled water	
CRAC/CRAH type	Row-based CRAH	
CRAC/CRAH redundancy	N+1	
Containment type	Hot Aisle	

Design Attributes

OVERVIEW	Value	Unit
Target availability	Tier 3	Tier
Annualized PUE at 100% load	1.53 / 1.31 / 1.39	
Data center IT capacity	440	kW
Data center overall space	9315	ft^2
Average density	10	kW/rack

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# Data Center Infrastructure Management (DCIM) System

Good design and quality construction alone do not ensure a highly available & efficient data center. DCIM provides on-going monitoring and control to ensure the facility lives up to its design intent. *StruxureWare for Data Centers* is a software management suite designed to collect and manage data about a data center's assets, resource use, and operational status throughout the life cycle of the facility. This information is then distributed, integrated, and applied in ways that help managers optimize the data center's performance and meet IT, business, and service-oriented goals. From IT assets to racks, rows, rooms and buildings, *StruxureWare for Data Centers* delivers the right information to the right users at the right time.

Control level: Experts, on site or remotely, can control process performance and ensure business continuity in real time, while tracking energy consumption in a highly critical and secure environment.

Operations level: Functional managers can optimize operations, energy, and assets through smart analytical tools, often spanning multiple sites.

Enterprise level: C-level executives can drive their sustainability strategy efficiently, choosing the best scenario that meets their business objective to conserve enterprise-wide resources.

StruxureWare for Data Centers allows for flexibility when requirements and implementation strategies change over time. *StruxureWare* software applications and suites simplify integration time, improve reliability, enhance visibility to energy information, and streamline operational efficiency.
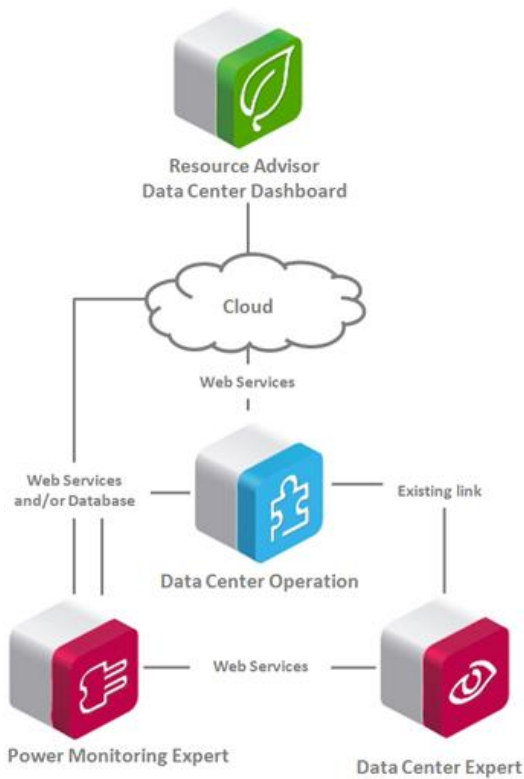
> **Demo:**
> **Visit *www.apc.com/software* to learn more about StruxureWare for Data Centers!**

Schneider Electric Life-Cycle Services
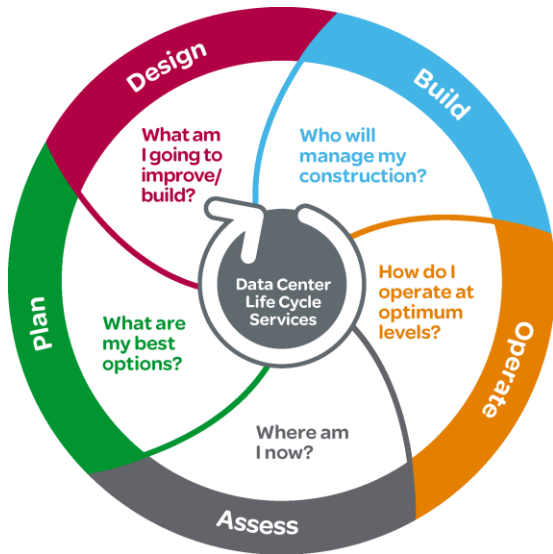
1 Team of over 7,000 trained specialists covering every phase and system in the data center

2 Standardized, documented, and validated methodology leveraging automation tools and repeatable processes developed over 45 years

3 Complete portfolio of services to solve your technical or business challenge, simplify your life, and reduce costs

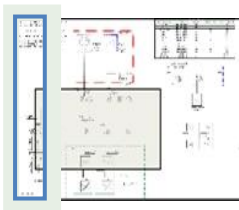# Get more information for this design:
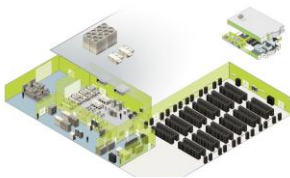
3D spatial views

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.

> **Click here to register to receive the Engineering Package for this design**, **or email ReferenceDesigns@Schneider-Electric.com.**