600 kW, Configurable Tiers, Indirect Air, Semi-Prefabricated, 17000 sq. ft.

DESIGN OVERVIEW

Data Center IT Capacity
600kW as shown
Adaptable from 200kW to 3.6MW in 1.2MW sections

Target Availability
Tier 2 shown, with options to provide Tier 3 and 4

Annualized PUE at 100% Load
1.3 in Miami, FL USA
1.19 in Montreal, Canada
1.22 in St. Louis, MO USA

Total Racks and Average Density
60 racks at 10 kW/rack as shown. Expandable to 120 racks at 10kW/Rack or 240 racks at 5kW/Rack

Data Center Overall Space
Min. 17000 ft^2

Regional Voltage and Frequency
480V, 60Hz

ABOUT THIS DESIGN

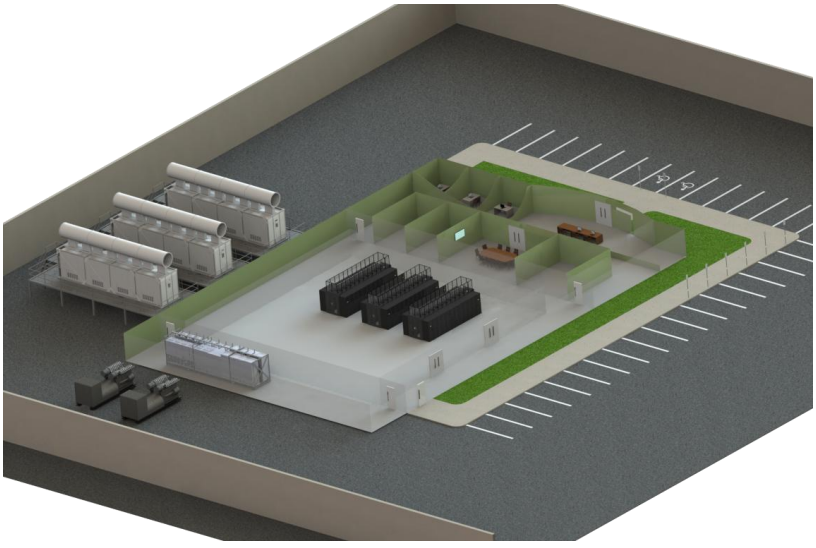
- **Extremely flexible with low cost entry point**
- **Incremental capital and operational expense outlay with modular and scalable deployment**
- **Modular and repeatable architecture to aid in greenfield builds and brownfield retrofits**

INTRODUCTION

Customers place a high value on the ability to simplify and reduce the time needed to plan and design a data center, but the planning process of most data center projects is iterative and thereby expensive. Schneider Electric's data center reference designs help optimize the planning process by providing validated, proven, and documented data center physical infrastructure designs. Using these designs has a positive impact on not only the project itself, but also on the performance, reliability, and efficiency of the data center over its lifetime.

This data center reference design is a flexible single-story, purpose-built facility composed of prefabricated power and cooling modules joined with an IT space. Given the flexible architecture behind the design, the data center can be easily re-configured to support a range of densities, build methods, tier levels, cooling architectures, and capacity ranges.

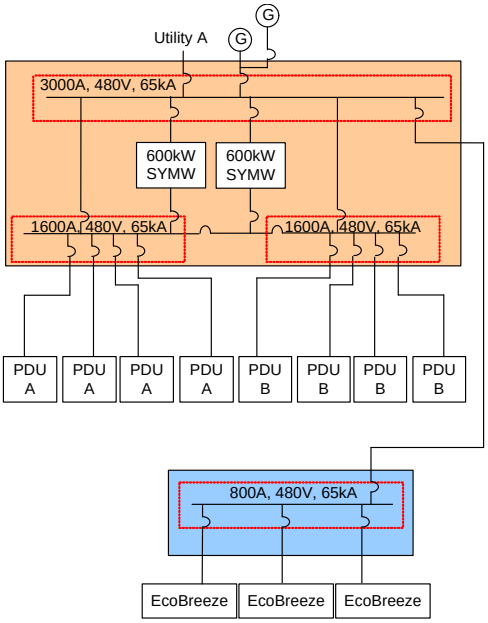
Starting at 600kW of IT load, this design can be built out to over time to support additional pods within the existing IT space totaling 1.2MW, supported by pre-fabricated power skids and EcoBreeze frames. The flexibility of the power skids and IT pods allows for a range of configurations to be tailored to future needs.

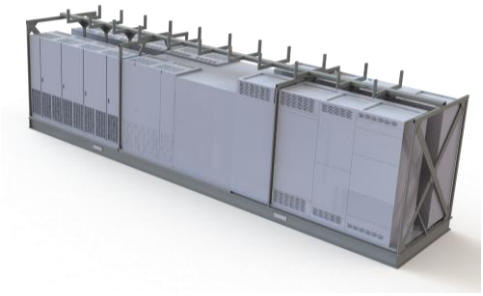


Schneider Electric

Facility Power

FACILITY POWER BLOCK DIAGRAM





DESIGN OPTIONS

This reference design can be modified to meet a wide range of applications

- Permanent Load Bank/Load Bank Switchgear
- Increased Battery Runtime
- Increased Generator Fuel Runtime
- Small UPS for non-IT Loads
- Small Generator for non-IT Loads

Possible Substitutions

- UPS Batteries, wet-cells
- Prime-rated Generators
- Natural Gas Generators

The facility power system supplies energy to the critical and non-critical components within the data center. In this design, power is supplied through a single flexible skid inside the building's electrical room. The skid provides 2N UPS power to the IT space and is backed up by a single generator with a swing backup. A 3000 amp primary bus on each skid feeds a *QED-2* electrical switchboard, two 600kW *Symmetra MW* UPS with 5 minutes of runtime and an *I-Line* panelboard, which provides energy to the cooling system. 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 pre-fabricated skid, consisting of 2 independent 600kW Symmetra MW UPSs, powers both the A and B IT space feeders. , If additional capacity is ever required, the skid can be easily modified via a cross-tie breaker on the output bus to output 1MW N+1 (internally modular), or 1.2MW N power. The transition between generator and utility supports open transition, but can be field configured for closed transition.

The facility power system is also 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.

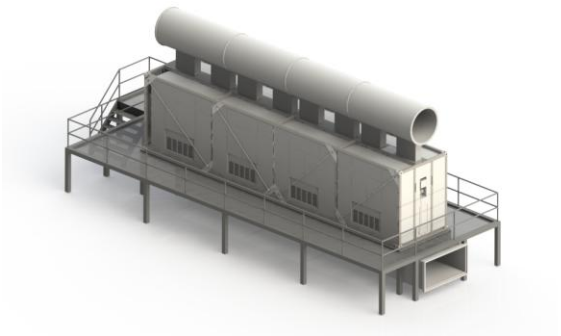
Further design details and schematics are available in the engineering package.

FACILITY POWER ATTRIBUTES

Name	Value	Unit
Total amps (main bus)	3000	A
Input voltage (main bus)	480	V
Switchboard kAIC	65	kA
Power path	Dual	
Generator redundancy	N+1	
IT space UPS capacity	600	kW
IT space UPS redundancy	2N	
IT space UPS runtime @ rated load	5	minutes
IT space UPS output voltage	480	V

Facility Cooling

ECOBREEZE FRAME



The cooling plant design employs Schneider Electric's EcoBreeze™ Air Economizers which use an innovative modular, scalable, and highly efficient air delivery system. The EcoBreeze indirect air system delivers clean and conditioned air to the data center utilizing two different economization modes with mechanical DX cooling as backup. By operating primarily in economizer mode from a central location outside of the white space, EcoBreeze eliminates the need for CRAC or CRAH units in the IT space. This achieves a low PUE and reduces OPEX costs as a result of lower utility bills and reduced maintenance costs compared to traditional CRAC/CRAH designs.

A set of 3 EcoBreeze frames provide N+1 cooling to the IT space. The air-to-air heat exchange brings in hot IT air in from the data center through the modules EC (Electronically Commutated) fans which is then passed through internal channels of the Indirect Evaporative Cooler (IEC). After the IT air is cooled it leaves the IEC and passes through a cooling coil and returned to the data center.

When ambient temperatures can't support an air-to-air heat exchange, cooling is achieved through indirect evaporative cooling which removes heat from the IT air by evaporating water on the outside of the heat exchanger channels. The EcoBreeze prevents the outside air from coming in contact with the data center air, regardless of which cooling mode is used (air-to air or indirect evaporative).

DESIGN OPTIONS

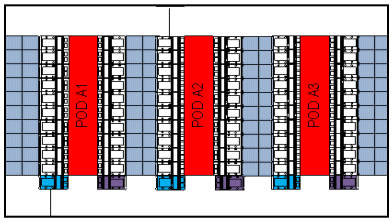
This reference design can be modified to include the following

- Chilled water architecture
- Perimeter and In Row Cooling

FACILITY COOLING ATTRIBUTES

Name	Value	Unit
Total cooling capacity	600	kW
Input voltage	480	V
Mechanical redundancy	N+1	
Outdoor heat exchange	Indirect Evaporative Cooling with EcoBreeze	

IT Space



Three IT pods make up the IT space of this design, each housing 20 *NetShelter™SX* racks. At the maximum rack density of 10 kW per rack shown in this design, the 200 kW IT pods provide 600 kW of total IT capacity. The design is highly scalable and adaptable by means of a “step and repeat” approach, increasing IT capacity in 200kW blocks. If 5kW per rack is desired, this design could provide 100kW within a 20 rack pod. The build out of this IT space to reach 1.2MW could be achieved with 5kW or 10kW pods. This flexibility drives efficiency and defers capital expenditure until needed.

Each IT pod is powered by 2N floor mount modular power distribution units (PDUs) with isolation transformers to bring the feeder voltage to 240/415VAC. Each rack is configured with redundant metered rack-mount PDUs to enable remote monitoring of the units for efficiency and capacity management.

EcoAisle™ hot aisle containment system is included with each IT Pod to increase the cooling efficiency of the N+1 EcoBreeze systems, which use redundant frames and piping to ensure reliability.

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:

- 100kW pods with 5kW/Rack
- Hot Aisle Contained with InRow Cooling or Ducted
- 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	600	kW
Input voltage	480	V
Supply voltage to IT	240	V
Average density	10	kW/rack
Number of racks	60	racks
IT floor space	4000	ft^2
Single or dual cord	Dual	
Heat rejection medium	Indirect Evaporative	
CRAC/CRAH type	EcoBreeze	
CRAC/CRAH redundancy	N+1	
Containment type	Hot Aisle	

Design Attributes

OVERVIEW	Value	Unit
Target availability	Tier 2 with ability for Tier 3 and 4	Tier
Annualized PUE at 100% load	1.3 / 1.22 / 1.19	
Data center IT capacity	600	kW
Data center overall space	17000	ft^2
Average density	10	kW/rack

FACILITY POWER	Value	Unit
Total amps (main bus)	3000	A
Input voltage (main bus)	480	V
Switchboard kAIC	65	kA
Power path	Dual	
Generator redundancy	N	
IT space UPS capacity	600	kW
IT space UPS redundancy	2N	
IT space UPS runtime @ rated load	5	minutes
IT space UPS output voltage	480	V

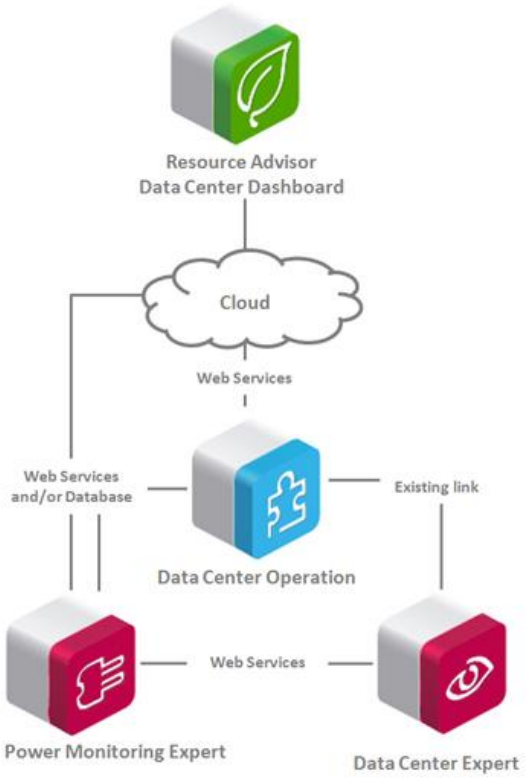
FACILITY COOLING	Value	Unit
Total cooling capacity	600	kW
Input voltage	480	V
Mechanical redundancy	N+1	
Outdoor heat exchange	Indirect Evaporative Cooling with EcoBreeze	

IT SPACE	Value	Unit
IT load	600	kW
Input voltage	480	V
Supply voltage to IT	240	V
Average density	10	kW/rack
Number of racks	60	racks
IT floor space	4000	ft^2
Single or dual cord	Dual	
Heat rejection medium	Indirect Evaporative	
CRAC/CRAH type	EcoBreeze	
CRAC/CRAH redundancy	N+1	
Containment type	Hot Aisle	

Data Center Infrastructure Management (DCIM) System

Schneider Electric's *StruxureWare for Data Centers* matches the unique flexibility and scalability found in Reference Design 21. From the rack, row, pod, room, and to the facility itself, *StruxureWare* can be quickly and easily scaled in terms of the type and number of devices monitored, as well as the number of DCIM functions utilized. It is possible to start small and simple while growing in coverage and capability as the business itself grows.

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.

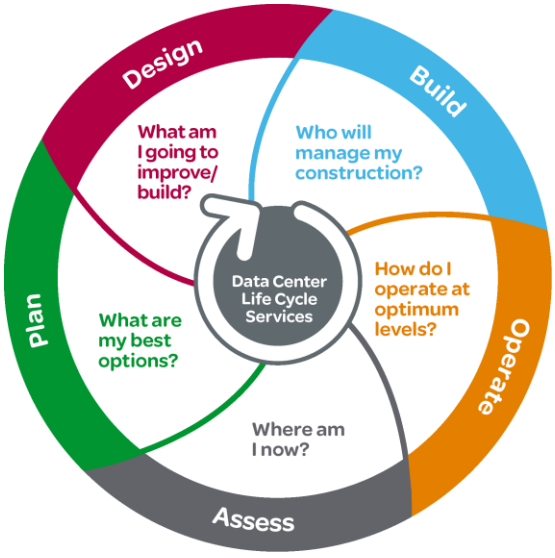
Operations level: Functional managers can optimize operations, energy, and assets through smart analytical tools, often spanning multiple sites.

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

Demo:
Visit *www.apc.com/software* to learn more about StruxureWare for Data Centers!

Schneider Electric Life-Cycle Services

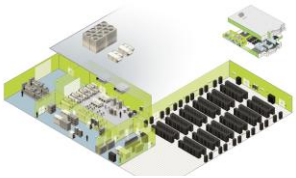


1. Team of over 7,000 trained specialists covering every phase and system in the data center

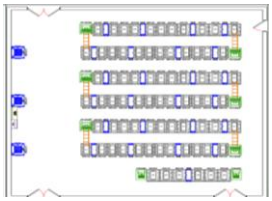
2. Standardized, documented, and validated methodology leveraging automation tools and repeatable processes developed over 45 years

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

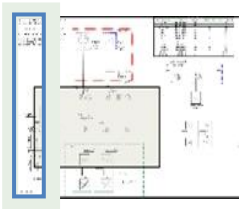
Get more information for this design:



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.