



Vertiv™ NetSure™ HVT
400V HVDC Power Solution



Vertiv™ NetSure™ HVT

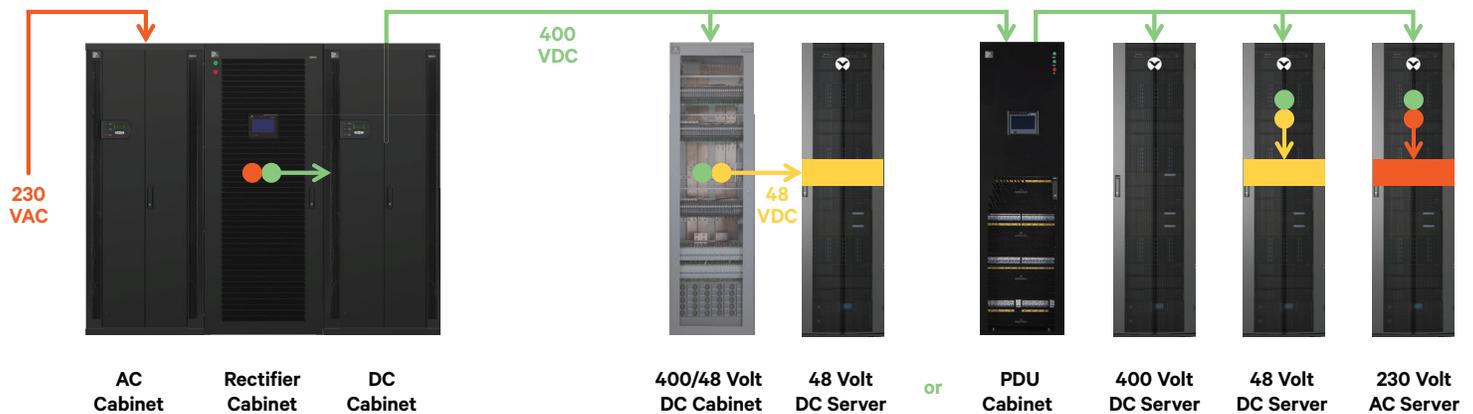
Reducing energy consumption in core facilities

Today's data center and communication facilities are growing more rapidly than ever before. The availability of these facilities is of crucial importance as unreliable data and communication services will not survive the fierce competition. Data center providers are therefore focusing on reliable power solutions that at the same time can help save energy, space and cost of maintenance. One potential area to meet the multiple needs of facility managers lies in the power delivery architecture within the facility. Taking a closer look at the facility power chain reveals that even though much equipment on site supports direct current (DC) power supply and most renewable energy resources generate energy in DC form, conventional power is still being utilized.

The Vertiv™ NetSure™ HVT high voltage DC (HVDC) power solution enables you to meet your site goals. HVDC technology combines the proven benefits of -48V DC power – modularity, scalability, and ease of integration – with the cable and installation savings benefit of higher voltage distribution.

Vertiv™ NetSure™ HVT is designed to ensure the highest levels of system efficiency and reliability. Based on a flexible architecture, 400V HVDC power solutions can be implemented at a wide variety of different telecom and data centers sites. Whether your site equipment powering needs include 400 VDC, -48 VDC, or AC power – or a combination of all three – 400V HVDC can be the backbone infrastructure of a cost effective and efficient site design.

Typical 400V HVDC Eco-system



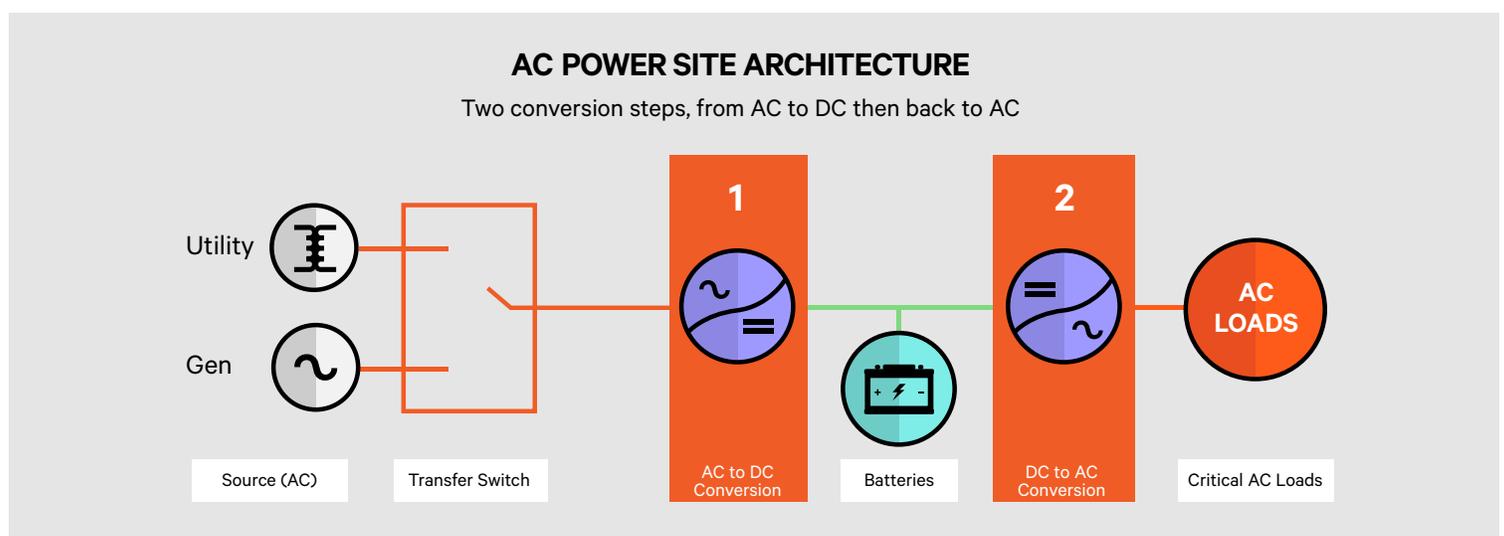
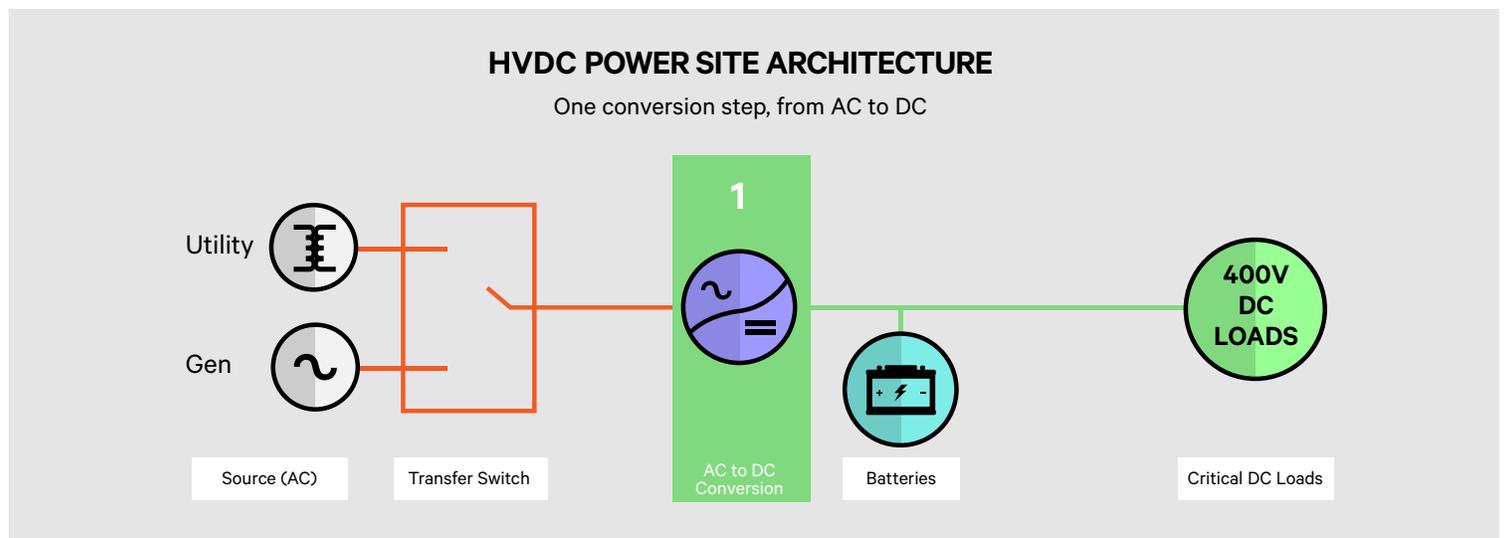
The Vertiv™ NetSure™ HVT solution includes all of the components required for your 400V HVDC power site including a rectifier cabinet, DC distribution cabinet, optional AC distribution cabinet, PDU cabinet, as well as supporting control and monitoring devices.

Key Benefits

- Free up floor space near IT and telecom gear by backing up your loads remotely
- Transition to HVDC power while supporting critical AC and -48 VDC loads with converter systems close to loads
- Use 10 times less copper cabling than -48 VDC
- Reduce energy losses on site with less AC to DC conversions, high rectifier efficiency (96.9%) and low voltage drop
- Scale capacity as demand increases and power needs grow, by adding easy to operate cabinets, rectifiers and batteries to live sites
- Increase site availability by tracking power system status and monitoring load data with the intelligent M822E Vertiv™ NetSure™ Controller

HVDC Power Compared to Traditional AC Power Site Architecture

HVDC site architecture requires fewer conversion steps which saves energy and improves availability.



Technical Specifications

AC Input

Voltage, Nominal	380 VAC to 480 VAC
Voltage Range	260 VAC to 530 VAC
Power Supply	3-phase without neutral, TN-C, TN-S, TN-C-S, TT
Frequency	50/60 Hz
Maximum Current	4 x 202 A at 380 VAC
Power Factor	≥ 0.99
Total Harmonic Distortion	<5.1% at 30% load

DC Output

Voltage, Nominal	400 VDC
Voltage Range	280 VDC to 400 VDC
Maximum Power	500 kW per cabinet, up to 1 MW system
Maximum Current	1488 A at 280 VDC to 336 VDC
Peak Efficiency	96.9%
Current Sharing Imbalance	±5% (10% ~ 100% within the scope of the load)
Voltage Regulation	±1%
Peak-to-Peak Noise Voltage	≤1 V

Environmental

Operating Temperature	-5°C to +40°C
Storage Temperature	-40°C to +70°C
Altitude	≤2000 m

Standards Compliance

Safety	EN 62368-1, IEC 62368-1
Environment	ROHS
Ingress Protection	IP20

Rectifier Cabinet

Deliver efficient and reliable power while using minimal floor space.

- High power density up to 500 kW per cabinet
- Parallel up to (2) rectifier cabinets to form a 1 MW system
- Hot-pluggable rectifiers with individual AC input breakers
- Reduce CapEx by adding rectifiers and an additional cabinet to increase capacity as needed

Model	F02-CKY
AC Input	250 A / 3P x 4 terminals
DC Output	Copper bus bar
Controller Module	M822E
Rectifier Module	R400-25k
Rectifier Positions	20 available
Cabinet Capacity	500 kW
Power Density	781 kW/m ²
Dimensions (H x W x D)	2000 x 800 x 800 mm
Cabinet Weight	<300 kg (without modules)



Vertiv™ eSure™ Rectifiers

Lower operating cost with 25 kW HVDC rectifiers that deliver 96.9% efficiency. These high-density 400 VDC modules save valuable space.

- R400-25K modules supply 25 kW at 400 VDC
- Operates at 96.9% peak efficiency
- Hot pluggable design for easy expansion

Model	R400-25K
Input Voltage	260 VAC to 530 VAC
Output Voltage	280 VDC to 400 VDC
Output Power	25 KW
Peak Efficiency	96.9%
Dimensions (H x W x D)	88 x 240 x 470 mm / 3.5 x 9.4 x 18.5 inches
Weight	13 Kg



Vertiv™ NetSure™ Control Unit

Intelligently manage your HVDC power solution with the powerful M822E controller.

- 7-inch touch screen provides a user-friendly graphical interface
- Communication via web browsers and SNMP over TCP/IP
- Comprehensive battery management including float and boost charging, automatic voltage regulation, temperature compensation, battery capacity calculation, and online battery testing



Model	M822E
Display	800 x 480 dot matrix, 7 inch touch screen LCD
Communication	RS232, RS485, Ethernet, USB (for software upgrades)
Protocol	IPv4, HTTP, SNMP, EEM, Modbus
Digital Inputs	6x digital inputs (4 passive, 2 active)
Outputs	8x digital outputs (6x dry contact, 2x OC)

DC Distribution Cabinet

Intelligently distribute, monitor and manage your critical 400 VDC loads.

- Integrated monitoring with real-time status of DC cabinet information such as voltage, current, and branch status
- Built-in >10 kA surge protection
- Reduce CapEx by adding additional primary and secondary DC distribution cabinets as needed



Primary DC Distribution Cabinet

Model	PD400/1200-1	PD400/1600-2
Capacity	1200 A	1600 A
Controller	4 line LCD display	4 line LCD display
Communication	RS485 for remote monitoring	RS485 for remote monitoring
Battery Charge Current	≤200 A	≤200 A
Battery Fuses	NT4: 2 x 1250 A	NT4: 2 x 1600 A
Load Output	≤1200 A	≤1600 A
Load Output Fuses	NT2: 9 x 400 A	NT3: 5 x 630 A; NT2: 4 x 400 A
Branch Current Reading	Yes	Yes
Insulation Detection	Yes	Yes
Cable Access	Top and bottom cabling with full front and rear access for easy install and maintenance	
Dimension (H x W x D)	2000 x 800 x 800 mm	2000 x 800 x 800 mm
Weight	≤ 300 kg	≤ 300 kg

Secondary DC Distribution Cabinet

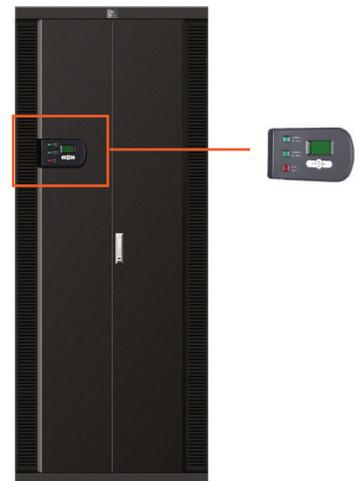
Model	PD400/630-3	PD400/630-4
Capacity	630 A	630 A
Controller	4 line LCD display	4 line LCD display
Communication	RS485 for remote monitoring	RS485 for remote monitoring
Load Output	≤500 A	≤500 A
DC Input Fuse	NT3: 1 x 630 A	NT3: 1 x 630 A
DC Output Breaker/Fuse	MCB: 56 x 32 A/2P	Fuse NT2: 10 x 250 A
Cable Access	Top and bottom cabling with full front and rear access for easy install and maintenance	
Dimension (H x W x D)	2000 x 800 x 800 mm	2000 x 800 x 800 mm
Weight	≤ 300 kg	≤ 300 kg

AC Distribution Cabinet

Connect your facility to the grid and backup generators while keeping track of AC voltage performance.

- Safely and reliably support two AC inputs with manual switch function
- Monitor AC cabinet voltage, current, frequency, branch status and lightning protection in real-time using an independent distribution controller

Model	PD380/630	PD380/800
Capacity	630 A	800 A
Controller	4 line LCD display	4 line LCD display
Communication	RS485 for remote monitoring	RS485 for remote monitoring
AC Input	MCCB 2 x 630 A/3P	MCCB 2 x 800 A/3P
AC Transfer Switch	Manual switch-over electronic	Manual switch-over electronic
AC Input Current	500 A maximum	700 A maximum
AC Output	MCCB (Icu=35 KA): 6 x 250 A/3P thermal magnetic MCB (Icu=4.5 KA): 1 x 63 A/3P MCB (Icu=6 KA): 3 x 32 A/3P	MCCB (Icu=35 KA): 8 x 250 A/3P thermal magnetic
Cable Access	Top and bottom cabling with full front access, rear access for cabling and maintenance if needed	
Dimension (H x W x D)	2000 x 800 x 800 mm	2000 x 800 x 800 mm
Weight	≤ 300 kg	≤ 300 kg



PDU Cabinet

Easily distribute and monitor power to individual loads in your data center.

- Dual-source A & B input
- Integrated monitoring system provides real-time status of DC voltage, current, and branch load status
- Supports remote monitoring through RS485 communication port (standard PDU) or M822E integration (smart PDU)
- Optional insulation monitoring, branch current detection and 7-inch touch screen display



Standard PDU



Smart PDU

Standard PDU

Model	PD400/250 DF-Y1	PD400/250 DF-Y2	PD400/400 DF-Y3
Capacity	250 A	250 A	400 A
Controller	SMPDU with X1 board, 2 line LCD display	SMPDU with X1 board, 2 line LCD display	SMPDU with X1 board, 2 line LCD display
Communication	RS485 for remote monitoring	RS485 for remote monitoring	RS485 for remote monitoring
Configuration	Dual-source A & B input	Dual-source A & B input	Dual-source A & B input
DC Input	MCCB NDM3Z: 2*250 A/3P	Fuse NT2: 2*(2*250 A)	MCCB T5N: 2*400 A/3P
DC Output	MCB: Dual 24*32 A/2P	MCB: Dual 24*32 A/2P	MCB: Dual 24*32 A/2P
Cable Access	Top and bottom cabling with full front and rear access for easy installation and maintenance	Top and bottom cabling with full front and rear access for easy installation and maintenance	Top and bottom cabling with full front and rear access for easy installation and maintenance
Dimension (H x W x D)	2000 x 800 x 400 mm	2000 x 800 x 400 mm	2000 x 800 x 400 mm
Weight	≤ 350 kg	≤ 350 kg	≤ 350 kg

Smart PDU

Model	PD400/250 DFI-3-Y1	PD400/250 DFI-3-Y2	PD400/400 DFI-3-Y1	PD400/400 DFI-3-Y2
Capacity	250 A	250 A	400 A	400 A
Controller	7-inch touch screen (M822E-R)	SMPDU, 4 line LCD display	7-inch touch screen (M822E-R)	SMPDU, 4 line LCD display
Communication	RS232, RS485, Ethernet, USB (for software upgrades)	RS485 for remote monitoring	RS232, RS485, Ethernet, USB (for software upgrades)	RS485 for remote monitoring
Configuration	Dual-source A & B input			
DC Input	MCCB NDM3Z: 2*250 A/3P	Fuse NT2: 2*(2*315 A)	MCCB NDM3Z: 2*400 A/2P	Fuse NT2: 2*(2*400 A)
DC Output	MCB: Dual 24*32 A/2P			
Branch Current Reading	Yes with ±1% accuracy	Yes with ±1% accuracy	Yes with ±0.65% accuracy	Yes with ±1% accuracy
EGU01	No	No	Yes	No
Cable Access	Top and bottom cabling with full front and rear access for easy installation and maintenance	Top and bottom cabling with full front and rear access for easy installation and maintenance	Top and bottom cabling with full front and rear access for easy installation and maintenance	Top and bottom cabling with full front and rear access for easy installation and maintenance
Dimension (H x W x D)	2000 x 600 x 600 mm			
Weight	≤ 350 kg	≤ 350 kg	≤ 350 kg	≤ 350 kg

Battery Control Box (BCB)

Integrate battery backup into your HVDC solution by adding a battery control box that protects and monitors MCCB status.

- Standalone design for flexible deployment
- Supports wall-mounted and battery rack-mounted installations
- MCCB alarm dry contacts are available to monitor the MCCB on/off status
- Embedded battery detection device streamlines battery management



Model	PDB 400/1000	PDB 400/1250	PDB 400/1600
Capacity	1000 A	1250 A	1600 A
Configuration	MCCB NDM3Z: 1*630 A/4P, 2 poles in parallel	MCCB NDM3Z: 1*800 A/4P, 2 poles in parallel to meet 1250 A	MCCB NDM3Z: 1*800 A/4P, 2 poles in parallel to meet 1600 A
Cable Access	Top and bottom cabling for easy installation and maintenance	Top and bottom cabling for easy installation and maintenance	Top and bottom cabling for easy installation and maintenance
Dimension (H x W x D)	550 x 200 x 800 mm	550 x 180 x 800 mm	550 x 180 x 1000 mm
Weight	≤40 kg	≤35 kg	≤50 kg

Battery Monitoring Unit

Monitor the status of your batteries to detect issues before they arise.

- Cascade up to 24 units to measure the cell voltage of one or multiple battery strings
- Accurately measure battery temperature with multiple temperature sensors
- Monitor the charging and discharging current of battery string
- Set alarm voltage thresholds



Model	BM400V1
Ambient Temperature	-20°C to +65°C
Power Supply Voltage	36 VDC to 60 VDC
Single-cell Voltage Range	0.2 to 20 V with ≤±0.5% accuracy
Battery Temperature Measurement Accuracy	≤±2°C
Battery Current Monitoring Accuracy	≤±1%
No of Acquisition Channels	31 battery cells
Indicators	Run indicator, alarm indicator and 4 battery capacity indicators (SOC)
Dimension (H x W x D)	255 x 110 x 43 mm
Weight	≤0.8 kg

Insulation Detector

Detect insulation faults with configurable alarm settings and remote monitoring

- Supports the monitoring of two independent copper buses and the insulation failure of each branch.
- Insulation fault alarm threshold can be set and configured, adapts to different load conditions and weather conditions
- Alarm information can be transmitted to the distribution monitoring unit via the RS485 port
- Intelligent design with self-detection function



Model	EGU01
Power Supply Voltage	80 VDC to 400 VDC
Detection Accuracy	±10% from 2 to 50 kΩ
Communication	RS485
Dimension (H x W x D)	88 x 117 x 120 mm
Weight	≤1.5 kg

Support for Other Critical Loads

400/48 VDC Converter System: Easily support -48 VDC equipment used in traditional telecom networks while leveraging 400V HVDC efficiency gains.

- Rack-mounted or stand alone 400/48 VDC converter system
- Hot-pluggable high-efficiency converter modules
- Monitored and controlled by an intelligent Vertiv™ NetSure™ Control Unit



Model	Vertiv™ NetSure™ 732 A41	Vertiv™ NetSure™ Converter System
Input Voltage	190 VDC to 410 VDC	290 VDC to 410 VDC
Converter Efficiency	>96.5%	96.5%
Converter Module	C400/48-3500e3	C400/48-3500e3
Controller	M830B	M830D
Output Voltage	-42 VDC to -58 VDC	-42 VDC to -58 VDC
Mounting	19 inches wide, 4U high	Stand-alone cabinet with top and bottom cabling
Dimensions (H x W x D)	178 x 483 x 390 mm	2020 mm x 600 mm x 600 mm
Weight	<20 kg (excluding rectifier and controller)	250 kg (without converters)

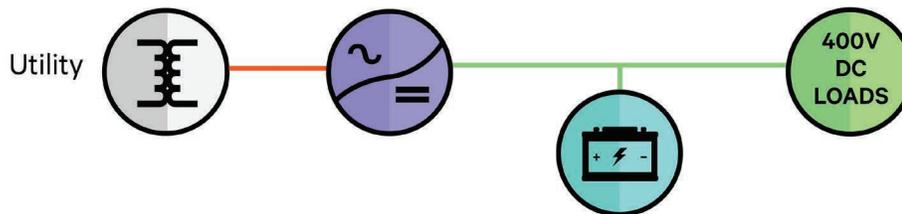
400/230 VAC or 400/120 VAC Inverter System: Vertiv also offers custom 120 VAC or 230 VAC power and inverter solutions depending on your site's needs.

HVDC System Configuration Guide

The quantity of units listed is a general recommendation. Actual number of units is determined by the specific requirements of the user.

System	Model	Part Number	Quantity of Units				
			50-300kW	325-375kW	400-425kW	450-500kW	525-750kW
Rectifier Cabinet	NetSure HVT F02	024009T	1	1	1	1	2
	R400-25K Rectifier	2131122	2-12	13-15	16-17	18-20	21-30
	M822E Controller	2440081	1	1	1	1	1
Primary DC Cabinet	PD400/1200	2403335	1-2	—	—	2	—
	PD400/1600	2403337	—	1-2	1-2	—	2
Secondary DC Cabinet	PD400/ 630DF	—	0-8	0-8	0-8	0-8	0-8
AC Cabinet	PD380/ 630A	2403325	0-1	0-1	—	0 or 2	—
	PD380/ 800A	2403329	—	—	0-1	—	0 or 2
PDU Cabinet	400A/250A	—	0-12	0-12	0-12	0-12	0-12
BCB	PDB400	—	0-4	0-4	0-4	0-4	0-4
Other	Converter System	—	Configured to fit site requirements				
	Inverter System	—	Configured to fit site requirements				

Leverage HVDC Technology Today



400V HVDC power technology can solve your data center and telecom core site problems, helping you simplify your site, reduce costs, and achieve exceptional availability. Whether you are building a new site or upgrading an existing one, Vertiv can reduce the footprint of your power architecture to support the challenges of the rapidly increasing demand for data.



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