Vertiv™ Power Module H2

Zero On-site Emission Backup for Datacenters*

Vertiv™ Power Module H2 is a prefabricated backup power solution based on Proton Exchange Membrane (PEM) hydrogen fuel cell (FC) technology. Vertiv partnered with Ballard Power Systems, leading PEM fuel cell company, to ensure strong foundation for the system.

Vertiv Power Module H2 provides reliable, zero on-site emission backup as an alternative to diesel generator, enabling deployment of datacenter capacity in regions with environmental and power grid capacity constraints.

By integrating PEM FCs with power converters, bridging batteries, heat rejection, master controller into a single product, Power Module H2 reduces complexity for end user.

ZERO ON-SITE EMISSION BACKUP POWER

Vertiv Power Module H2 output is pure water with zero Nitrogen and Sulphur oxides (NOx, SOx) and zero Particulate Matter (PM) emissions. This makes the system suitable for sites with environmental air permitting restrictions. Additionally, Vertiv Power Module H2 does not produce Scope 1 (on-site), Greenhouse Gas (GHG) emissions, helping achieve carbon emission avoidance goals.

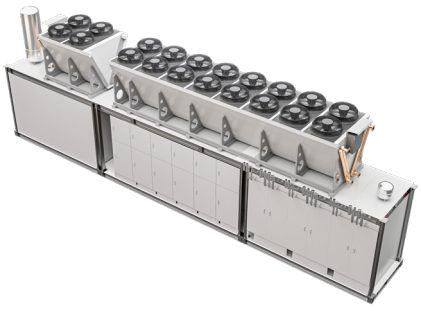
ZERO ON-SITE EMISSIONS GRID SUPPORT

Vertiv Power Module H2 generates zero on-site emissions, allowing datacenter operators to actively manage power consumption from the grid without environmental impact. A datacenter can then become flexible power consumer and offer services to grid operators, supporting electrical power grid. This capability can help unlock power capacity which is not accessible to non-flexible consumers.

FROM CONCEPT TO REALITY

In 2024, Vertiv developed and tested Vertiv Power Module H2 500' (350kW net output). Power Module H2 platform can be expanded to 3000kW net output, matching the power rating of typical datacenter backup system.

Vertiv™ Power Module H2 500'



Vertiv™ Power Module H2 1500'

**Off-site emissions depend on the method of hydrogen generation and transportation to site.*

Vertiv Power Module H2 Advantages

Backup capable:

- Up to 10 seconds to start-up from Standby.
- Instant 100% load acceptance after startup.
- AI ready – stable output during load transients.
- Islanded or grid parallel operation.

Clean on-site power:

- Zero on-site emissions (NOx, SOx, PM, CO2)
- Zero on-site Scope 1 carbon emissions.

Grid support:

- Dispatchable, zero-emission on-site power.
- Instant response to multi-hour dispatch.

Reliable:

- Up to 25 000h run hours before overhaul.
- Fewer moving parts than generators.
- Modular design, internal redundancy as option.

Integrated, Modular and Prefabricated

- Several complex systems in a single product.
- From 400kW to 3000kW low voltage AC output.
- Factory manufactured and tested.
- Designed for seamless datacenter integration

Vertiv™ Power Module H2 combines several complex subsystems into a single functional unit.

PEM Fuel cell modules convert hydrogen to DC power output with high efficiency and zero on-site emission. With millions of operation hours, Ballard's fuel cell modules deliver proven reliability and durability to the system.

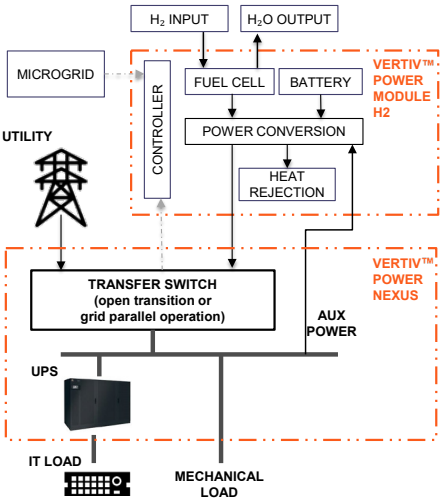
Energy storage: batteries improve dynamic response during load changes and startup energy to ensure black start capability. **Power conversion system** transforms DC power from FCs to conditioned single bulk AC output.

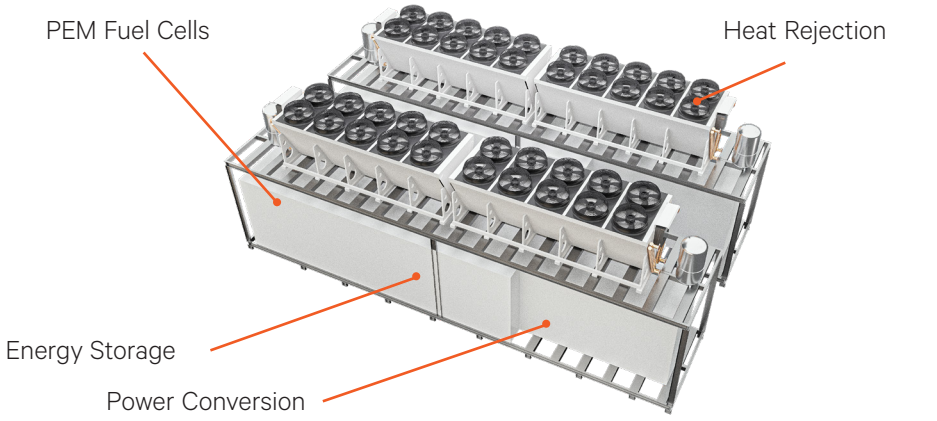
The solution is integrated in secure, weatherproof, and transportable **enclosure**.

Integrated liquid **heat rejection** system to cool FCs and power conditioning.

System Controller manages power balance between fuel cell system and energy storage, and ensures efficient, stable, and safe operation.

For even higher degree of seamless integration, Vertiv Power Module H2 can be coupled with **Vertiv™ Power Nexus** and **Vertiv™ DynaFlex** offering.





Vertiv™ Power Module H2 4000'

Vertiv™ Power Module H2 preliminary application guide

Model Name		500'	500' XD	1500'	1500' XD	4000' XD
Electrical	Net output power	350kW	410kW	1000kW	1250kW	3000kW
	Electrical output	Air Circuit Breaker, bulk output. 400-480Vac, 50/60Hz, 3P+N+PE Islanded and Grid parallel operation capability				
	Startup time	10 seconds from start signal to nominal frequency and voltage at system output				
	Ramp rate	100% load acceptance capability once system is started up				
	Auxiliary Input	400/480Vac, 50/60Hz,3PH+N+PE. Battery charging during standby, preheating during cold weather.				
	Battery system	Valve Regulated Lead Acid (VRLA), sized for system startup and load following. Long duration lithium battery optional.				
Physical	Dimensions LxWxH	8.3x2.4x5.8m		17.3x2.4x5.8m		(2)16x3.3x6.3m
Hydrogen	No. of H2 inputs	2	1	6	3	8
	H2 Pressure	3.5-5 bar	8-10 bar	3.5-5 bar	8-10 bar	8-10 bar
	H2 supply	0-80°C; Fuel shutoff solenoid valve close to PM H2 inlet to minimize residual H2 in pipeline in case of shutdown.				
	H2 Quality	ISO 14687:2019 (Type I/II, grade D); 99,97% purity				
H2O output	Water quality	De-Ionized Water, 20 – 80°C; Mostly water vapor mixed with process exhaust. Small percentage drains as liquid.				
Controls and monitoring interfaces	Control	Modbus TCP/IP; Start/Stop signal, Power Output Setpoint (in Grid parallel mode)				
	Monitoring (BMS)	Modbus TCP/IP				
	Remote Power Off	Dry Contacts				
Environmental	Temperature	Standard DB: min. -25°C / max. 40°C; Site specific configurations as option				
	Elevation	Standard: 1000m; Site specific modifications as option				
	Enclosure	IP54 steel frame, doors/covers with security locks				
	Structural ratings	Wind: 25m/s; Snow 100kg/m2; Seismic 0.2g; Site specific modifications optional				

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