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INTELLIGENCE UPDATE

Vendors gearing up for 800V DC adoption

Daniel Bizo 8 Apr 2026

Over the past two decades, the data center industry has repeatedly discussed the use of direct current (DC) for power distribution — and made multiple attempts to commercialize it.

In theory, it makes sense: microelectronics run on DC. Feeding IT systems with DC power would eliminate all but one AC-DC conversion. By contrast, a typical electrical chain — using double-conversion UPS systems and standard IT power supply units (PSUs) — can have as many as five conversion steps.

Fewer active electrical components between the grid and the chips mean lower costs, reduced energy losses, and less risk of component failure. The telecom industry has long standardized on DC power distribution and has recently started adopting higher DC voltages (i.e., 336-400V) to lower distribution costs and losses. However, for most operators, the business case is not yet convincing enough to make data centers shift to DC power — although China is a notable exception.

Now the topic of DC power in data centers is back in vogue, but for different reasons: the focus is now on IT hardware performance, not facility optimization. In its push for extreme densification of compute systems, Nvidia is proposing a disaggregated IT power supply architecture centered on 800V DC (also including ±400V DC implementations) power delivery to the compute rack — and for in-rack power distribution in the future. In the first-generation of installations, DC-DC PSUs within the compute racks will step voltage down to 48V.

Nvidia's main motivation is the shift toward extremely dense racks, where PSUs would occupy valuable space that could otherwise be used for additional compute nodes. The total space needed for DC-DC power supplies is about a third or less of AC-DC PSUs. Future plans call for native 800V DC support integrated onto IT system boards, eliminating the need for dedicated rack DC-DC power supplies and freeing up even more space in compute cabinets.

Industry efforts to commercialize this architecture have accelerated since Nvidia first discussed it in 2024. At GTC San Jose 2026, the company's flagship conference held in mid-March, Uptime Intelligence counted at least eight equipment vendors showing reference designs for 800V DC power racks — power "sidecars" in industry jargon — with plans to deploy them in data halls as early as the first half of 2027.

At their core, 800V DC power racks take on most of the functionality of standard rack PSUs: they convert AC facility power (e.g., 415V AC or 480V AC) to DC while also providing isolation between the source and the load. Most vendors appear to follow similar design philosophies, producing highly modular designs in which a typical power cabinet comprises breakers and rack PDUs (for AC distribution) and multiple AC-DC power shelves, each of which contains several (e.g., three, six or nine) rectifier modules. The power shelves feed an 800V DC rack busbar that delivers power to the compute rack(s) via whips (cables) or a busway.

But there is more to power racks than simply moving AC-DC conversion out of the compute rack:

- **More efficient PSU redundancy.** Several of the power rack designs seen by Uptime Intelligence have 3+1 redundancy (also known as "four makes three"), providing around 660-680 kW rated capacity. This is already a much lower capacity overhead when compared with common 2N rack and server PSU setups. Next generation designs with larger capacity power racks (1 MW+) will provide opportunities to lower this overhead further. With larger GPU compute installations using 800V DC busway systems, an entire power rack may become a unit of redundancy.
- **Power stabilization.** Most of the 800V DC power racks will support extreme density AI training systems that have the potential to produce frequent, large load steps due to GPU synchronization and storage checkpoint events. This can create AC power quality issues, reduce UPS system efficiency and put stress on transformers and diesel engine generators. Power racks open up possibilities to add more capacitance than before by adding bulk capacitors or supercapacitors to the compute racks, providing energy storage for up to a few seconds and helping smooth AC input power.
- **Ride-through.** For compute cluster installations without central UPS systems, vendors may offer the option to configure power cabinets with backup battery energy storage — most likely using lithium-ion chemistries, which represent a fire risk. Ride-through times are typically measured in the tens of seconds at rated load, compared with several minutes commonly offered by static UPS systems. However, this is sufficient time for engine generators to start up and synchronize to the load. With additional software controls triggered by a grid event, throttling the compute cluster can extend ride-through to a couple of minutes, minimizing the risk of an abrupt shutdown.
- **First step toward 800V DC facility power.** Vendors present 800V DC power racks as an initial step toward more extensive, native facility support for 800V DC distribution. This transition is expected to evolve gradually and take several forms.
  Some UPS vendors, such as Schneider Electric and Vertiv, are likely to offer centralized 800V DC UPS systems as an option by around 2028. These would serve as an alternative to sidecars for dedicated multi-megawatt installations, particularly where maintaining compatibility with AC power chains is important. Uptime Intelligence notes that IT vendor support for DC PSUs in general has already become much broader. Meanwhile, the data center industry is coordinating the creation of DC electrification standards through the Open Compute Project (OCP), including but not limited to 800V DC. All this suggests that development costs of higher voltage (380+) DC PSUs for generic servers, storage and

networking systems are becoming relatively incremental, paving the way to broad-based adoption of DC power delivery for IT systems.

In the longer term, electrification and IT vendors appear to agree that data center power architectures will undergo more fundamental changes, beyond adding 800V DC as an option for power delivery to IT racks. The plans call for extended use of medium-voltage AC (typically 10 kV and above) distribution systems, with conversions to 800V DC (and 400/480V AC in mixed environments) occurring close to the IT load. In the immediate future, this can be achieved using a combination of large transformers and rectifiers. Ultimately, solid-state transformers, still in development, are expected to take on this role in highly integrated packages, with early commercialization anticipated from 2028-2029.

An upcoming Uptime Intelligence report will discuss potential future data center power architectures in more detail.

ABOUT THE AUTHOR

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Over the past 15 years, Daniel has covered the business and technology of enterprise IT and infrastructure in various roles, including industry analyst and advisor. His research includes sustainability, operations, and energy efficiency within the data center, on topics like emerging battery technologies, thermal operation guidelines, and processor chip technology.

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