

Power distribution infrastructure and data centers

Scalable. Compliant. Resilient.

The global data center industry is undergoing a profound transformation because traditional data centers cannot meet the power density ecosystem.

In the past, a rack of servers may have used only 10–20 kW, but GPUs today already use more than 100 kW per rack. Soon, that power density may be more 1 MW per rack. Data centers that were previously designed for 5 MW of IT load are now being designed for more than 1 GW. Voltage distribution is also changing dramatically. Facilities that were previously designed for 480 V alternating current (AC) designs are now built to deliver direct current (DC) power at 800 V today and 1,500 V in the near future — with that power distribution equipment relocated to positions adjacent to graphics processing units (GPUs) on the data center floor.

These are dramatic changes to the power requirements for data centers — changes that create complex challenges and risks. To successfully overcome those challenges and mitigate risk, data center owners/operators and hyperscalers need an entirely new approach to power distribution in the data center.

The strategy must support increasing density, rising overall IT loads, the shift to DC power and the evolving design of power distribution to GPUs. Organizations that do this successfully will not only optimize performance of their data centers but also accelerate time to market for new facilities while supporting reliability, safety, compliance and sustainability.

The power trends in data centers are clear

Power density in the GPU rack transitioning from 10 kW to 1,000 kW

Facility power requirements transitioning from 5 MW to 1,000 MW

Higher voltage distribution, transitioning from 480 V AC to 800 V DC, then 1,500 V DC

Distribution voltage moving closer to the GPU before step-down to utilization voltage





Key considerations for data center power distribution:

- **Design for high-density performance** – Optimize power strategies to meet rigorous power density demands.
- **Build scalable, future-ready architectures** – Implement highly scalable systems that can adapt to evolving workloads and provide a smart foundation for growth.
- **Support DC power evolution** – Develop distribution strategies that accommodate the shift to DC power and address the unique challenges of DC environments.
- **Prioritize operational reliability** – Engineer resilient power systems that minimize downtime and protect mission-critical operations.
- **Address upstream dependencies and risks** – Proactively manage grid and upstream power considerations to help prevent delays, redesigns and costly retrofits.
- **Integrate testing, inspection and certification (TIC)** – Embed comprehensive TIC strategies from grid to chip to enable reliability, safety and compliance.
- **Engage power expertise early** – Partnering with experienced power experts early to accelerate time to market, strengthen compliance, enhance safety and deliver a smarter foundation for long-term success.

Benefits of UL Solutions data center power distribution services



Accelerate time to market – UL Solutions' deep expertise and proven services can help significantly accelerate the timeline for high-density data center projects to go from concept to operation.



Aid scalable, future-ready power systems – Through science-based insights and holistic certification, UL Solutions helps reduce deployment risk, optimize uptime and achieve more consistent performance in an increasingly complex landscape.



Harness power innovation to optimize operations – From grid to chip, UL Solutions works alongside the full data center power value chain to define and evaluate emerging architectures – enabling organizations to confidently adopting new technologies that keep pace with evolving needs and standards.



Identify and mitigate risks – Our deep expertise in power systems identifies and mitigates risks early before they lead to delays, downtime and costly redesigns or retrofits.



World-class safety – UL Solutions helps shape industry standards and best practices for safety, not just compliance outcomes. Our safety science expertise helps to mitigate the higher safety risks that are inherent to high-density AI computing environments.

Learn where next generation data center power meets scalability and resiliency visit [UL.com/DCPower](https://www.ul.com/DCPower)



Safety. Science. Transformation.™

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