Research @ Citi Podcast, Episode 85: The Next Power Shift — How Asia Is Building the AI Era

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Guest: Pierre Lau, Asia Utilities Analyst, Citi

Transcript:

Erica Poon Werkun (0:00)

Hi, everyone. Welcome to the Research @ Citi podcast. I'm Erica Poon Werkun, JANA & Asia South Head of Research at Citi.

Joining me today are Kyna Wong, China Technology and Communications Analyst, and Pierre Lau, Asia Utilities Analyst. Kyna, Pierre, and the broader Asia team have recently collaborated on a Super-Sector report [available to existing clients here] examining the structural shift to 800VDC power architecture in AI data centers and the investment implications across Asia.

Kyna and Pierre, welcome to the podcast, and thank you both for joining us today.

Kyna Wong (0:41)

Hi Erica, hi everyone. Great to be here.

Pierre Lau (0:42)

Hi, everyone.

Erica Poon Werkun (0:46)

Great. I will turn the first few questions to Kyna. Kyna, why is 800VDC becoming the standard for next-generation AI data centers, and why now?

Kyna Wong (0:57)

Thanks for that question. It's a little bit complicated and also related to physics. But I wanted to say the fundamental driver is about the GPU power density. We see that rack power has grown nearly 100-fold since 2020 — from 10kW, at that kind of energy level, with the NVIDIA Ampere architecture GPU to 120kW with Blackwell now, and projected to even exceed one megawatt with upcoming Rubin Ultra and also Kyber platforms. The standards are getting much higher now. At these kind of power levels, traditional AC power distribution simply cannot handle it physically and also economically. So doubling the voltage to 800VDC is massive because it halves the electricity current for the same power delivery. That can save on a lot of things. It will reduce power requirements, cable usage, transmission losses. It's all about physics, but it helps a lot.

This is also the reason why electricity is transmitted from rural area to rural area through very high-voltage transmission lines in the country and then transferred to a lower voltage to the household. I think this is the reason they wanted to save the energy losses during the transmissions.

Beyond the headline efficiency improvement and also the copper cable savings, 800VDC also frees up space in the data center by eliminating lots of parts. For example, UPS is Uninterruptible Power Supply, it's a back-up power system, and also transformers like stepping up or down the power voltage and the batteries in the data centers, which already occupy around 30 to 40% of a traditional facility's total footprint. Critically, for hyperscalers with carbon-neutrality commitments, they want to be green so 800VDC is architecturally compatible with DC-power-native renewable energy that are already using DC power transmissions, and also battery-storage-saving intermediate AC inversion losses that also saves on other parts. And the distributed battery-backup unit, called the BBU, and also the battery energy-storage system, or BESS, is actually replacing some of the other parts and is better architecture fit for managing these very dynamic loading profiles of GPU AI clusters in data centers than historically in UPS.

Erica Poon Werkun (3:26)

Thank you, Kyna. With power being such a bottleneck for the AI DC development, this technological advancement surely is very important. So how quickly will 800VDC be adopted globally, and what does the transition timeline look like?

Kyna Wong (3:42)

That's a good question. The demand for 800VDC is accelerating, driven by NVIDIA's cloud and data-center architecture roadmap. We project 800VDC will account for 16% of new global data-center capacity additions in 2027, rising to 58% in 2028, 73% in 2029, and even 79% by 2030, based on high-end GPU server shipment projections.

In absolute terms, that represents incremental 800VDC data-center capacity growing from 4.3 gigawatts in 2027 to over 25 gigawatts annually in 2030.

The transition is not a single event. It unfolds in phases, beginning with sidecar retrofits of existing facilities in 2027 to 2028, and progressing toward purpose-built solid-state transformer or SST-native data centers from 2029 onward. The distinction in architectures matters because the two modes create very different equipment-demand profiles. Sidecars probably could peak in 2027 to 2028; SST may take over from 2029 onward.

Erica Poon Werkun (4:51)

Well, Asia is the center for a lot of the supply chain for AI. So, if we look at the individual sectors, which are the most directly impacted by this 800VDC transition and how?

Kyna Wong (5:06)

In our report, we summarized the 800VDC theme impact into six distinct sectors across the data-center infrastructure.

First, data-center operators are the primary demand aggregators. Their ability to develop high-density, 800VDC-ready white space will increasingly determine their lease pricing power and tenant retention.

Second, power equipment is the most structurally disrupted sector, or transition sector. Low-voltage transformer and also UPS manufacturers face permanent displacement as SSTs take over. We project low-volt transformer demand for data-center buildouts drops from around 55,000 MVA in 2027 to around 30,000 MVA by 2030, while SST demand surges from near zero to over 37,000 MVA over the same period. Relay manufacturers, switch-gear suppliers, and power-plant equipment providers such as gas turbines and diesel generators are OK because they participate across both the traditional and also 800VDC supply chains.

Number three, battery energy-storage systems, or BESS, they transition from a niche data-center add-on to a core infrastructure component. We estimate BESS battery demand in data centers grows at 80% or above CAGR over the next five years, driven by its role replacing the centralized UPS. And also China's dominant LFP battery-manufacturing position creates a structural supply-chain advantage here.

Number four, IT rack power and also cooling, in which we highlight that rack-level BBU adoption will increase the content value rising from around $4,000 to $5,000 per rack at Hopper to $33,000 to $34,000 per rack at Rubin Ultra, with penetration exceeding 85% by 2028. And secondly, liquid cooling, which transitions from optional to mandatory as per-rack power crosses 100 kW. And also, MLCC passive components also see structural content uplift across every stage of the 800VDC power delivery chain.

Number five, cooling solutions will migrate from air cooling to liquid cooling, which becomes a standard requirement rather than a premium option. Notably, cooling accounts for over 60% of non-IT power consumption in data centers, yet no major vendor currently offers a fully DC-native cooling system, creating an emerging opportunity here.

The last is actually power semiconductors. They are the enabling layer for the entire 800VDC ecosystem. The power equipment also depends on silicon carbide, and also the gallium nitride devices. The AI server power semiconductor market is projected to grow from $7.4 billion in 2025 to $32.5 billion by 2027 at a 110% CAGR.

Erica Poon Werkun (8:06)

Kyna, thank you so much for highlighting some of the key components of this trend. So let me focus on the power equipment and also the BESS parts that Kyna mentioned, and I'll turn that over to Pierre. Pierre, how does the 800VDC transition specifically reshape the power equipment supply chain? And what does the SST opportunity look like for Asian manufacturers?

Pierre Lau (8:34)

Hello, Erica. The move to 800-volt DC power is causing the biggest-ever change for the power-equipment supply chain. This transition eliminates the need for large, centralized backup power systems, known as UPS. For every 1 gigawatt of 800-volt DC data center capacity built, the industry will lose 1,563 megawatts of UPS sales — a shift that will accelerate from 2028.

Meanwhile, a large and complex device called the solid-state transformer, or SST, is being introduced. Unlike a simple, traditional transformer, the SST is an advanced, all-in-one system. This makes it much more valuable, costing three to five times more than the old ones that need to be replaced, but to create a major new revenue opportunity. Asian manufacturers are really smart and moving quickly to capture this market. Korean companies are already testing their SSTs in pilot and demonstration phases with major U.S. tech companies. Meanwhile, Chinese suppliers launched their products in mid-2026 and expect to start shipping them in 2027. The SST also requires special power semiconductors, creating a new link between the power and chip industries. Finally, the demand for other components like relays is also growing across the new 800VDC equipment, offering new sales for their suppliers.

Erica Poon Werkun (10:01)

Could you also specifically talk about the role of energy storage systems in 800VDC data centers?

Pierre Lau (10:00)

Good question, Erica. In 800-volt data centers, the way energy is stored changes completely. The old method used a single battery to provide 10 to 15 minutes of backup power.

The new 800-volt data center system replaces this with two different layers. Firstly, small battery units are placed at the server-rack level to handle very quick power spikes from the computer chips. Secondly, a larger battery system for the whole facility provides backup power for several minutes. This larger system also helps manage big power demands and can even support the main power grid.

This turns the battery system into a smart, active tool, rather than just a simple backup. It allows the data center to use a steady amount of power from the grid, even when the AI computers inside have large power swings. Having this stable power usage is becoming a key requirement for running large AI operations.

Erica Poon Werkun (11:07)

Let me just circle back to what you mentioned on solid-state transformers, or SST. What is the significance and is it commercially ready?

Pierre Lau (11:17)

This is an interesting question, Erica. The solid-state transformer, or SST, is the final piece of the 800VDC power system. It is a single device that directly converts high-voltage AC power into 800-volt DC power.

While the SST is new to the market, it is developing very fast. I researched a company called Sungrow in China recently that launched a ready-to-use SST product in July 2026. Several other suppliers are also testing their own versions. The key technologies needed for SSTs, such as special power chips, are now advanced enough. This means the technology is no longer a barrier. Instead, the main challenge for suppliers is to finish developing their products and bring them to market.

We expect that new power capacity using SSTs will reach 3.2 gigawatts in 2028 and grow to 17.8 gigawatts by 2030. This will be the biggest equipment change in the history of data-center power systems. We are excited to see this in the market.

Erica Poon Werkun (12:20)

Well, with that, thank you so much Pierre, and also Kyna, for sharing your insights of this important development.

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Disclaimer (12:55)