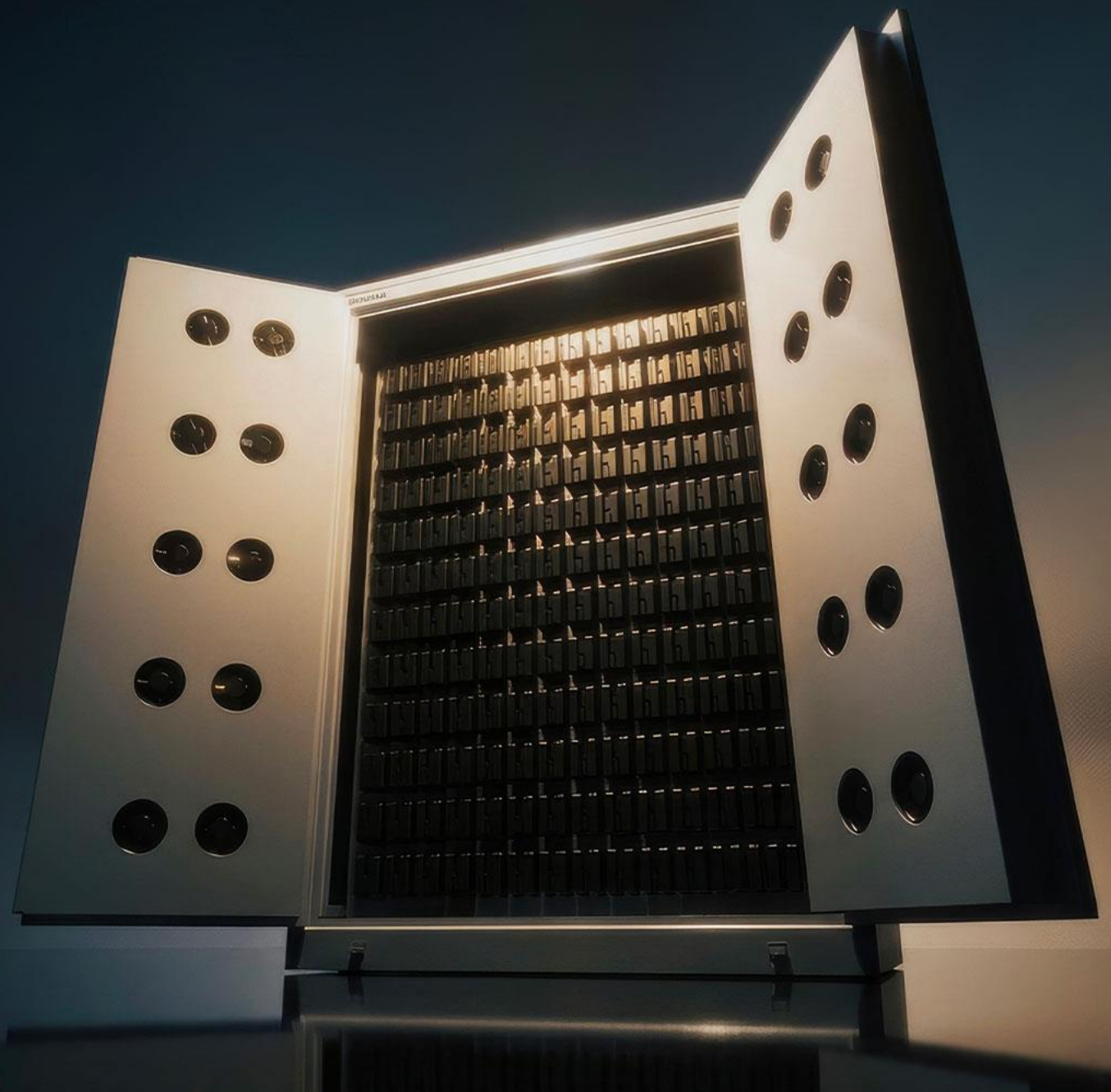
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Intelligent power for AI

IQ SST: Distributed, solid-state transformers for AI data centers



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AI data centers create a new power problem

Three constraints emerging at the same time: capacity, dynamic response, and efficiency

Capacity gap

Demand is growing faster than active AI-dedicated capacity and available power infrastructure.

Dynamic loads

AI training loads can swing from idle to full power several times per second, stressing the grid.

Efficiency losses

Legacy architectures rely on too many conversion stages between the grid and compute racks.

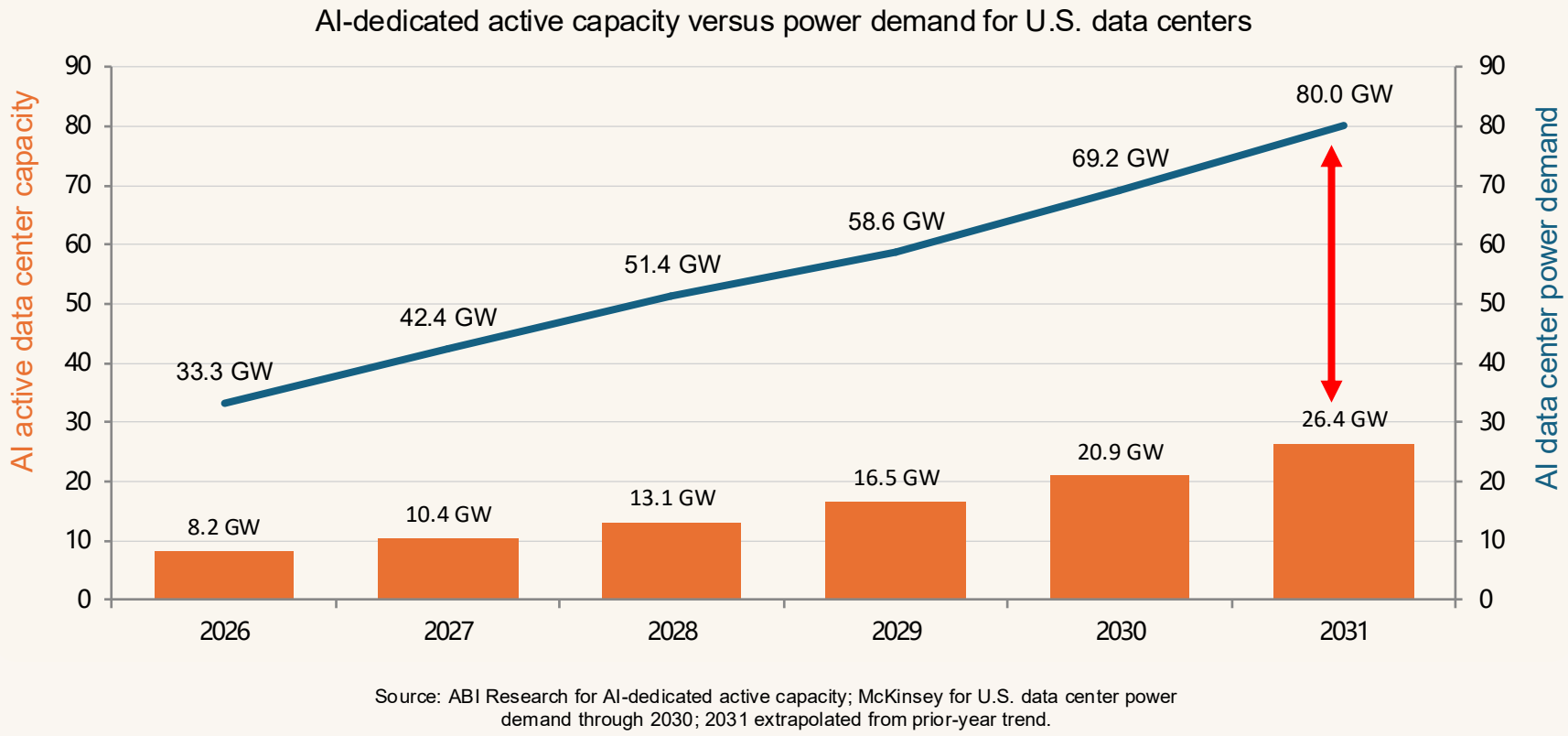


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AI demand is outpacing power infrastructure

U.S. data center power demand could reach ~80 GW by 2031, far ahead of expected AI-dedicated active capacity—and today's power architecture cannot deliver it efficiently.



Source: ABI Research for AI-dedicated active capacity; McKinsey for U.S. data center power demand through 2030; 2031 extrapolated from prior-year trend.

~80 GW

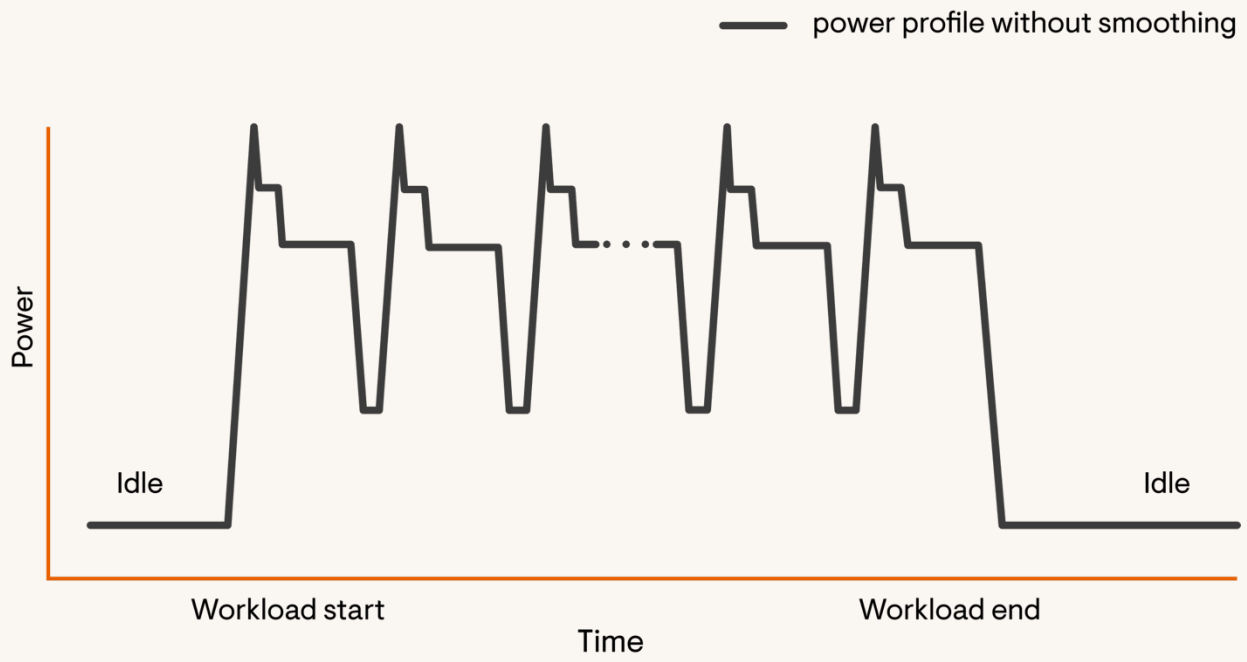
U.S. data center power demand by 2031 versus ~26 GW AI-dedicated active capacity

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AI also has a dynamic load problem

AI training loads can swing from idle to full power several times a second. Power infrastructure must respond in milliseconds, not seconds.



4 Hz · 1 cycle = 250 ms

Graph source: NVIDIA Technical Blog, "How New GB300 NVL72 Features Provide Steady Power for AI," Figure 1 (AI training workload power profile), July 28, 2025.



Picture every light in San Francisco going dark.

Then blazing back on.

Then dark again — several times a second.

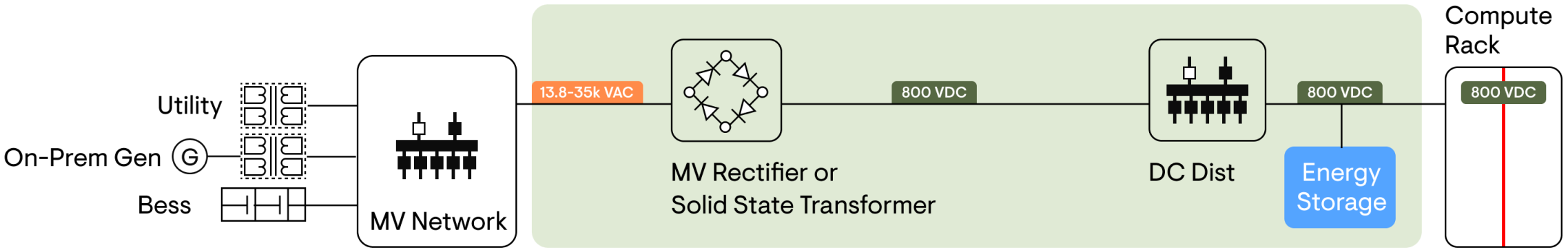
That's a 1 GW AI data center.

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The shift to 800 VDC architecture

800 VDC Distribution -MV to 800 VDC



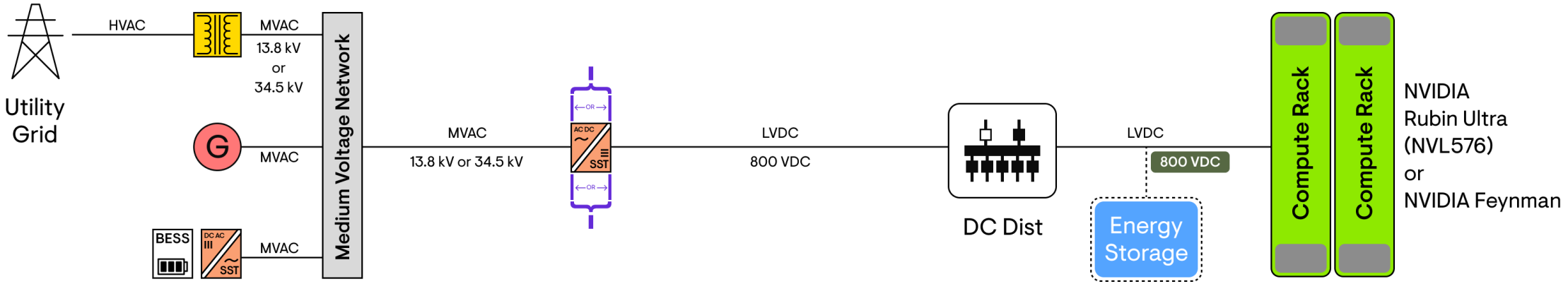
Source: NVIDIA white paper "800 VDC Architecture for Next-Generation AI Infrastructure" by Jared Huntington and Mike Tu

Opportunity

- Convert MV AC to 800 VDC and deliver directly to GPU rack
- Reduce complexity by eliminating multi-stage power conversion
- Eliminate the sidecar and move energy storage near the SST

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IQ SST supports two use cases



Enphase's differentiated solution: SST coupled with a BESS in the medium voltage section, and an SST for the compute load in the low voltage section

Enphase differentiated solution

- IQ SST supports two use cases:
  1. Without LV battery: Sub-millisecond response time enables us to reflect rapid compute load changes to the BESS SST
  2. With LV battery: A DC/DC block to charge and discharge a LV battery which is part of the IQ SST skid
- Reliability: Modular architecture enables very high reliability to achieve 99.999% uptime
- Manufacturing scale and cost: Soft switching and widely available components drive lower cost; supplied from U.S. manufacturing facilities

Product under development. Specifications and performance subject to change.
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AI needs a new power architecture—IQ SST

IQ SST will be a distributed solid-state transformer that converts medium voltage AC directly to 800 VDC for next-generation AI racks.

	Today	Tomorrow
Architecture	UPS, PDU + sidecar (PSU, BBU, CBU)	Reduced sidecar and backup infrastructure (more space for compute)
Voltage	48 V power delivery	800 VDC power delivery to align with NVIDIA/OCP architecture
Reliability	Important	Distributed redundancy; five-nines availability
Supply chain	Fragile, offshore, custom builds	Supplied from U.S. manufacturing facilities
O&M	Specialized field service team	Modular hot-swap; no specialists

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Why Enphase, and why now?

AI is setting a new standard for power delivery. Enphase is ready.

20-year head start

The core technology is what we've been shipping for two decades.

~89.4 million microinverters in the field. Nine microinverter generations. Five ASIC generations. Established and scalable manufacturing.

Distributed by design

No single point of failure. 99.999% availability.

Hundreds of power modules per unit with built-in redundancy.

Performance

Single-stage power conversion with sub-millisecond response time.

Fewer failure points. Higher efficiency. Simpler manufacturing. Lower service cost. Built on platforms we already ship at scale.

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Microinverter shipment numbers as of June 30, 2026.

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We changed solar.
Now we’re bringing distributed power to AI.

20 Years of distributed power electronics	**9** Microinverter generations	**~89.4M** Microinverters shipped	**~5.3M** Systems worldwide
~32.25 GW Managed solar systems	**~2.61 GWh** Deployed energy storage	**165** Countries served	**~550** Patents and pending applications

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Figures listed as of June 30, 2026.

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Our distributed architecture

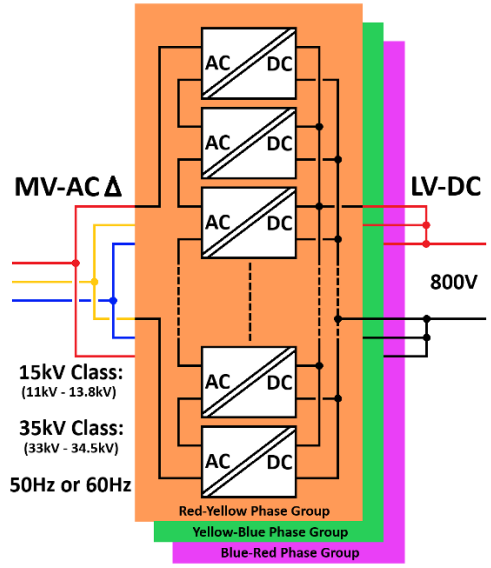
Enphase power module

- 5.5 kW rated building block; over 98.5% peak efficiency expected
- 250–500 kHz switching frequency; control ASIC: Kestrel (proprietary Enphase)
- BDS and UDS GaN for input and output power stage
- Weight: ~8 lbs; plastic enclosure with silicone potting
- Soft-switching design for low EMI



How power modules create an IQ SST rack

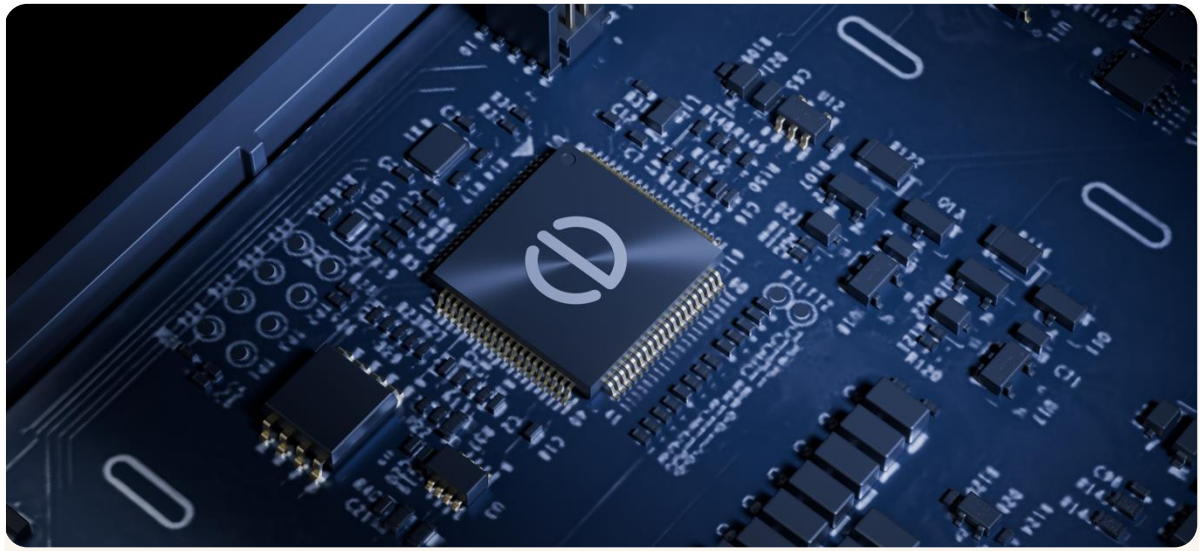
- Multiple power modules stacked depending on MV input and power
- Series connection on the input; parallel connection on the output (ISOP)
- Delta configuration; no neutral
- Input has triple redundant short-on-fail circuit (anti-fuse)
- Dual sided backplane for power module connection
- Sub-millisecond response time
- Output has short circuit current limit (fused)



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Heart of the Enphase power module

Two breakthroughs, one single-stage converter.



Kestrel ASIC

- 5th-gen custom 22 nm control ASIC powering the single-stage converter
- Multi-core software with built-in communications, security, and safety
- Proprietary tandem function supports fiber-optic interface for SST application
- Read the Enphase white paper



GaN bi-directional switch

- Bi-directional GaN switching technology proven in IQ9 Microinverters
- Enables compact, high-efficiency power conversion
- Supports low EMI and fast switching in single-stage design
- Read the Enphase white paper

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IQ SST 5 MW rack @ 34.5 kV

Key specifications

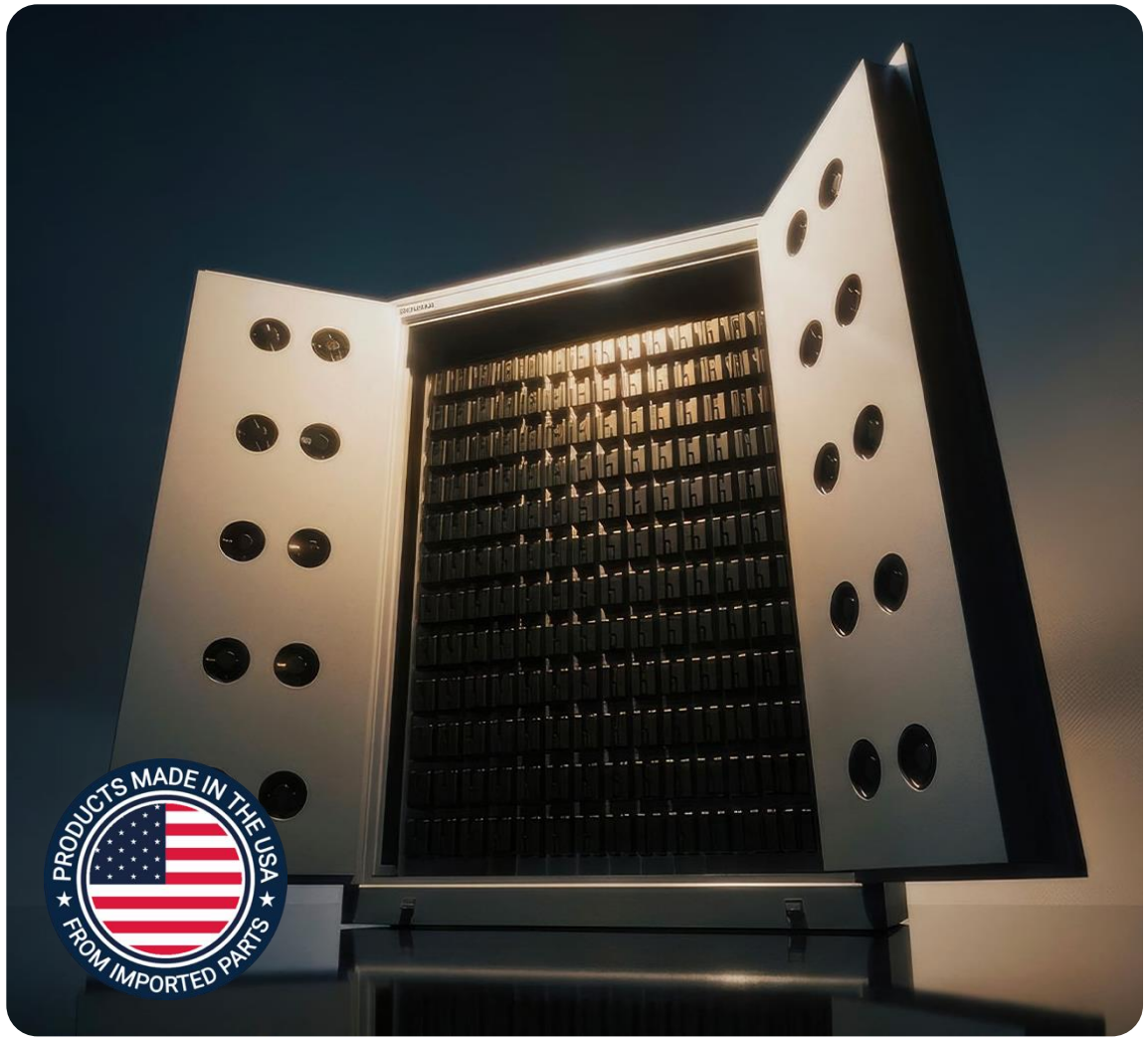
- Power: 5 MW, ambient-air cooled
- Will support 35 kV utility interconnection class
- Designed for 99.999% availability
- 10-year limited warranty
- Modular hot-swap design—service with a cobot
- U.S.-based manufacturing
- FEOC-compliant supply chain
- Scales up to 10 MW per skid

AC/DC only configuration

- Architecture: 1,008 power modules (Δ configuration)
- No LV batteries required

AC/DC + DC/DC configuration

- Architecture: 1,008 + 672 power modules (Δ configuration)



Product under development. Specifications and performance subject to change.
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IQ SST roadmap

From functioning power modules to volume shipments

12+
Months of active development

130+
Dedicated IQ SST engineers

50+
Prospective customers and partner engagements

Product roadmap



Functioning power modules

Engineering samples in-house and producing power. Core conversion architecture validated.

Full system demonstration

Complete demonstration of 34.5, 13.8 kV AC → 800 VDC.

Customer pilots

Pilot deployments with select data center partners. Real-world validation at customer sites.

Volume shipments

Full commercial production ramp. U.S.-manufactured, FEOC-compliant supply chain at scale.

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Designed in Silicon Valley. Manufactured in the United States.

In the heart of the AI revolution, with current U.S. manufacturing in Texas and FEOC-compliant supply chain built to scale.

- High-volume automated manufacturing
- Leverages existing manufacturing processes
- Made from standard off-the-shelf components
- Potted, all-plastic enclosure
- FEOC-compliant supply chain

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Intelligent power for AI

Distributed by design. Backed by 20 years of Enphase.

Learn more at enphase.com/iq-sst

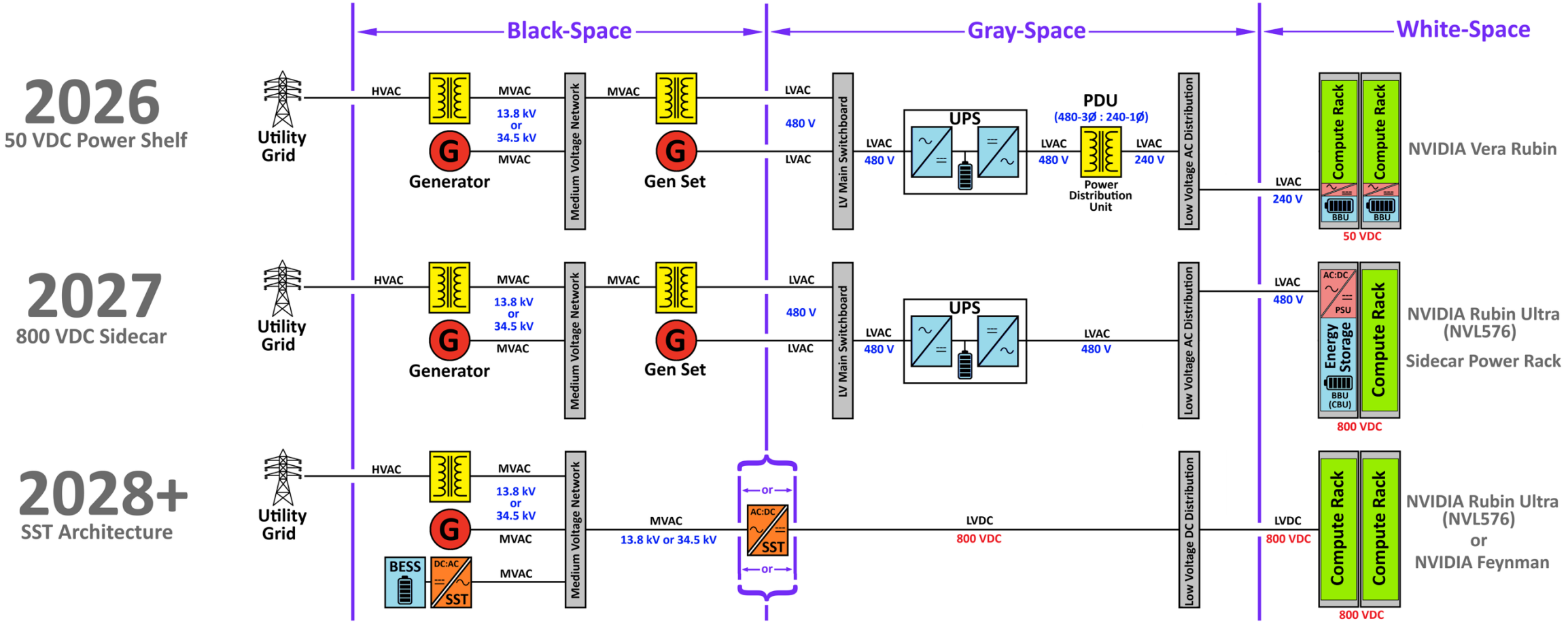
Appendix



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AI has an efficiency problem

Today's architecture has too many conversion stages. IQ SST will convert medium-voltage AC directly to 800 VDC, reducing sidecar infrastructure and power losses.



Source: Based on NVIDIA, "800 VDC Architecture for AI Data Centers"; NVIDIA Developer Blog, "NVIDIA 800 V HVDC Architecture Will Power the Next Generation of AI Factories," May 2025; Open Compute Project, "Power Architecture Evolution in Data Centers," Sept. 2025.

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Rearchitecting AI power—the Enphase advantage

Reduce or eliminate sidecar infrastructure
Less power infrastructure. More space for GPUs. More tokens. More revenue.

Sub-millisecond response
Single-stage power conversion.
>250 kHz average switching frequency

99.999% availability
Distributed architecture. No single point of failure

Lower field service cost
Hot-swap without shutdown—no specialized technicians required

U.S. supply chain
Supplied from U.S. manufacturing facilities; standard high-volume components

Semiconductor-based, software-defined
Custom Kestrel ASIC and bi-directional GaN. 98.5% efficiency

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