Enphase Energy Publishes Technical White Paper on IQ SST Architecture for AI Data Centers

White paper explains how Enphase's distributed supercluster architecture, custom ASIC predictive control, and GaN-based power conversion are designed to enable fast response for 800 VDC (±400 VDC) AI infrastructure

FREMONT, Calif., May 04, 2026 (GLOBE NEWSWIRE) -- Enphase Energy, Inc. (NASDAQ: ENPH), a global energy technology company, today published a technical white paper titled "IQ Solid-State Transformer: Intelligent Power for AI." The paper provides a deeper engineering view of Enphase's IQ® Solid-State Transformer (IQ® SST) architecture and the design choices behind its distributed approach to AI data center power conversion. The white paper is available on the Enphase website here.

The AI data center industry is moving toward higher-voltage direct current (DC) power architectures, including 800 VDC and ±400 VDC, to support rapidly rising rack power densities. The Enphase white paper examines the implementation challenge behind that transition: converting medium-voltage alternating current (AC) to regulated DC power with fast transient response, high availability, serviceability, and scalable manufacturing.

Unlike monolithic SST approaches that rely on a small number of large power blocks, IQ SST will use a distributed supercluster of 342 smaller power modules operating as one coordinated system. This highly modular design enables lower-voltage, high-frequency switching — the foundation for fast response to dynamic AI loads.

Kestrel, Enphase's custom control ASIC, is designed to provide the predictive control required for this single-stage power conversion architecture. GaN-based switching is expected to support power-efficient high-frequency operation, while Enphase's proprietary high-frequency transformer is designed to help deliver a low-EMI power module. Together, these technologies are intended to reduce local energy buffering and, in supported data center configurations, may reduce or eliminate the need for sidecar power racks.

"Enphase's core architectural choice is to use many smaller power modules rather than fewer large ones," said Raghu Belur, co-founder and chief product officer at Enphase Energy. "That design choice is central to IQ SST's intended performance, redundancy, serviceability, and manufacturability. The white paper explains why this distributed architecture is important for next-generation AI data center power."

The paper highlights four technical differentiators of the IQ SST architecture:

- **Single-stage power conversion:** Enphase's custom ASIC predictive control is designed to enable the power module to convert medium-voltage AC to DC in a single stage.
- **Fast response:** High-frequency distributed modules are designed to respond quickly to dynamic AI loads.
- **High system availability:** Parallel redundancy and module-level hot-swap serviceability are designed to support system uptime.
- **Scalable manufacturing:** Expected to leverage lower-voltage, high-volume components consistent with Enphase's manufacturing foundation.

The white paper also details the design of the IQ SST power module, including Enphase's custom control ASIC, fiber-optic control interface, proprietary high-frequency transformer, and GaN-based switching technology. It explains how Enphase is extending two decades of distributed power electronics experience into AI-scale power infrastructure.

Following Enphase's announcement of the development of IQ SST last week, the white paper is now available on the Enphase website here and provides a deeper technical view of the architecture.

About Enphase Energy, Inc.

Enphase Energy, a global energy technology company based in Fremont, CA, is the world's leading supplier of microinverter-based solar and battery systems, EV chargers, home energy management systems, and virtual power

plant (VPP) solutions. Enphase products enable people to harness the sun to make, use, save, and sell their own power, all controlled through the Enphase App. The company revolutionized the solar industry with its microinverter-based technology and has shipped approximately 87.8 million microinverters, with more than 5.2 million Enphase-based systems deployed in over 165 countries. For more information, visit https://enphase.com/.

Forward-Looking Statements

This press release may contain forward-looking statements, including statements related to the expected capabilities, features, architecture, functionality, benefits, reliability and performance of the IQ Solid-State Transformer (IQ SST), including its expected power output, conversion efficiency, response time, system availability, redundancy, and ability to reduce or eliminate rack-level battery sidecars and traditional UPS systems; and Enphase Energy's expectations regarding the suitability of IQ SST for AI data centers and other large adjacent power markets. These forward-looking statements are based on Enphase Energy's current expectations and assumptions and inherently involve significant risks and uncertainties. Actual results and the timing of events could differ materially from those contemplated by these forward-looking statements as a result of such risks and uncertainties. Such risks include, but are not limited to, technological development and validation risks; the ability to achieve targeted performance, efficiency, and availability metrics at scale; customer acceptance and adoption of new power architectures; changes in AI data center design standards and infrastructure requirements; market demand; competitive dynamics; supply chain availability and costs; regulatory and interconnection requirements; execution risks related to new market entry; and other factors discussed in Enphase Energy's filings with the Securities and Exchange Commission, including those risks described in more detail in Enphase Energy's most recently filed Annual Report on Form 10-K and other filings made from time to time with the Securities and Exchange Commission. Enphase Energy undertakes no duty or obligation to update any forward-looking statements contained in this release as a result of new information, future events, or changes in its expectations, except as required by law.

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