GE VERNOVA

FACT SHEET

MV-UPS | MEDIUM VOLTAGE UNINTERRUPTIBLE POWER SUPPLY

Bidirectional power immunity for AI-Scale Data Centers

The MV-UPS is designed to decouple AI workloads in a data center from these risks. By creating a stable island, a private grid, for the load, it shifts the infrastructure strategy from reactive cost-containment to proactive asset optimization. MV-UPS provides the predictable grid interface necessary to minimize TOTEX, maximize power availability, and transform the energy infrastructure into a foundation for growth.

On the grid side, the MV-UPS precisely regulates how much active power is drawn from the network, ensuring compliance with increasingly strict AI-era utility requirements. On the load side, it operates in a grid-forming mode to maintain steady voltage and frequency for high-value AI workloads. Integrated batteries dynamically absorb or inject power, instantaneously balancing the difference between grid input and load demand.

This architecture enables near instantaneous response to load steps, smooths power swings, provides fault ride through, and protects sensitive processes from voltage dips and frequency events – allowing energy intensive industries to operate reliably, efficiently, and with confidence in an increasingly unstable grid environment.

THE CHALLENGE: THE COST OF POWER INSTABILITY

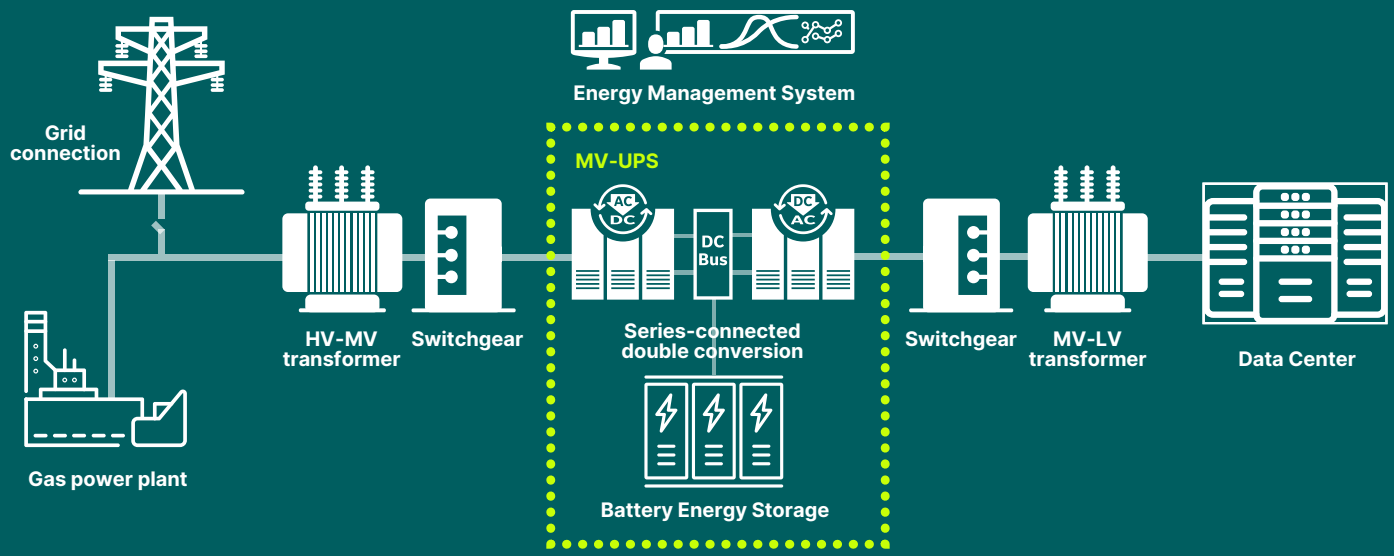
AI-scale data centers face an unprecedented challenge: power demand is growing faster than grid infrastructure can be reinforced. These high-density compute environments exhibit highly dynamic load profiles, characterized by sharp, sub-second ramp rates and frequent power swings that stress transmission and distribution networks.

In modern AI-driven operations, compute demand can fluctuate dramatically within seconds. These rapid variations cause localized voltage instability, degraded power quality, and heightened sensitivity to external grid disturbances. As grid operators enforce stricter connection requirements – including rigid ride-through, ramp-rate, and power-quality constraints – data center operators face rising risks of curtailment, regulatory penalties, and costly unplanned downtime.

When coupled with aging grids and intermittent supply, grid instability becomes a direct threat to uptime. In this environment, maintaining a stable, decoupled power interface is no longer just an engineering goal; it is a critical business imperative for protecting compute availability and ensuring the profitability of AI-scale deployments.

INTEGRATED BIDIRECTIONAL POWER INTERFACE

The MV-UPS serves as a high-performance decoupling layer, providing AI-scale data centers with sub-cycle response times, grid-forming intelligence, and comprehensive transient immunity.



KEY FEATURES

- **Medium voltage UPS with integrated energy storage** – Delivers continuous, high-quality power while decoupling mission-critical AI compute loads from grid instability.
- **Grid forming output with independent voltage and frequency control** – Ensures stable, localized operation, providing robust support during grid disturbances, faults, or islanded conditions.
- **Predictable and compliant grid interaction** – Precisely controls power drawn from the grid, reducing exposure to curtailment, penalties, and grid constraints.
- **Ultra fast response to load fluctuations** – Absorbs sharp power swings and ramp rates in real time, protecting sensitive AI compute infrastructure.
- **Built in Fault Ride-Through (FRT) and power quality protection** – Shields operations from voltage dips, frequency events, and grid faults.
- **Resilient, scalable architecture** – Supports multi-MW AI-scale data center applications with high availability and seamless expansion.

CUSTOMER BENEFITS & ECONOMIC IMPACT

The MV-UPS system is an architectural catalyst that optimizes capital expenditure, accelerates time-to-revenue, and transforms grid stability into a competitive advantage.

Accelerated time-to-market & revenue

Faster interconnection

Complete grid isolation and robust ancillary service support facilitate faster, more efficient discussions with TSOs, reducing the time required to bring mission-critical operations online.

Time-to-token efficiency

A simplified, integrated architecture reduces deployment complexity, enabling faster commissioning and earlier realization of operational revenue for high-density compute environments.

Operational revenue & market participation

Active grid monetization

Transform energy storage into a revenue-generating asset. Utilize **peak shaving**, **load shifting**, and **load shedding** to monetize battery capacity within local energy markets and maximize operational efficiency.

Total Expenditure (TOTEX) optimization

Infrastructure consolidation

The system's high-performance fault immunity eliminates redundant downstream Low Voltage (LV) UPS systems—saving ~15% in total power distribution CAPEX—while recovering valuable square footage for additional IT racks.

Asset right-sizing & performance

Leveraging an improved Power Factor (PF=1) enables a ~10% reduction in HV Transformer ratings to lower initial CAPEX, while simultaneously boosting attached Gas Turbine performance by ~25% and efficiency by 0.4%.

Operational efficiency

The MV-UPS delivers 98.5% efficiency for the global power train, significantly reducing energy losses and providing an inherent secondary benefit: lower cooling requirements and reduced OPEX.

Resilient & future-proofed infrastructure

Comprehensive fault immunity

By managing HVRT/LVRT and transient overvoltage at the medium voltage level, the system eliminates the need for costly, complex downstream mitigation hardware.

Self-sustaining operations

Integrates Black-Start and N+1 capabilities, removing the requirement for secondary diesel-based backup power.

Asset life extension

Protects Gas Turbines by eliminating torsional stress (SSTI) and Forced Power Oscillations (FPO) – power pulsations within the load profile that align with the gas turbine shaft's resonant frequency – preventing mechanical degradation and preserving the integrity of critical power assets.

Proven innovation & reliability

Field-proven MMC technology - Our Modular Multilevel Converter (MMC) subsystem is built on multiple generations of deployment in demanding environments. Because electric arc furnaces (EAFs) present workload profiles remarkably similar to the rapid-load fluctuations of AI training (as confirmed by NERC), our technology is battle-tested to handle mission-critical AI-scale applications.

Robust energy storage foundation - The system's DC Block is engineered upon years of iterative evolution in battery management, safety, and performance. With support for a wide range of industry-leading battery vendors and highly flexible energy storage sizing, the architecture is designed to evolve alongside specific operational requirements.

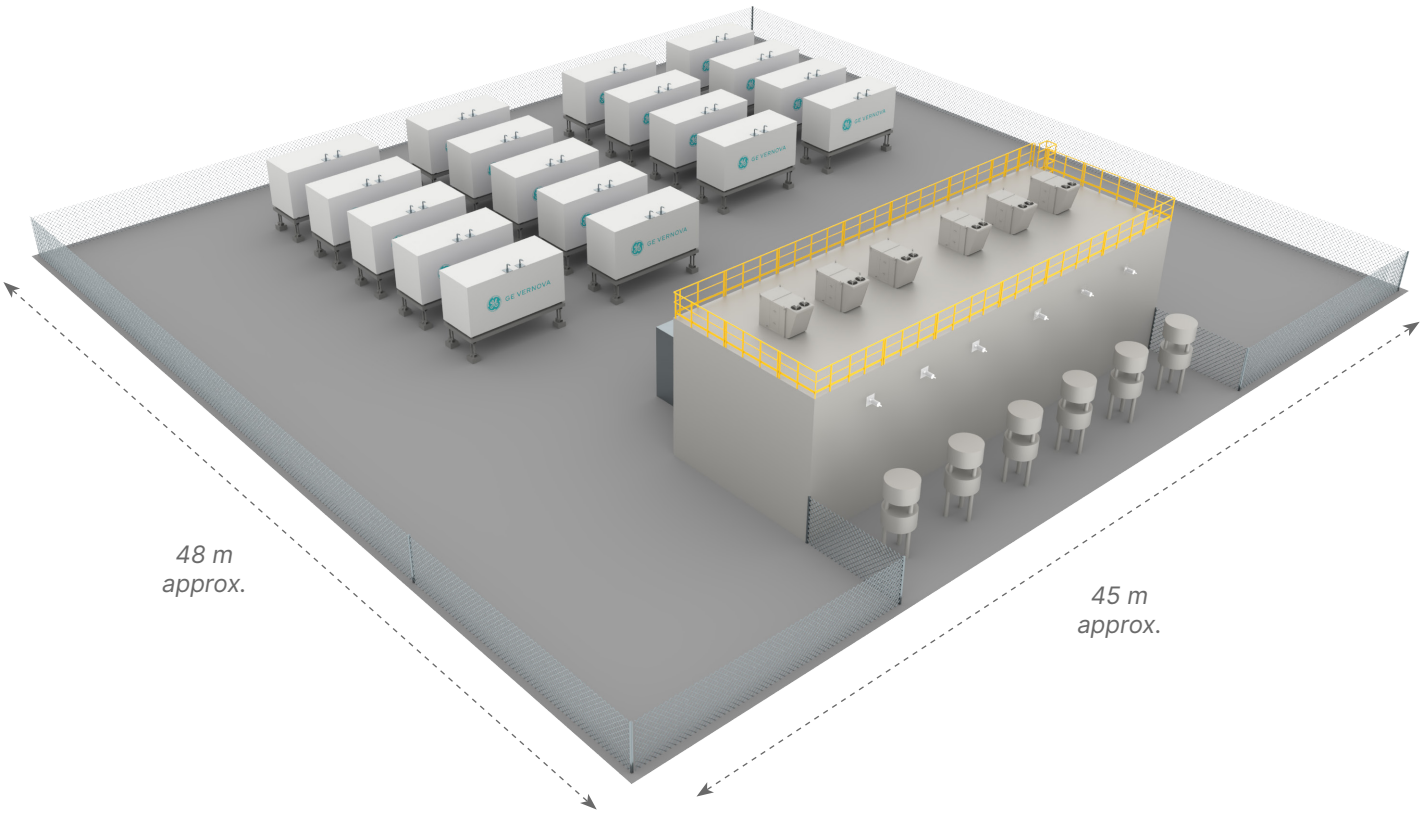
MITIGATING OPERATIONAL RISK IN AI-SCALE DATA CENTERS

RISK CATEGORY	STATUS (WITHOUT MV-UPS)	STATUS (WITH MV-UPS)
Grid exposure	⚠ Coupled	✓ **100% decoupled**
Production uptime	⚠ Vulnerable	✓ **Islanded continuity**
Power quality	⚠ Unstable	✓ **Grid-forming precision**
Asset longevity	⚠ Stressed	✓ **Protected load-swing absorption**
Fault propagation	⚠ Bidirectional	✓ **Unidirectional isolation**
Integration complexity	⚠ High	✓ **Simplified synchronization**

Traditional grid-connected architectures leave mission-critical compute infrastructure vulnerable to fluctuations and faults. By establishing an active power bridge, the MV-UPS transforms grid-dependency into a self-regulated, immune environment. This proactive decoupling shields primary generation assets from mechanical stress, isolates sensitive AI workloads from grid-side disturbances, and eliminates the propagation of faults – effectively shifting the facility from a state of reactive mitigation to active power immunity.

MV-UPS NOTIONAL LAYOUT

200 MVA - 34.5 kV -65 MWh



TECHNOLOGY

CONVERTER

Type	Voltage Source Converter
Topology	MMC back-to-back
Operation	4 quadrants - Bidirectional
AC input voltage	34.5 kV +/- 10%
AC input frequency	50/60 Hz +/- 2%
Power	175 MW/200 MVA
Power factor range	0-1
AC output voltage	34.5 kV
AC output frequency	50/60 Hz
Converter efficiency	98.5%

CONVERTER FUNCTION

Islanded mode	
Gas turbine soft starter	0-100% speed
Gas turbine frequency control	50/60 Hz
Black start	0-100% speed

Grid tied mode	**Load side**
Voltage ride through	Voltage regulation
Frequency ride through	Frequency regulation
Reactive power control	Active filtering
Power factor control	Power damping

VALUE STREAM COMPATIBITILY

Load shedding
Frequency response
Voltage support
Reactive power support
Demand Response

Glossary

AI: Artificial Intelligence
BESS: Battery Energy Storage System
CAPEX: Capital Expenditure
DC: Direct Current
EAF: Electric Arc Furnace
FPO: Forced Power Oscillations
FRT: Fault Ride-Through
HV: High Voltage
HVRT: High Voltage Ride-Through
LV: Low Voltage
LVRT: Low Voltage Ride-Through
MMC: Modular Multilevel Converter
MV: Medium Voltage
MV-UPS: Medium Voltage Uninterruptible Power Supply
MW: Megawatt
MVA: Megavolt-Ampere
NERC: North American Electric Reliability Corporation
OPEX: Operational Expenditure
OV: Overvoltage
PF: Power Factor
ROI: Return on Investment
SSTI: Sub-Synchronous Torsional Interaction
TOTEX: Total Expenditure (CAPEX + OPEX)
TSO: Transmission System Operator
UPS: Uninterruptible Power Supply
VRT: Voltage Ride-Through

About GE Vernova's Power Conversion & Storage business

GE Vernova's Power Conversion & Storage business combines advanced energy conversion and storage systems to meet the electrification needs of utilities and industries. With a focus on power stability, energy storage, and industrial electrification solutions, Power Conversion & Storage empowers customers by addressing their most complex electrification challenges and accelerating their transition to a sustainable, decarbonized future.

For more information, please visit
gevernova.com/electrification

GEA35589_Power-Stability_FS_MV-UPS-for-Data-Centers_EN_20260805_Rev1

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