Fact sheet

AI Data Center Power Infrastructure

Bridging Modular Data Centers to Utility-Grade Power Systems

AI data centers are evolving into utility-scale electrical systems. Factory-built modular power blocks can accelerate deployment, but approval usually depends on more than a single product label. Successful projects align the module, equipment, and the site approval paths before shipment.

The Market Shift

Then
1–10 MW • LV distribution • centralized UPS

Now
300 MW–1 GW • substations • MV distribution • modular power blocks

The Result
Data centers now operate like mini power grids

Where UL 2755 Fits

UL 2755 evaluates the complete modular data center system, including:

- Power distribution & backup power
- IT infrastructure
- Cooling systems (air & liquid)
- Fire detection & suppression
- Structural enclosure
- Monitoring & control systems

- Enables factory-built deployment
- Reduces field construction and schedule risk

The Critical Gap

AI power blocks are now functioning like mini-substations.
UL 2755 alone does not fully address:

- Medium-voltage performance
- Transformer behavior under fault
- Protection coordination
- Utility interconnection requirements
- Commissioning and energization readiness

Power Generation (When Applicable)

Some AI data centers incorporate on-site generation systems to support uptime, grid constraints, or backup strategies.

Typical Applications

- Emergency standby power
- Prime or continuous power (in constrained grids)
- Black start capability
- Hybrid systems with batteries and UPS

Typical Equipment

- Diesel or natural gas generators
- Medium-voltage generator sets
- Paralleling switchgear
- Automatic transfer switches (ATS)

Applicable Requirements (When Installed)

- UL 2200 – Generator assemblies
- NFPA 110 – Emergency and standby power systems
- Integration with MV switchgear, protection systems, and controls

Required Standards for Acceptance

Utility-Grade Requirements Include:

Switchgear

- IEEE C37 Series (MV performance)

Transformers

- IEEE C57 Series (thermal, dielectric, fault performance)

Generators (when applicable)

- UL 2200
- NFPA 110

System & Field

- ANSI / NETA ATS (acceptance testing)
- IEEE 693 (seismic, where required)

Product Standards

- UL 891 (switchboards)
- UL 1558 (LV switchgear)
- UL 508A (control panels)

NFPA (When Applicable)

- NFPA 70 (NEC installation)
- NFPA 70E (electrical safety / arc flash)
- NFPA 70B (maintenance)
- NFPA 72 / NFPA 75 (fire & IT protection)

AI Data Center Power Infrastructure

Required Testing & Validation

To achieve utility, EPC, and AHJ approval, evaluation may include:

- Short-circuit & withstand testing
- Dielectric / insulation (Hi-Pot, BIL)
- Temperature rise / thermal performance
- Mechanical endurance
- Arc-flash / fault containment
- Protection relay validation
- Grounding and bonding verification
- System coordination and integration
- Generator load testing and transfer verification (when applicable)

AHJ Acceptance (Authority Having Jurisdiction)

Approval from the Authority Having Jurisdiction (AHJ) is critical for installation and energization. ETL supports AHJ acceptance through:

- Recognized NRTL certification (ETL Mark)
- Compliance with NEC and applicable NFPA codes
- UL 2755 system-level evaluation
- Generator compliance (when applicable)
- Clear labeling, markings, and documentation

- **Facilitates permit approval**
- **Supports inspection readiness**
- **Accelerates final sign-off and energization**

ETL TDE Services

Product Certification

MV switchgear •Transformers • LV switchgear • UPS • BESS • Control panels • Generators

System Integration Review

One-lines • Protection coordination • Fault current • Grounding • Generator integration

Type Testing & Lab Support

Short-circuit • Dielectric • Thermal • Endurance • Arc-flash • Generator performance testing

Modular Power Block / E-House Evaluation

Integrated system validation • MV/LV interface • Structural review • Generator tie-in

FAT

Witness testing • Relay validation • SCADA verification • Generator load testing • Energization readiness

Utility & AHJ Acceptance Support

Compliance matrices • Test documentation • Protection philosophy • Commissioning packages • Generator documentation

ETL Value Proposition

From:

Certification → Approval → Energization

Intertek enables:

- Faster AHJ approvals and permitting
- Reduced commissioning risk
- Verified system and backup performance
- Improved system reliability
- Confidence with utilities, EPCs, and inspectors

Key Takeaway

AI infrastructure requires complete power system certification and validation, including generation, where applicable.

ETL verifies not just the modular system, but the entire AI power ecosystem, ready for approval and energization.

Intertek

FOR MORE INFORMATION

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