
LANGLEY
PILLER
Power Systems
SHIELD X™
Dynamic Power Stabilization

# The Shift to **Behind-the-Meter Power**

As grid-connection queues lengthen and available grid capacity tightens, data center operators are increasingly turning to **behind-the-meter (BTM)** generation to secure the power they need.

Running a data center off-grid, in true behind-the-meter **island mode**, exposes a critical challenge that AI has made impossible to ignore: **extreme power volatility**.

Unlike conventional data center demand, AI workloads arrive in bursts. Massive clusters of high-performance servers can draw tens of megawatts in milliseconds, then release that load just as fast.

In a 100 MW-class facility, demand can **step from 80% to 50% to 90%** almost instantaneously.

On a grid-connected site, the hard public grid absorbs these shocks. An islanded power plant cannot.

On-site generation has physical limits on how fast it can ramp. When AI load changes faster than engines or turbines can respond, frequency and voltage stability are compromised — driving inefficiency, equipment stress, and, in extreme cases, plant trips.

**This is the new reality of AI-driven, behind-the-meter power.**

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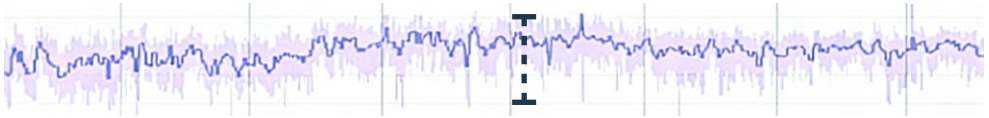
# AI Workloads **Break Conventional Power**

Sub-seconds load swings outpace traditional islanded power plants.

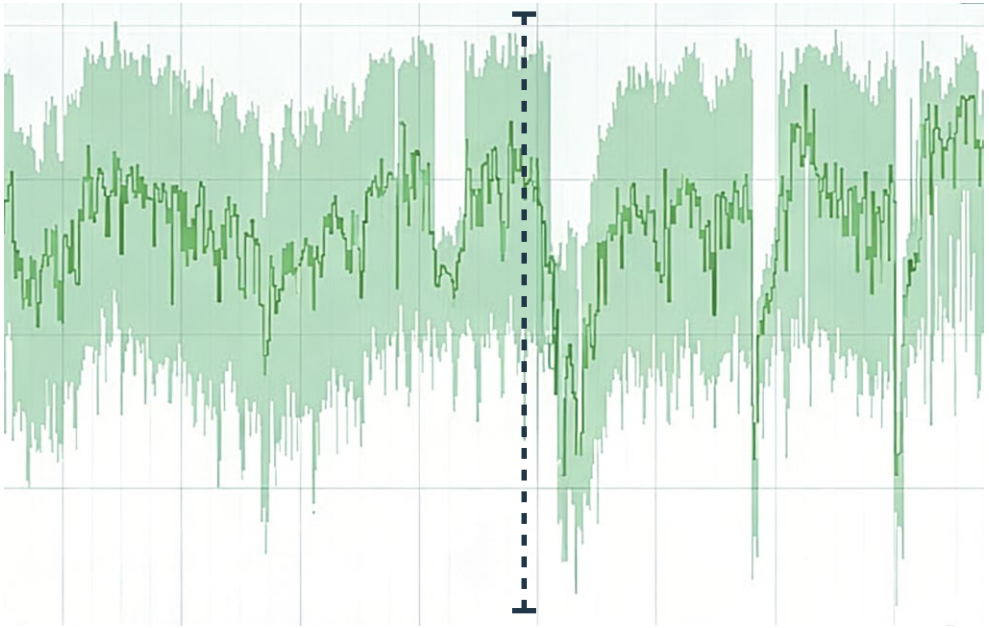
- **Lightning-fast power surges**
  AI clusters can spike or collapse tens of megawatts in milliseconds.
- **Generators can't keep up**
  Reciprocating engines are typically limited to ~1% instantaneous load steps, while gas turbines ramp even more slowly and are more vulnerable to shearing under fast transients.
- **Islanded plants are vulnerable**
  No hard-grid buffer means frequency dips, voltage flicker, equipment stress, and risk of outages.

**None AI Workloads**



1-5% load steps / minute

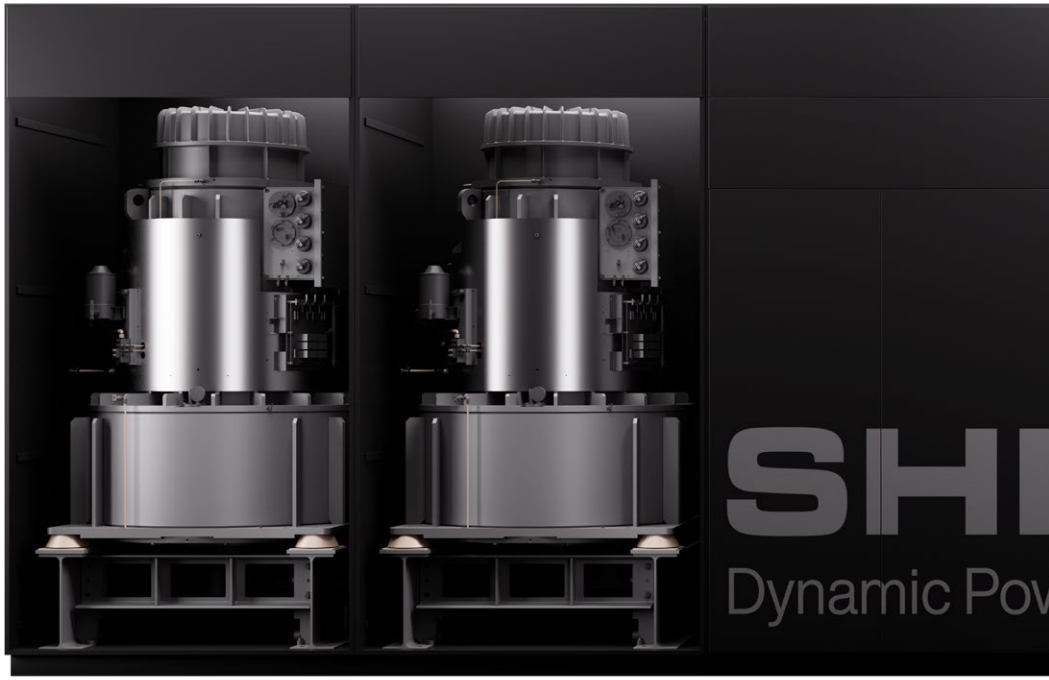
**AI Workloads**



20-60%+ load steps / second

# **SHIELDX**™ by Piller

Two complementary battery-free technologies that work in tandem at the plant level to address the very behaviors that make AI-driven loads so disruptive.




## 1. Bi-Directional Power Exchange Modules

- **Handles rapid load-ramps engines and turbines can't follow –** instant Active Power injection or absorption in milliseconds, with no C-rate limitation, supplying peaks and troughs while generation remains stable and optimally loaded.
- **Protects against sudden generation loss –** bridges outages until standby units or spinning reserve synchronize.
- **Absorbs surplus energy on load collapse –** prevents over-frequency and voltage spikes during ramp-down.
- **True bi-directional operation –** seamlessly shifts between injection and absorption as workloads fluctuate.
- **Maintains continuous, stable supply –** the data-center sees stable, uninterrupted power at all times.

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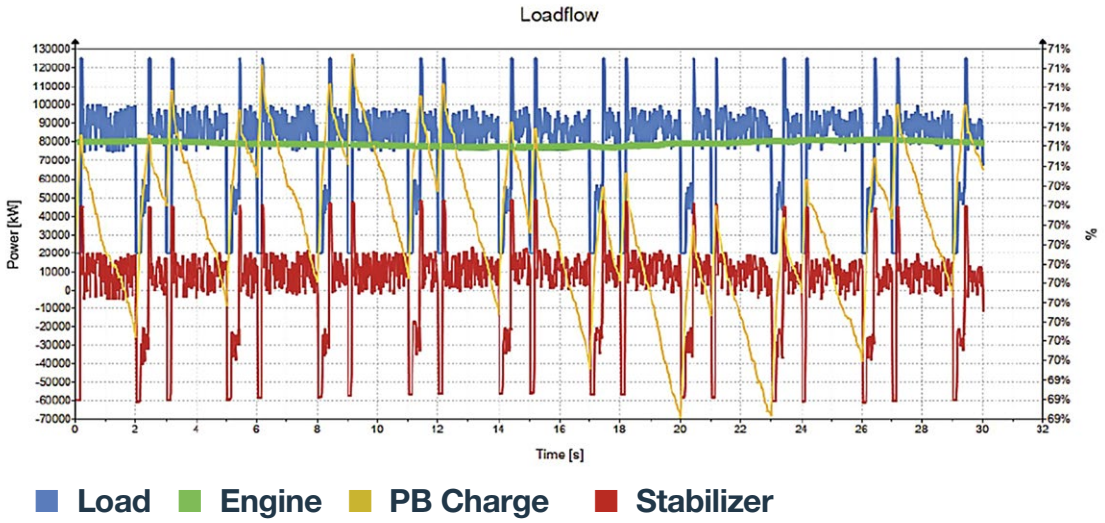
## 2. High Inertia Stabilizer

- **Instantaneous response –** always synchronized and spinning; reacts in sub-milliseconds with no wake-up delay.
- **Absorbs AI-driven transients –** acts as a mechanical shock absorber between generation and load.
- **Voltage stability under extreme ramps –** smooths micro-spikes and flicker before they reach IT loads.
- **Frequency control at plant level –** typically maintains frequency within ±1% during sharp load changes.
- **High fault-clearing capability –** delivers the short-circuit current required for selective protection.
- **No batteries, no switching –** continuous electromechanical operation with inherent reliability.

# SHIELDX™ **In Action**

- **Fully technology-agnostic – compatible with high and medium-speed engines, turbines, nuclear, fuel cell and Grid-tide sites.**
- **Shields the power plant from AI transients.**
- **Maintains voltage and frequency stability within ±1%.**
- **Rapid short-circuit response and high-fault clearing capability.**
- **Tier III/IV concurrent maintainability and fault tolerance, 99,999% uptime.**
- **Battery-free without degradation of energy storage capacity over its 20+ years lifecycle.**



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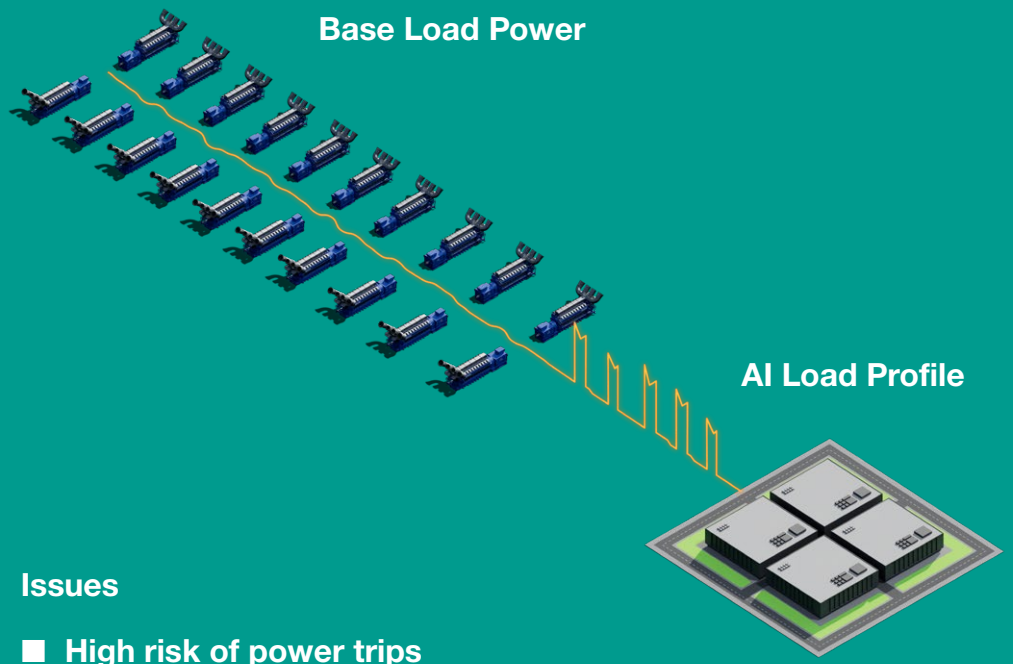
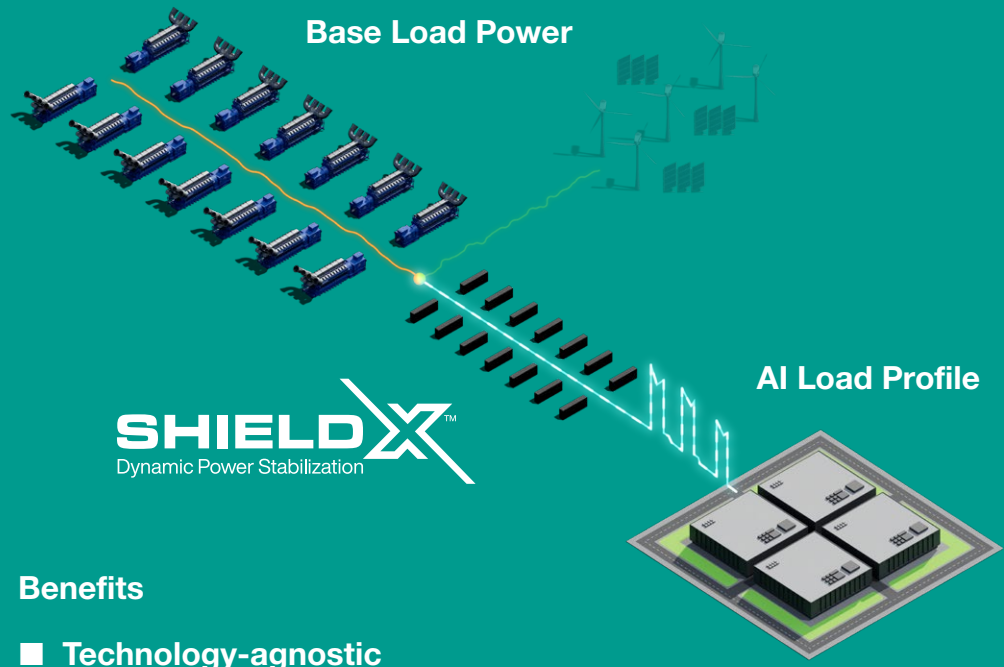
# Without **SHIELDX**™




**Issues**

- High risk of power trips
- Oversized power plant
- Unstable voltage & frequency
- More unplanned maintenance
- Higher OPEX

# With **SHIELDX**™




**Benefits**

- Technology-agnostic
- Smooth ramp-rates
- Right-sized power plant
- Ultra stable voltage & frequency
- High fault clearing capability

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# Piller Power Systems

## SHIELDX™ Dynamic Power Stabilization

- **Built for high-intensity AI power stability**
- **Mechanical inertia absorbs spikes and dips instantly**
- **Delivers true short-circuit strength, fast fault clearing**
- **Load charge > SHIELDX™ Absorbs > Engines ramp safely**

| | |
|---|---|
| Power Rating | 3600 kVA (3240 kW) |
| Voltage Range | MV, up to 38 kV |
| Frequency | 50Hz or 60Hz |
| Energy Storage, Capacity | Kinetic (battery free), 2 x 21 MJ |
| Active Frequency Support Capability | ± 3240 kW |
| Active Voltage Support Capability | 3600kVAr |
| Inertia | 218kgm² (1500 RPM), 257kgm² (1800 RPM) |

Bank of England

NYSE

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**We have the power.**

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