EATON
Powering Business Worldwide

As technology advances, data centers are evolving for real-time efficiency, driven by the rise of AI application and the need for faster data handling.

Supercapacitors in AI Datacenters

Market Overview

AI Data center capacity is growing fast.

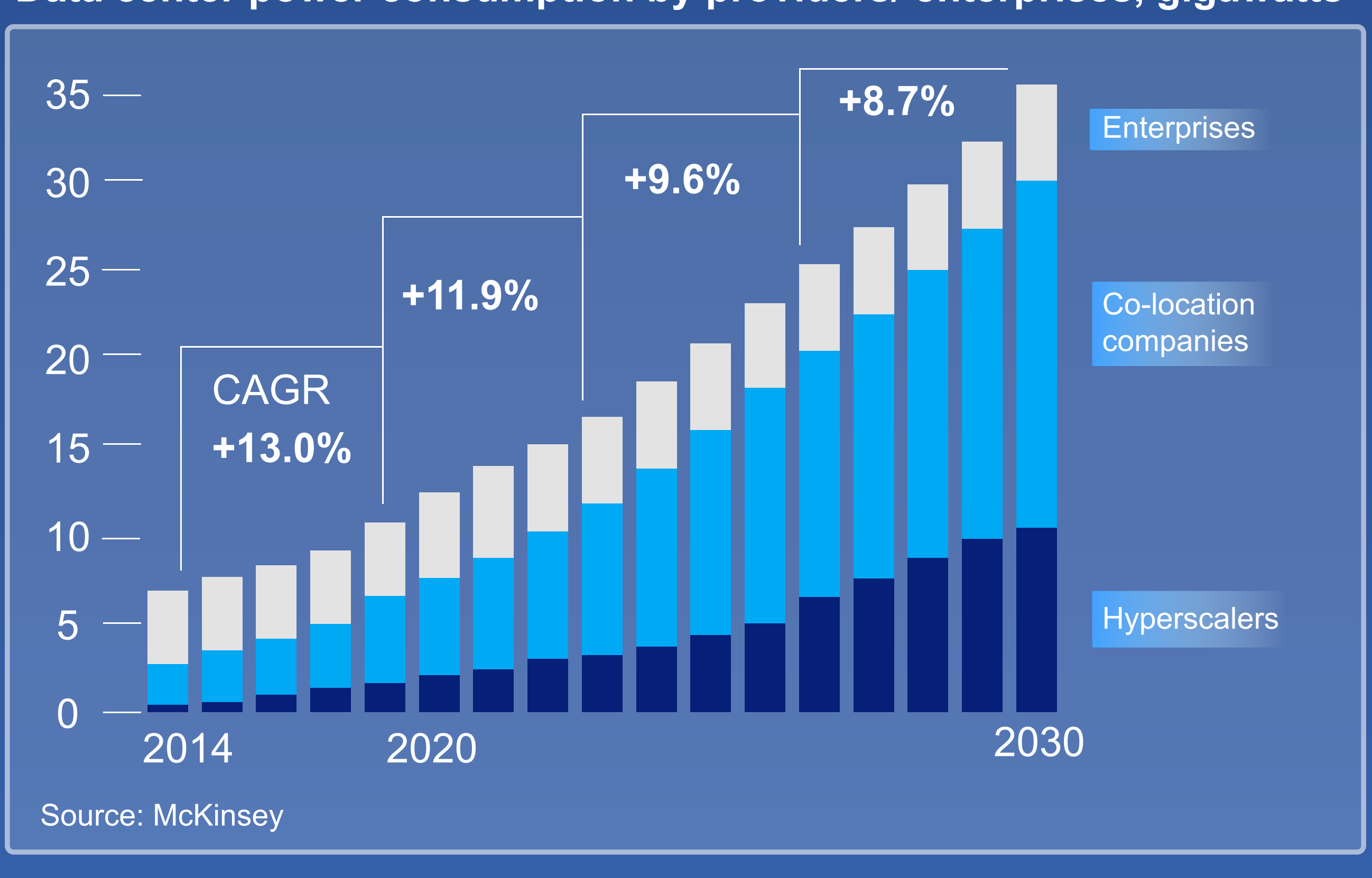
23% Data center capacity annual growth through 2028

43% AI data center capacity annual growth through 2028

146 TWh AI data center energy consumption reaching by 2027

Source: Moody's, IDC

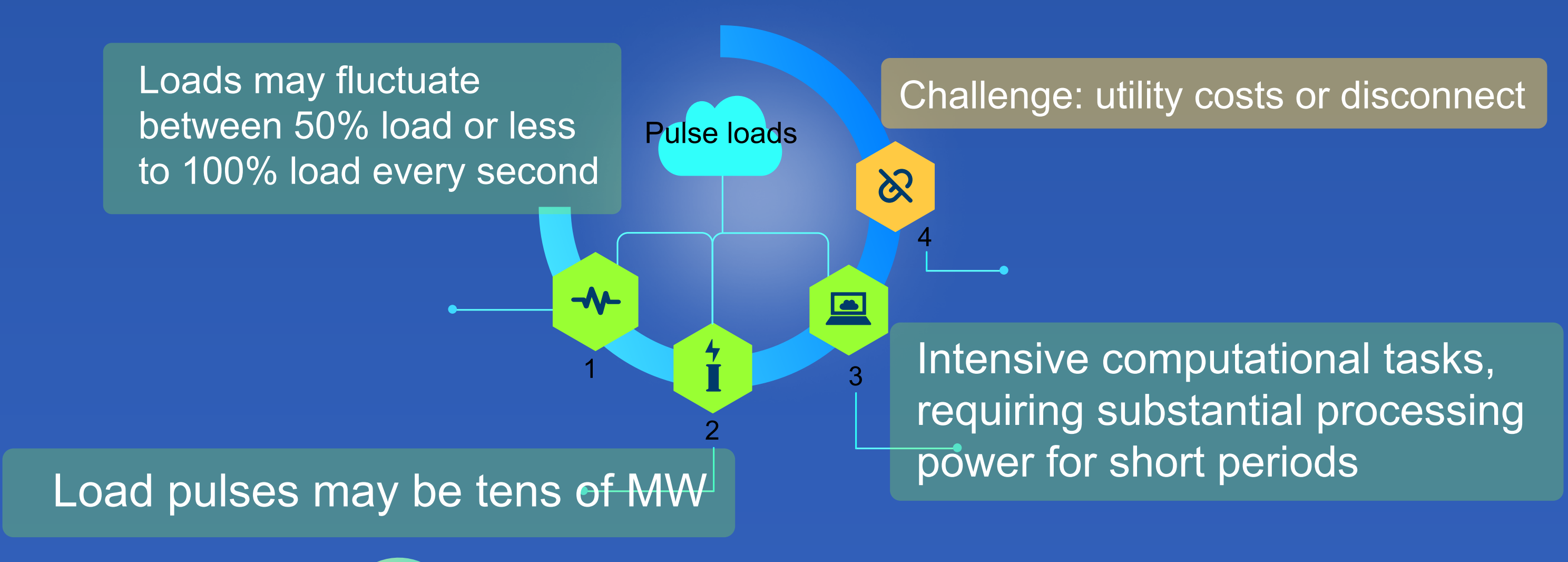
◆ **Data center power consumption by providers/ enterprises, gigawatts**



Source: McKinsey

Pulse loads

Generative AI algorithms act as pulse loads - create sudden and significant spikes in power consumption.



Loads may fluctuate between 50% load or less to 100% load every second

Challenge: utility costs or disconnect

Intensive computational tasks, requiring substantial processing power for short periods

Load pulses may be tens of MW

Power challenges

Utility and load profile example for a **1.5 MW** datacenter block with **750 kw/50% fluctuation** every second

1 Generative AI cycle power

a) Between full load and half load

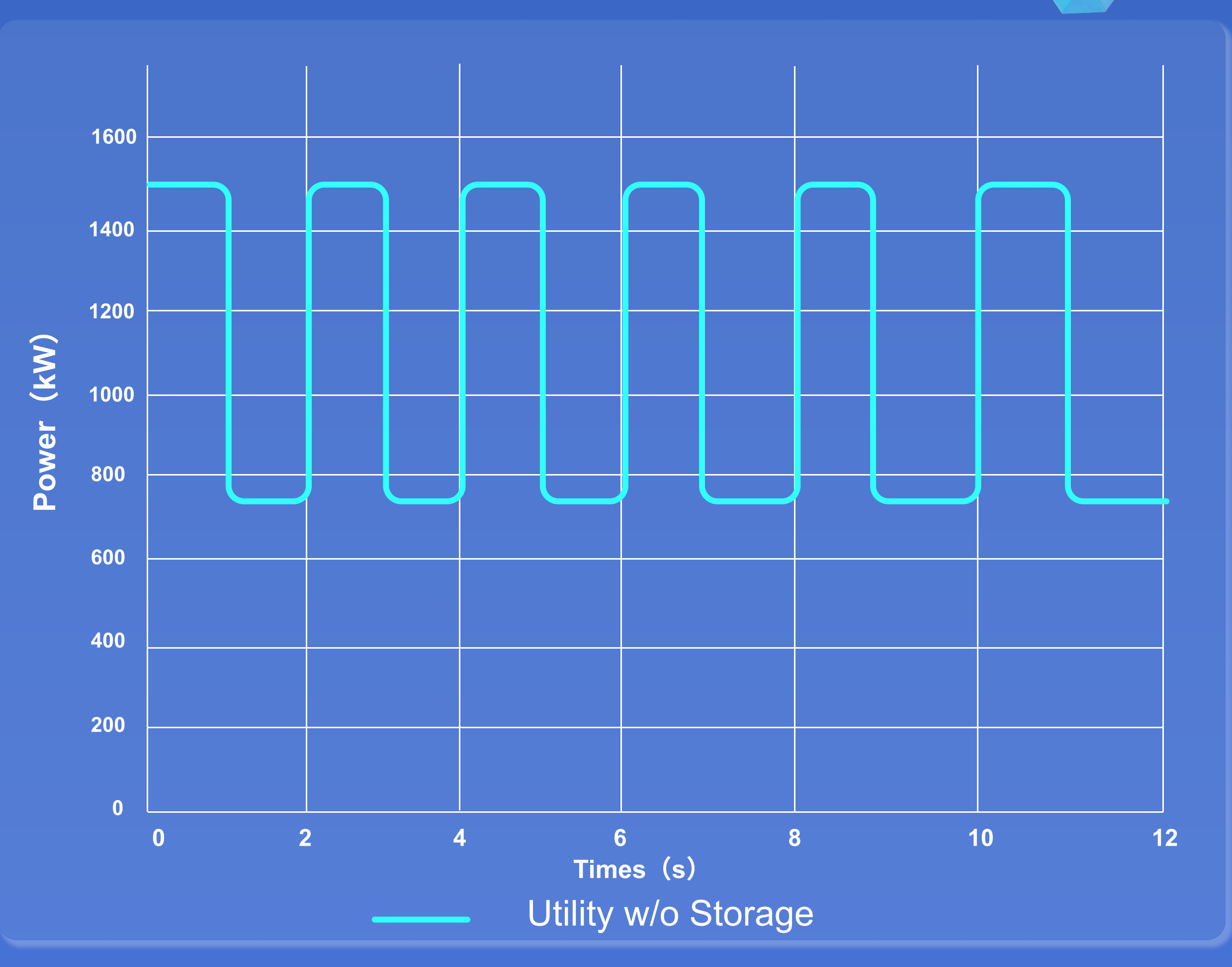
b) Cycles occur **1 second**

c) Length of cycling: seconds to 10's seconds

2 Utility capability

Utility cannot support data center power fluctuations at **multi-MW** total power

3 No consensus on solution



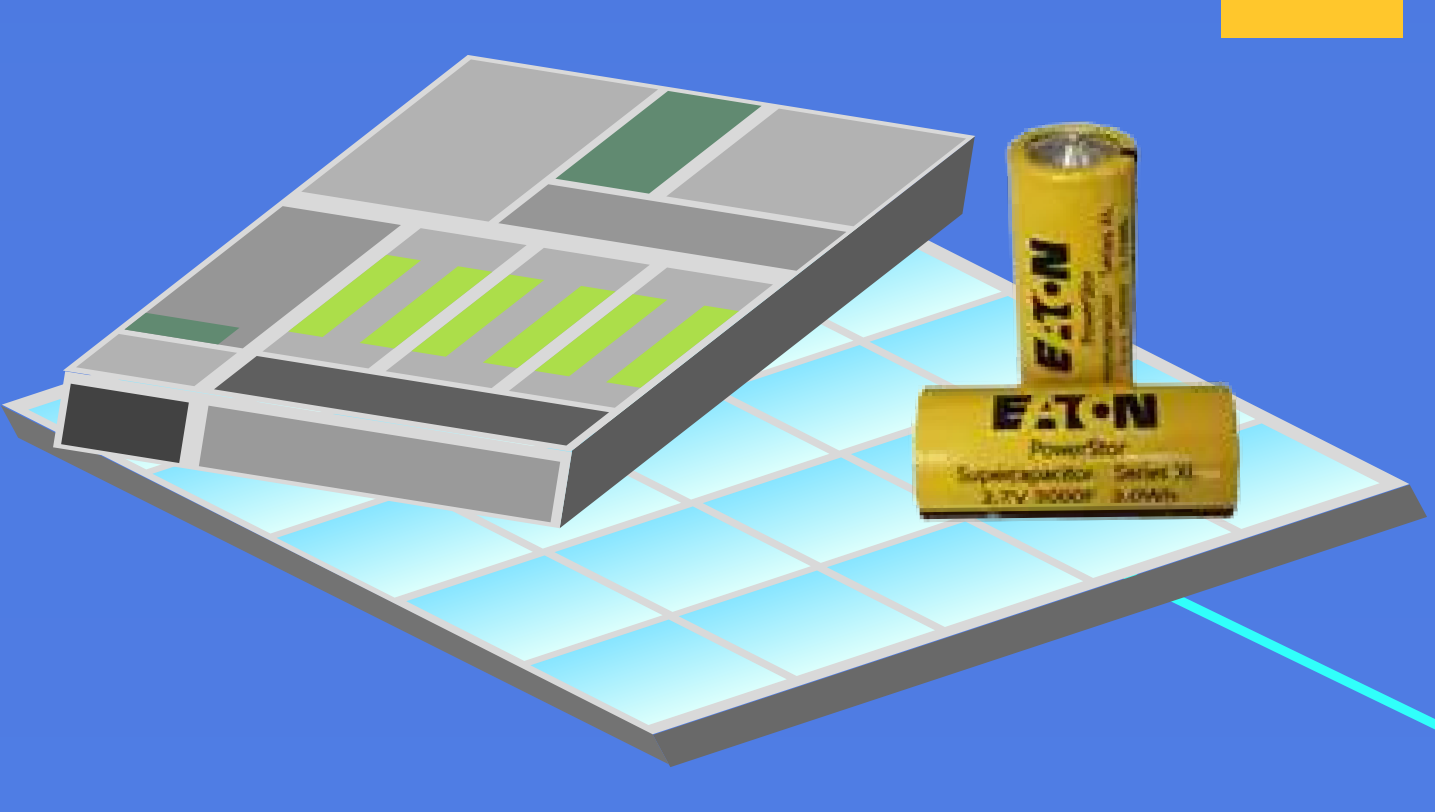
AI Potential Solutions

Supercapacitors are the perfect solution to handle the peak power cycle

Supercapacitors ideal for pulse power
- **High power**, low internal resistance
- Millions of **full charge/discharge cycles**
- **Safe**: no thermal runaway, no heavy metals or shipping restrictions
- Fast: Ideal for charges/discharges < 30 seconds

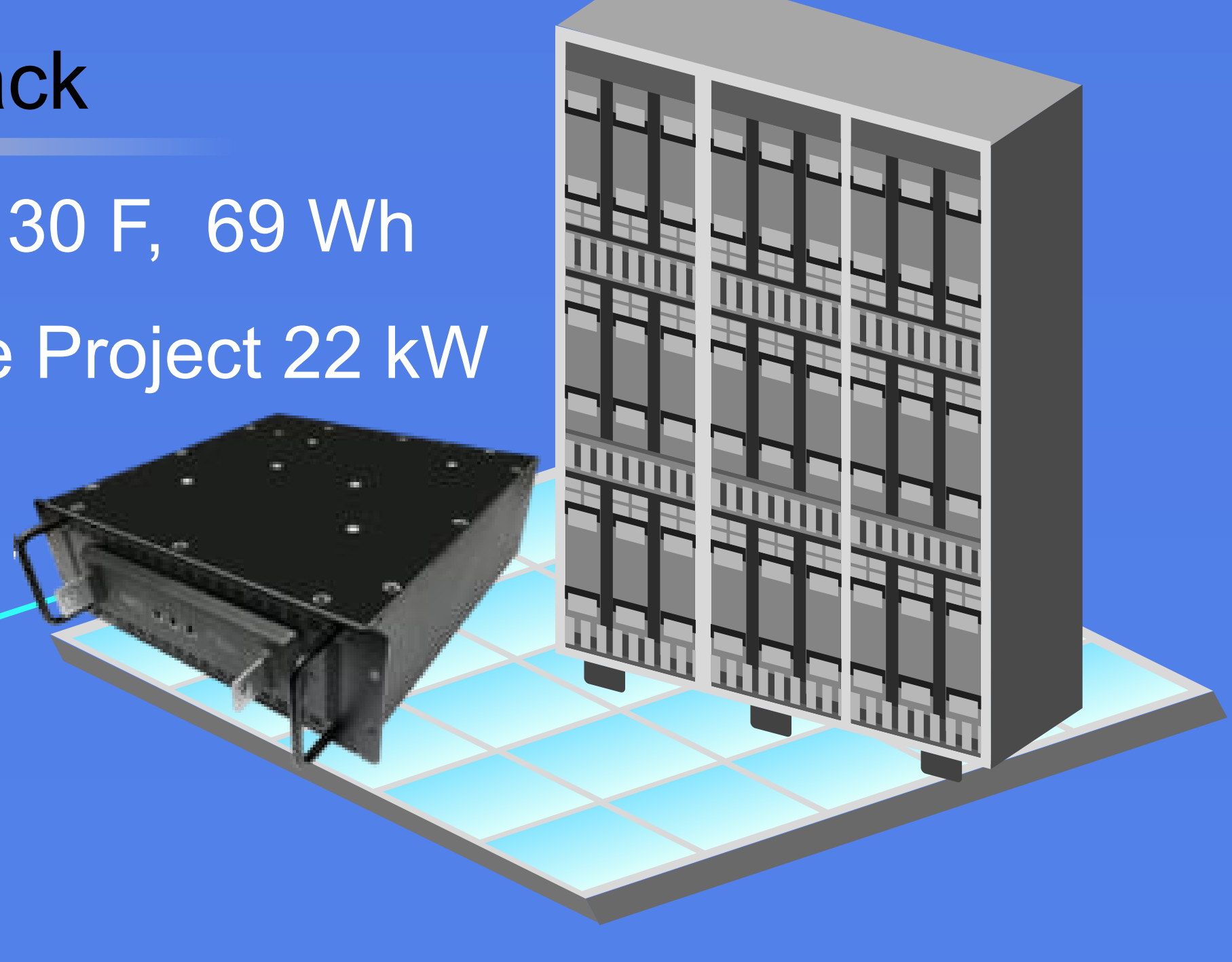
Customer/industry engagement

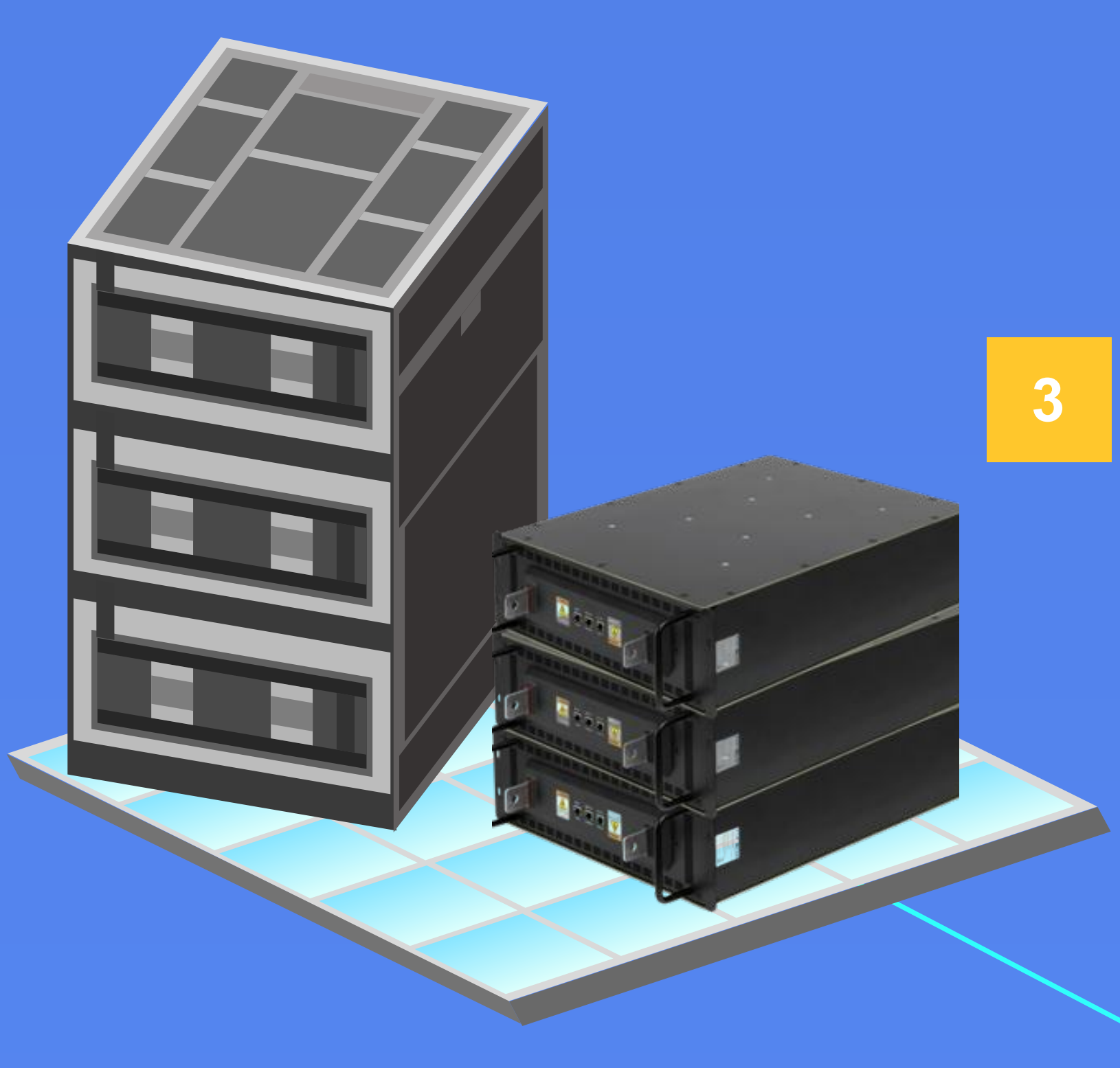
- 🟢 Customer Solution
- 🔴 Eaton Product
- 🔵 Pulse Power Requirements



1 Internal to Server
- XTLRS 3 V, 360 F, 1.7 mohm
- 1.4 kW

2 Internal to Rack
- XLHVS 64 V, 130 F, 69 Wh
- Open Compute Project 22 kW



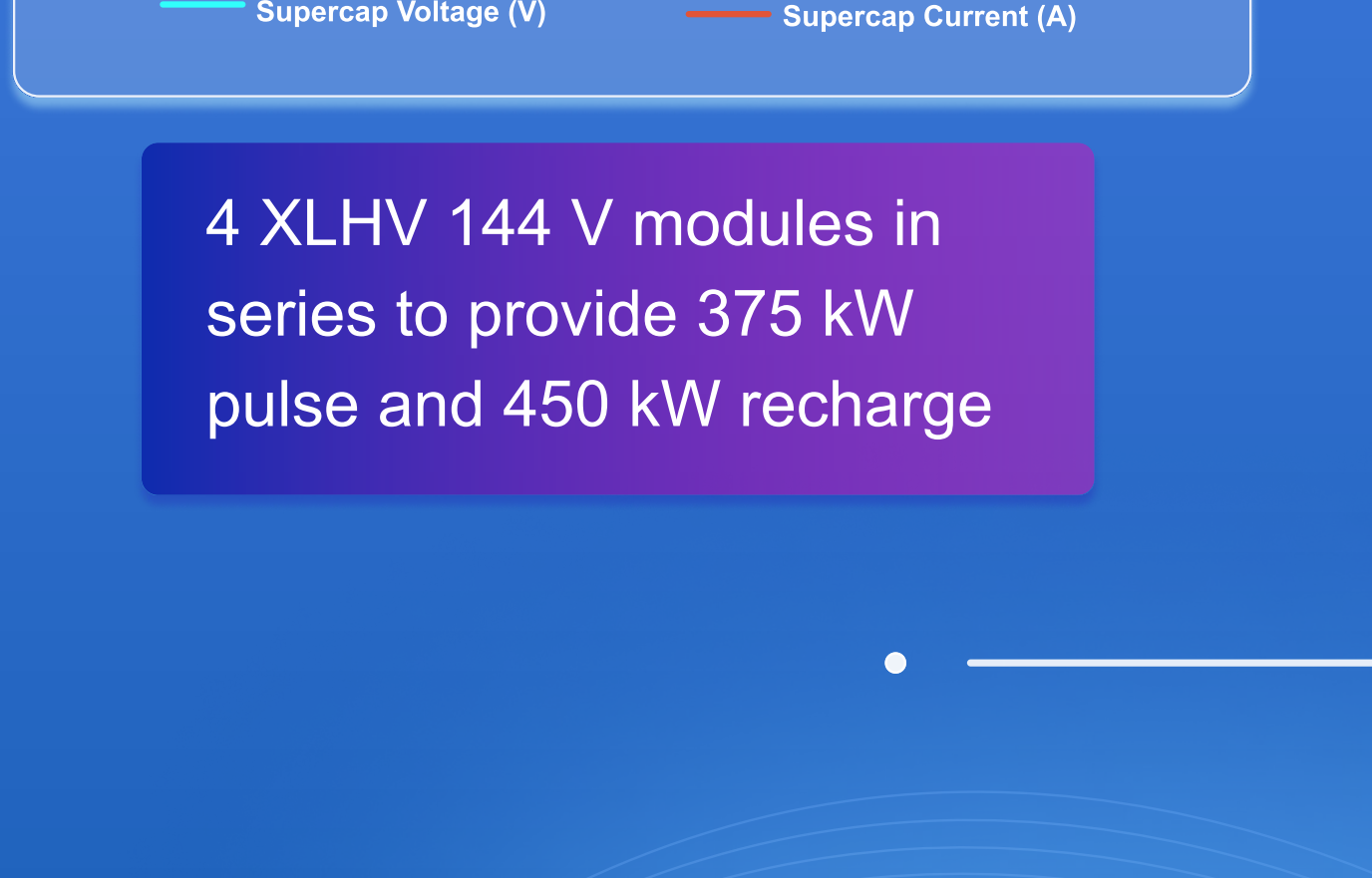


3 Power Rack
- XLHV 144 V, 62.5 F, 86 Wh
- 300 kW

4 Datacenter
- XLHV 144 V, 62.5 F, 86 Wh
- 2 MW

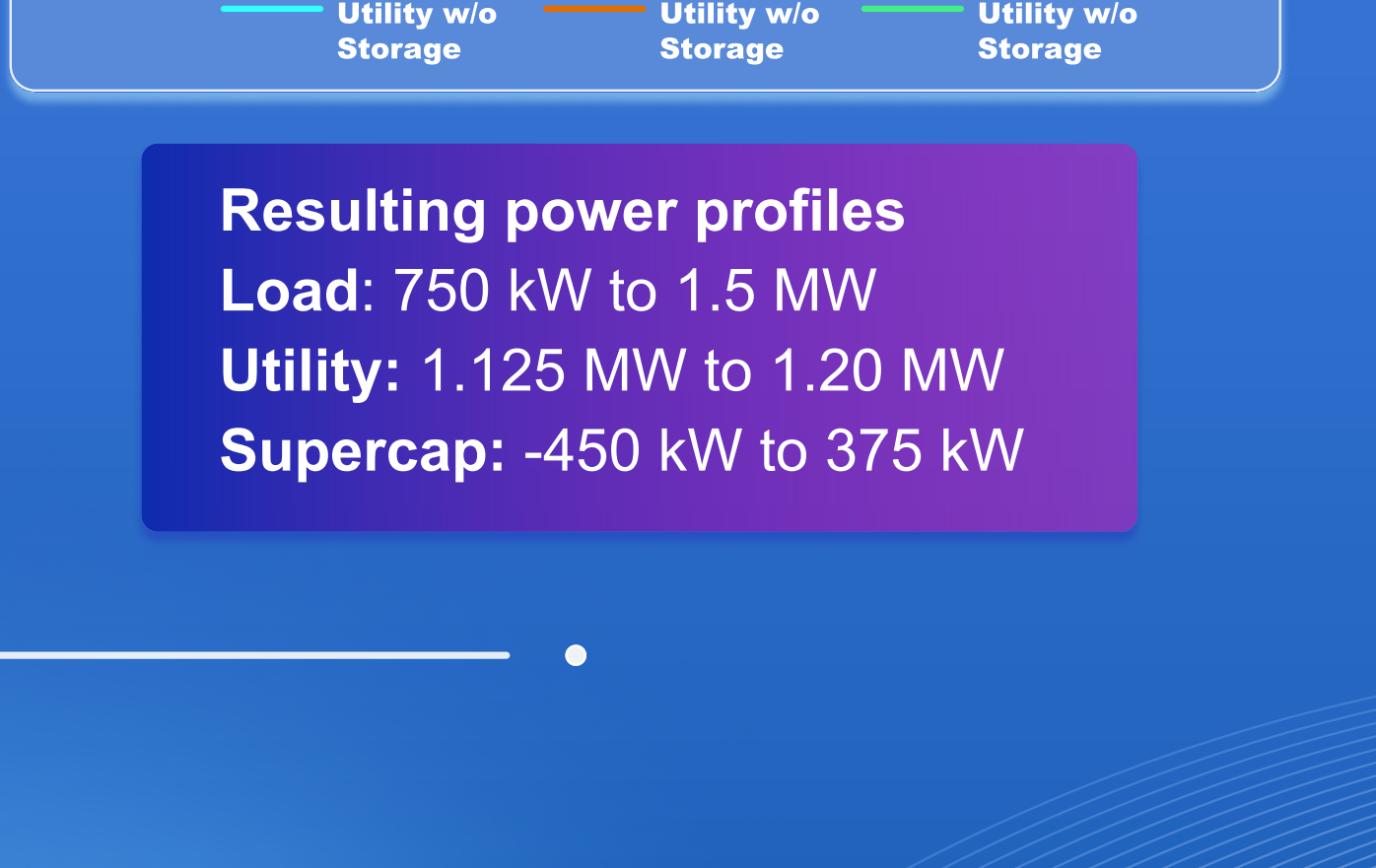
XLHV modules for utility stress reduction.

1.5 MW peak load
1 second full load, 1 second 50% load



4 XLHV 144 V modules in series to provide 375 kW pulse and 450 kW recharge

Utility stress reduced from 750 kW to 75 kW



Resulting power profiles
Load: 750 kW to 1.5 MW
Utility: 1.125 MW to 1.20 MW
Supercap: -450 kW to 375 kW

Eaton's supercapacitors ensure efficient and stable power management, crucial for the high demands of AI datacenters.

For more information, visit **Eaton.com/electronics**

Website

Contact

Sample