Pathfinder Communications

Strategy · Integrity · Results

White Paper

HOW SUPERCAPS CAN HELP SOLVE THE GEOPOLITICAL CHALLENGE OF BATTERY OVER DEPLOYMENTS

Domestic Materials Sourcing and Manufacturing Also Offers Data Center Owners and Developers Immense Strategic Advantages

July 30th, 2026

Commissioned by florrent

Peter Asmus
President
Pathfinder Communications

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The speed-to-power movement is driving decision-making in the data center industry as it searches for near-term solutions to its power supply needs. The inability of many utilities and wholesale market control areas to bring new capacity on-line in a timely manner has prompted many data centers to go behind-the-meter (BTM) and create microgrids and other forms of on-site power.

Yet this approach also carries risk. Generators can become compromised by generative AI spikes. Likewise, lithium ion (li-ion) batteries may also fail much earlier than anticipated.

Absent from too many discussions today among data centers seeking smart approaches to resilient, reliable and sustainable energy infrastructure are the key role that supercapacitors can play.

This white paper highlights how relying upon domestic sourcing of raw materials and supply chains and manufacturing of a different kind of energy storage technology – supercapacitors – is a prudent but largely unrecognized approach to speed-to-power. Rather than competing with either generators or li-ion batteries, supercapacitors complement these on-site assets. Absent from too many discussions today among data centers seeking smart approaches to resilient, reliable and sustainable energy infrastructure are the key role that supercapacitors can play.

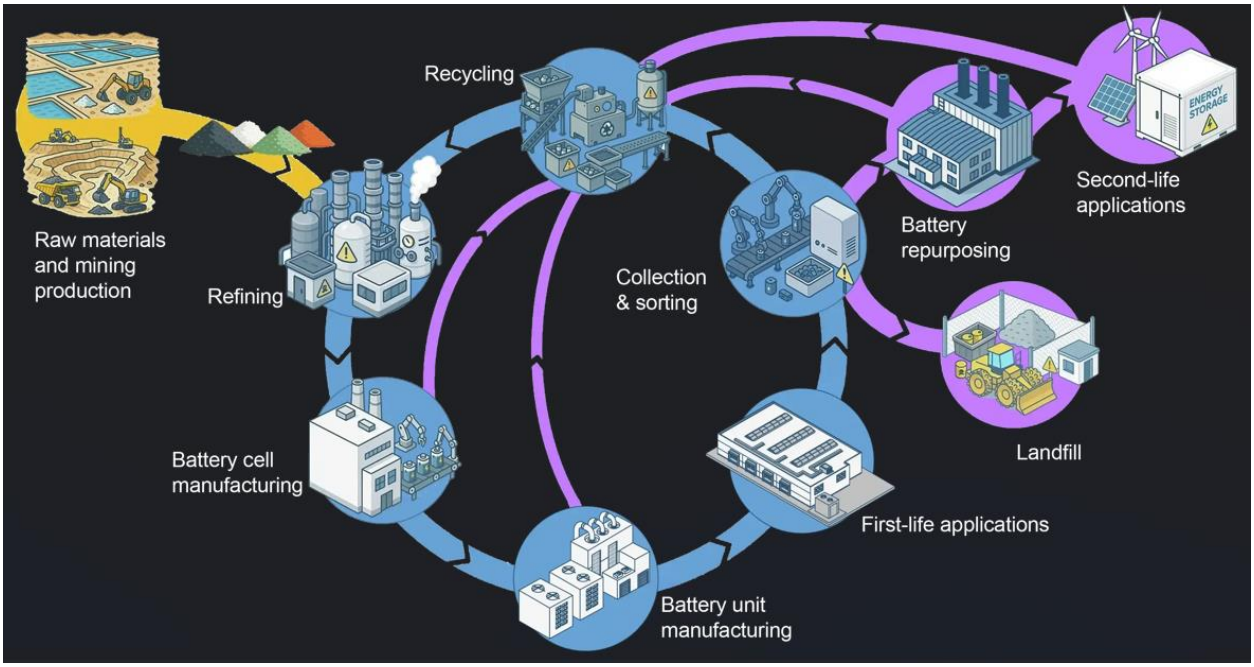
Supercapacitors are adept at near-instantaneous bursts of power to smooth out load gyrations that can wreak havoc with power generation equipment. Since the florrent technology is sourced from domestic waste streams and manufactured in the U.S., it can be viewed as a way to maximize economic and environmental benefits locally. In addition, US-sourced supercapacitors enjoy additional tax benefits – up to 10% – that most other supercapacitor suppliers cannot provide.

INTRODUCTION: THE GEOPOLITICAL CHALLENGE OF BATTERY OVER DEPLOYMENTS

Data center growth has been grabbing constant headlines recently. Lurking beneath these big headlines about the need for accelerated access to power and corresponding impacts on utilities – and their customers – is an untold story that carries immense geopolitical and environmental risk.

What's the secret problem? In a nutshell, it is the risk attached to the over deployment and overuse of lithium-ion (li-ion) batteries to handle the sharp spikes in energy usage for data centers, particularly those providing regenerative AI services. A major concern about battery deployments in data centers is circulating at conferences and other data center industry networking gatherings. Though not yet publicly being revealed in any systematic way, credible sources are reporting that li-ion batteries are burning out and needing replacement at data centers within a few months instead of lasting for a decade or more, as they typically should. Even if such displacements are not yet widespread, this is a major threat to the data center industry, potentially creating toxic stockpiles since they are, to date, not being handled or recycled in a comprehensive manner.

The process of recycling - as well as sourcing raw materials - for li-ion batteries for both electric vehicles and stationary applications is complex and fraught with complicated and little recognized environmental risks, as is illustrated below.



Source: florrent

Li-ion batteries will always be important assets for modern data center designs. Yet they cannot effectively deliver all of the energy storage services data centers need. The solution? Supercapacitors, a form of energy storage ideally suited to the needs of both data center owner/developers as well as utilities and grid operators. These state-of-the-art buffering devices can be manufactured domestically and can supplement and protect both batteries *and* on-site generation sources being called upon to power up on-site solutions such as microgrids. They should become a cornerstone of a smart speed-to-power solution that also reduces reliance upon China, which today dominates the world's battery and supercapacitor energy storage market.

Li-ion batteries will always be important assets for modern data center designs. Yet they cannot effectively deliver all of the energy storage services data centers need.

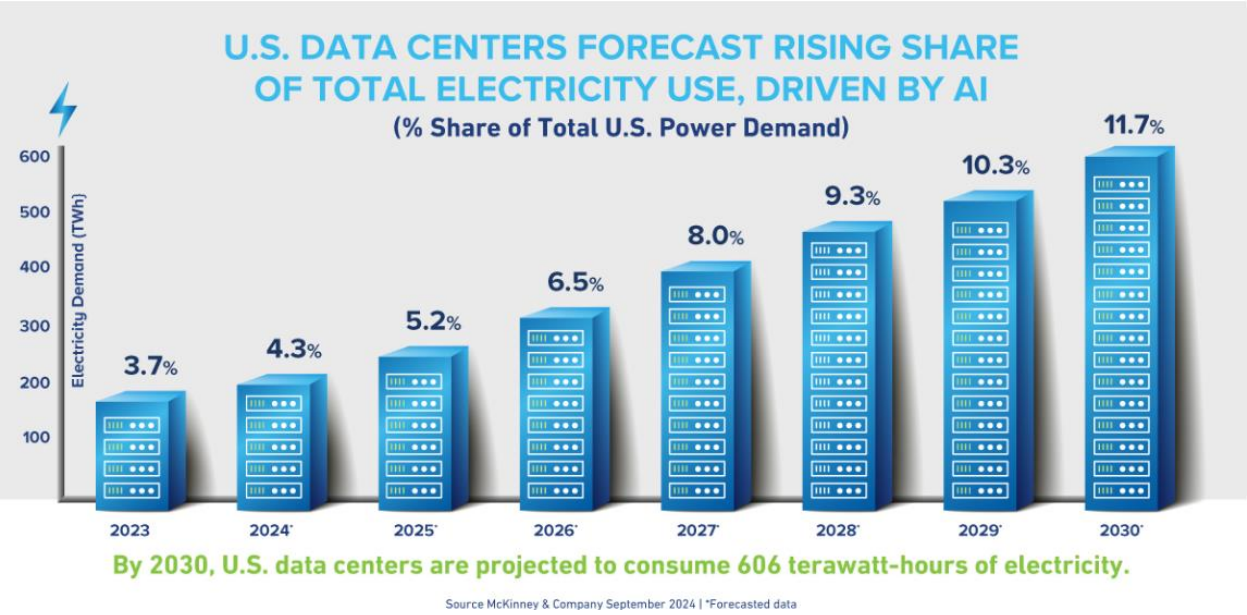
Incorporating supercapacitor technology into data center designs to displace over deployments of li-ion batteries has the potential to supercharge data center performance. In the process, the data center industry can develop smart hybrid systems that can right-size components to reduce costs and environmental impact. To sum up, these are the benefits attached to domestically sourced and manufactured supercapacitor deployments:

- A new variation on "speed-to-power" that can stretch out the same volume of existing li-ion battery deployment capacity to bring additional new data centers on-line faster. How? Extending the life of li-ion batteries ill-suited to mitigating demand spikes offers multiple benefits to developers as well as the environment.
- A way to mitigate geopolitical risk by reducing reliance upon China for li-ion energy storage solutions.
- Increase data center compute revenue by surgical use of supercapacitors to clip regenerative AI power spikes.
- Development of new U.S. manufacturing jobs by tapping both domestic raw materials and manufacturing facilities to create supercapacitors.
- A smarter approach to resilience and uptime that shrinks environmental footprints while also protecting on-site power generation equipment.

THE BIG PICTURE

The global market for battery energy storage systems is robust due, in large part, to the surge in electricity consumption from data centers, the largest of which is a gargantuan 17 gigawatt (GW) proposal for a single site! (For reference, 1 GW could supply up to 750,000 U.S. homes.)

According to the Battery Council International (BCI), energy consumption from data centers deployed just in the U.S. could reach 400 or even 600 terawatt hours (TWh) by 2030 based on an assumed 15% compounded annual growth rate. The corresponding projected battery energy storage system deployments for these data centers supporting growth in AI will grow from $76.7 billion spent in 2025 to $172.2 billion by 2030, according to BCI. Data centers could represent between 11.7% (see chart below) to 17% of total energy consumption in the U.S. by 2030.



One could argue that batteries supplementing traditional resiliency options, such as diesel generators, is a plus for the environment. Yet there is a hidden toll to the current practice of oversizing li-ion batteries for an application the technology is not well-suited. This mismatch between technology and the very precise need of clipping millisecond spikes in electricity demand that occur with AI processing adds unnecessary cost, creates speed-to-power barriers, and could be an environmental mishap in the making.

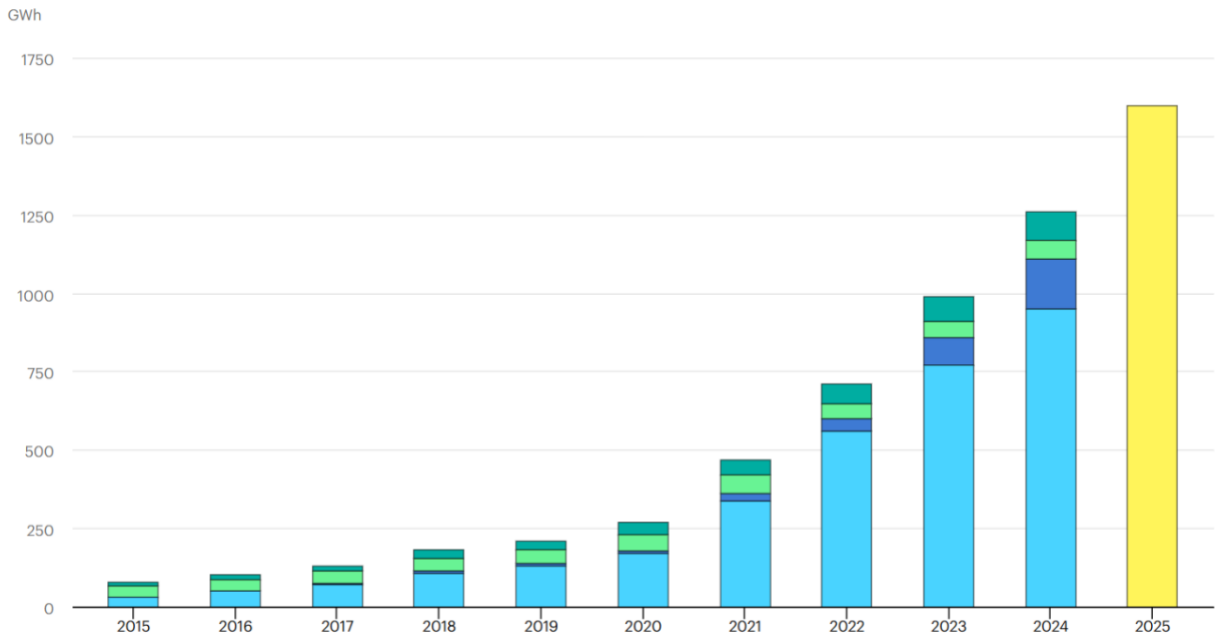
The pressure created by today's U.S. tariff environment could reshape procurement strategies. The uncertainty over tariff conditions - which currently stand at an 82% effective tariff on batteries from China - led to a rush to lock in battery procurements

over the past year. (The tariff on li-ion batteries for stationary applications from China was approximately 11% in 2024.)

A key reason for the shift in focus from renewables to batteries for those seeking decarbonization pathways was that U.S. subsidies included in the Inflation Reduction Act (IRA) for wind and solar required installation by the end of 2027 due to modifications to federal incentives included in the so-called One Big Beautiful Bill Act. These shifts in public policy often spurred conflicting impulses about the best way to accelerate data center deployments. Efforts to tap not yet fully commercialized generation sources, such as small modular reactors, are one example. Fuel cells - which are notoriously fickle when it comes to frequency deviations that data center operations can create - have also gained traction with hyperscalers such as Oracle.

No matter what the generation sources are for a data center, some form of energy storage is required. Forward-looking forecasts speak to the expected growth in li-ion deployments for power grid applications, which include those deployed in data centers.

Li-ion Battery Deployments for Grid Applications, 2015-2025



Source: IEA

How can supercapacitor technology maximize the value of these forecasted trends in li-ion battery deployments? Instead of over deploying li-ion batteries to meet power specifications, a much more efficient and cost-effective strategy would be to strategically install supercapacitors to handle millisecond spikes. This approach would delegate li-ion batteries to the type of services they were designed for: back-up power

needs to cover minute-by-minute disruptions as well as extended outages and renewables smoothing.

Rather than relying upon a generic design for a data center based on the ever-popular li-ion battery chemistry, it would be wise to always include supercapacitors into a data center design and procurement strategy. Diversity in storage solutions is as important as diversity in supply options - perhaps even more so. There are other clear advantages attached to any domestic supercapacitor supplier, which are addressed below.

THE GEOPOLITICAL RISK ATTACHED TO CHINA

The longer lead times now occurring for li-ion battery shipments are also introducing a new challenge to the speed-to-power mantra driving data center development. Yet these delays could, ironically enough, be welcome news for both the economy *and* the environment.

At present, it is estimated that approximately 30 to 40% of lithium reserves are owned by the Chinese government. According to the IEA, China has recently accounted for 44% of international trade of raw materials for battery manufacturing as well as 58% of battery-related materials, packs, and components. By 2035, China is set to supply over 60% of refined lithium and cobalt and around 80% of battery-grade graphite and rare earth elements, all of which are vital components for li-ion batteries.

Data center companies seeking not to abandon their commitment to decarbonization goals are seeking a speed-to-power strategy that also makes economic sense.

As the conflict with Iran has highlighted the geopolitical risk associated with fossil fuels, the overreliance on batteries whose components and manufacturing are based in China presents equally challenging risks. Large companies such as Fluence (which claims to have signed deals representing 30 GWh of battery deployments to date) are seeking to build domestic supply chains for li-ion batteries, citing the 10% federal tax investment credit advantage of going this route. Yet these efforts will take time. They also do not address the core issue of the limitations of li-ion batteries in effectively mitigating momentary but frequent spikes in demand. The AI race is on now, and data center developers are not patient.

China's record when it comes to environmental stewardship on both front-end manufacturing and back-end recycling and waste disposal is less than stellar. Data center companies seeking not to abandon their commitment to decarbonization goals are seeking a speed-to-power strategy that also makes both economic and strategic sense.

What is the smart path forward?

It is clearly prudent for data center developers and owners to diversify their supply chains over the long run. In the near-term, maximizing domestically sourced and manufactured storage options is a priority - as is diversification of energy storage devices. Here is the good news. Unlike other supercapacitors, the florrent technology in particular offers advantages since it relies upon biomass diverted from landfills as raw material. The company then relies upon a patented contoured carbon process that extracts far more activated carbon - the building block for supercapacitor technology - than is the industry standard.

Source: florrent

By relying upon both domestic feedstocks *and* contracting with domestic ISO 9001 certified manufacturers, florrent eliminates emissions attached to long-distance transportation of products from overseas. Since florrent handles all of these processes in the U.S., reductions in carbon and other pollutants attached to final products are indeed meaningful and immense. And the technology is eligible for a 10% federal tax credit due to its domestic content.

CONCLUSION: UNLOCKING RAPID DATA CENTER GROWTH WITH SUPERCAPS

A smart hedging strategy optimizes the capabilities of different forms of energy storage to meet both resiliency and decarbonization goals. A smart path forward would be to integrate supercapacitors manufactured in the U.S. into li-ion battery deployments at data center sites. This approach allows developers to scale up without delay and spread forecasted li-ion investments to a larger number of data center sites.

Supercapacitors whose raw materials are sourced domestically and also manufactured in the U.S. reduce transportation carbon footprints. They also reduce geopolitical risk. Clearly, li-ion technology is a key piece of the puzzle for new data center deployments. But they cannot do the job alone. Sourcing superior supercapacitors to integrate with li-ion batteries solves the most critical energy storage needed today to support speed-to-power planning.

THREE TAKEAWAYS

- China's domination of the clean energy sector has only increased over time.
- Li-ion battery technology cannot provide the full stack of energy storage needs of the data center industry.
- Today's data center dynamics clearly underscore the market value of the florrent supercapacitor technology.

Peter Asmus *is* ***President*** *of* ***Pathfinder Communications*** *and has been covering, informing and shaping energy markets for almost 40 years.*

A journalist, analyst, book author and consultant, he specializes in tracking global trends in microgrids, virtual power plants, data centers and distributed energy resource management systems: www.peterasmus.com.

He is also a ***Senior Advisor*** *to* ***Clarum Advisors*** *(www.clarumadvisors.com).*