

The *Automation Advantage* in Meeting Energy-Storage Demand

JR AUTOMATION®

A Hitachi Group Company



UTILITY DIVE

Custom content for JR Automation by studioid



Energy storage is rapidly evolving from a costly, niche technology into a cornerstone of modern grid infrastructure. The American Clean Power Association and consultancy Wood Mackenzie recently released [a report](#) showing that the U.S. added a record 2 gigawatts of energy storage in the first quarter of 2025, with utility-scale projects increasing nearly 60% from the first quarter of 2024.

+60%

increase in utility-scale projects

The report was not an anomaly. Earlier in the year, the U.S. Energy Information Administration (EIA) [forecast](#) that storage would account for almost 30% of all new utility-scale generating capacity in 2025. The reasons for the rapid ascent of energy storage are many and include its critical role in supporting intermittent renewable energy generation, its ability to serve as a backup source of power for businesses and homes, and the role storage can play in helping meet rapidly growing demand for electricity, especially from energy-thirsty data centers.

Still a *young* industry

While the advance of energy storage has been fast, it's easy to overlook that it is still a relatively nascent industry with ample opportunity to improve and for industry players to differentiate themselves. For instance, utility-scale energy storage today is dominated by systems using lithium-ion chemistries, especially lithium iron phosphate, or LFP. For example, the [EIA reports](#) that the vast majority of utility-scale energy-storage systems deployed in the U.S. are lithium-ion.

Energy storage is rapidly becoming a critical component of the modern energy grid. This white paper explores how automation can address the challenges of scaling production, improving efficiency and ensuring safety in manufacturing.



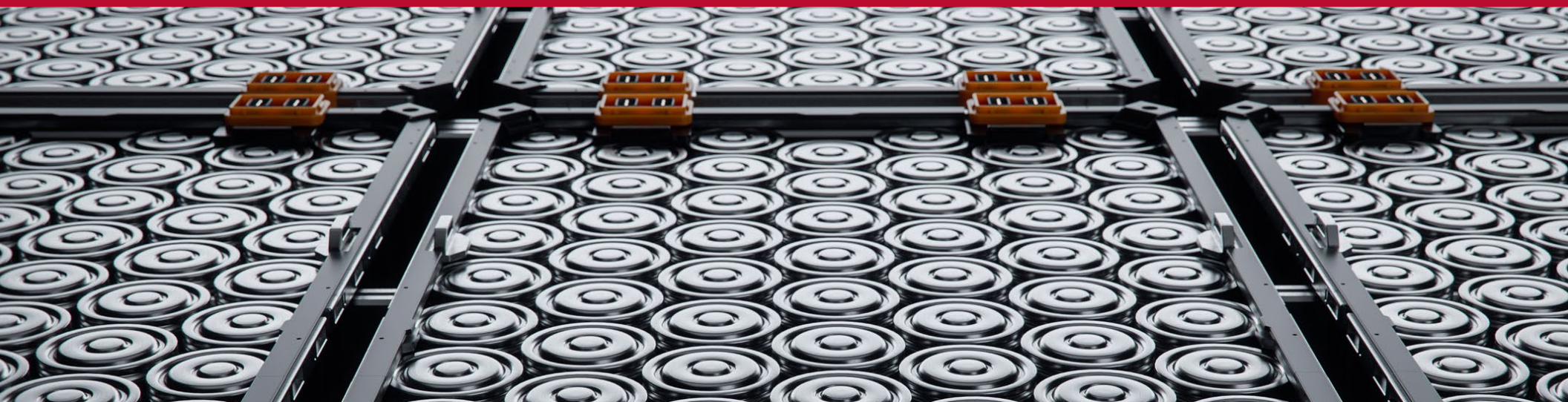


The rise of *new* storage chemistries

Though lithium-ion is likely to continue to dominate over the near term, many startups and established original equipment manufacturers (OEMs) alike continuously push to improve the performance and cost competitiveness of a growing number of battery chemistries, including sodium-ion, flow and thermal batteries. In part, investments support emerging energy-storage chemistries because LFP batteries have shortcomings.

“Being a lithium-based product means that LFP-based systems still require thermal management, cooling systems and safety countermeasures,” said Chip Seabolt, Director of Sales, [Energy Market for JR Automation](#), a Hitachi Group company and global leader in advanced automation technologies. “Grid storage installations tend to be in high-sun load locations, and they must remain cool, which adds operational cost.”

Chinese domination of LFP energy-storage production is also compelling emerging and established manufacturers to pursue new technologies. Indeed, China largely controls the LFP energy-storage supply chain. This includes almost all production capacity for LFP cathode active material, a critical precursor material for LFP batteries, and about 75% of global battery-cell production. “What we’re seeing is a mad scramble to increase domestic LFP cell-manufacturing capacity to meet short-term demand before the alternative battery technologies complete their development and scale production,” Seabolt said.



Accelerating the pathway for *emerging* technologies

Emerging energy-storage chemistries, such as sodium-ion and iron-ion, show potential to avoid some of the thermal challenges associated with lithium-ion batteries and blunt reliance on Chinese suppliers. But the use of the word “emerging” to describe novel energy-storage technologies is not an accident. Significant product development is often still necessary to produce a viable design, let alone a design that can then be manufactured efficiently and at scale.

JR Automation works with both startups and established OEMs as a collaborative partner to do everything from improving a product’s design so that it can be built outside of a lab to enabling scaled-up and automated manufacturing that allows energy-storage companies to meet growing demand.

“Many companies have immature product designs. They have something that works on a bench, and then they realize it can’t be manufactured at scale, or they identify an improvement which must be incorporated. That’s often when we get brought in, because companies have a technology that is proving to be effective, but they have been assembling their prototypes manually. As part of our pre-automation consulting services, we provide input for product design and design for automation.”

Chip Seabolt, Director of Sales, Energy Market for JR Automation



The emergence of *collaborative* partnerships

Collaboration that enhances design and enables automation is essential regardless of the energy-storage chemistry being produced. In the case of startup companies that have enjoyed initial success designing an energy-storage solution in a controlled environment, guidance around design for automation can accelerate the journey from prototype to scaled production.

Strategically timed partnerships can provide more value. Indeed, Seabolt said that JR Automation was cautious to avoid work with emerging manufacturers too early in their product development, when designs are still in flux and prototyping costs are high. Instead, startups with product designs 75% to 80% complete can benefit from automation insights while still retaining flexibility for design changes.

“Once a design is 75% to 80% complete, we assess the design for manufacturability, identifying what assembly steps are candidates for automation and what design changes may be required.”

Chip Seabolt, Director of Sales, Energy Market for JR Automation

Benefits for established manufacturers

Partnership with JR Automation can improve efficiency, quality and safety of production for both emerging manufacturers and established OEMs. For example, automation helps OEMs with already mature designs — including for LFP — ramp up production to meet surging demand.

One way to reach production scale that meets demand is by improving throughput efficiency. Manual assembly lines slow down — and add costs — during labor-intensive steps such as module integration or thermal-management installation.

By contrast, automation can streamline the entire manufacturing process, from the sorting of cells to module assembly and integration to final preparation before shipping.

Throughput optimization involves identifying potential bottlenecks and the best material flow for individual manufacturers with the use of digital models. These models forecast efficiency and performance before a manufacturing line is built — allowing for time- and cost-saving adjustments to be made in advance.





A step-by-step implementation and consistent *quality*

Flexible and modular manufacturing lines that increase automation over time can also bolster efficiency. Seabolt said automation could be implemented gradually, starting with core processes and expanding as budgets allow.

“We start with a mix of automated and semiautomated process steps,” Seabolt said. “The operator is able to perform a task until volumes are such that they can’t meet throughput.”

Automation can also improve product quality. With systems expected to operate reliably for decades in harsh environments, defects can lead to costly failures, safety risks or performance shortfalls. Manual processes introduce variability — human error in welding, alignment or testing — that automation minimizes through precision robotics and advanced inspection. For example, JR Automation offers industry-leading inspection, including artificial intelligence (AI) solutions able to detect product anomalies in real time. Additionally, JR Automation provides end-to-end digital tracking empowering traceability that can be invaluable in the event of recalls or compliance requests.

Enhanced safety

Energy-storage manufacturing poses significant safety risks because it involves handling heavy battery packs and volatile chemistries. Accidents involving lithium-ion and other energy-storage chemistries can result in fires and injuries. Suitable site infrastructure and material handling mitigate risks. For instance, overhead cranes and high-ceilinged bays allow for the safe handling of packs weighing more than 1,000 kilograms.

Crash carts equipped with necessary tools allow trained factory staff to quickly respond to thermal runaway before it can spread to other cells, modules or equipment.

These safety protocols are standardized regardless of a factory's location. "All JR Automation divisions use an ISO-certified project-execution process which ensures consistent, timely and safe project execution," Seabolt said.





Real-world *automation*

JR Automation recently worked with a startup manufacturer of mobile energy-storage products. The company needed to optimize product design to enable manufacturability, upgrade its automated assembly line to improve reliability and achieve a throughput of 36.98 seconds per module. JR Automation's team collaborated closely with the manufacturer, identifying design changes that improved assembly.

JR Automation also collaborated with the customer to rethink its use of automation technologies. The results of the collaboration: Both the product and line were designed in ways that allowed for the storage solution to be manufactured with the benefit of automation and still fit in the site's original footprint. The partnership also allowed the customer to meet its cycle-time goal.



Supporting energy-storage *growth*

As energy-storage technologies continue to evolve and deployment scales rapidly, automation can play a role in bridging the gap between promising designs and mass production.

The sector's future hinges on manufacturing systems that can adapt quickly to new chemistries, higher volumes, and ever-higher quality and safety standards. Seabolt said he believed America had a unique opportunity in energy storage — one that can be seized with strategic, mutually beneficial partnerships.

“The U.S. has an aging power grid. At the same time, investments in AI data centers and computing capacity, renewable sources of energy, and alternative battery chemistries are accelerating. We need expertise and collaboration to reach the scale that will deliver benefits.”

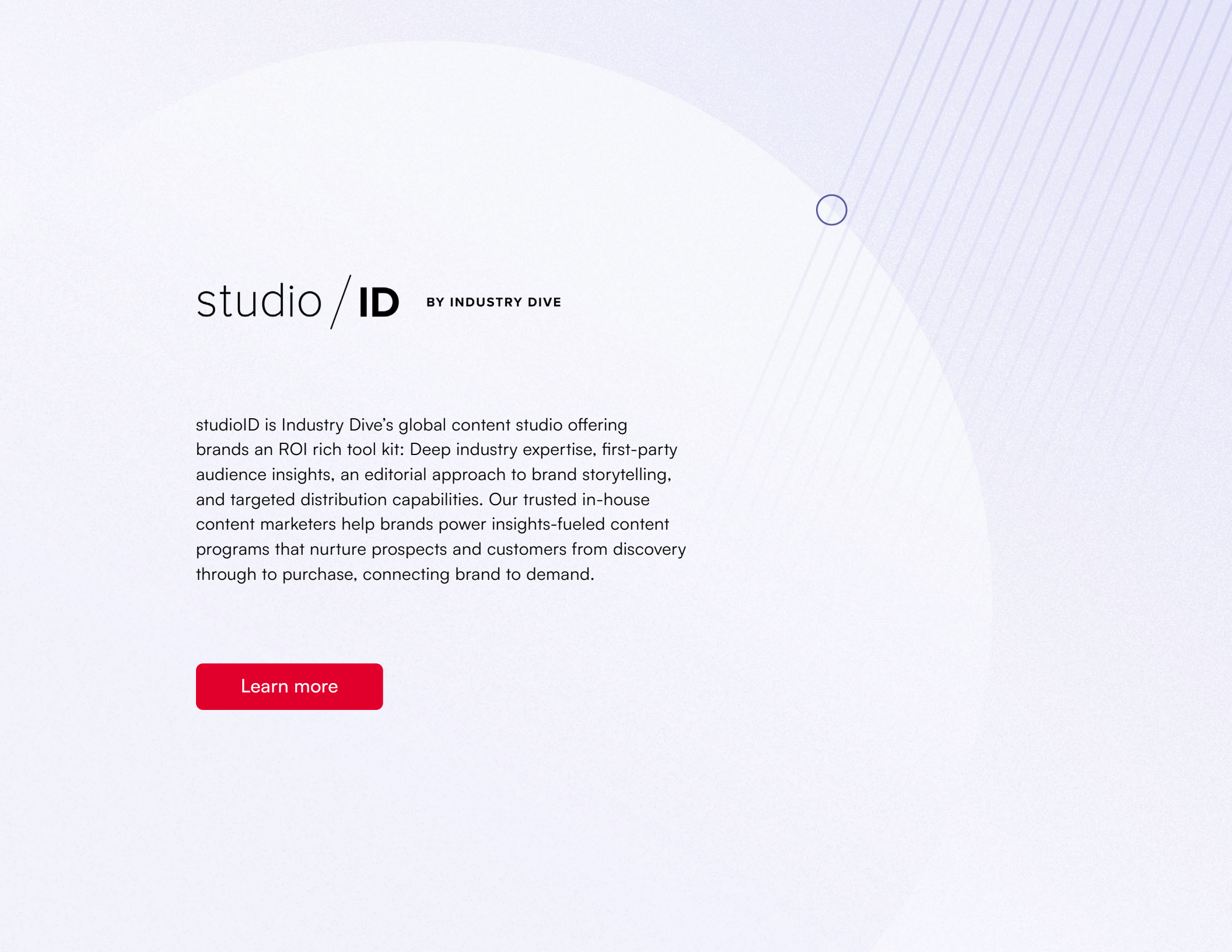
Chip Seabolt, Director of Sales, Energy Market for JR Automation

JR AUTOMATION[®]

A Hitachi Group Company

At JR Automation, we accelerate what's possible by delivering intelligent, connected manufacturing solutions that adapt, evolve, and scale with the speed of business. With over 45 years of proven experience, we're passionate about solving complex manufacturing challenges and driving innovation across industries. Our solutions are designed to deliver measurable results today while preparing our customers for what's next. As a proud member of the Hitachi Group of Companies, our global team of 2,000+ professionals serves customers from 21 state-of-the-art facilities across North America, Europe, and Asia. Discover how we're shaping the future of smart manufacturing at jrautomation.com.

[LEARN MORE](#)



studio / **ID** BY INDUSTRY DIVE

studioID is Industry Dive's global content studio offering brands an ROI rich tool kit: Deep industry expertise, first-party audience insights, an editorial approach to brand storytelling, and targeted distribution capabilities. Our trusted in-house content marketers help brands power insights-fueled content programs that nurture prospects and customers from discovery through to purchase, connecting brand to demand.

[Learn more](#)